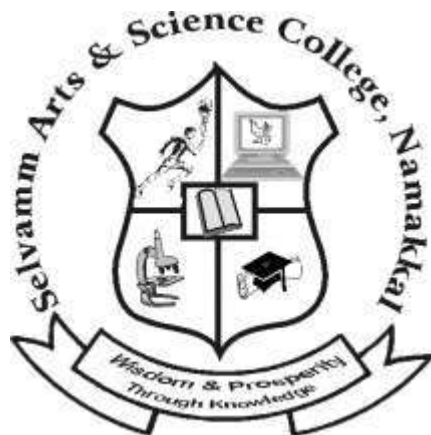


# **Selvamm Arts & Science College (Autonomous)**

Nationally Grade by NAAC  
UGC Recognized 2(f) and 12(B) Institution  
Affiliated to Periyar University, Salem  
NAMAKKAL



## **Department of Biotechnology**

### **M.Sc Biotechnology**

CHOICE BASED CREDIT SYSTEM

SEMESTER PATTERN

**FROM 2021-2022 Onwards**

## **Regulations**

### **1. Conditions for Admission:**

A candidate who has passed B.Sc. Degree examination in any branch of Life Sciences/ Biological Sciences, B.V.Sc., B.Sc. (Agri), B.Pharm, BDS, BPT, B.Sc. (Nutrition), Bachelor's degree in Indian Medicine and MBBS of the University or an examination of some other University accepted by the admission committee and academic council of the college as equivalent there to, shall be permitted to undergo the programme and to appear and qualify for the M.Sc. Biotechnology programme.

### **2. Eligibility for the award of Degree:**

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed programme of study in the college for a period of not less than two academic years, passed the examination of all the four semesters prescribed earning 100 credits.

### **3. Duration of the programme:**

The duration of the M.Sc. Biotechnology programme is for two academic years consisting of four semesters.

### **4. Examination:**

There shall be four semester examinations, the odd semester examination at the middle of the first academic year (October- November) and the even semester examination at the end of the first academic year (April- May) respectively.

For this programme there is both formative (Continuous Internal Assessment (CIA)) and summative (End of Semester) examinations with the weight ages in the ratio of 25:75 for theory and 40:60 for practical's.

### **The following components to be followed for Continuous Internal Assessment (CIA):**

#### **Theory:**

S.No	Test Components	Marks
1	Five Snap test / Assignment	5
2	CIA test I	5
3	CIA test II	5
4	Model Examinations	5
5	Class Seminar / Attendance	5
<b>Total</b>		<b>25</b>

**Practical:**

S.No	Test Components	Marks
1	Observation	15
2	Attendance	05
3	Record	10
4	Model Exam	10
<b>Total</b>		<b>40</b>

**Project:** Project will be based upon research and actual bench work. It will begin from III<sup>rd</sup> semester and will continue through the IV<sup>th</sup> semester. Project report will be submitted at the end of IV<sup>th</sup> semester and evaluated.

**Student Seminar:** Each student under the supervision of a faculty member will deliver a comprehensive seminar, which will be evaluated. The topic normally will be from an emerging area of Modern Biology, Biomedical, Biotechnology or its applications.

**Laboratory I, II, III, IV:** Independent practical's may be held under each course. However, for examination purposes model practicals are held for each semester, covering different courses offered during that semester. Invited lectures from Eminent Researchers, Industrialists and others, on recent issues related to biological sectors, Biodiversity, Ethics, Biosafety, Intellectual Property Rights and Patent Issues and Good laboratory and manufacturing practices will be organized.

**5. Requirements for proceeding to subsequent semester:**

Candidates shall register their name for the first semester Examination after the admission in the M.Sc. Biotechnology programme. Candidates shall be permitted to proceed from the first semester up to final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subject.

Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed by the department from time to time.

Provided in case of candidate earning less than 64% of attendance in any one of the semester such candidate shall have to repeat the programme by rejoining in to the respective semester, after paying the prescribed tuition by the college from time to time.

## 6. Passing minimum:

Theory Maximum = 100 Marks				Passing Minimum			
CIA	=	25	Marks	CIA	(50%)	-	13 Marks
ESE	=	75	Marks	ESE	(50%)	-	38 Marks
<b>CIA= 25 Marks</b>				<b>ESE= 75 Marks</b>			
CIA Test-I	:	05	Marks	Section A	10x2	=	20 Marks
CIA Test-II	:	05	Marks	Section B	5x 5	=	25 Marks
Model Exam	:	05	Marks	Section C	3x10	=	30 Marks
Seminar	:	05	Marks	-	-	-	-
Assignment	:	05	Marks	-	-	-	-
Total	:	25	Marks	Total		=	75 Marks
Practical Maximum = 100 Marks				Passing Minimum			
CIA = 40 Marks				CIA	(50%)	-	20 Marks
ESE = 60 Marks				ESE	(50%)	-	30 Marks
<b>CIA = 40 Marks</b>				<b>ESE = 60 Marks</b>			
Observation Note	=	15	Marks	Practical	= 50	Marks	
Attendance	=	05	Marks	Record	= 10	Marks	
Model Exam	=	10	Marks				
Record	=	10	Marks				
Total	=	40	Marks	Total	= 60	Marks	

The Candidate shall be declared to have passed the examination if the candidate secures not less than 38 marks out of 75 marks in the Semester examination in each theory paper. For the practical paper a minimum of 30 marks out of 60 marks in the Semester examination and the record note book taken together is required to pass the examination. There is no passing minimum for record note book however submission of record note book is a must.

Project:

Dissertation = 150 Marks, Viva Voce = 50 Marks Total = 200 Marks

## 7. Evaluation:

# Question Paper Pattern

**Time: 3 Hours**

**Max Marks: 75**

## **Section – A** (10x 1 = 10)

(Answer all the questions)

(Two questions from each unit)

## **Section – B** (5 x 5 = 25)

(Answer all the questions)

(One set of question from each unit with either or type)

## **Section – C** (5x 8 = 40)

(Answer all the questions)

(One set of question from each unit with either or type)

### **8. Extension Activities:**

PG Students of Biotechnology should attend Extension Activities in their respective adopted villages during the period of II and III semester of their studies. Period of Extension Activities minimum 40 hours.

The following activities should be undertaken:

- 1.Tree Plantation,
- 2.Conducting different awareness programmes.
- 3.Adult Education,
- 4.Clean Green' programmes, etc...

### **7. Classification of successful candidates**

Candidates who secured not less than 60% of aggregate marks (Internal+External) in the whole examination shall be declared to have passed the examination in the first class. All other successful candidates shall be declared to

have passed in second class. Candidates who obtained 75% of the mark in aggregate (Internal+External) shall be deemed to have passed the examination in first class with distinction, provided they pass all the examination (theory, practical's ,project and viva-voce) prescribed for the programme in the first appearance. Candidates who pass all the examinations prescribed for the programme in the first appearance itself alone are eligible for ranking/distinction.

### **8. Ranking:**

Candidates who pass all the examinations prescribed for the programme in the first appearance itself alone are eligible for Ranking/Distinction.

Provided in the case of candidates who pass all the examinations prescribed for the programme with a break in the First Appearance due to the reasons as furnished in the regulation under "Requirements for Proceeding to subsequent semester" are only eligible for classification.

### **9. Appearance for improvement:**

Candidates who have passed in a theory paper/ papers are allowed to appear again for theory paper/ papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such candidates are allowed to improve within a maximum period of 10 semesters counting from his/her first semester of his/her admission. If candidate improve his marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes/Medals, Rank and Distinction. If the candidate does not show improvement in the marks, his previous marks will be taken in to consideration.

No candidate will be allowed to improve marks in the Practical's, Project and Viva-voce.

## 10. Board of Studies

<b>Department of Biotechnology</b>	
<b>Principal</b>	: <b>Dr. N. Rajavel</b> Selvamm Arts and Science College, Namakkal
<b>Board Chairman</b>	: <b>Ms. M. Anitha</b> Assistant Professor and Head, Department of Biotechnology, Selvamm Arts and Science College , Namakkal.
<b>University Nominee</b>	: <b>Dr. N. Elangovan</b> Department of Biotechnology, Periyar University, Salem.
<b>Other University Nominee</b>	: <b>Dr.S.Sivaramakrishnan</b> Head & Associate Professor, Department of Biotechnology and Genetic Engineering Bharathidasan University, Trichy.
<b>Board Members</b>	: <b>Ms.M.Anitha</b> M.Sc.,M.Phil.,B.Ed.,, <b>Mr.A.Mohan</b> M.Sc., <b>Dr.K.Varutharaju</b> M.Sc., M.Phil., PhD <b>Mrs. P.Priyanka</b> M.Sc., <b>Dr. A.Karthick Kumar</b> M.Sc., PhD.

## Programme Outcomes (PG)

<b>PO1</b>	Application: Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems
<b>PO2</b>	Analysis: Perform analysis to assess, interpret, and create innovative ideas through practical experiment.
<b>PO3</b>	Solution Finding: Facilitate to enter multidisciplinary path to solve day- to- day problems.
<b>PO4</b>	Progression in Career: Prepare students for prominent career in industry, banks offices and for further academic study.
<b>PO5</b>	Research Capability: Able to do the experiments with proper procedure, appropriately record and Analyze the results.
<b>PO6</b>	Expressing their talents: Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources
<b>PO7</b>	Individual sustainability: Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
<b>PO8</b>	Competency: Attain competency in job market / entrepreneurship



### Programme Specific Outcomes (PSO):

<b>PSO</b>	<b>Upon completion of M.Sc. Degree Programme , the graduates will be able to:</b>
<b>PSO1</b>	Introduce endocrine glands, enzyme secreted by Hormones and its functions and the role in molecular level, characterization of enzymes and its types To have successful career as professional or a researcher through lifelong learning in the field of biotechnology.
<b>PSO2</b>	Apply the fundamental organization of life and how is deteriorating their normal role at molecular level and know about cell signaling and cell-cell communication
<b>PSO3</b>	Study about pharmacokinetics and dynamics learn something the commercial products from marine bioactive compounds. Demonstrate the application of biotechnological processes of industrial biochemical processes that are of social and industrial importance.
<b>PSO4</b>	Introduce the biodiversity of the Plant, Animal and microbes and understand the Principles of Plant and Animal Taxonomy
<b>PSO5</b>	Exhibit skills of handling microbial processes, biochemical analysis by making use of state of the art instruments. Cure the genetically disorder with help of gene therapy and r DNA technology
<b>PSO6</b>	Perform immunodiffusion and immuno electrophoresis. Apply research based knowledge and biotechnological methods to investigate complex biological problems
<b>PSO7</b>	Assess personal, product and environmental safety, health, intellectual property rights, Ethical and social Responsibilities related to modern biotechnological research and development
<b>PSO8</b>	Bioinformatics tools play on crucial role in initial drug development, Evaluate the mechanism of Drug action. Apply the tissue metabolism in human being
<b>PSO9</b>	Isolate, purify and characterize biological samples using sophisticated analytical experimental techniques and understand the Intellectual property rights.
<b>PSO10</b>	Exhibit strong, independent learning, analytical and problem solving skills with special emphasis on design, communication, and an ability to work in teams

## M.Sc – Biotechnology - 2021-2022 Total Number of Credits : 100

Sem	Category	Code	Course	Hrs	Credits	Marks		
						CIA	EA	Total
I	Core Course -I	21P1BT01	Cell and Molecular Biology	5	5	25	75	100
	Core Course -II	21P1BT02	Biochemistry and Enzymology	5	5	25	75	100
	Core Course -III	21P1BT03	Marine and Pharmaceutical Biotechnology	5	5	25	75	100
	Core Practical-I	21P1BTP01	Lab in Cell and Molecular Biology	5	3	40	60	100
	Core Practical-II	21P1BTP02	Lab in Biochemistry and Enzymology	5	3	40	60	100
	Core Elective- I	21P1BTE01	Taxonomy and Biodiversity	5	4	25	75	100
21P1BTE05		Food and Agricultural Biotechnology						
<b>Total</b>				<b>30</b>	<b>25</b>	<b>-</b>	<b>-</b>	<b>600</b>
II	Core Course -IV	21P2BT04	Microbiology and Immunology	5	5	25	75	100
	Core Course -V	21P2BT05	Genetic Engineering	5	5	25	75	100
	Core Practical-III	21P2BTP03	Lab in Microbiology and Immunology	5	3	40	60	100
	Core Practical-IV	21P2BTP04	Lab in Genetic Engineering	5	3	40	60	100
	Core Elective -II	21P2BTE02	Bioinstrumentation and Research Methodology	4	4	25	75	100
		21P1BTE06	Genomics and Proteomics					
	EDC	21P2xxxxxx	Extra Disciplinary course	4	4	25	75	100
	21P2HR01	Human Rights	2	2	40	60	100	
<b>Total</b>				<b>30</b>	<b>26</b>	<b>-</b>	<b>-</b>	<b>700</b>
III	Core Course -VI	21P3BT06	Plant and Animal Biotechnology	5	5	25	75	100
	Core Course -VII	21P3BT07	Industrial and Fermentation Technology	5	5	25	75	100
	Core Course -VIII	21P3BT08	Medical and Herbal Biotechnology	5	5	25	75	100
	Core Practical- V	21P3BTP05	Lab in Plant and Animal Biotechnology	5	3	40	60	100
	Core Practical -VI	21P3BTP06	Lab in Industrial and Fermentation Technology	5	3	40	60	100
	Core Elective -III	21P3BTE03	Tissue Engineering and Stem Cell Biology	4	4	25	75	100
		21P1BTE07	Plant and Animal physiology					
		21P3BTI01	Internship	*	#	-	-	-
		21P3SSS01	Soft Skills	2	1	25	75	100
<b>Total</b>				<b>30</b>	<b>26</b>			<b>700</b>
IV	Core Course - IX	21P4BT09	Environmental and Nano-Biotechnology	6	5	25	75	100
	Core Course -X	21P4BT10	Drug Discovery and Development	6	5	25	75	100
	Core Elective -IV	21P4BTE04	Bioinformatics, IPR, Bioethics & Biosafety	6	5	25	75	100
		21P1BTE08	Bio-Entrepreneurship					
		21P4BT01	Project / Viva-voce	12	7	50	150	200
		21P4EX01	Extension Activities (II&III Sem)	(40)* *	1	-	-	-
	<b>Total</b>				<b>30</b>	<b>23</b>		
<b>Overall Total</b>				<b>120</b>	<b>100</b>			<b>2500</b>

\*- 15 Days – II Semester Leave

# - Commended/Highly Commended will be given, based on Reports & Viva Voce Examination.

\*\*-. Outside the Class Hours.

Xxxxxx-Corresponding Department ED Course Code

**Core Elective Courses: Choose any one course in each semester**

<b>Course Core Elective</b>	<b>Course Code</b>	<b>Title of the Course</b>
Core Elective - I	21P1BTE01	Taxonomy and Biodiversity
	21P1BTE05	Food and Agricultural Biotechnology
Core Elective - II	21P2BTE02	Bioinstrumentation and Research Methodology
	21P1BTE06	Genomics and Proteomics
Core Elective - III	21P3BTE03	Tissue Engineering and Stem Cell Biology
	21P1BTE07	Plant and Animal physiology
Core Elective - IV	21P4BTE04	Bioinformatics, IPR, Bioethics & Biosafety
	21P1BTE08	Bio-Entrepreneurship

**EDC**

<b>The following EDC offered to other departments</b>		
<b>Semester</b>	<b>Course Code</b>	<b>Title of the Course</b>
II	<b>21P2BTED01</b>	<b>Mushroom Cultivation and Its Marketing</b>
	<b>21P2BTED02</b>	<b>Microbial Biotechnology</b>

<b>Core: I - Cell and Molecular Biology</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BT01</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. To understand of the basics of cell and molecular biology such as cell organelles, cell cycle, cell signals, central dogma of cell and its molecular mechanism.	
2. To develop comprehensive understanding on the complete cellular and molecular function of cell organelles in terms of cell to cell interaction, gene regulation, cellular signalling .	
3. To impart the molecular biology knowledge in applications of various human health care	
4. To familiarize the student in various aspects of cell and molecular biology streams including cellular organization and their interactions in DNA replication, and protein biosynthesis and translational regulation.	
5. Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the underlying cellular function. □	
<b>UNIT- I - Architecture of cell</b>	
The dynamic cell - the molecules of life Biomembranes and sub cellular organization of eukaryotic cells - microscopy and cell architecture - purification of cells and their parts, organelles of prokaryotic and eukaryotic cell.	
<b>UNIT- II - Biomembranes and cell organelles</b>	
Membrane structure and function: structure of models membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, electrical properties of membranes. Structural organization and function of intercellular organelles: nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, cell wall, paroxysms, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.	
<b>UNIT - III - Molecular Structure of Nucleus and chromosome</b>	
Nucleus (structure including ultra structure and functions) - chromosome structure and types - Programmed Cell Death (PCD), DNA - Denaturation and renaturation, Circular and spherical DNA - Gene amplification - PCR, DNA finger printing - DNA replication - polymerases, primers and mechanism - molecular methods of DNA replication.	
<b>UNIT- IV - Central Dogma of Prokaryotes and Eukaryotes</b>	
Translation-Prokaryotic and eukaryotic, translation machinery. Regulation of gene expression: Operon concept (Lac Operon, trp Operon, his Operon and arabinose Operon). Structural basis of DNA-Protein interaction. Attenuation & termination. Gene silencing: DNA methylation, Chromatin modification and gene expression. Histone acetylation and deacetylation. Environmental regulation of gene expression.	

**UNIT – V - Cell communication and Cancer biology**

Cell signaling - communication between the cells and their environment. Types of cell signaling, strategies of chemical signaling, surface receptor mediated transduction (DAG, Ca<sup>2+</sup>, c-AMP, G-Proteins). Cancer: genetic rearrangement of progenitor cells, oncogenes, tumor suppressor genes, cancer-cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

**Text Books:**

1. Verma, P.S. and Agarwal, V.K. "Cell Biology". S. Chand, Publication. 2008.
2. Arumugam N, "Cell Biology", Saras Publication, 2014.
3. Arumugam N, R P Meyyan, "Cell Biology and Molecular Biology", Saras Publication, 2014.
4. David Frifielder Cell and molecular biology.

**Reference Books:**

1. Sambrook, J. E. F. Rritsch and I. Maniatis, Molecular cloning: A Laboratory Manual, Cold Spring Hratbor Laboratory Press, New York, 2000.
2. Dabre, P.D. Introduction to Practical Molecular Biology, John Wiley and Son Ltd. New York, 1988.
3. Watson. J. D. N. H. Hopkins, J. W. Roberts, J. A. Steitz and A. M. Weiner. Molecular Biology of gene (4th Edition), The Benjamin/Cummings publications C Inc. California, 1987.
4. Darnell J. H. Lodish and D. Baltimore, Molecular Cell Biology, 2ND Edition, Scientific American Book, USA, 1994.
5. Aberts, B. D. Bray, J. Lewis, M. Raff, K. Roberts and J. D. Watson Molecular Biology of the Cell (2ND Editiion), Garland Publishing, Inc. New York, 1994.
6. Benjamin Lewin, Gene VII. Oxford University Press. U.K.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understand and apply the principles and techniques of molecular biology which prepares students for advance learning and/or employment in teaching, fundamental research, or the health professions.	<b>K2 and K3</b>
<b>CO-2</b>	Demonstrate a knowledge base in cell and molecular biology, anatomy and physiology and biomedical sciences.	<b>K2</b>
<b>CO-3</b>	Highly developed laboratory practices in cell and molecular biology will provide them chose their techniques in molecular biology research and further will help them to get job opportunities.	<b>K4</b>
<b>CO-4</b>	Conduct sovereign work in a laboratory with basis of cell biology	<b>K1</b>
<b>CO-5</b>	The theoretical knowledge gained from this paper will help the student to apply these concepts in their future research	<b>K5 &amp; K6</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**–Create

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	S	M	S	S	M	S	M	M	M
<b>CO-2</b>	S	S	S	M	S	S	M	M	S	S
<b>CO-3</b>	S	M	S	M	M	M	S	S	S	S
<b>CO-4</b>	M	M	M	M	M	S	S	S	M	M
<b>CO-5</b>	S	S	S	S	S	S	S	M	M	M

**S**-Strong; **M**-Medium.

<b>Core: II - Biochemistry and Enzymology</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BT02</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. Get an overall understanding of the structure and functions of biomolecules, enzyme	
2. Understand the principles of biochemical pathways which regulate the cellular mechanisms.	
3. Acquire the knowledge on the role of biomolecules on general dogma of all living cell	
4. Understand biochemistry at the atomic level, draw molecules and reaction mechanisms perfectly.	
5. Understand in detail about amino acid structures, types of amino acids, classifications, structure of proteins and types of proteins.	
<b>UNIT- I</b>	
Principles of thermodynamics- First and second laws of Thermodynamics. Free energy – Concepts of metabolism: Sugars-Classification and reactions, polysaccharides-types, structural features, methods for compositional analysis. EMP pathway, TCA cycle. Lipids-Classification, structure and functions. Beta oxidation of fatty acids cholesterol biosynthesis	
<b>UNIT- II</b>	
Aminoacids -Classification, chemical reactions. Proteins-Classification, hierarchy in structure, Protein sequencing, Glyco and Lipoproteins- Structure and function. Biosynthesis of purines and pyrimidines, de Novo and salvage pathway. Secondary metabolites in living systems: Alkaloids, Steroids and Flavonoids.	
<b>UNIT - III</b>	
Hormones: Definition, Classification of hormones. Biological functions and disorders of pancreatic hormone (Insulin), thyroid hormone (Thyroxin), Hypothalamus and pituitary hormone (GH,TSH,GTH,ADH) and Adrenal gland (Adrenaline, Nor adrenaline).	
<b>UNIT- IV</b>	
Enzyme Kinetics- Steady state theory , MM Equation, LB Plot, EadieHostsee Plot , Hanes Plot, Enzyme catalysis and Mechanism of Enzyme catalysis, Serine proteases(Carboxypeptidases, Chymotrypsin) and Lysozyme. Mechanism of Bi Substrate reaction. Metalloenzymes and Metal Activated Enzymes. Co enzymes – Structure and functions.	
<b>UNIT - V</b>	
Enzyme Regulation: Mechanism, Feed forward stimulation, Feedback inhibition- Allosteric Enzymes, Sigmoidal Kinetics and their Significance, Hill's Equation, Scachard Plot and their application. Reversible and irreversible inhibition- types, Kinetics, Determination of Inhibitor constant.	

**Text Books:**

1. Narayanan LM, Meyyan RP, Nallasingam K, Prasanna Kumar S, Arumugam N and Dulisy Fatima, "Biochemiatry", 2014.
2. RaghunathNarverkar, "Handbooks of Biochemistry", 2008.
3. Trevor Palmer, "Enzymes: Biochemistry, Biotechnologyand Clinica Chemistry", Horwood Publisher, 2001.
4. Biochemistry (9thEdition) –Berg JM, Tymoczko JL and Stryer L (2019). WH Freeman and Company, NY.

**Reference Books:**

1. Lehninger. A.L., D.L. Nelson and M.M. Cox, "Principles of Biochemistry". Worth Publishers, New York. 1993
2. Stryer.L. "Biochemistry". 5th edition. W.H. Freeman and company. 2001.
3. Zubay.G. "Biochemistry". Macmillan Publishing Co, New York. 1998.

**Course Outcomes:**

CO. No.	Upon completion of this course, students will be able to	Knowledge level
<b>CO-1</b>	Recognize the structures and functions of biomolecules such as carbohydrate that form the basis of what we understand to be living organisms.	<b>K2</b>
<b>CO-2</b>	Get information pertaining to role of enzymes, co-enzyme and cofactor in catalytic reaction as a properties of biochemical pathways regulation	<b>K4</b>
<b>CO-3</b>	Acquire knowledge base of metabolic pathways occurring inside living cells in respect to lipids and fat.	<b>K3</b>
<b>CO-4</b>	Understand in detail the structure and physico chemical properties of carbohydrates from monosaccharide to polysaccharides.	<b>K2</b>
<b>CO-5</b>	Understand the etiology of the disorders associated with the carbohydrate, aminoacid, lipid and nucleic acid metabolism.□	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** -Create

**Mapping with Programme Specific Outcomes:**

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO-1</b>	S	S	M	S	S	S	M	M	M	M
<b>CO-2</b>	S	S	M	M	S	M	S	S	S	M
<b>CO-3</b>	S	M	M	M	S	S	M	S	S	M
<b>CO-4</b>	M	M	M	M	M	M	M	M	M	M
<b>CO-5</b>	M	S	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium.



<b>Core: III- Marine and Pharmaceutical Biotechnology</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BT03</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. To provide knowledge about marine micro and macro organisms and its medically important products.	
2. To provide an overview about identifying drug targets and strategies to develop drugs.	
3. To learn about basic and essential qualities of a candidate drug and testing methods.	
4. To understand the prerequisites of obtaining drug approval, important aspects of Commercialization.	
5. To understand the medicinal and pharmaceutical importance of inorganic compounds.	
<b>UNIT- I - Introduction to marine biotechnology</b>	
Introduction to marine biotechnology. Types of marine ecosystem, Marine plant- phytoplankton, zooplankton and its relationship, sea grasses, mangroves and marine fungi. Marine animal resources. Marine microorganisms and their utilization.	
<b>UNIT- II - Marine products</b>	
Bioactive compounds from marine resources. Marine natural products and their commercial production. Marine microalgal biotechnology	
<b>UNIT - III - Introduction to Pharmaceutical biotechnology.</b>	
Introduction to Pharmaceutical biotechnology, Introduction to pharmacokinetic concepts, biological /research advances and approved biological for pharmaceutical uses and introduction to pharmacogenomics.	
<b>UNIT- IV - Therapeutics enzymes and Antibiotics</b>	
Enzymes in therapeutics, clinical analysis and Pharma Industry. Screening of antibiotics procedures, inoculums and medium for commercial production of penicillin and cephalosporin, fermentation process, isolation and purification.	
<b>UNIT – V - Pharmacokinetics and Pharmacodynamics</b>	
Pharmacokinetics and Pharmacodynamics - Peptide and protein drugs. Elimination of protein Therapeutics and Distribution of therapeutics, Protein binding of proteins therapeutics, Heterogeneity of protein therapeutics. Chemical modification of protein therapeutics and immunogenicity.	

### **Text Books**

1. Sambamurthy K, AshutoshKar, Pharmaceutical Biotechnology, New Age International Pvt Ltd Publishers, 2006.
2. Arumugam N, “Cell Biology”, Saras Publication, 2014.
3. ChandrakantKokate, Pramod H.J, SS Jalalpure, Textbooks of Pharmaceutical Biotechnology [Kindle Edition], Elsevier; First edition, 2011.
4. David H. Attaway, Oskar R. Zaborsky, Pharmaceutical and Bioactive Natural Products (Marine Biotechnology) 3rd Edition. 1993.

**Reference Books:**

1. Daniel Figeys (Ed.) Industrial proteomics: Applications for Biotechnology and Pharmaceuticals. Wiley and Sons, 2005.
2. Kayser, O. R.H. Muller.. Pharmaceutical Biotechnology Drug Discovery and clinical applications. Wiley - VCH. 2004.
3. HeonrichKlefenz. Industrial Pharmaceutical Biotechnology. 2002.
4. Garywalsh. Biopharmaceutical, biochemistry and biotechnology. 2003.
5. Thomas Lengauer, Bioinformatics – from Genomes to drugs. Vol.I and II. Wiley - VCH. 2002.
6. Benjamin Lewin, Gene VII. Oxford University Press. U.K.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Obtain knowledge regarding natural sources of drugs, communication of drugs with different types of biological molecules to mediate physiological effects, metabolism and removal of drugs from the system.	<b>K3</b>
<b>CO-2</b>	Understanding the advantages and pitfalls of these systems will support them during analysis and decision making during practical application.	<b>K2 and K5</b>
<b>CO-3</b>	Understanding of the fundamentals of Marine resources and learn about the commercial products from marine bioactive compounds	<b>K2</b>
<b>CO-4</b>	Obtain comprehensive knowledge about vital facets of clinical testing in obtaining approval for new drugs. Improve their prudent skills to be employed in drug discovery efforts.	<b>K3 and K6</b>
<b>CO-5</b>	Discover about intricate aspects of drug development that need to be implied during new drug development	<b>K6</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** –Create

### Mapping with Programme Specific Outcomes

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	S	S	S	M	S	M	M	M
CO-2	S	S	S	M	S	S	M	M	S	S
CO-3	S	M	S	S	S	M	S	M	S	S
CO-4	M	S	M	S	M	S	S	S	S	S
CO-5	S	S	S	S	S	S	S	S	S	S

**S**-Strong; **M**-Medium.

<b>Core Practical: I - Lab in Cell and Molecular Biology</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BTP01</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. To educate and train the students for lab techniques of Cell and Molecular Biology	
2. Ascertain them that subsequent practical would be understandable based on these experiments.	
3. Provide them a base on diverse areas like Cell and Molecular Biology related advanced biology.	
4. To understand the different gradient plating techniques	
5. To understand the isolation of DNA	
<b>List of Experiments:</b>	
1.Principles of Microscopy and optics	
2. Cell counting - RBC and WBC	
3.Mitosis in onion root tip and Meiosis in Flower bud and Grasshopper	
4. Isolation of genomic DNA from Prokaryotic & Eukaryotic	
5. Isolation of Plasmid DNA from E.coli	
6. Polytene chromosome	
7. Single Cell Colony isolation – Checking for antibiotic resistant Markers.	
8. Induced Mutagenesis (UV & NTG).	
9. Gradient plate technique.	
10. Detection of mutants by replica plate technique.	

**Text Books:**

1. Gunasekar. P. 1995.“Laboratory Manual in Microbiology”. New Age International Private Ltd. Publishers, New Delhi, Chennai
2. Prakash, M and C.K. Arora, “Biochemical techniques”, Anmol Publications Ltd New Delhi. 1998.

**Reference Books:**

1. Ian Freshney R. “Culture of Animal Cells: A Manual of Basic Technique”, Wiley-Liss, 2005.
2. David T. Plummer, “An Introduction to Practical Biochemistry”, 3rd Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.
3. Bruce A. White, “Methods in Molecular Biology”, Chapman and Hall, 1997.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understand the Microscopic techniques and demonstration	<b>K2</b>
<b>CO-2</b>	Gain the practical knowledge required to support a career in cell and Molecular biology research environment.	<b>K3</b>
<b>CO-3</b>	Isolate genomic and plasmid DNA from different Prokaryotic & Eukaryotic and E. coli know how to optimize bacterial media.	<b>K6</b>
<b>CO-4</b>	Recognize and describe different forms of plating and including different colonies	<b>K2</b>
<b>CO-5</b>	Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields	<b>K3</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create.

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	S	S	M	S	S	M	S	M
<b>CO-2</b>	S	M	S	M	M	S	S	S	S	S
<b>CO-3</b>	S	S	S	S	M	M	S	M	M	M
<b>CO-4</b>	M	M	S	S	M	M	M	M	M	M
<b>CO-5</b>	M	M	M	M	M	M	M	M	S	S

**S**-Strong; **M**-Medium.

<b>Core Practical: II- Lab in Biochemistry and Enzymology</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BTP02</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. To educate and train the students for lab techniques of Biochemistry and Enzymology	
2. Ascertain them that subsequent practical would be understandable based on these experiments.	
3. Provide them a base on diverse areas like Biochemistry and Enzymology related advanced biology.	
4. Demonstrate knowledge and understanding of the molecular machinery of living cells	
5. Demonstrate knowledge and understanding of the principles that govern the structures of macromolecules and their participation in molecular recognition	
<b>List of Experiments:</b>	
1. Estimation of glucose (DNS method)	
2. Estimation of DNA (Diphenylamine)	
3. Estimation of RNA (Orcinol)	
4. Estimation of Protein ( Lowry's and Bradford Methods)	
5. Separation of amino acids by Paper and Thin layer chromatography	
6. Qualitative analysis of carbohydrate	
7. Qualitative analysis of amino acids.	
8. SDS-PAGE	
9. Effect of pH on the activity of acid phosphates	
10. Effect of temperature on the rate of acid phosphates	
11. Determination of SGOT	
12. Determination of SGPT	
13. Effect of P <sup>H</sup> on $\alpha$ amylase activity	
14. Effect of temperature on $\alpha$ amylase activity.	

**Text Books:**

1. Jayaraman J, "Laboratory Manual in Biochemistry" (5th reprint) New Age International Publishers Mumbai, Chennai, 1996.
2. Prakash, M,C.K. Arora, "Biochemical techniques", Anmol Publications (I) Ltd New Delhi. 1998.
3. Wilson. K and Walker. J. Principles and Techniques of Practical Biochemistry, Cambridge Univ Press, (1994).

**Reference Books:**

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| 1. David T. Plummer, "An Introduction to Practical Biochemistry", 3rd Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi. |
| 2. Robert Weaver, "Molecular Biology", 5th edition, McGraw-Hill, 2011.   |
| 3. Bruce A. White, "Methods in Molecular Biology", Chapman and Hall, 1997.   |

**Course Outcomes:**

CO. No.	Upon completion of this course, students will be able to	Knowledge level
<b>CO-1</b>	The method (DNS) is well suited to the estimation of random blood sugars and the handling of diabetic clinic requirements in hospital laboratories.	<b>K5</b>
<b>CO-2</b>	Estimate RNA and DNA from present in the given unknown solution	<b>K4 and K6</b>
<b>CO-3</b>	Analyze the various biochemical tests.	<b>K4</b>
<b>CO-4</b>	Assess the importance of carbohydrates, proteins and lipids in foods with regard to carbon, nitrogen and energy requirements of the living organisms.	<b>K3</b>
<b>CO-5</b>	Generate in silico models for biological macromolecules	<b>K5</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

**Mapping with Programme Specific Outcomes:**

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO-1</b>	S	S	M	S	S	S	S	M	S	M
<b>CO-2</b>	S	S	S	M	S	S	S	M	S	S
<b>CO-3</b>	S	M	M	M	M	M	S	S	S	M
<b>CO-4</b>	M	M	M	M	M	M	M	M	M	S
<b>CO-5</b>	S	S	S	M	M	S	S	S	S	M

**S**-Strong; **M**-Medium

<b>Elective: I - Taxonomy and Biodiversity</b>	
<b>Semester – I</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P1BTE01</b>	<b>Credit: 4</b>
<b>Course Objectives:</b>	
1. To impart knowledge on Microbial diversity and Molecular taxonomy with special reference to Bacteria, besides fungi and viruses.	
2. To introduce the concept polyphasic taxonomy which eventually lead to report a novel organism.	
3. To enlighten on culture independent techniques and anaerobic cultivation.	
4. Understanding the basics of science of biodiversity in an ecological context	
5. Learning tools and techniques relevant to monitoring of biological diversity	
<b>UNIT- I - Introduction of Taxonomy</b>	
Classification - Artificial, natural and phylogenetic system of classification, Whittaker's five kingdom system, Major characteristics features used in taxonomy-classical and molecular, taxonomic hierarchy, taxon, nomenclature and species concept. Numerical taxonomy.	
<b>UNIT- II - Classification of prokaryotes</b>	
Classification of prokaryotes – Bacteria, Archaea and Actinomycetes. Characteristic features of the domain and phylum. General classification of viruses- morphological structure	
<b>UNIT - III - Classification of Eukaryotes</b>	
Classification of eukaryotic microorganisms Fungi, Algae and Protozoa with their characteristic features.	
<b>UNIT- IV - Principles of Plant and Animal Taxonomy</b>	
Principles of Plant taxonomy - Bentham and Hooker classification upto the level of order. Animal taxonomy – origin of vertebrates and invertebrates upto class level with one example.	
<b>UNIT – V - Introduction of Biodiversity</b>	
Biodiversity –definition, global and Indian perspective, hot spots, IUCN, climate change.	

**Text Books:**

1. Plant Taxonomy. Sharma O.P. Tata McGraw-Hill Publishing Company Limited, New Delhi, 1993.
2. Introduction to the principles of plant taxonomy. Shivarajan, V.V. 2 <sup>nd</sup> edition. Cambridge University Press, 1991.

**Reference Books:**

1. Prescott, Harley and. Klein's Microbiology. 7th edition. Willey JM, Sherwood LM, and Woolverton CJ. S. Chand and Company Limited, New. Delhi, 2008.
2. Principles of Microbiology. Atlas M.R. McGraw-Hill co Ltd., 1995.
3. Campbell, N.A. Biology. Sixth Edition. Menlo Park. California: Benjamin/Cummings Publishing Company. Inc. 2002



**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Learn the importance of microbiology at basic level with laboratory level understanding	<b>K2</b>
<b>CO-2</b>	Get introduced to terms related to Polyphasic taxonomy and apply them during reporting them as a novel species.	<b>K6</b>
<b>CO-3</b>	Understand on cultivation of Anaerobic organisms	<b>K2</b>
<b>CO-4</b>	The underlying case for the valuation of ecosystem services is that it will contribute towards better decision-making, ensuring that policy appraisals fully take into account the costs and benefits to the natural environment.	<b>K2</b>
<b>CO-5</b>	The course would facilitate development of Forest Disaster preparedness, Mitigation & Management, leadership among individuals who will be able to contribute in generating awareness and up-gradation for sustainable development.	<b>K4</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	S	M	S	S	S	S	M	M	M
<b>CO-2</b>	S	S	S	M	S	M	M	M	S	S
<b>CO-3</b>	S	S	M	S	M	M	S	M	S	M
<b>CO-4</b>	M	M	M	M	M	M	S	S	M	M
<b>CO-5</b>	S	S	S	M	S	M	S	M	M	S

**S**-Strong; **M**-Medium

<b>Core: IV- Microbiology and Immunology</b>	
<b>Semester – II</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P2BT04</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. Understand the imperative to think like an immunologist and predict about nature of immune response that develops against bacterial, viral or parasitic infection and prove it by designing new experiments.	
2. The candidates undertaking this course will gain knowledge about the structure of bacteria; types of microscopes and microscopy; sterilization methods and quality control; disinfection, antibiotics – testing and quality control; alga structure and life-cycle patterns. □	
3. Learn about structural features of components of immune system as well as their function.	
4. Emphasis on development of immune system and mechanisms by which our body elicit the immune response.	
5. To provide detailed knowledge about taxonomy and diversity of microbes, growth, disease/infectious microbe and aspects of immunotechniques and vaccine technology.	
<b>UNIT- I - General Microbiology</b>	
Microbial taxonomy and diversity: Bacteria, Archea and their broad classification; Eukaryotic microbes; fungi, yeasts, molds and protozoa; viruses and their classification, molecular approaches to microbial taxonomy. Prokaryotic and eukaryotic cells. Structure and function; prokaryotic cell wall, cell membrane, mechanism of solute transport across membranes, flagella and pili, capsules.	
<b>UNIT- II - Microbial growth and antimicrobials</b>	
Microbial growth: Definition of growth; Growth curve ; Mathematical expression of exponential growth phase; Measurement of growth yields; Synchronous growth; Continuous culture; Effect of environmental factors on growth. Effect of physical and chemical agents; Evaluation of effectiveness of antimicrobial agents.	
<b>UNIT - III - Microbial diseases and general immunology</b>	
Microbial diseases and host pathogen interaction : Reservoirs of infection; Nosocomial infection; Emerging infectious diseases; Mechanism of microbial pathogenicity; Nonspecific defense of host; antigen and antibodies; Humoral and cell mediated immunity; vaccines; Immune deficiency; Human diseases caused by viruses, bacteria, and pathogenic fungi general characteristic of antimicrobial drugs and Mode of action	
<b>UNIT- IV - Antigens and antibodies</b>	
Antigen and antibodies interactions: Antibody affinity-avidity-specificity-cross reactivity; Antigen processing and presentation through MHC 1 and 2 and BCR. Hybridoma and monoclonal antibody production	

**UNIT – V - Hypersensitivity**

Generation of T cell clones; HLA typing. Types of hypersensitivity-assessment of delayed hypersensitivity reactions. Antigen isolation, purification and characterization of various antigens and haptens from pathogens and other biological molecules by biophysical, chemical and affinity separation methods. Biology and assay of cytokines

**Text Books:**

1. Subhash Chandra Parija, "Textbooks of Microbiology and Immunology", Elsevier; Second edition, 2012.
2. Arumugam N. A. Mani, L.M.Narayanan, Dulsy Fatima, A. M. Selvaraj, "Immunology & Microbiology", Saras Publication, 2015.
3. Arumugam N, "Immunology & Microbiology", Saras Publication, 2007.
4. Ramasamy, P and R.E.B. Hanna, "Immunity and inflammation", University of Madras publications, Pearl Press Ltd., 2002.

**Reference Books:**

1. Pelczar. MJ, Chan ECS, KingNR, "Microbiology – concepts and applications", McGraw –Hill, Edd., 27th, Jnc. NY – 2004..
2. Prescott LM, Haley JP, Klecin Da, "Microbiology", WCB Publishers, Sydney – 2002.
3. Ingraham J.L. and C.A. Ingraham, "Essential of diagnostic Microbiology", 2nd edition by Brooks/cole, Thomson Learning, USA-2000.
4. Tak W Mark and Mary Saunders, "The Immune Response Basic and Clinical Principles", 1St edition, AP. 2005.
5. Parslow, T.G, D. P. Sites, A. L. Terr, "Medical immunology", 10 <sup>th</sup> edition by McGraw-Hill Publishing, 2001.
6. Zola H, "Monoclonal antibodies", Bios Scientific Publishers LTD., 2000.
7. Goldsby R.A., T.J. Kindt and B.A. Osborne, "Kuby Immunology", Freeman and company, 2000

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Gain knowledge of the importance of microbiology at basic level with laboratory level understanding	<b>K3</b>
<b>CO-2</b>	Evaluate the usefulness of immunology in different pharmaceutical companies.	<b>K5</b>
<b>CO-3</b>	Apply their knowledge and design immunological experiments to demonstrate innate, humoral or cytotoxic T lymphocyte responses and figure out the kind of immune responses in the setting of infection (viral or bacterial) by looking at cytokine profile	<b>K3 and K6</b>
<b>CO-4</b>	Considerably think on the role of Soil, Agriculture and Food Microbiology	<b>K4</b>

<b>CO-5</b>	Understand the mechanisms involved in initiation of specific immune responses and Differentiate the humoral and cell mediated immune mechanisms in vaccine	<b>K2</b>
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**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5**- Evaluate; **K6** – Create.

### Mapping with Programme Outcomes

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO-1</b>	M	S	M	S	S	S	S	M	M	M
<b>CO-2</b>	S	S	S	M	S	S	M	S	S	M
<b>CO-3</b>	M	S	S	S	S	S	S	M	S	M
<b>CO-4</b>	S	S	M	S	M	M	S	S	M	M
<b>CO-5</b>	M	M	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium

<b>Core: V - Genetic Engineering</b>	
<b>Semester - II</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P2BT05</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. To understand the principles of Genetic engineering and its applications.	
2. Impart adequate knowledge about tools and techniques in genetic engineering.	
3. Make them better understand the genetic engineering approach for enhancing efficiency, precision, and proper expression of the nucleic acid molecules in the plant system.	
4. To expose students to application of recombinant DNA technology in biotechnological research.	
5. To train students in strategizing research methodologies employing genetic engineering techniques.	
<b>UNIT- I - Basic tools of genetic engineering</b>	
DNA cutting and modifying enzymes-restriction endonucleases, alkaline phosphatase, polynucleotide kinase, DNA ligase, S1 nuclease, exonucleases; Ligation of DNA fragments-in vitro ligation strategies (Joining DNA with ligases, topoisomerases and site specific recombinases); Chemical synthesis of DNA adaptors, linkers and homo-polymer tailing for in vitro ligation.	
<b>UNIT- II - Cloning vectors</b>	
Fundamental principles of cloning vectors –Plasmid biology: E.Coli vectors- pBR322 and its derivatives- Phage- Filamentous phages – Cosmid – Phagemid – Gene markers. Eukaryotic vectors – Saccharomyces cerevisiae. Animal cell cloning vectors and Plant cloning vectors.	
<b>UNIT - III - Molecular Tools</b>	
Restriction mapping, Southern, western & northern blotting, DNA and Protein sequencing methods, mechanism & types of PCR,RFLP,RAPD,DNA finger printing, DNA micro array, DNA and RNA shifting, site directed mutagenesis, phage display and cell surface display and gene silencing by RNAi.	
<b>UNIT- IV - Gene expression in recombinants</b>	
Principles of maximizing gene expression; Expression vectors design for downstream processing and protein purification- Histag, GST-tag and MBP-tag.	
<b>UNIT - V - Applications</b>	
Recombinant products, new materials and devices-biosensors; Agricultural applications; Industrial applications; Medicinal applications-vaccines and nucleic acid therapeutics; Environmental applications; r-DNA regulation guidelines.	

**Text Books:**

1. Vadakar Praveen. Concepts, Theories and Practice of Human Rights, Raja Publications, 2000.
2. Mishra Promod, Human Rights Global Issues, Kalpaz Publications. 2000
3. Singh.B.D. 2005, Molecular biology and Genetic Engineering, Kalyani publishers.2005.
4. Brown, T.A. Gene cloning and DNA analysis, 6th edition, Wiley Blackwell science.2010.
5. Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
6. Biotechnology - A comprehensive treatise (Vol. 12). Legal economic and ethical dimensions VCH. (2nd ed) ISBN-10 3527304320.

**Reference Books:**

1. Watson, Molecular Biology of the gene, 5th edition Person education, Singapore. 2004.
2. Kreuzer-Massey, Recombinant DNA and Biotechnology, ASM Press. 2001.
3. Alcamo, I. Edward. DNA Technology, Academic Press.2001.
4. Traylor, P.C., Frederick, R. and Koch M. Biosafety. Board of Trustees, Michigan State University, USA. 2002
5. Paul, R.C. Situations of Human Rights in India, Efficient Offset printers.2000.
6. JeckerNancy.S et al. Bioethics: An Introduction to the History, Methods and practice, Jones and Bartlett.2010.
7. Walker. J.M. and R. Rapley, Molecular Biology and Biotechnology, 4th edition. 2006.
8. Fleming, D.A., Hunt, D.L., (2000). Biotechnology and Safety Assessment (3rd Ed) Academic press. ISBN 1555811804,9781555811808
9. Thomas, J.A., Fuch, R.L. (1999). Biotechnology and safety assessment (3rd Ed). CRC press, Washington. ISBN: 1560327219, 9781560327219

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understanding of the basics of gene cloning, genetic engineering tools and enzymes.	<b>K2</b>
<b>CO-2</b>	Learn about the principles of cloning vectors	<b>K1</b>
<b>CO-3</b>	Learn the molecular tools and its applications	<b>K1</b>
<b>CO-4</b>	Technical know-how on versatile techniques in recombinant DNA technology	<b>K4</b>
<b>CO-5</b>	An understanding on application of genetic engineering techniques in basic and applied experimental biology	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create.

**Mapping with Programme Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	S	M	M	M	S	M	S	M
<b>CO-2</b>	M	S	S	M	M	M	M	M	M	M
<b>CO-3</b>	S	S	M	M	M	M	M	M	M	M
<b>CO-4</b>	M	M	M	M	S	S	S	M	M	M
<b>CO-5</b>	M	M	M	M	S	S	M	M	M	M

**S**-Strong; **M**-Medium

<b>Core Practical: III- Lab in Microbiology and Immunology</b>	
<b>Semester – II</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P2BTP03</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. Design an experiment to test a hypothesis or fundamental concept in microbiology	
2. Learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries	
3. Identify techniques applicable for Improvement of microorganisms based on known biochemical pathways and regulatory mechanisms	
4. To develop practical laboratory skills in microbiology and immunology	
5. Learn how to make careful observations, collect and analyze data, and draw appropriate conclusions.	
<b>List of Experiments: Microbiology</b>	
1. Sterilization techniques	
2. Preparation of culture media (a) broth type of media (b) Agar.	
3. Culturing of Microorganisms: Pure culture techniques: Streak plate; pour plate, isolation and preservation of bacterial and fungal culture.	
4. Identification of microorganisms. (a) Staining techniques (b) Biochemical testing.	
5. Quantization of microorganisms	
6. Environmental sample analysis-Quantitative estimation of pathogenic and non-pathogenic microbes from sewage and soil samples.	
7. Food microbiology (a) milk (b) Fermented Food (c) Salmonella in poultry.	
8. Clinical microbiology: Normal mouth flora, blood and urine culture, antibiotic disc test assay	
<b>List of Experiments: Immunology</b>	
1. Immunization Techniques – Collection of Serum	
2. Purification of antibodies/immunodiffusion.	
3. Agglutination and precipitation.	
4. Enzyme linked immunoabsorbant Assay (ELISA).	
5. Immunoelectrophoresis.	
6. Mononuclear cell isolation and T-cell identification.	

**Text Books:**

1. Myers, Mika, Klein, “Microbiology and Immunology Laboratory Manual”, Pearson Learning Solutions; 4th edition, 2013
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**Reference Books:**

1. James G. Cappuccino, Natalie Sherman, "Microbiology: A Laboratory Manual" (10th Edition), 2013.
2. Ivan Lefkovits, "Immunology Methods Manual: The Comprehensive Sourcebooks of Techniques", 1996.
3. Bruce A. White, "Methods in Molecular Biology", Chapman and Hall, London, New York. 1997.
4. William Wu, Michael J. welshpeter B. KaufmanHelen H. Zhang, Methods in "Gene Biotechnology", CRC Press, New York. 1997.

**Course Outcome:**

CO. No.	Upon completion of this course, students will be able to	Knowledge level
<b>CO-1</b>	Knowledge and design immunological experiments to demonstrate innate, humoral or cytotoxic.	<b>K3 and K6</b>
<b>CO-2</b>	Learn about the principles Sterilization techniques	<b>K1</b>
<b>CO-3</b>	Learn the Immunization Techniques	<b>K1</b>
<b>CO-4</b>	Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial and Immunology product synthesis.	<b>K2</b>
<b>CO-5</b>	Skills to design conduct an experiment and successfully process and report the observations in the form of a scientific report/manuscript/thesis.	<b>K3</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5**- Evaluate; **K6** – Create

**Mapping with Programme Outcomes**

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO-1</b>	M	M	S	M	M	M	S	M	S	S
<b>CO-2</b>	M	M	S	M	M	S	S	S	M	S
<b>CO-3</b>	M	S	M	M	M	M	M	M	M	M
<b>CO-4</b>	M	M	M	M	M	M	M	M	M	M
<b>CO-5</b>	M	S	M	S	M	M	S	M	S	M

**S**-Strong; **M**-Medium

<b>Core Practical: IV- Lab in Genetic Engineering</b>	
<b>Semester – II</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P2BTP04</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. To educate and train the students for lab techniques of genetic engineering and gene cloning, lab techniques of fermentation technology processes for the product development.	
2. Provide hands-on experience in performing basic recombinant DNA techniques.	
3. To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences	
4. Introduce students to the theory behind in each techniques and to describe common applications of each methodology in biological research.	
5. To familiarize the student with emerging field of biotechnology i.e. DNA Technology as well as to create understanding and expertise in wet lab techniques in genetic engineering. □	
<b>List of Experiments:</b>	
1. Bacterial culture and antibiotic selection media	
2. Isolation of Plasmid DNA, Genomic DNA-AGE	
3. Purification and Quantization of nucleic acids by gel elution method.	
4. Preparation of Competent cells, construction of plasmid vectors	
5. Transformation and Selection of transformed colonies	
6. Polymerase Chain Reaction - Amplification of DNA	
7. Manual DNA sequencing (Demo)	
8. Restriction digestion	
9. Protein molecular weight determination	

**Text Books:**

1. Sadasivam. S and A. Manickam. Biochemical Methods. IInd Edition, New Age International (P) Ltd., Publishers, 2004.
2. Michael R. Green, Joseph Sambrook, Molecular Cloning: A Laboratory Manual (Fourth Edition), 2014.
3. Gunasekar, P. Laboratory Manual in Microbiology. New Age International Private Ltd. Publishers, New Delhi, Chennai. 1995
4. Dube, R.C. Practical Microbiology, S. Chand & Company, 2009.

**Reference Books:**

1. James G. Cappucino Natalie Sherman 1999. Microbiology - A Laboratory Manual 4th Edition - Wesley California, England. 1999.
2. William Wu, Michael J. welshpeter B. KaufmanHelen H. Zhang, Methods in Gene Biotechnology, CRC Press, New York. 1997.

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	The students develop and apply the modern technology of molecular biology and genetic engineering in industries and research	<b>K3</b>
<b>CO-2</b>	The students will examine the results obtained using genetic engineering	<b>K5</b>
<b>CO-3</b>	The students gain the technical skills involved in extraction, manipulation of biomolecules and identification of gene and its expressions	<b>K4</b>
<b>CO-4</b>	Describe the main principles, methods for preparation and cloning of DNA in various organisms.	<b>K5</b>
<b>CO-5</b>	The students will have sufficient scientific understanding of the subject and have good knowledge of application of DNA techniques in Life Sciences Research. □	<b>K2 &amp;K3</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5**- Evaluate; **K6** – Create.

**Mapping with Programme Outcomes**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	S	M	M	M	S	M	S	M
<b>CO-2</b>	S	S	S	S	M	S	S	S	M	S
<b>CO-3</b>	M	S	M	S	S	M	M	S	S	M
<b>CO-4</b>	S	S	S	M	M	M	S	S	S	S
<b>CO-5</b>	S	M	M	M	M	S	M	M	M	S

**S**-Strong; **M**-Medium

<b>Elective: II- Bioinstrumentation and Research Methodology</b>	
<b>Semester – II</b>	<b>Hrs/week: 4</b>
<b>Course Code: 21P2BTE02</b>	<b>Credit: 4</b>
<b>Course Objectives:</b>	
1.Enrich the student intelligentsia in all the biological observations which are explainable in terms of physical principles.	
2.To provide fundamental theoretical knowledge to the students about principle and methods of bioinstrumentation and research methodology.	
3. Emphasize the working skill in basic and advanced analytical instruments	
4. Enhance the ability of understating and working methods of various instruments	
5. Apply these principles in the context of bioinstrumentation interactions with tissues, organs and human body to explain the measurement results and to develop the instrumentations.□	
<b>UNIT –I- Microscope and Spectroscopy</b>	
Microscopic Techniques: Principle and methods and types of light microscopy,scanning and transmission electron microscope. Analysis of biomolecules using UV/visible, fluorescence, NMR and ESR spectroscopy, structure determination using x-ray diffraction.	
<b>UNIT- II - Histochemical and immunotechniques</b>	
Histochemical and immunotechniques: detection of molecules using ELISA, RIA, immunoprecipitation, flow cytometry and immunofluorescence microscopy, in situ localization by techniques such as FISH and GISH. Medical imaging techniques (X- ray, CAT-Scan, ECG, EEG). X-ray crystallography, Methods for detecting radioactivity- GM and Scintillation counters, Autoradiography	
<b>UNIT III Introduction of Research</b>	
Research: Meaning, objectives and types of research. Research methods in biological sciences. Research process, selection of problems - stages in the execution of research; preparation of manuscript - report writing - format of journals - proof reading. Sources of information; journals, reviews, books, and monographs-bibliography. Standard of research journals - impact factor - citation index	
<b>UNIT IV Introduction and Measures of Dispersion</b>	
Introduction to biostatistics. Types of data and data collection. Measures of central tendency- sample mean mode and median. Percentiles and measures of variability sample variance, Standard deviation properties and parameters of normal and poison distribution. Sample distribution and central limit theory.	
<b>UNIT V Sampling, Hypothesis and ANOVA</b>	
Introduction- properties of the t- distribution, uses of t- distribution. Two sample test and paired t-test. Hypothesis- testing-steps in hypothesis testing, decisions and conclusions. Probability, Test for normality and equality of variance. Types of error- sample size calculations. ANOVA one way and two ways ANOVA. Single and multiple linear regression and correlations.	

**Text Books:**

1. Ramakrishnan .N .Biostatistics, Ist Edition, Saras Publications, 2009.
2. Mariappan, P. Biostatistics: An Introduction [Kindle Edition], Pearson; 1 edition, 2013.
3. Vashisth, A.K, Textbooks Of Biostatistics, Neha Publishers & Distributors, 2008.
4. VeerakumariL.,Bioinstrumentation, Mjp Publishers; 1 edition, 2011
5. Webster, Bioinstrumentation, Wiley India Private Limited, 2007.

**Reference Books:**

1. Gupta S.C.andV.K.Kapoor, Fundamentals of mathematical statistics, 2010.
2. Helio S. Migon, DaniGamerman, and Francisco Louzada, Statistical Inference: An Integrated Approach, Second Edition, Chapman and Hall/CRC, 2014.
3. John G Webster, Bioinstrumentation. John Wiley & Sons, New York, 2004. Physical John.
4. Robyt F., Bernard J. White, Biochemical Technique: Theory and Practice, - Wavelan PrInc; Reprint edition, 1990.
5. Wilson,K., Walker, J. E. J. Wood, K., Walker, J, Principles and techniques of practical biochemistry (5th Ed.): Cambridge University Press, Cambridge, 2000.

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understand the analytical techniques and the principles of equipment used in different fields	<b>K2</b>
<b>CO-2</b>	Have complete insight in these techniques for the possible applications in various research areas	<b>K1</b>
<b>CO-3</b>	Understand the objectives and types of research.	<b>K2</b>
<b>CO-4</b>	Handle basic and advanced instruments with trouble shooting in the biological and medical industries.	<b>K3</b>
<b>CO-5</b>	An ability to analyze contemporary bioinstrumentation studies to make connections and decisions based on their scientific merit.	<b>K4</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5**- Evaluate; **K6** – Create.

## Mapping with Programme Outcomes

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	M	M	S	M	M	M	S	M	S	M
<b>CO-2</b>	M	M	S	M	M	S	S	S	M	S
<b>CO-3</b>	M	S	M	M	M	M	M	M	M	M
<b>CO-4</b>	S	S	S	S	M	S	S	S	S	S
<b>CO-5</b>	S	M	M	S	M	S	S	M	M	M

**S**-Strong; **M**-Medium

<b>Core: VI Plant and Animal Biotechnology</b>	
<b>Semester – III</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P3BT06</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. This course aims to help the students to gain an advanced level of understanding in the comprehensive components of plant and Animal biotechnology	
2. To develop comprehensive understanding course contributes for food security and human health towards sustainable agriculture	
3. The course is designed to provide students a perspective on recent advances in animal cell culture and various technical applications including cell line and stem cells.	
4. The students will get familiarized with the concept of transfer of new genes in animal cells culture methods and to understand the different phases of the embryo development and associated medical implications basic embryo structure and morphological fundamentals will be imparted to the students.	
5. To make the student to understood usage of Plant products and exploitation of them in Biotechnology	
<b>UNIT- I - Introduction to Plant Biotechnology</b>	
Plant-genome organization. Genetics of chloroplast and mitochondria. Set up of plant tissue culture laboratory. Nutritional requirements of plant tissue culture. Types of media. Plant hormones. The concept of totipotency of cells.	
<b>UNIT- II - Introduction to plant tissue culture</b>	
Plant tissue culture – Suspension cultured cells – haploid plants – Cloning of hosts -micropropagation – Somatic embryogenesis – protoplast isolation and applications. Somatic cell hybridization, marker-assisted selection, gene transfer methods viz. direct and vector-mediated, plastid transformation, transgenic plants and their application in agriculture	
<b>UNIT - III - Application of Plant tissue culture</b>	
Valuable chemicals from plant tissue culture. Virus – free plants. Genetic engineering of crop plant for insect resistance, fungus resistance, virus resistance, stress resistance. In-vitro pollination and fertilization.	
<b>UNIT- IV - Introduction of Animal Biotechnology</b>	
Biotechnology for Animal Improvement: Conventional methods of animal improvement, predominantly selective breeding and cross-breeding - Artificial insemination - Pregnancy diagnosis - Embryo biotechniques: Augmentation of reproductive efficiency and faster multiplication of superior germ plasma - Super ovulation - In vitro maturation of oocytes - In vitro fertilization	

**UNIT – V - Gene therapy and animal cell culture preservation**

Equipments and materials for animal cell culture technology. Aseptic Techniques for cell culture. Preparation and Sterilization of cell culture media and reagents. Basic techniques of mammalian cell culture in vitro; disaggregation of tissue and primary culture; maintenance of cell culture; Cell line preservation and characterization: Cell/embryo cryopreservation - Cell line banking - Cytotoxicity and viability assays – Karyotyping.

**Text Books:**

1. Chawla H. S, "Introduction to Plant Biotechnology", Science Publishers, 2002
2. Sasidhara R., "Animal Biotechnology", Neha Publishers & Distributors, 2009
3. Yadav, P R, "Text Books Of Animal Biotechnology", Discovery Publishing House Pvt. Ltd. 2009

**Reference Books:**

1. Jack G. Chirikjian, "Biotechnology: Plant biotechnology, animal cell culture, immunobiotechnology", Jones & Bartlett Learning, 1995.
2. Grieson and S.N.Covey, Blackio, "Plant Molecular Biology", 1988
3. Chrispeels M.J. and Sadava, D.F. "Plants, genes and agriculture". Jhones and Barlett. 1994.
4. Glyn Stacey. "Medicines from Animal Cell Culture", John Wiley and Sons Ltd. 2007.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understand the basic principles of plant kingdom and their economic importance.	<b>K1 &amp; K2</b>
<b>CO-2</b>	Explain the basics, methodology and applications of plant tissue culture. Design experiments for functional characterization of plant genes and to identify those suitable for creating agronomically important traits	<b>K1 &amp; K6</b>
<b>CO-3</b>	To understand the difference between stem cell types and methods for producing transgenic animals	<b>K2</b>
<b>CO-4</b>	To improve artificial embryo transfer and nuclear transfer methods and applications.	<b>K2 &amp; K3</b>
<b>CO-5</b>	To learn the various type cell morphology, stages, and fertilization and transformation techniques employed in animal systems	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create



**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	M	S	M	M	M	M	M	M
<b>CO-2</b>	S	S	S	M	S	S	M	M	S	S
<b>CO-3</b>	S	M	S	M	M	M	S	S	M	M
<b>CO-4</b>	M	M	M	M	M	S	M	M	M	M
<b>CO-5</b>	M	M	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium

<b>Core: XII- Industrial and Fermentation Technology</b>	
<b>Semester - III</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P3BT07</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. To provide knowledge about fermentation technological process for industrial important.	
2. The objectives of this course are to introduce the students to the field of microbiology and application of microbes on industry.	
3. To train the students about microbial growth, methods for fermentation technology, effluent treatment and enzyme immobilization.	
4. To prepare and sensitize the students to scope for research, the increasing for skilled scientific manpower with an understanding of research, industrials applications and microbiology ethics. □	
5. The course can educate the students about fermenter design, different modes of bioprocess operation and the current trend of fermentation process in biotech-industry.	
<b>UNIT- I- Introduction to fermentation technology</b>	
Introduction to fermentation technology; interaction between chemical engineering, microbiology and biochemistry. History of fermentation. Outline of upstream processing. Media formulation, Sterilization and process optimization	
<b>UNIT- II- Bioreactors and its design</b>	
Bioreactors: Functions, design, aeration and agitation, sterilization instrumentation and control. Differentiation types of reactors, continuous and Fed-batch cultures, Garden's fermentation classification, design and operation of fermenters, basic concepts for selection of a reactor.	
<b>UNIT – III- Industrially important microbes</b>	
Production of industrial starters: Isolation, maintenance of industrially important microorganisms. Strain improvement. Inoculum development. Immobilization of biocatalysts: kinetics effects, inactivation kinetics biocatalysts in non-conventional media (biphasic, organic, ionic liquids, supercritical fluids).	
<b>UNIT- IV- Downstream process</b>	
Downstream processing. Recovery of particulate matter, product isolation, distillation, centrifugation, whole broth processing, filtration, aqueous two – phase separation, solvent extraction, chromatography and electrophoresis	
<b>UNIT – V - Microbial products and computer assisted data monitoring and analysis</b>	
Production of microbial products: Enzymes- Amylase, Organic acid- Citric acid, Amino acid- Glutamic acid, Antibiotics- Penicillin, Solvent- Ethanol, Vitamins- Riboflavin and SCP. Monitoring of bioprocesses - Computer based data acquisition, monitoring and control-LABVIEW software.	

**Text Books:**

1. Kalaiselvan P T, I Arul Pandi, Bioprocess Technology (Volume 1), MJP PUBLISHERS; 1st edition 2007.
2. Stanbury F, A Whitaker, Principles Of Fermentation Technology, Elsevier; 2 edition,2008
3. Mukhopadhyay, S.N.Processes biotechnology fundamentals, Viva Books Pvt. Ltd. 2001.
4. Satyanarayana. U, Biotechnology, (2008), Books and Allied (p) Ltd.

**Reference Books:**

1. Keith Wilson and John Walker, Practical Biochemistry-principles and Techniques, Cambridge, 5th Ed. 2000.
2. Coulson and Richardson JF, chemical engineering-volume 3 (Chemical and biochemical reactors and process controls ed. Richardson, J.F., Peacock, D.G., First Indian ed. Asian Bookss Pvt.Ltd. 1998.
3. Bailey and Ollis, Biochemical Engineering Fundamentals, McGraw-Hill, 1990.
4. Ponmurugan, P.Nithya Ramasubramanian and Fredimoses, Experimental Procedures in Bioprocess technology and Downstream processing. 2012. Anjana Book House, Chennai.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	To show the main microbial processes, methods, cultivation, preservation, metabolism and synthesis activity.	<b>K2</b>
<b>CO-2</b>	To explain about the microorganisms (Bacteria, Fungi, Algae, Protozoa and viruses) type's specifics in principals and applications of animal and plants.	<b>K2</b>
<b>CO-3</b>	To understand the bioprocess engineering, basic techniques, methods, functions and industrial products.□	<b>K2</b>
<b>CO-4</b>	To know the different microorganisms and their products (enzymes, polymers, metabolites, etc.) that are used in the biotech industry.	<b>K2 &amp; K4</b>
<b>CO-5</b>	Examine the application of biological and engineering principles to problems involving microbial, mammalian, and biological/biochemical systems.	<b>K6</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate;**K6** - Create.

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	M	S	M	S	S	S	M	M	M	M
<b>CO-2</b>	M	M	M	M	S	M	S	S	S	M
<b>CO-3</b>	S	S	M	M	S	S	M	M	S	M
<b>CO-4</b>	M	M	S	M	M	M	M	M	S	M
<b>CO-5</b>	S	S	S	S	S	S	S	S	S	S

**S**-Strong; **M**-Medium.

<b>Core: VIII- Medical and Herbal Biotechnology</b>	
<b>Semester – III</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P3BT08</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. A comprehensive training to postgraduate students to empower them with the knowledge of allied biomedical sciences to create a work force for advanced research and diagnostics in a medical environment.	
2. It provides both conventional and innovative approaches to resolve the problems associated with clinical, diagnostic and advanced therapeutics.	
3. The course is designed to give a broad view of stem cells, reviewing where they are found in the body, the different types.	
4. This course will be helpful for the students from various science disciplines to explore the application of medicinal values of herbs.	
5. The purpose of this course is to provide basic knowledge in the area of basic science, herbal biotechnology, agriculture and human health	
<b>UNIT I- Introduction to medical biotechnology</b>	
Introduction to medical biotechnology and its scope. Disease Diagnosis and Therapy- ELISA and hybridoma technology, - DNA vaccine,- Gene Therapy,- Toxic genomics. DNA, RNA, Protein in Drug Development. Diagnosis of disease by Proteomics. Separation and identification techniques for protein analysis. Development of antibody based protein assay for diagnosis.	
<b>UNIT II- Diagnosis and medical coding</b>	
Diagnosis and Kit Development- Use of enzymes in clinical diagnosis, Use of biosensors for rapid clinical analysis.- Diagnostic kit development for microanalysis. Introductions to medical coding and transcription. Importance of ICD9 and ICD10.	
<b>UNIT III- Introduction to Stem Cell Biology</b>	
Introduction to Stem Cell Biology, Fate Mapping of Stem Cells, Cell Cycle Control, Checkpoints, and Senescence of Dividing Somatic Cells. Drosophila Ovary: An In Vivo Stem Cell System, Primordial Germ Cells as Stem Cells, Embryonic Trophoblast Stem Cells, Hematopoietic Stem Cells, Epidermal Stem Cells: Liver Stem Cells, Pancreatic Stem Cells, Stem Cells in the Epithelium of the Small Intestine and Colon.	
<b>UNIT IV - Introduction to Herbal medicine</b>	
Study of on history and scope of herbals. Important medicinal herbs in treating diseases. Photochemistry of medicinal plants- alkaloids- flavones- flavanoids- furocoumarins - glycosides -Saponins - sswsquiterpene - sterols and steroid like compounds - tannins and terpenes. Introduction to analysis and quality controls of herbal products (TLC, HPLC, IR, NMR, and Mass spectroscopy).	
<b>UNIT V - Herbal biotechnology</b>	
Biotechnological methods of plant propagation. Somatic Embryogenesis and somoclonal variation. Herbal gardening and maintenance - Standardization of cultivation protocols of selected medicinal plants; in vitro production of secondary metabolites. Polyhouse technology. Important diseases of medicinal plants and their management.	

**Text Books:**

1. Trivedi P. C., Herbal Drugs and Biotechnology, Pointer Publishers, 2009.
2. Khadabadi S. S., B. A. Baviskar S. L. Deore, Pharmacognosy and Phytochemistry: A Comprehensive Approach (Pharmacognosy), PharmaMed Press; 1 edition 2014.
3. Prathibha Nallari, V. Venugopal Rao, Medical Biotechnology, Oxford University Press, 2010.
4. Agrawal S.S. and M. Paridhavi, Herbal Drug Technology, University press 2007

**Reference Books:**

1. Anderson, F.J Illustrated History of the Herbals. New York: Columbia University press. 2009
2. Daniel Figeys (Ed.) Industrial proteomics: Applications for Biotechnology and Pharmaceuticals. Wiley and Sons, 2005.
3. Kayser, O, R.H. Muller. Pharmaceutical Biotechnology - Drug Discovery and clinical applications. Wiley - VCH. 2004.
4. James Thomson et al; "Handbooks of Stem Cells' Embryonic / Adult and Fetal Stem Cells" Vol I and II; Academic Press (2004).

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Students will be able to examine and analyze the theoretical and practical principles of cell culture. Getting the knowledge for the diagnostics and treatment of genetic and chromosomal disorders.	<b>K1 &amp; K3</b>
<b>CO-2</b>	Students will be able to take out primary cells from animal or human tissues and can grow them in outside environments for long period of time and perform various experiments on these cells	<b>K5</b>
<b>CO-3</b>	To interpret about culture of specific cell types like hematopoietic cells and tumor cells, tissue engineering and stem cell technology and its applications, role of animal cell culture in IVF & test tube babies and gene therapy using embryonic stem cells.	<b>K3</b>
<b>CO-4</b>	Describe the basics of parasitic diseases and their herbal control measures. Summarize various forms of human diseases and their treatments using herbal plants.	<b>K6</b>
<b>CO-5</b>	Understand the basic principles of traditional system of herbal medicine. Obtain the knowledge on basics of plant diseases and their control measures using herbal plants.	<b>K2 &amp; K3</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create.

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	M	S	M	S	S	S	M	M	M	M
<b>CO-2</b>	M	M	M	M	S	M	S	S	S	M
<b>CO-3</b>	S	S	M	M	S	S	M	M	S	M
<b>CO-4</b>	M	M	S	M	M	M	M	M	S	M
<b>CO-5</b>	M	M	M	M	M	S	M	M	M	M

**S**-Strong; **M**-Medium.

<b>Core: V - Lab in Plant and Animal Biotechnology</b>	
<b>Semester – III</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P3BTP05</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. To educate and train the students for lab techniques of plant and animal tissue culture and its manipulation.	
2. The objective is to familiarize students with various immunological techniques like blood grouping, their types, antigen-antibody interactions, quantization of antigens and antibody, ELISA, agglutination reactions, immunoelectrophoresis	
3. The student also learns animal cell culture methods like preparation of culture media, sterilization, and single cell suspension from spleen. Also learn basic knowledge about cryopreservation and thawing.	
4. To understand the methods for identifying the viability of live cells.	
5. The students will develop fundamental knowledge in Plant and Animal Biotechnology and its application in laboratory and industry settings	
<b>List of Experiments</b>	
<b>Plant Biotechnology</b>	<b>Animal Biotechnology</b>
1. Preparation of Media	1. Preparation of tissue culture medium and membrane filtration
2. Surface sterilization	2. Preparation of single cell suspension from spleen
3. Callus propagation of plants.	3. Trypsinization of monolayer cell and Passage
4. Micro-propagation	4. Egg Innoculation
5. Protoplast isolation and culture.	5. Cryopreservation techniques for cell culture
6. Organ culture	6. Cell counting and viability
7. Synthetic Seed	7. Role of serum in cell culture
8. Anther culture, production of haploids	
9. Cytological examination of callus tissue	

### **Text Books**

1. Ashok Kumar, Practical Manual for Plant Biotechnology. Publisher: Jai Durga Printing Press, Kota (Raj.). 2018
2. Byong Lee, Plant Biotechnology, Animal Biotechnology, and Safety Assessment. In book: Fundamentals of Food Biotechnology (pp.431-489). 2014



**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Acquaint with principles, technical requirement, scientific and commercial applications in Plant Biotechnology,	<b>K1 &amp; K3</b>
<b>CO-2</b>	Explain the preparation of antigens and antibody in the blood sample.	<b>K5 &amp; K6</b>
<b>CO-3</b>	Describe the basic knowledge about antigen and antibody interaction using (ODD, Rocket-immune electrophoresis).	<b>K6</b>
<b>CO-4</b>	Become familiar with sterile techniques, media preparation, DNA extraction methods, gene isolation and nucleotide sequence analysis,	<b>K2 &amp; K4</b>
<b>CO-5</b>	Learn various techniques like Immunoelectrophoresis, Immunoprecipitation etc in laboratory.	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	S	M	S	S	M	S	M	M	M
<b>CO-2</b>	S	S	S	M	S	S	M	M	S	S
<b>CO-3</b>	M	M	S	S	M	M	S	M	S	S
<b>CO-4</b>	M	M	M	S	S	S	S	M	M	S
<b>CO-5</b>	M	M	M	M	M	S	M	M	M	M

**S**-Strong; **M**-Medium.

<b>Core: VI -Lab in Industrial and Fermentation Technology</b>	
<b>Semester – III</b>	<b>Hrs/week: 5</b>
<b>Course Code: 21P3BTP06</b>	<b>Credit: 3</b>
<b>Course Objectives:</b>	
1. The aim of the course is to give the students broad theoretical and practical skills in industrial microbiology.	
2. This course covers the principles of various processes associated with the production and recovery of different bio-products derived from microorganisms.	
3. The students will be able to discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.	
4. The students will learn the concepts of bioprocessing and its application in industries, media design, cultivation, fermentation technology.	
5. To understand the concept of fermentation technology, the design of industrial fermentation processes, and products of fermentation processes	
<b>List of Experiments:</b>	
1. Production of wine using common yeast.	
2. Isolation and screening of microorganism producing proteases	
3. Isolation and screening of microorganism producing amylases	
4. Isolation and screening of antibiotic producers by crowded plate technique.	
5. Immobilization of yeast cells.	
6. Determination of thermal death point [TDP] and thermal death time [TDT] of Microorganism for design of a sterilizer	
7. Production of alcohol by fermentation and Estimation.	
8. Growth curves of bacteria, Measurement of growth in liquid cultures	
9. Microbial production of citric acid using <i>Aspergillusniger</i> .	
10. Estimation of biomass– dry weight and wet weight method	
11. Isolation of antibiotic producing microbes from soil.	
12. Production of industrial enzyme by submerged fermentation	
13. Production of industrial enzyme by solid-state fermentation	

**Text Books:**

- |  |
|--|
| 1. Janarthanan Sundaram, University of Madras. Practical Manual on Fermentation Technology. I K International Publishing House Pvt. Ltd ISBN: ISBN-10 : 9789381141809; ISBN-13 : 978-9381141809. Manuals and Handbooks. 2012 |
| 2. Sugitha Thankappan Karunya University. Practical Manual Cum Workbook on Industrial Biotechnology. Tamil Nadu Agricultural University ISBN: ISBN:978-93-87443-16-7. 2020   |

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	To learn media preparation, sterilization, organism details and staining methods.	<b>K2</b>
<b>CO-2</b>	To perform antimicrobial sensitivity test and preserve bacterial cultures.	<b>K2</b>
<b>CO-3</b>	To know the different microorganisms and their products (metabolites, enzymes, pigments, etc.) that are used in the biotech industry.□	<b>K4</b>
<b>CO-4</b>	To demonstrate a clear understanding of wine production.	<b>K6</b>
<b>CO-5</b>	To Isolate, identify and develop the microbial inoculum for industrial processing.	<b>K5</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	S	S	M	S	S	M	S	M
<b>CO-2</b>	S	M	S	M	S	S	S	S	S	S
<b>CO-3</b>	S	S	S	S	M	M	S	M	M	M
<b>CO-4</b>	S	S	S	S	M	S	S	S	S	S
<b>CO-5</b>	M	S	S	S	S	S	S	M	S	S

**S**-Strong; **M**-Medium.

## Elective: III -Tissue Engineering and Stem Cell Biology

**Semester – III**

**Hrs/week: 4**

**Course Code: 21P3BTE03**

**Credit: 4**

### **Course Objectives:**

1. To provide students with knowledge of wide ranging topics related to stem cells, regenerative medicine and tissue engineering.
2. Tissue engineering provides a general understanding of tissue growth and development as well as the tools and theoretical information necessary to design tissues and organs.
3. The objective of this course is to familiarize students with fundamental process of human embryology and developmental biology and progression of pluripotent stem cells through different phases of development.
4. To develop comprehensive understandings on the complete cellular and molecular function of cell organelles in terms of cell to cell interaction, gene regulation, cellular signaling.
5. Learn about existing examples which promotes critical thinking that can help in developing tests. Comprehensive knowledge about ethical and regulatory aspects of handling and conducting tests in clinical samples. □

### **UNIT- I - Basic biology of Tissue Engineering**

Basic biology of tissue engineering; the basis of growth and differentiation – morphogenesis and tissue engineering. Role of basic fibroblast growth factors and angiogenesis. Biomaterials in tissue engineering. Cell-Based Therapies.

### **UNIT II: Biomaterials and Bioreactors**

Biomaterials Scaffolds, Scaffold Fabrication and Tailoring, Bioreactor technologies, Bioreactor cultivation of functional tissues and its applications. Bio artificial pancreas, renal replacement devices. Structural tissue engineering – Bone regeneration through cellular engineering-Brain implants –Neural stem cell – Periodontal applications – Artificial womb.

### **UNIT III: Introduction to Stem cell**

Stem cell – Definition, characterization, Pluripotent stem cells, Self renewal and differentiation, hierarchy, Stem cell niche, Niche specification -0 Drosophila germ line stem cells. Types of stem cells: Adult stem cell from amniotic fluid, cord blood and tooth primordial. Neural stem cells and its applications.

### **UNIT IV: Cell signals and its pathways**

Characteristics of stem cell – cell cycle, Ras / Raf pathways, P13K cell signaling, p53 check points, Role of LIF pathways in cell cycle control. Stem cell communications – gap junctions, cell fusions, HOX genes, upstream transcriptional factors, Tran differentiation, cell fusion.

### **UNIT V: Applications of stem cells**

Therapeutics applications of embryonic stem cells, Bone marrow stem cells, Adipose derived stem cells and Hematopoietic stem cells in heart regeneration and neural defects. Ethics in human stem cell research; Controversy surrounding human embryonic stem cell research, societal implications: women, low-income, Different religious views, Current Ethical Guidelines in India, Ethical views of other countries and how this affects advancement of science Policy.

**Text Books:**

1. Jonathan Slack, Stem cells- A Very Short Introduction, Oxford, 2012.
2. Bernhard O. Palsson , Sangeeta N. Bhatia, Tissue Engineering, Prentice Hall; edition, 2003.

**Reference Books:**

1. Robert P. Lanza, Robert Langer and Joseph Vacanti. Principles of tissue engineering. Second edition Academic Press. 2002.
2. Micklem.H.S., LoutitJohn.F., Tissue grafting and radiation, Academic Press, New York.2004.
3. Penson, Balducci.D., Tissue cultures in biological research, Elsevier, Amsterdam.2004.
4. Robert Lanza, John earhart, Brigid Hogan, Douglas Melton, Roger Pedersen, E. Donnall Thomas, James Thomson and Sir Ian Wilmut, Essentials of Stem Cell Biology. Second Edition, 2009.
5. Robert Lanza. “Essential of Stem Cell Biology” Academic Press, 2005.

**Course Outcomes:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Apply the principles of cellular and tissue engineering to theoretically develop processes for the production of biologics and tissue engineered medical devices	<b>K3</b>
<b>CO-2</b>	Describe clinical applications of tissue engineered products in regenerative medicine	<b>K6</b>
<b>CO-3</b>	Students will be able to explain how tumor stem cells give rise to metastases and treatment-resistant remnant cells that cause relapse, and how this impacts on the development of future cancer treatment strategies.	<b>K2</b>
<b>CO-4</b>	To study about stem cell, cell signals and its pathways □	<b>K3</b>
<b>CO-5</b>	Understanding of disease types and their diagnosis. Obtain knowledge about ethical and regulatory aspects of conducting diagnostic tests.□	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate;**K6** – Create.

**Mapping with Programme Specific Outcomes:**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	M	S	M	S	S	S	S	M	M	M
<b>CO-2</b>	S	S	S	M	S	M	S	S	S	S
<b>CO-3</b>	S	S	M	S	M	M	S	M	S	M
<b>CO-4</b>	S	M	M	M	M	S	M	M	S	S
<b>CO-5</b>	M	M	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium.

<b>Core: IX- Environmental and Nano-Biotechnology</b>	
<b>Semester – IV</b>	<b>Hrs/week: 6</b>
<b>Course Code: 21P4BT09</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. Students will understand the various fields of the Environmental biotechnology, i.e. Ecosystems, Biodiversity, Threats and policy.	
2. To impart appropriate information and adequate knowledge about environmental impact assessment and environmental acts; to acquaint students in the area of disasters management.	
3. Sources for environmental pollution and its remedial measures, Toxic chemicals and their impact on environment and human health, Role of microbes in remediation of environmental pollutants, applications of bio-products in society	
4. Understand the use of basic quantum concepts for describing nano systems and processes.	
5. Make them understand the different quantum nanostructures and their density of states.	
<b>UNIT I: Introduction of environmental biotechnology</b>	
The scope of environmental biotechnology; Biodegradation of macromolecules; biodegradation of xenobiotics. Heavy metal pollution. Bioleaching.	
<b>UNIT II: Bioremediation</b>	
Biochemical & Genetic basis of Bioremediation - Bioremediation of soil, water, contaminated with oil spills, heavy metals & detergents. Phytoremediation, Degradation of pesticides & petroleum products.	
<b>UNIT III: Biotechnological methods</b>	
Biotechnological methods Biofilms, Bioenergy and Biofuels, Biosensors in environmental monitoring, Environmental significance of GMO's. Eco management. Bioleaching. Environment protection Act & Policies.	
<b>UNIT IV: Introduction to nanotechnology</b>	
History of nanotechnology and future of nanotechnology. Impact of nanotechnology in different fields. Nanometer, Nanotubes, Biosensors, Nanorods and Nanofibres. Nanostructured materials, synthesis of nano-structured material and properties of nano-materials. Quantum dots, carbon nanotubes and their properties. Nanocomposites and Nanomachines. Nanowires, Nanoparticles and characterization of nanoparticles.	
<b>UNIT V: Applications of Nanobiotechnology</b>	
Introduction to nanobiotechnology. Nanobiotechnology and future perspectives. Biological nanostructures. Nanolithography. Application of nanobiotechnology in health and life sciences. Microbial nanoparticles, DNA - Protein nano structures. Self- assembly of nanomolecules. Drug nano particles. Bioincompatibility and drug delivery.	

**Text Books:**

1. Mohapatra, P.K., Textbooks of Environmental Biotechnology, I K International Publishing House Pvt. Ltd, 2006.
2. Alan Scragg, Environmental Biotechnology, Oxford; Second edition, 2007.
3. ManasiKarkare, Nanotechnology: Fundamentals and Applications, I K International Publishing House Pvt. Ltd, 2008.
4. Brown, T.A. Gene cloning and DNA analysis, 6th edition, Wiley Blackwell science.2010.
5. Charles Poole, Frank Owens, Introduction to Nanotechnology, Wiley 2007.

**Reference Books:**

1. Manahan, S.E. Environmental science and technology .Lewis, New York, 1997.
2. Metcalf and Eddy (eds). Wastewater engineering: treatment and reuse, Tata McGraw-Hill, New Delhi. 2003.
3. Nelson, G.C. genetically modified organism in agriculture: economics and politics academic press. 2001.
4. Evans,G.M and Furlong J.C. Environmental biotechnology: theory and application. John Wiley and Sons. 2003.
5. Thomas,J.A. and Fuchs R. biotechnology and safety assessment, 2002.

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Understanding the various types of ecosystems, biodiversity components, environmental threats and Policy.	<b>K2</b>
<b>CO-2</b>	Explaining the role of microbes in remediation of various products, i.e. pesticides, heavy metals, plastics and oil spills	<b>K3</b>
<b>CO-3</b>	Obtain the knowledge on quantum confinement effects.	<b>K1</b>
<b>CO-4</b>	Understand the quantum nanostructures, such as quantum dots, nanowires and quantum wells and their density of states.	<b>K2</b>
<b>CO-5</b>	Understand the roles, responsibilities and organizational structure of regulatory bodies. Obtain in depth knowledge which can be useful for practical applications while preparing drug approval applications	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create.



### Mapping with Programme Outcomes

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	S	M	M	M	S	M	S	M
<b>CO-2</b>	M	S	S	M	M	M	M	M	M	M
<b>CO-3</b>	S	S	M	M	M	M	M	M	M	M
<b>CO-4</b>	M	M	M	M	M	M	M	M	M	M
<b>CO-5</b>	M	M	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium

<b>Core: X - Drug Discovery and Development</b>	
<b>Semester - IV</b>	<b>Hrs/week: 6</b>
<b>Course Code: 21P4BT10</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. This course will provide students with a fundamental knowledge of drug discovery and development from both a preclinical and clinical perspective.	
2. To provide an overview about identifying drug targets and strategies to develop drugs	
3. Students with a comprehensive knowledge of drug discovery and development, from bench to bedside.	
4. This includes approaches to sourcing and developing new drugs, from natural sources through to rational drug design, as well as approaches to testing drug efficacy and safety in both preclinical phases and in clinical trials	
5. To understand the prerequisites of obtaining drug approval, important aspects of commercialization	
<b>UNIT I- Introduction of Drugs</b>	
Drugs - definition, source and nature, types of classification and nomenclature, dose response curve and LD50. Role of drugs, Drug - protein interactions, routes of drug administration.	
<b>UNIT II- Drug targets</b>	
Drug targets - Enzymes, receptors, carrier proteins. Structural proteins, nucleic acids, lipids and carbohydrates. Forces in drug - receptor interaction, Receptor theories.	
<b>UNIT III- Drug design</b>	
Drug absorption, distribution, metabolism, excretion and dosing. Pharmacokinetic oriented drug design - Drug solubility and drug stability.	
<b>UNIT IV- Drug discovery</b>	
Biological testing and bioassays - testing drugs in vitro and in vivo. Drug discovery. Lead compounds - natural sources and synthetic sources.	
<b>UNIT V- Drug development</b>	
Drug development. Target - oriented drug design, computer aided drug design, Quantitative structure, activity relationship - binding interaction, Functional groups and Pharmacophore. High throughput screening and Molecular docking.	

**Text Books:**

1. Subhash Chandra Parija, "Textbooks of Microbiology and Immunology", Elsevier; Second edition, 2012.
2. Arumugam N. A. Mani, L.M.Narayanan, Dulsy Fatima, A. M. Selvaraj, "Immunology & Microbiology", Saras Publication, 2015.
3. Arumugam N, "Immunology & Microbiology", Saras Publication, 2007.
4. Ramasamy, P and R.E.B. Hanna, "Immunity and inflammation", University of Madras publications, Pearl Press Ltd., 2002.

**Reference Books:**

1. Pelczar. MJ, Chan ECS, KingNR, "Microbiology – concepts and applications", McGraw –Hill, Edd., 27th, Jnc. NY – 2004..
2. Prescott LM, Haley JP, Klecin Da, "Microbiology", WCB Publishers, Sydney –2002.
3. Ingraham J.L. and C.A. Ingraham, "Essential of diagnostic Microbiology", 2nd edition by Brooks/cole, Thomson Learning, USA-2000.
4. Tak W Mark and Mary Saunders, "The Immune Response Basic and Clinical Principles", 1St edition, AP. 2005.

**Course Outcome:**

CO. No.	Upon completion of this course, students will be able to	Knowledge level
<b>CO-1</b>	Acquire knowledge about natural sources of drugs, interaction of drugs with different types of biological molecules to mediate physiological effects, metabolism and removal of drugs from the system.	<b>K2</b>
<b>CO-2</b>	The students will get an insight about how various biological systems can be used for biopharmaceutical production	<b>K5</b>
<b>CO-3</b>	Learn about emerging powerful tools employed for efficient and safe delivery of drugs into the host system. Enhance their decision making capacity to choose right system for drug delivery	<b>K6</b>
<b>CO-4</b>	Obtain comprehensive knowledge about vital facets of clinical testing in obtaining approval for new drugs. Improve their prudent skills to be employed in drug discovery efforts.	<b>K3</b>
<b>CO-5</b>	Learn about intricate aspects of drug development that need to be implied during new drug development	<b>K4</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create.

**Mapping with Programme Outcomes**

S.No	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO-1</b>	M	S	M	S	M	S	M	M	M	M
<b>CO-2</b>	S	S	S	M	S	S	M	S	S	M
<b>CO-3</b>	S	S	S	S	S	S	S	M	S	M
<b>CO-4</b>	S	S	M	S	M	M	S	S	M	M
<b>CO-5</b>	S	M	M	S	S	S	M	M	M	M

**S**-Strong; **M**-Medium

<b>Elective: IV Bioinformatics, IPR, Bioethics &amp; Biosafety</b>	
<b>Semester – IV</b>	<b>Hrs/week: 6</b>
<b>Course Code: 21P4BTE04</b>	<b>Credit: 5</b>
<b>Course Objectives:</b>	
1. To gain basic knowledge in the concept of systems biology and essential of bioinformatics. □	
2. The subject focuses on knowledge in the realm of bioinformatics databases, sequence alignment methods and tools, homology modeling and drug targeting.	
3. To become familiar with India's IPR Policy	
4. To become familiar with ethical issues in biological research. This course will focus on consequences of biomedical research technologies such as cloning of whole organisms, genetic modifications, DNA testing.	
5. To learn biosafety and risk assessment of products derived from biotechnology and regulation.	
<b>UNIT I - Bioinformatics</b>	
Introduction of Bioinformatics - History and scope of bioinformatics, Database -Biological Databases: Nucleic Acid sequence Databases: Genbank, NCBI, EMBL, DDBJ; Protein Sequence Databases: Swiss Prot, PIR; Structural Data Bases: PDB, CATH, SCOP and specialized databases.	
<b>UNIT II- Biological Databases</b>	
Tools for Bioinformatics: Pair wise alignment –Dotplots –scoring matrices –Blosum Matrices –PAM Matrix –Gap Penalty Alignment Algorithms: Needleman – Wunsch Global Alignment Algorithm; Smith –Waterman Local Alignment Algorithm. Genomealigners- BLAST, MUMmer, WABA, Glass, Dialign, Avid, LAGAN and Multi LAGAN. Protein gene prediction method-ORF finder, restriction analysis, secondary structure prediction. Homology modeling and drug designing.	
<b>UNIT III- IPR</b>	
Introduction to IPR, WTO, GATT, TRIPS, WIPO – Establishment and function. Intellectual property Rights, definition and types. Patent, trademark, trade secret, copyright. Geographical indication and industrial design. Patents in Biotechnology. Plant Breeders and farmer rights. Patenting in India: Indian patent act.	
<b>UNIT- IV-Bioethics</b>	
Bioethics- Ethical, Legal & Social Issues of Biotechnology. National & International issues on Genetic modification & recombinant DNA technologies, Release of GMO's in environment, Human embryonic cloning & stem cell research, transgenic plants and animals. □	
<b>UNIT -V-Biosafety</b>	
Biosafety-Introduction to bio-safety and health hazards concerning biotechnology. Introduction to the concept of containment level, General guidelines for rDNA research. Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).	

**Reference Books:**

1. David R Westhead, J Howard parish and Richard M Twyman. Instant Notes Bioinformatics, Viva Books Private Limited, Chennai.
2. Sillince JA and Sillince M. (1991). Molecular databases for protein sequence and structure studies, Springer Verlag.
3. Gribskov M, Devereux J. (1989). Sequence analysis, Primer Stockton Press.
4. Seizberg DB searls, S.Kasif. (1998). Computational methods in Molecular biology now comprehensive Biochemistry, Vol 32.S.L Elsevier.
5. Garfield LI. (1992). Information theory and living systems, Columbia University Press.
6. Recombinant DNA safety guidelines, Department of Biotechnology, Ministry of Sciences & Technology, Government of India.
7. Recombinant DNA safety guidelines & regulation, Department of Biotechnology, Ministry of Sciences & Technology, Government of India.
8. Revised guidelines for research in transgenic plants Department of Biotechnology, Ministry of Sciences & Technology, Government of India.
9. Radhakrishnan R and Balasubramanian S. (2008). Intellectual Property RIGHTS text and case. Excel books.
10. Jose Cibelli, Robert P lanza, Keith HS. (2002). Principles of cloning, Campbell, Michael D. West, Academic Press.

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	Explain the importance of bioinformatics in systems biology	<b>K1, K2 &amp; K3</b>
<b>CO-2</b>	Understand why India has adopted an IPR Policy and be familiar with broad outline of patent regulations;	<b>K2</b>
<b>CO-3</b>	Understand different types of intellectual property rights in general and protection of products derived from biotechnology research and issues related to application and obtaining patents.	<b>K2</b>
<b>CO-4</b>	Understand ethical aspects related to biological, biomedical, health care and biotechnology research.	<b>K2</b>
<b>CO-5</b>	Students will be able to describe facility features and special practices of a BSL-1 laboratory including Standard Microbiological Practices and aseptic technique	<b>K3</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create.

**Mapping with Programme Outcomes.**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	M	M	M	M	M	M	M	S	M
<b>CO-2</b>	M	M	S	M	M	M	M	M	M	S
<b>CO-3</b>	M	M	M	M	S	M	M	S	M	M
<b>CO-4</b>	M	M	M	M	M	M	M	M	M	M
<b>CO-5</b>	M	M	M	M	M	M	M	M	M	M

**S**-Strong; **M**-Medium

<b>EDC -Mushroom Cultivation and Its Marketing</b>	
<b>Semester – II</b>	<b>Hrs/week: 4</b>
<b>Course Code: 21P2BTED01</b>	<b>Credit: 4</b>
<b>Course Objectives:</b>	
1. To learn the cultivation of various mushrooms and create the student for self- employment.	
2. To teach to the students knowledge and skills, which allow them to establish a mushroom cultivation enterprise, or to cultivate mushrooms in a form of extra- earnings, or simply as a hobby	
3. To help create new employment opportunities for rural women and the youth through mushroom cultivation.	
4. Enable the students to identify edible and poisonous mushrooms	
5. To understand the Diseases. Post harvesting techniques of Mushrooms.	
<b>UNIT I: Mushroom Biology</b>	
Introduction to Mushroom - History of Mushroom - Ecology of Mushroom -Life cycle of Mushroom. Identification of Mushrooms - Phylogeny of Mushrooms.	
<b>UNIT II: Cultivation Methods</b>	
General preparation for Mushroom Cultivation. - Basic elements for Mushroom growth and farm settings - Basic elements for Mushroom growth and farm settings - Cultivation methods (Agaricusmorcella, Volvariella and Pleurotus).	
<b>Unit III: Value of Mushroom</b>	
Production of Mushrooms from waste substrates. Rice bran, Ground nut, Sugar cane trash. Mushrooms in food and medicine. Nutritional and medicinal value of mushrooms.	
<b>UNIT IV: Compounds from mushroom</b>	
Production of Mushrooms enzymes and metabolites and Preparation of other value added products from Mushroom. Diseases and Pest control.	
<b>UNIT V: Mushroom Marketing</b>	
Post-harvest technology, marketing strategies of mushroom with special reference to export and local marketing.	

**Text Books:**

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|---|
| 1. Suman, B.C and V. P. Sharma. Mushroom Cultivation in India, Daya Publishing House. 2007. |
| 2. Ravinder Singh Rana. Mushroom Cultivation and its Diseases. 2020                         |

**Reference Books:**

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|--|
| 1. Suman, B.C and V. P. Sharma. Mushroom Cultivation in India, Daya Publishing House.2007. |
| 2. Ram R.C.Mushrooms and Their Cultivation Techniques, Pointer Publishers- Jaipur.2007     |
| 3. Yaniv. Handbook of Medicinal Plants, Cbs Publisher.2007.                                |
| 4. ZoharaYaniv. Handbook of Medicinal Plants, Crc Press.2005.                              |
| 5. Benson, Plant Conservation Biotechnology, Taylor and Francis.2002.                      |
| 6. Nicholas L.G and Kerry Ogame, Psilocybin Mushroom Hand Book.2006.                       |

**Course Outcome:**

<b>CO. No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge level</b>
<b>CO-1</b>	To learn about History, Ecology and life cycle of Mushroom.	<b>K1</b>
<b>CO-2</b>	Gain the knowledge of cultivation of different types of edible mushrooms and spawn production	<b>K3</b>
<b>CO-3</b>	Manage the diseases and pests of mushrooms	<b>K2</b>
<b>CO-4</b>	Apply laboratory techniques to the capture, culture, and fruiting of many types of mushrooms in the home kitchen lab.	<b>K3</b>
<b>CO-5</b>	Understood the Diseases. Post harvesting techniques of Mushrooms	<b>K2</b>

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5**- Evaluate; **K6** – Create.

**Mapping with Programme Outcomes**

<b>S.No</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO-1</b>	S	S	S	M	M	M	S	M	S	M
<b>CO-2</b>	M	M	S	M	M	S	S	M	M	S
<b>CO-3</b>	S	S	M	M	S	M	M	M	M	M
<b>CO-4</b>	S	M	S	M	M	S	S	S	S	M
<b>CO-5</b>	M	M	M	M	M	M	M	S	M	M

**S**-Strong; **M**-Medium



**SELVAMM ARTS & SCIENCE COLLEGE, NAMAKKAL**  
**(AUTONOMOUS)**

**Nationally Accredited by NAAC**

**Affiliated to Periyar University, Salem-11**



**M.Sc. CHEMISTRY**

**(Semester pattern)**

**REGULATIONS AND SYLLABUS**

**(Under Choice Based Credit System)**

**for**

**Students Admitted**

**2021-2022 Onwards**

## REGULATIONS

Effective from the Academic year 2021 – 2022

### OBJECTIVE OF THE COURSE

To Develop the Post Graduates in Chemistry with strong knowledge of theoretical chemistry subjects who can be employed in research and development units of industries and academic institutions.

#### 1. Condition for Admission

A candidate who has passed B.Sc., Chemistry Degree any other University accepted by the syndicate as equivalent there to subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc., Chemistry Degree Examination of Periyar University after a course of study of two academic years.

#### 2. Duration of The course

The programme for the degree of **Master of Science in chemistry** shall consist of **two Academic years** divided into four semesters. Each semester consist of 90 working days.

#### 3 Passing Minimum

The candidate shall be declared to have passed the examination if the candidate secures not less than 50% marks in the Board Examination in each paper / practical. However submission of a Record notebook is a must. For the project work and viva-voce a Candidate should secure 50% of the marks for pass. The candidate should that paper compulsorily attend viva-voce Examination to secure pass.

### EDC – EXTRA DISCIPLINARY COURSE

Students are expected to optics EDC (Non-Major) offered by other department.

### 5. EXAMINATIONS: Theory Evaluation of Internal Assessment

Assignment / Snap Test	05 Marks
Seminar	05 Marks
CIA-I	05 Marks
CIA-II	05 Marks
Model Exam	05 Marks
Total	25Marks

The Passing minimum shall be 50% out of 25 marks (13 marks)

## EVALUATION OF EXTERNAL EXAMINATIONS

### Pattern of Question Paper

Time: 3 Hours

Max Marks: 75

PART – A: 10 x 1 = 10

Answer all the questions. Each question carries **ONE** mark:

PART- B: 5x5=25

(Either or Type from Each Unit)

PART- C: 5x8=40

(Either or Type from Each Unit)

The Passing minimum shall be 50% out of 75 marks (38 marks)

### **PRACTICAL: Evaluation of Internal Assessment**

Attendance	05 Marks
Observation	15 Marks
Record	10 Marks
Model	10 Marks
Total	40 Marks

The passing minimum shall be 50% out of 40 marks (20 Marks)

### **EVALUATION OF EXTERNAL EXAMINATIONS:**

DISTRIBUTION OF MARKS	
Time	6 Hours
Max Marks	60 Marks
Viva-Voce	10 Marks
Record	05 Marks
Estimation / Mixture/ Expt.	35/20/45 Marks
Preparation/Colorimetric	10/15 Marks

DISSERTATION	
Evaluation (External)	150 Marks
Viva-voce (joint)	50 Marks

## **I. REGULATIONS OF PROJECTWORK**

1. Students should do their five months [Dec to Apr] Project work in Company / Industries.
2. The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the Ist Week of January in their Project semester.
3. Each internal guide shall have maximum of eight Students.
4. Periodically the project should be reviewed minimum three times by the advisory committee.
5. The Students should prepare three copies of the dissertation and submit the same to the college on 30th April for the evaluation by examiners. After evaluation one copy is to be retained in the College Library and one copy is to be submitted to the University (Registrar) and the student can hold one copy.
6. A Sample format of the dissertation is enclosed in Annexure-II.
7. Format of the Title page and certificate are enclosed in Annexure- III.
8. The Students should use OHP / Power Point Presentation during their Project Viva voce Examinations

## **II. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class. All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance. Candidates who pass all the examinations prescribed for the course in first instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.

## **1. COMMENCEMENT OF THIS REGULATION**

These regulations shall take effect from the academic year 2021-22, i.e., for students who are to be admitted to the first year of the course during the academic year 2021-22 and thereafter.

## **2. TRANSITORY PROVISION**

Candidates who were admitted to the PG course of study before 2021-2022 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2025. Thereafter, there will be permitted to appear for the examination only under the regulations then in force.

## Vision

To impart a high quality of education & training in the field of chemistry to enable Successful career for the post graduate students in the field of research, education & industrial Applications.

## Mission

Independent thought, collegiality, exchange of ideas and high ethical standards, development of innovative instructional techniques and increased job opportunities.

## Programme Outcomes (M.Sc )

PO. No	Upon completion of M.Sc Degree Programme , the Graduates will be able to
PO 1	<b>Application:</b> Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
PO 2	<b>Analysis:</b> Perform analysis to assess, interpret, and create innovative ideas through practical experiment.
PO 3	<b>Solution Finding:</b> Facilitate to enter multidisciplinary path to solve day-to-day problems
PO 4	<b>Progression in Career:</b> Prepare students for prominent career in industry, banks offices and for further academic study.
PO 5	<b>Research Capability:</b> Able to do the experiments with proper procedure, appropriately record and Analyze the results.
PO 6	<b>Expressing their talents:</b> Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.
PO 7	<b>Individual sustainability:</b> Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
PO 8	<b>Competency:</b> Attain competency in job market / entrepreneurship.

**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**  
**COURSE STRUCTURE UNDER CBCS**  
**DEPARTMENT OF CHEMISTRY**

**M.Sc. CHEMISTRY (For candidates admitted from 2021-2022 onwards)**

Sem	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
I	Core Course-I	21P1CH01	Reaction Mechanism	5	5	25	75	100
	Core Course-II	21P1CH02	Coordination Chemistry and Inorganic Spectra	5	5	25	75	100
	Core Course-III	21P1CH03	Quantum Chemistry and Chemical Kinetics	5	5	25	75	100
	Core Elective-I	21P1CHE01	Polymer Chemistry	4	4	25	75	100
		21P1CHE05	Molecular Modelling & Drug Design					
		21P1CHE09	Textile Chemistry					
	Core Practical-I	21P2CHP01	Organic Chemistry Practical-I	4	-	-	-	-
Core Practical-II	21P2CHP02	Inorganic Chemistry Practical-I	4	-	-	-	-	
Core Practical-III	21P2CHP03	Physical Chemistry Practical-I	3	-	-	-	-	
<b>Total</b>				<b>30</b>	<b>19</b>	<b>-</b>	<b>-</b>	<b>400</b>
II	Core Course-IV	21P2CH04	Stereochemistry and Organic Photochemistry	5	5	25	75	100
	Core Course-V	21P2CH05	Thermodynamics and Group Theory	5	5	25	75	100
	Core Elective-II	21P2CHE02	Organometallic Chemistry and Bioinorganic Chemistry	4	4	25	75	100
		21P2CHE06	Medicinal Chemistry					
		21P2CHE10	Natural Product					
	Core Practical-I	21P2CHP01	Organic Chemistry Practical-I	4	3	40	60	100
	Core Practical-II	21P2CHP02	Inorganic Chemistry Practical-I	3	3	40	60	100
	Core Practical-III	21P2CHP03	Physical Chemistry Practical-I	3	3	40	60	100
EDC	21P2CSDE01	Extra Disciplinary course	4	4	25	75	100	
Common	21P2HR01	Human Rights	2	2	40	60	100	
<b>Total</b>				<b>30</b>	<b>29</b>	<b>-</b>	<b>-</b>	<b>800</b>
III	Core Course-VI	21P3CH06	Organic Reactions and Natural Products	6	5	25	75	100
	Core Course-VII	21P3CH07	Thermodynamics and Spectroscopy	5	5	25	75	100
	Core Elective-III	21P3CHE03	Electro Chemistry and Photochemistry	5	5	25	75	100
		21P3CHE07	Electroanalytical Techniques					
		21P3CHE11	Instrumental Methods of Analysis					
	Core Practical-IV	21P3CHP04	Organic Chemistry Practical-II	4	4	40	60	100
	Core Practical-V	21P3CHP05	Physical Chemistry Practical-II	4	4	40	60	100
	Core Practical-VI	21P4CHP06	Inorganic Chemistry Practical-II	4	-	-	-	-
Common	21P3SSS01	Soft Skills	2	1	25	75	100	
Common	21P3CHI01	Internship	*	#	-	-	-	
<b>Total</b>				<b>30</b>	<b>24</b>	<b>-</b>	<b>-</b>	<b>600</b>
IV	Core Course-VIII	21P4CH08	Solid State and Nuclear Chemistry	6	5	25	75	100
	Core Course-IX	21P4CH09	Organic and Inorganic Spectroscopy	5	5	25	75	100
	Core Elective-IV	21P4CHE04	Nano and Green Chemistry	5	5	25	75	100
		21P4CHE08	Experimental Methods in Chemistry					
		21P4CHE12	Industrial Organic Synthesis					
	Core Practical-VI	21P4CHP06	Inorganic Chemistry Practical-II	4	4	40	60	100
Project	21P4CHPR01	Dissertation/Project work	10	8	50	150	200	
Common	21P4EX01	Empowering Rural People	(40)**	1	-	-	100	
<b>Total</b>				<b>30</b>	<b>28</b>	<b>-</b>	<b>-</b>	<b>700</b>
<b>Grand Total</b>				<b>120</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>2500</b>

\*-15 days- II semester leave

#- commended /highly commended will be given, based on Report & Viva-Voce Examination

\*\* Outside the class Hours.

xxxxx- To Choose the Corresponding Department.

**CORE COURSE - I**  
**REACTION MECHANISM**

**Semester : I**

**Hours/weeks : 5**

**Course code : 21P1CH01**

**Credits : 5**

**Course Objectives**

1. To understand the concepts of reaction intermediates.
2. To learn the concepts of elimination reaction and mechanisms.
3. To understand the mechanism of addition reactions.
4. To study the mechanism of nucleophilic substitution reactions.
5. To know the electrophilic substitution reaction.

**UNIT – I Reaction Intermediate**

1.1 Organic reactive intermediates: Generation, stability and reactivity of carbocations, Carbanion, free radicals, carbenes, benzyne and Nitrenes.

1.2 Free radical reactions: Sandmeyer reaction, Gomberg-Bachmann reaction, Pschorr reaction and Ullmann reaction, Hunsdiecker reaction

**UNIT - II Elimination reactions**

2.1  $E_1$ ,  $E_2$ ,  $E_1CB$  mechanisms, Orientation of the double bond - Hofmann and Saytzeff rule, competition between elimination and substitution, dehydration and dehydrohalogenation reactions.

2.2 Stereochemistry of  $E_2$  eliminations in cyclohexane ring systems, mechanism of pyrolytic eliminations, Chugaev reaction and Cope elimination.

**UNIT - III Addition Reactions**

3.1 Addition to Carbon - Carbon and Carbon - Hetero atom Multiple bonds: Addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation, epoxydation, Michael addition, 1,3-dipolar addition.

3.2 Mechanisms of Mannich, Stobbe, Darzen Glycidic ester condensation, Benzoin condensation, Peterson olefination (Silyl Wittig reaction), Strecker synthesis, Wittig, Wittig - Horner, Perkin, Thorpe, Ritter and Prins reactions.

**UNIT - IV Nucleophilic Substitution Reactions**

4.1 The  $S_N1$ ,  $S_N2$ , mixed  $S_N1$  and  $S_N2$ ,  $S_{Ni}$  and SET mechanisms. The neighboring group mechanism, neighboring group participation by  $\sigma$  and  $\pi$  bonds, anchimeric assistance. Reactivity effects of substrates structure, attacking nucleophile, leaving group and reaction medium, ambident nucleophile, regioselectivity.



4.2 Reactions involving substitution at carbon doubly bonded to oxygen and nitrogen: Williamson reaction, Von Braun reaction, Claisen and Dieckmann condensation. Hydrolysis of esters

4.3 Aromatic nucleophilic Substitution -  $S_N1$ ,  $S_NAr$ ,  $S_Ni$ , Benzyne mechanism Aromatic nucleophilic substitution of activated halides - Ziegler alkylation, Chichibabin reaction.

### UNIT –V: Electrophilic Substitution Reactions

5.1 Aromatic electrophilic substitution: The arenium ion mechanism, typical reactions like nitration, Sulphonation, Halogenation, Friedel-Crafts alkylation, acylation and, electrophilic substitution on monosubstituted benzene, orientation and reactivity - ortho, meta and para directing groups, ortho-para ratio, ipso attack, Gatterman, Gatterman-Koch, Vilsmeier, Reimer-Tiemann reaction.

5.2 Coupling reaction- diazonium coupling, Negishi, Suzuki-Miyaura, Kumada Coupling, Stille Coupling .

5.3 Aliphatic Electrophilic substitution -  $S_E2$  and  $S_E1$  mechanisms, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity on the reactivity

#### Course Outcomes.

CO No.	On the successful completion of the course, students will be able to	PSOs addressed	Knowledge Level
CO-1	Appreciate the mechanistic pathways of nucleophilic substitution reactions.	1	K1
CO-2	Understand the nucleophilic substitution reactions shown by organic molecules.	4	K2
CO-3	Learn the techniques of studying the mechanisms of reactions.	5	K1
CO-4	Know the chemical reactions and the mechanisms via different intermediates.	6	K3
CO-5	Predict the various application in electrophilic substitution reaction.	6	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

#### Text Books:

1. Jerry March, **Advanced Organic Chemistry-Reactions, Mechanisms and Structure**, Fourth Edition, John Wiley & Sons ,1992
2. E.S Gould, **Mechanism and Structure in Organic Chemistry**, New York: Holt, Rinehart and Winston, 1963-1959.

3. T.L. Gilchrist and C.W. Rees, **Carbenes, Nitrenes and Arynes** by Thomas Nelson and Sons Ltd., London, 1969.
4. Francis A. Carey, **Organic Chemistry**, Third Edition, McGraw-Hill Companies, Inc., 1996.
5. P.S. Kalsi, **Organic Reactions and Mechanisms**, Second Edition, New Age International Publishers, 2002.

#### Reference Books:

1. P.S. Kalsi, **Stereochemistry and Mechanism through solved problems**, Second Edition, New Age International Publishers, 1994.
2. S.M. Mukherji and S. P. Singh, **Reaction Mechanism in Organic Chemistry**, 1st Edition, Macmillan, 1976.
3. R.T. Morrison and R.N. Boyd, **Organic Chemistry**, 6th Edition, Prentice- Hall, 1992.
4. R.O.C. Norman, **Principles of Organic Synthesis**, Second Edition, Chapman and Hall, 1978.
5. R.M. Acheson, **Introduction to Chemistry of Heterocyclic Compounds**, 2<sup>nd</sup> Edition, Inter science Publishers, 1967.
6. J.A. Joule and G.F. Smith, **Heterocyclic Chemistry**, Van Nostrand Reinhold Co., London, 1978.

#### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	M	S	S	M	M
CO2	S	M	M	M	M	M	M	M
CO3	S	M	M	M	M	M	M	S
CO4	S	M	S	M	M	S	M	M
CO5	S	M	M	M	M	M	M	S

S – Strong

M – Medium

L-Low

**CORE COURSE – II**  
**COORDINATION CHEMISTRY AND INORGANIC SPECTRA**

**Semester : I**

**Hours/week : 5**

**Course code: 21P1CH02**

**Credits : 5**

**Course Objectives**

1. To understand the basic concepts of Coordination Chemistry.
2. To learn the CFT and MOT of coordination complexes.
3. To learn the Kinetics and mechanism of coordination complexes.
4. To study the Electronic Spectra of coordination complexes
5. To learn the Physical Methods in Coordination Chemistry.

**UNIT – I Principles of Coordination Chemistry**

1.1. Studies of coordination compounds in solution – detection of complex formation in solution – stability constants – stepwise and overall formation constants.

1.2. Determination of stability constants -polarographic, photometric and potentiometric methods factors affecting stability – statistical and chelate effects – forced configurations.

1.3. Macrocyclic ligand types - porphyrins, corrins, Schiff bases and crown ethers (simple complexes).

**UNIT – II Crystal Field Theory**

2.1 Crystal field theory - splitting of d-orbital's in different symmetries, crystal field stabilization energy, factors affecting the magnitude of  $10 Dq$ , high spin-low spin cross over and magnetic properties. Applications of CFSE – Lattice energy, Ionic radii, enthalpy of hydration and structure of spinals.

2.2 Ligand field theory –MO theory of octahedral complexes (sigma and pi bonding) and tetrahedral complexes. Nephelauxetic effect – the angular overlap model.

**UNIT – III Reaction Mechanisms in Complexes**

3.1 Kinetics and mechanism of reactions in solution – labile and inert complexes – ligand displacement reactions in octahedral and square planar complexes – acid hydrolysis, base hydrolysis and anionic reactions.

3.2 Trans effect – theory and applications – electron transfer reactions – electron exchange reactions – complementary and non-complementary types – inner sphere and outer sphere processes – application of electron transfer reactions in inorganic complexes – isomerisation and racemisation reactions of complexes.

**UNIT – IV Electronic Spectra of Complexes**

4.1 Spectroscopic Term symbols for  $d^{1-10}$  ions – derivation of term symbols and ground state term symbol, Hund's rule; Selection rules – break down of selection rules, spin-orbit coupling, band intensities, weak and strong field limits- correlation diagram

4.2 Energy level diagrams; Orgel diagram - Jahn- Teller effect (static, dynamic, elongation and flattening). Charge transfer spectra of LMCT and MLCT. Spectral properties of lanthanides and actinides.

### UNIT – V Spectra of Coordination Compounds

5.1 Characterisation of inorganic compounds by NMR, EPR, Mössbauer Spectra of metal Complexes.

5.2 NMR Spectra of  $^{31}\text{P}$ ( $\text{H}_3\text{PO}_4$ ,  $\text{H}_3\text{PO}_3$ ,  $\text{H}_3\text{PO}_2$ ,  $\text{F}_2\text{HPO}_2$ ,  $\text{H}_4\text{P}_2\text{O}_4$ ),  $^{19}\text{F}$ ( $\text{ClF}_3$ ,  $\text{BrF}_5$ ,  $\text{TiF}_4$ (Cis-Trans)  $\text{TiF}_2$ ,  $^1\text{H}$ ( $\text{H}_2\text{O}$ ,  $\text{H}_2\text{O}_2$ ),  $^{11}\text{B}$  ( $\text{B}_3\text{H}_8$ ) $^-$ .

5.3 Mossbauer spectroscopy – Quadrupole interactions – magnetic interactions –  $\text{FeSO}_4$ ,  $\text{FeCl}_3$ , ferro- and ferricyanides, nitroprusside,  $\text{Fe}_3(\text{CO})_{12}$ .

5.4 ESR-pattern for number of lines of complexes having  $d^1$ - $d^9$  systems – bis(salicylaldimine)  $\text{Cu}(\text{II})$  and  $\text{Mn}(\text{II})$  complexes.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Analysis applications of IR, NMR, ESR and Mossbauer spectrometric methods to the field of coordination chemistry	8	K4
CO-2	The fundamentals of electronic spectra of complexes and their interpretations are learnt.	3	K5
CO-3	Concept of different types of magnetic behaviors and their measurement are learnt.	8	K2
CO-4	Understood the theories of bonding in coordination compounds	7	K2
CO-5	Recognize the mechanisms of complexes are learnt.	6	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text books:

1. J.E.Huheey, E.A.Keiter and R.L.Keiter, **Inorganic chemistry principles of structure and reactivity**, 4th edition, Pearson-Education, 2002
2. J.D. Lee., **Concise Inorganic Chemistry**, sixth edition, ELBS, London 1998,
3. F.A.Cotton and G.Wilkinson, **Advanced Inorganic Chemistry**, Wiley Eastern, 5th edition, 1988.
4. R.S.Drago, **Physical methods in chemistry**, Reinhold New York, 1968.

### Reference Books:

1. N.H. Ray , **Inorganic Polymers**, Academic Press, 1978.
2. K.F. Purcell and J.C. Kotz, **Inorganic Chemistry**, WB Saunders Co., USA 1977.
3. G.S. Manku, **Inorganic Chemistry**, T.M.H. Co., 1984.

4. H.A.O. Hill and P.Day, **Physical methods in advanced Inorganic chemistry**, John Wiley, 1986.

**Mapping with Programme Specific Outcomes**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>
<b>CO1</b>	S	S	S	M	M	S	S	S
<b>CO2</b>	S	M	S	M	M	M	M	S
<b>CO3</b>	S	M	M	S	M	M	S	S
<b>CO4</b>	S	M	S	M	S	S	S	M
<b>CO5</b>	M	S	M	M	S	S	S	M

**S – Strong**

**M – Medium**

**L-Low**

## CORE COURSE – III

### QUANTUM CHEMISTRY AND CHEMICAL KINETICS

Semester : I

Hours / week : 5

Course Code: 21P1CH03

Credits : 5

#### Course Objectives:

1. To Study the fundamentals of classical Quantum Chemistry.
2. To learn concept of Quantum Chemistry.
3. To understand the concepts and applications of reaction kinetics chemistry.
4. To study the theories of chemical kinetics.
5. To study the theory and mechanism of catalytic and surface reactions.

#### UNIT – I: Quantum Chemistry – I

- 1.1 De – Broglie equation – Heisenberg uncertainty principle – Compton effect.
- 1.2 Operators- linear, angular momentum, Laplacian, Hermitian, Hamiltonian and Ladder operators.
- 1.3 Quantum mechanical postulates – Eigen values and Eigen functions, Hermitian property of operators, orthogonality and normalization. Schrodinger equation and its solution to the problem of a particle in one and three dimensional boxes – the harmonic oscillator.

#### UNIT – II Quantum Chemistry –II

- 2.1 Schrödinger equation for the rigid rotator and Hydrogen atom – arriving solution for energy and wave function – the origin of quantum numbers and their physical significance.
- 2.2 Probability distribution of electrons. Spin - orbit interaction – LS coupling and JJ coupling – Term symbols and spectroscopic states. Ground state term symbols for simple atoms.

#### UNIT – III Chemical Kinetics – I

- 3.1 Theories of Reaction rates – Arrhenius theory – effect of temperature on reaction rate
- 3.2 Hard – Sphere collision theory of reaction rates – molecular beams – Reaction cross section – effectiveness of collisions – Probability factor.
- 3.3 Transition state theory of reaction rates – Potential energy surface – Partition functions and activated complex – Eyring equation – Comparison of collision theory and activated complex theory – Estimation of free energy, enthalpy and entropy of activation and their significance.

#### UNIT – IV Chemical Kinetics – II

- 4.1 Reactions in solutions – comparison between gas phase and solution reactions – the influence of solvent, ionic strength, dielectric constant and pressure on reaction in solution. Primary and secondary salt effects. The reactivity-selectivity principle – Isokinetic temperature -Isoselectivity rule.

4.2 Kinetic isotope effects – Linear free energy relationship – Hammett and Taft equations-substituent ( $\sigma$  and  $\sigma^*$ ) and reaction constant ( $\rho$  and  $\rho^*$ ) with examples. Deviations from Hammett correlations, reasons- Change of mechanism, resonance interaction. Taft four parameter equation. Correlations for nucleophilic reactions.

### UNIT – V Surface Chemistry and Catalysis

5.1 Kinetics of surface reactions: Physical and chemical adsorption – adsorption isotherms – types of adsorption isotherms – Langmuir adsorption isotherm – B.E.T theory– measurement of surface area – the adsorption coefficient and its significance.

5.2 Acid – Base catalysis – mechanism – Bronsted catalysis Law – catalysis by enzymes, Michaelis–Menten equation – rate of enzyme catalysed reactions – effect of substrate concentration, pH and temperature on enzyme catalysed reactions.

#### Course outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Understood the theories of reaction rates	4	K2
CO-2	The concepts and applications of reaction kinetic chemistry are understood	8	K3
CO-3	Acid-base and enzyme catalysis concepts are learnt	1	K4
CO-4	learnt and understand the concepts of Schrodinger equation	5	K2
CO-5	Learnt and understand the concept of classical mechanics	6	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

#### Text Books:

1. S.Glasstone, **Thermodynamics for chemists**, Affiliated East West press, New Delhi, 1960.
2. J.Rajaram and J.C. Kuriacose, **Thermodynamics for students of chemistry**, Lal Nagin Chand, New Delhi, 1986.
3. K.J.Laidlar, **Chemical Kinetics**, Harper and Row Newyork, 1987.
4. R.K. Prasad, **Quantum Chemistry**, Wiley Eastern, New Delhi, 1992.
5. V.Ramakrishnan and M.S.Gopinathan, **Group theory in chemistry**, Vishal publications,1988.

#### Reference Books:

1. K.G. Den beigh, **Thermodynamics of Steady state**, Meklien and Co., London, 1951.
2. L.K. Nash, **Elements of Chemical Thermodynamics**, Addison Wesley, 1962.
3. J.W. Moore and R.G. Pearson, **Kinetics and Mechanism**, 1981.

### Mapping with Programme Specific Outcomes

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>
<b>CO1</b>	S	M	S	S	M	S	M	S
<b>CO2</b>	M	M	S	S	M	S	M	S
<b>CO3</b>	S	S	M	S	M	S	M	S
<b>CO4</b>	S	M	S	S	M	M	L	S
<b>CO5</b>	S	M	S	S	M	M	M	M

**S – Strong**

**M – Medium**

**L-Low**



**CORE ELECTIVE-I  
POLYMER CHEMISTRY**

**Semester : I**

**Hours / Week: 4**

**Course Code: 21P1CHE01**

**Credits : 4**

**Course Objectives:**

1. To Study the basic concepts of polymer chemistry.
2. To study the polymers and their types.
3. To learn the properties of commercial polymers.
4. To understand the preparation, characterizations and applications of various types of polymers.
5. To study the detailed preparation of commercial polymers and their physico-chemical properties.

**UNIT – I Basic Concepts:**

1.1 Monomers, repeat units, degree of polymerization, Linear, branched and network Polymers. Condensation Polymerization: Mechanism of stepwise polymerization. Kinetics and statistics of linear stepwise polymerization.

1.2 Addition polymerization: Free radical, cationic and anionic polymerization. Polymerization conditions. Polymerization in homogeneous and heterogeneous systems.

**UNIT – II Co- Polymerization:**

2.1 Copolymerization: Block and graft co-polymers, kinetics of copolymerization. Types of copolymerization. Evaluation of monomer. Reactivity ratio, Rate of copolymerization.

2.2 Kinetics of mono and bimetallic mechanism of co-ordination polymers.

**UNIT – III Molecular Weight and Properties:**

3.1 Polydispersion – average molecular weight concept, number, weight and viscosity average molecular weights. Measurement of molecular weights. Gel permeation chromatography, viscosity, light scattering, osmotic and ultracentrifugation methods.

3.2 Polymer structure and physical properties – crystalline melting point  $T_m$ . The glass transition temperature. Determination of  $T_g$ . Relationship between  $T_m$  and  $T_g$ .

**UNIT – IV Polymer Processing:**

Plastics, elastomers and fibres. Compounding processing techniques: calendaring, die casting, rotational casting, film casting, injection moulding and blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning.

**UNIT – V Commercial Polymers:**

5.1 Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers, Fire retarding polymers and electrically conducting polymers.

5.2 Biomedical polymers – contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand the different mechanism of polymerization	9	K2
CO-2	Explain the polymerization techniques and commercial applications of different polymers	3	K1
CO-3	Determine the molecular weight of polymers by various methods	8	K4
CO-4	Learnt the fabrication techniques and applications of polymers.	5	K3
CO-5	Recall the various commercial polymer properties.	4	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

- 1.F.W. Billmeyer, **TextBook of Polymer Science**, 3rd Edition, J.Wiley, 2003.
- 2.V. R. Gowariker, N.V. Viswanathan and J. Sreedhar, **Polymer Science**, New Age Int., 1986.

### Reference Books:

1. R. Alcock and F.W. Lamber, **Contemporary Polymer Chemistry**, Prentice Hall, 1981.
2. P.J. Flory, **Principles of Polymer Chemistry**, Cornell University press, New York, 1953.
3. G. Odian, **Principles of Polymerization**, 2nd Edition, John Wiley & Sons, New York, 1981.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	M	M	S	M	S	M
CO2	S	S	L	M	S	M	S	M
CO3	S	S	M	M	S	L	M	S
CO4	M	S	M	S	S	M	S	M

**S – Strong**

**M – Medium**

**L-Low**

**CORE ELECTIVE-I**  
**MOLECULAR MODELLING & DRUG DESIGN**

**Semester : I**

**Hours /week: 4**

**Course code: 21P1CHE05**

**Credits : 4**

**Course Objectives:**

1. To the students should be acquainted with theoretical and practical knowledge of molecular modeling tools and techniques for drug design and discovery.
2. To understand the detailed knowledge and skill is given in the course and the students get acquired the same after studying the course.
3. To analyse about the importance of pharmacophores in drug discovery process.
4. To practice some online softwares to predict the physical and biological properties of natural/synthesized molecules.
5. To evaluate the drug-receptor binding affinities of the compounds by using in-silico method.

**UNIT - I** Introduction to Molecular Modelling Introduction to drug design, discovery and development- drug metabolism- toxicity and pharmacokinetics. Useful concepts in molecular modelling: Coordinate systems. Potential energy surfaces. Molecular graphics. Surfaces. Computer hardware and software. The molecular modelling literature.

**UNIT - II** Force Fields for molecular modelling Fields. Bond stretching. Angle bending, torsional term and miscellaneous interaction. Introduction to nonbonded interactions. Electrostatic interactions. Van der Waals Interactions. Hydrogen bonding in molecular mechanics– parameterization of a force field, distributed multiple and polarizable force fields, hydrophobic effect and solution energy- potential of mean force. Force field models for the simulation of liquid water.

**UNIT - III** Basics of molecular modelling Basics of molecular modelling, methods, steps involved in MM, selection of target and template, homology modelling, refinement and validation - SAVES server, the critical assessment of protein structure prediction (CASP), superposition of proteins using different tools, RMSD, presentation of protein conformations, hydrophobicity factor, shape complementary. QSAR: Principles of ligand based drug design SAR, QSAR and 3D QSAR- receptor based drug design - principles of receptor based de novo ligand design- rigid body molecular docking- statistical techniques behind QSAR.

**UNIT - IV** Pharmacophore Historical perspective and viewpoint of pharmacophore, functional groups considered as pharmacophores, Ehrlich's "Magic Bullet", Fischer's "Lock and Key", two-dimensional pharmacophores, three-dimensional approach of pharmacophores, criteria for pharmacophore model,

pharmacophore model generation software tools, molecular alignments, handling flexibility, alignment techniques, scoring and optimization, pharmacophores, validation and usage, automated pharmacophore generation methods, GRID-based pharmacophore models, pharmacophores for hit identification, pharmacophores for human ADME/tox-related proteins.

**UNIT - V** Computer aided Chemistry: Structure Prediction and Drug Design Introduction to molecular docking, rigid docking, Flexible docking, manual docking, advantage and disadvantage of flex-X, flex-S, AUTODOCK and other docking software, scoring functions, simple interaction energies, GB/SA scoring (implicit solvation), C Score (consensus scoring algorithms).

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Describe knowledge on the molecular modeling and field effects as a part of drug discovery.	2	K1
CO-2	Get knowledge of molecular modeling software will be useful for commercial projects related to drug discovery and developments.	3	K3
CO-3	Understand on the various stages and various targets of drug discovery.	4	K2
CO-4	Classify the importance of the pharmacophores in drug discovery.	5	K4
CO-5	Analyses the importance of the role of computer aided drug design in drug discovery.	8	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Leach, A. R. (2001). **Molecular Modelling Principles and Application (II Edition)**. Longman: Prentice Hall.
2. Haile, J. M. (1997). **Molecular Dynamics Simulation Elementary Methods (I Edition)**. UK: John Wiley and Sons.

### Reference Books:

1. Gupta, S. P. (2008). **QSAR and Molecular Modeling (I Edition)**. SpringerNetherlands: Anamaya Publishers.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE ELECTIVE-I  
TEXTILE CHEMISTRY**

**Semester : I**

**Hours /week: 4**

**Course code: 21P1CHE09**

**Credits : 4**

**Course Objectives:**

1. To understand about the classification, Chemical structure, production, properties and uses of fibers.
2. To get knowledge about the dyeing process on fibers.
3. To analyzes the types of dyes in various applications.
4. To evaluate the Pollution Control in Textile Industry.
5. To apply the various finishing process of fibers.

**UNIT- I Fibers:** General classification of fibers-chemical structure, production, properties and uses of the following natural fibers (a) natural cellulose fibers (cotton and jute) (b) natural protein fiber (wool and silk). Chemical structure, production, properties and uses of the following synthetic fibers. (i) Manmade cellulosic fibers (Rayon, modified cellulose fibers) (ii) Polyamide fibers (different types of nylons) (iii) Poly ester fibers.

**UNIT- II Dyeing Process:** Impurities in raw cotton and grey cloth, wool and silk- general principles of the removal – scouring – bleaching – desizing – kierboiling- chemicking. Dyeing - Dyeing of wool and silk –fastness properties of dyed materials – dyeing of nylon, terylene and other synthetic fibres.

**UNIT- III Finishing:** Finishes given to fabrics- mechanical finishes on cotton, wool and silk, method used in process of mercerizing –anti-crease and anti-shrink finishes –water proofing.

**UNIT-IV Types of Dyes:** Quinonoid dyes-examples and structure-Anthroquinone and Mordant dyessynthesis and applications of Alizarin-Phthalocyanin dyes-Copper Phthalocyanin- synthesis and applications. Diphenylmethane dyes- Auramine-Triphenylmethane dyes-Malachite green, Crystal violet, Pararosaniline-preparation and applications. Indigo dyes-preparation and application-derivatives of Indigo- synthesis and uses of Indigosol and tetrahaloindigo. Phthalein dyes-Phenolphthalein- preparation and applications. Xanthene dyes-Rhodamine B, Fluorescein-Eosin- preparation and applications.

**UNIT-V Pollution Control in Textile Industry:** Textile effluent-characteristics, effect of untreated effluent, degradability of wastes. Effluent treatment plants-aerated lagoon, photo oxidation process.

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand about the classification, Chemical structure, production, properties and uses of fibers.	2	K2
CO-2	Describe about the dyeing process on fibers.	3	K1
CO-3	Classify the types of dyes in various applications.	4	K4
CO-4	Evaluate the Pollution Control in Textile Industry.	5	K5
CO-5	Illustrate the various finishing process of fibers.	8	K5

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Chatwal, R. (2016). **Synthetic Dyes**. Mumbai: Himalayan Publishing House.
2. **The Chemistry of Textile fibres(2nd New Edition)**. New York: RSC Publishing.

### Reference Books:

1. Sharma, B. K. (2016). **Industrial Chemistry**. Krishna Prakashan Media, P,Ltd, Meerut.
2. Jean Hellot (2017) **Art of Dying Wool, Silk and Cotton, Forgotten Books**, Andesite Press.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE COURSE - IV**  
**STEREOCHEMISTRY AND ORGANIC PHOTOCHEMISTRY**

**Semester : II**

**Hours and week : 5**

**Course code: 21P2CH04**

**Credits : 5**

**Course Objectives:**

1. To learn stereochemistry of organic compounds.
2. To understand the Conformational analysis.
3. To know the effect of light in organic reactions.
4. To study the concerted pericyclic reactions
5. To understand the basic concepts of Aromaticity.

**UNIT – I Stereochemistry**

- 1.1 Fundamentals of organic Stereochemistry: Projection Formulae: Fischer, Newman and Sawhorse projections and their interconversions. Homotopic, enantiotopic and diastereotopic atoms and groups in organic molecules;
- 1.2 Optical activity in the absence of chiral carbon-biphenyls, allenes and spiranes. R-S notations.
- 1.3 E-Z isomerism of olefins containing one double bond and more than one double bonds; Definition of prochirality – Asymmetric synthesis – Cram's rule.

**UNIT – II Conformational Analysis**

- 2.1 Conformational analysis of simple cyclic (chair and boat cyclohexanes) and acyclic (n-butane) systems, conformation of simple 1,2 disubstituted derivatives – ethylene dichlorohydrins and ethylene glycol, Conformational analysis and stereochemical features of disubstituted cyclohexanes (1,2; 1,3; 1,4 dialkylcyclohexanes).
- 2.2 conformation and stereochemistry of cis and trans decalins, effects of conformation on reactivity in acyclic and cyclohexanes, Oxidation and acylation of cyclohexanols, reduction of Cyclohexanone.

**UNIT – III Organic Photochemistry**

- 3.1 Organic photochemistry: Introductory theory of light absorption, photophysical processes – Jablonski diagram, energy transfer photochemical reaction of ketones – Norrish type I and type II reactions. Paterno – Buchi reaction and cis and Trans isomerisation.
- 3.2 Photo addition of olefins and amines to aromatic compounds, Photo rearrangements: Photo – Fries rearrangement and Photo rearrangement of 2,5 – Cyclohexadienones.



## UNIT – IV Pericyclic Reactions

4.1 Concerted reactions: Pericyclic reactions – the electrocyclic reactions, cycloaddition reactions and sigmatropic reactions. Woodward – Hofmann rules, orbital correlation diagrams, the frontier orbital theory.

4.2 Aromatic transition state concept; Diels-Alder reaction, Cope and Claisen rearrangements. Diels-Alder methane olefination.

## UNIT-V Aromaticity

5.1 Aromaticity: Benzenoid and non-benzenoid compounds – generation and reactions.

5.2 Definition of Aromaticity – Huckel's and Craig's Rules – ring currents – Nonbenzenoid aromatic compounds – Aromatic character in 3,5 and 7 membered ring compound – Anti-aromaticity – systems with 2, 4, 6, 8, 10, 14 and 18 electrons – Azulene – Annulenes – Sydnones and fullerenes – Alternant and non alternant hydrocarbons. Homoaromaticity

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	learnt the importance of stereochemical aspects of structure and properties.	4	K1
CO-2	Understand the structural and stereochemical implications on nucleophilic substitution reactions.	6	K2
CO-3	Learnt stereochemical implications of pericyclic reaction in organic synthesis.	8	K3
CO-4	Understand the structural and stereochemical implications on photochemical reactions.	1	K2
CO-5	Recognize the concepts of aromatic, non-aromatic and anti aromatic character.	3	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Jerry March, **Advanced Organic Chemistry-Reactions, Mechanisms and Structure**, Fourth Edition, John Wiley & Sons (1992)
2. Francis A. Carey, **Organic Chemistry**, Third Edition, McGraw-Hill Companies, Inc., 1996.
3. P.S. Kalsi, **Organic Reactions and Mechanisms**, Second Edition, New Age International Publishers, 2002.
4. P.S. Kalsi, **Stereochemistry - Conformation and Mechanism**, 6th Edition, Wiley Eastern Limited, 2005.

5.I.L. Finar, **Organic Chemistry**, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd., (2000)

**Reference Books:**

1. S. H. Pine, J.B. Hendrickson, D.J. Cram and G.S. Hammond, **Organic Chemistry**, IV Edn., McGraw Hill Company, 1980.
2. S.M. Mukherji and S. P. Singh, **Reaction Mechanism in Organic Chemistry**, 1<sup>st</sup> Edition, Macmillan, 1976.
3. R.T. Morrison and R.N. Boyd, **Organic Chemistry**, Prentice-Hall, 1992.
4. R.O.C. Norman, **Principles of Organic Synthesis**, Second Edition, Chapman and Hall, 1978.
5. S.M. Mukherji and S.P. Singh, **Reaction Mechanism in Organic Chemistry**, III Edn. 1984. MacMillan.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	S	M	M	M	M	S
CO2	S	M	S	M	M	M	S	S
CO3	S	M	S	M	S	M	M	S
CO4	S	M	S	M	S	M	S	S
CO5	S	M	S	M	S	M	S	S

**S – Strong**

**M – Medium**

**L-Low**

**CORE COURSE-V**  
**THERMODYNAMICS AND GROUP THEORY**

**Semester : II**

**Hours /week : 5**

**Course code: 21P2CH05**

**Credits : 5**

**Course Objectives:**

1. To understand the fundamental of classical thermodynamics.
2. To study the basics and applications of chemical thermodynamics.
3. To understand the symmetry of molecules and its applications.
4. To understand the concepts of group theory.
5. To understand the Kinetics of complex reactions.

**UNIT – I Classical Thermodynamics –I**

1.1 Maxwell's relations and thermodynamic equations of state – applications in the evaluation of  $C_p-C_v$  for solids and for vanderwaals gases Partial molar properties – Gibbs – Duhem equation.

1.2 Partial molar free energy (Chemical Potential) – Determination of chemical potential [Direct Method and Method of Intercepts] and partial molar volume – variation of chemical potential with Temperature and Pressure.

**UNIT – II Classical Thermodynamics – II**

2.1 Thermodynamics of ideal and non ideal gases and solution, Fugacity – definition – Methods of determination of fugacity – Variation of fugacity with temperature and pressure.

2.2 Determination of activities and activity coefficient from Vapour pressure Concept of ionic strength.

**UNIT – III Group Theory – I**

3.1 Symmetry elements and symmetry operations – Point groups – identification and representation of groups – comparison of Molecular symmetry with Crystallographic symmetry

3.2 Reducible and irreducible representation – Direct product representation – Great orthogonality theorem and its consequences – Character Table and their uses.

**UNIT – IV Group Theory – II**

4.1 Symmetry selection rules for vibrational, Electronic and Raman Spectra – determination of representation of vibrational modes in non-linear molecules such as  $H_2O$ ,  $CH_4$ ,  $XeF_4$ ,  $SF_6$  and  $NH_3$ .

4.2 Symmetry of Hybrid orbitals in non-linear molecule ( $BF_3$ ,  $CH_4$ ,  $XeF_4$ ,  $PCl_5$  and  $SF_6$ ) – Electronic spectra of formaldehyde.

**UNIT – V Chemical Kinetics – III**

5.1 Kinetics of complex reactions – reversible reactions, consecutive reactions – Parallel reactions and Chain reactions – General treatment of chain reaction – Chain length – Rice Herzfeld mechanism – explosion limits.

5.2 Polymerization kinetics: stepwise and chain polymerizations. Fast reaction kinetics: Relaxation methods (T- and P-jump methods) - Stopped flow methods - Shockwave technique - Flash photolysis.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand the concept of Partial molar properties and fugacity.	8	K2
CO-2	Determine fugacity and activity of ideal and non ideal gases / solution.	1	K4
CO-3	Understand the concept of group theory.	6	K2
CO-4	Apply group theory to IR and Raman Spectra for linear and non-linear molecules	4	K3
CO-5	Describe the kinetics of complex reactions.	3	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**  
**Text Books:**

1. S.Glasstone, **Thermodynamics for chemists**, Affiliated East West press, New Delhi, 1960.
2. J. Rajaram and J.C. Kuriacose, **Thermodynamics for students of chemistry**, Lal Nagin Chand, New Delhi, 1986.
3. J. Rajaram and J.C. Kuriacose, **Kinetics and mechanism of chemical transformation**, Macmillan India Ltd., 1993.
- 4.K.J.Laidlar, **Chemical Kinetics**, Harper and Row, Newyork, 1987.
5. R.K. Prasad, **Quantum Chemistry**, Wiley Eastern, New Delhi, 1992.

### Reference Books:

1. W.J. Moore, **Physical Chemistry**, Orient Longman, London, 1972.
2. J.W. Moore and R.G. Pearson, **Kinetics and Mechanism**, 1981.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	S	S	M	S	M	M
CO2	M	M	S	S	S	S	M	M
CO3	S	M	S	S	S	M	M	S
CO4	S	S	S	S	S	M	M	M
CO5	M	M	S	S	S	S	M	S

**S – Strong**

**M – Medium**

**L-Low**

## CORE ELECTIVE – II

### ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

Semester : II

Hours /week : 4

Course code: 21P2CHE02

Credits : 4

#### Course Objectives:

1. To learn the concepts of organometallic chemistry.
2. To understand the theories of metal-ligand Bond.
3. To learn the principle of catalysis and reaction mechanisms of organometallics.
4. To understand the role of metal ions in biological process.
5. To learn the functions of Blue copper proteins and enzymes.

#### UNIT – I Introduction to Organometallic Chemistry

1.1 Carbon donors – Alkyl and Aryls - preparation and properties. Carbonyls – 18 electron rule, isolable concept – application to structure of carbonyls (simple and polynuclear); Nitrosyls – bridging and terminal nitrosyls, bent and linear nitrosyls;

1.2 Chain Carbon donors - Olefins, acetylene and allyl complexes – Synthesis, structure and bonding;

1.3 Cyclic carbon donors – Metallocene – synthesis, structure and bonding (Ferrocene only) Substitution – electrophilic and Nucleophilic attack on ligands. Carbonylation and decarbonylation; fluxional isomerism.

#### UNIT-II Reaction of Organometallics and Alkylidene Complexes

2.1 Oxidative-addition reaction- Free radical, ionic, mechanism, addition of H<sub>2</sub>, HX, O<sub>2</sub>. Reductive elimination reaction-insertion reaction – CO insertion, Alkenes insertion. Nucleophilic and Electrophilic attack on coordinated Ligand.

2.2 Alkylidene complexes - synthesis of alkylidene complexes in low oxidation states and in high oxidation states, bonding in alkylidene complexes, reactivity of alkylidene complexes.

#### UNIT-III Catalysis

Organometallic in homogeneous – General features of catalysts and types of catalysts Hydrogenation of olefins (Wilkinson's catalyst); hydroformylation of olefins using Cobalt or Rhodium catalysts (oxo process); Oxidation of olefins to aldehyde and ketones (Wacker process); polymerization (Ziegler-Natta catalyst); Fischer – Tropsch synthesis and hydrosilation.

#### UNIT-IV Bio-Inorganic Chemistry -I

4.1 Metal ions in Biological Systems-Structure and function of chlorophyll – Photo system I and Photo system II– light reactions and dark reactions – Mn Catalyzed oxidation of H<sub>2</sub>O to O<sub>2</sub> in chlorophyll – Role of Mg<sup>2+</sup> ion.

4.2 Structure and function of Haemoglobin -Cooperative effect in Haemoglobin - Role of Globin - Structure and function of Myoglobin - Structure and function of Cytochrome C.

### UNIT – V Bio-Inorganic Chemistry –II

5.1 Structure and function of Blue copper proteins – Structure and function of Vitamin B12 – In-*vivo* nitrogen fixation – Fe-S proteins – Ionophores – Ion transport mechanism in cell membrane –Na-K pump.

5.2 Cis-platin and its mode of action in the treatment of cancer. Zinc enzymes - Carboxypeptidase A and Carbonic Anhydrase Liver Alcohol Dehydrogenase- zinc finger proteins –Superoxide dismutase.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Know structure and bonding in organometallic compounds.	1	K2
CO-2	Appreciate the industrial applications of organometallic complexes.	7	K3
CO-3	Mechanisms of reactions of complexes are learnt.	6	K2
CO-4	Understand the Structure and function of Bio molecules containing metal ions.	4	K2
CO-5	Explain the mechanism chlorophyll – Photo system I and Photo system II	8	K3

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**  
**Text Books:**

1. H.J.Emelius and Sharpe, **Modern aspects of Inorganic chemistry**, Universal book stall, New Delhi, 1989
2. F. Basolo and R.G. Pearson, **Mechanism of Inorganic Reactions**, Wiley Eastern, 1967.
3. J.E.Huheey, E.A.Keiter and R.L.Keiter, **Inorganic chemistry-principles of structure and reactivity**, 4th edition, Pearson-Education, 2002
- 4.F.A.Cotton and G.Wilkinson, **Advanced Inorganic Chemistry**, Wiley Eastern, 5th edition, 1988.
5. S.F.A. Kettle, **Coordination compounds**, ELBS, 1973.
6. K.F. Purcell and J.C. Kotz, **Inorganic Chemistry**, WB. Sanders Co. USA. 1977.
7. D.F. Shriver, P. W. Atkins and C.H. Longford, **Inorganic Chemistry**, ELBS, 2<sup>nd</sup> Edition, 1994.
8. W. Kaim and B. Schwederski, **Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life** , John Wiley & Sons, New York, USA

**Reference Books:**

1. D. Bannerje, **Coordination Chemistry**, Tata – McGraw Hill, 1993.
2. M.L. Tobe, **Inorganic Reaction Mechanism**, Nelson, 1972.
3. K. Burger, **Coordination Chemistry Experimental Methods**, Butterworths, 1973.
4. B.N. Figgis, **Introduction to Ligand Fields**, Wiley Eastern Ltd, NewDelhi, 1976.
5. A. K. Das, **Bioinorganic Chemistry**, Books and Allied Ltd. Kolkatta, 2016.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	M	M	M	M	S	S
CO2	S	S	M	M	S	M	S	S
CO3	M	M	M	M	S	M	S	S
CO4	S	S	S	M	S	M	S	S
CO5	S	S	S	M	M	S	S	S

**S – Strong****M – Medium****L-Low**

**CORE ELECTIVE-II**  
**MEDICINAL CHEMISTRY**

**Semester: II**

**Hours /week : 4**

**Course code: 21P2CHE06**

**Credits : 4**

**Course Objectives:**

1. To understand the basic concepts of the drugs.
2. To study the classification of various types of drugs.
3. To study the mode of action of various types of drugs.
4. To understand the immune system.
5. To study the various chemotherapeutic agents.

**UNIT I Basic Concepts of Drugs**

Drug design- analogues and pro- analogues, factors governing drug design, rational approach, method of variation and tailoring of drugs. Classification of drugs, mechanism of action of drugs, metabolism of drugs, absorption of drugs, factors affecting adsorption of drugs and SAR relationships.

**UNIT II Drugs Acting on CNS**

Anaesthetics - Classification, synthesis and mode of action of Halothane, Thiopental sodium, Methohexitone, Procaine hydrochloride and Lignocaine hydrochloride. Analgesics - Classification, mode of action and SAR of Morphine. Synthesis and mode of action of Pethidine and Fentanyl citrate. Sedatives and Hypnotics- Classification, synthesis and mode of action of Barbiturates and Diazepam. Antipsychotics drugs- Classification, synthesis and mode of action of Chlorpromazine hydrochloride and Thioridazine.

Anticonvulsants- Classification, synthesis and mode of action of Phenytoin and Ethosuximide.

**UNIT III Drugs Affecting the Cardiovascular System**

Antiarrhythmic drugs - Classification, synthesis and mode of action of Quinidine sulphate and Procainamide hydrochloride. Vasodilator- Classification, synthesis and mode of action of Hydralazine hydrochloride and sodium nitroprusside. Coagulants- Mode of action of Vitamin K and Protamine. Anticoagulants- Mode of action of Thromboplastin and Prothrombin. Antihypertensive agents- Classification, synthesis and mode of action of Methyl dopate hydrochloride and Clonidine. Diuretics- Classification, synthesis and mode of action of Acetazolamide and Chlorthiazide.

**UNIT IV Drugs Affecting the Harmonal System and Immune System**

Drugs affecting hormonal systems - Hypoglycemic drugs - Causes of diabetes, classification, synthesis and mode of action of Insulin, Tolbutamide and Glipizide. Thyroid drugs- Mode of action of thyroid hormones, Synthesis and uses of Thyroxine and Propyl thiouracil. Histamine, Classification, SAR amongst H1-receptor blockers, prevention of histamine release, synthesis and mode of action of



Diphenhydramine hydrochloride and Promethazine hydrochloride. Antiulcers Histamine H<sub>2</sub> Receptor Antagonists, SAR, synthesis and Characteristic features of Cimetidine and Ranitidine.

### UNIT V Chemotherapeutic Agents

Antibiotics- Classification, synthesis and mode of action of Penicillins, Chloramphenicol and Azithromycin. Sulpha drugs- Classification, SAR and mode of action of sulphonamides. Synthesis and uses of Sulfacetamide and sulpha guanidine. Antiviral drugs- Classification, synthesis and mode of action of Acyclovir and Methiazone. Anthelmintics- Types of worm parasites, classification, synthesis and mode of action of Albendazole and Mebendazole. Antineoplastic drugs- Causes of cancer, classification, synthesis and mode of action of Melphalan and Methotrexate.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Acquire knowledge on basic drugs.	2	K1
CO-2	Evaluate various drugs action on CNS.	3	K5
CO-3	Describe various mode of action of drugs.	4	K2
CO-4	Recognize the drugs affecting the immune system.	5	K1
CO-5	Apply the various role and functions of antibiotics.	8	K3

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books :

1. Jayashree Ghosh, **A Textbook of Pharmaceutical Chemistry**, S.Chand & Company Ltd.
2. Ashutar Kar, **Medicinal Chemistry**, 6th Edition, 2015.

### Reference Books :

1. Willing Foyes, **Principles of Medicinal Chemistry**, 3rd Edition.
2. Wilson and Gisvold, **Textbook of Organic Medicinal and Pharmaceutical Chemistry**, 11<sup>th</sup> Edition.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S- Strong**

**M-Medium**

**L-Low**

**CORE ELECTIVE-II**  
**NATURAL PRODUCT**

**Semester: II**

**Hours /week: 4**

**Course code: 21P2CHE10**

**Credits : 4**

**Course Objectives:**

1. To familiarize students with natural goods and their classifications.
2. To understanding of amino acids, steroids.
3. To recognize the properties of carbohydrates, and heterocycles.
4. The students will have a better understanding of antibiotics.
5. Students will be familiar with enzyme architectures and interactions of various sorts.

**UNIT I- CARBOHYDRATES:**

1.1 Introduction of sugars, Determination of configuration- Hudsons Rules-Structure of sugars structures of triose, tetrose, pentose, hexose, transformation of sugars, stereochemistry and reactions of Glucose, conformation and anomeric effects in hexoses.

1.2 Synthesis of vitamin C from glucose. Monosaccharides and derivatives of sugars, Lactose, Maltose, polysaccharides (Cellulose and starch) glycosaminoglycans, proteoglycans, protein glycosylation and its significance. Sugar derivatives; Mucopolysaccharides; Glycosaminoglycans; Proteoglycans.

**UNIT II LIPIDS**

2.1 Classification, structure, properties and functions of fatty acids, essential fatty acids, fats, phospholipids, sphingolipids, cerebrocides, bile acids, prostaglandins, lipoamino acids, lipoproteins, proteolipids, phosphatidopeptides, lipopolysaccharides,

2.2 Proteins: different types of Protein, Peptide synthesis: chemical and Merrifield synthesis. Primary (peptide conformation, N- and C- terminal, peptide cleavage), Secondary ( $\alpha$ -helix, sheet, random coil), Tertiary and Quaternary structures of proteins. Glycoproteins, lipoproteins and glycolpeptidolipids: Structure and biological activity, isolation, purification, degradation, structure determination. Chemical Structure of amino acid and their properties.

**UNIT III VITAMINS:**

3.1 Synthesis, properties and deficiency disease of Vitamin A, B complex, C, D and E. b) Alkaloids: Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants.

3.2 Structure, stereochemistry and synthesis of the following: Ephedrine, ( $\pm$ ) Conine, Nicotine, Atropine, Quinine and Morphine: Alkaloids derived from ornithine, lysine, tyrosine and tryptophan. Biosynthesis of alkaloids. The shikimate pathway – cinnamic acids, lignans and lignin, coumarins, flavonoids and stilbens, isoflavanoids

#### UNIT IV TERPENOIDS AND CAROTENOIDS:

4.1 Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry and synthesis of the following representative molecules: Citral, Geraniol, Terpeneol, Menthol, Abietic acid, Taxol and Carotene.

4.2 Biosynthesis of terpenoids. The Mevalonate and Methylerythritol Phosphate Pathways.

Steroids: Occurrence, nomenclature, basic skeleton, Diels hydrocarbon and stereochemistry Synthesis and structure elucidation of cholesterol, conversion of cholesterol to progesterone androsterone and testosterone-cortisone- Vitamin D - Isolation, structure determination and synthesis of Bile acids, Androsterone, Testosterone,

#### UNIT V PROSTAGLANDINS AND THROMBOXANES:

5.1 Introduction, nomenclature of prostaglandins and thromboxanes; approaches to prostaglandin synthesis; cyclohexane precursors (Woodward synthesis of PGF<sub>2a</sub>), bicycloheptane precursors (Corey's synthesis of prostaglandins E and F)

5.2 Plant Pigments: Occurrence, classification, nomenclature and general methods of structure determination. Isolation and synthesis of Chlorophyll, xanthophyll, Apigenin, Luteolin, Myrcetin, Quercetin-3-glucoside, Vitexin, Daidzein, Butein, Aureusin, Cyanidin-3, 5-diglucoside, Acetate pathway and Shikimic acid pathway.

#### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Sort the natural goods into categories based on their structures	2	K4
CO-2	Understand the many types of amino acids, their structures, and their importance.	3	K2
CO-3	Alkaloids' biofunctions and structures should be understood.	4	K2
CO-4	Recognize the biochemical actions and structures of terpenoids.	5	K1
CO-5	Understand the bio-functions and structures of steroids.	8	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Text Books:**

1. Chatwal, G. R. (2015). **Organic Chemistry of Natural Products Vol. II**. New Delhi: Himalaya Publishing House.
2. Finar, I. L. (2013). **Organic Chemistry Vol. II: Stereochemistry and the Chemistry of Natural Products (V Edition)**. New Delhi: Pearson Education, Ltd.

**Reference Books:**

1. F. A. Carey and R. J. Sundberg, **Part B: Reactions and Synthesis**. (Eds) 3rd Edition, Part B. Plenum/Rosetta, 1990.
2. R. Krishnaswamy, **Chemistry of Natural Products; A Unified Approach**, Universities Press.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

**CORE PRACTICAL - I**  
**ORGANIC CHEMISTRY PRACTICAL – I**

**Semester: II** **Hours /week : 4**

**Course code: 21P2CHP01** **Credits : 3**

**Total: 60 marks** **Duration: 6 hours**

**Course Objectives:**

1. To separate and identify the components in the binary organic mixture.
2. To familiar with some single stage preparation of organic compounds.
3. Recall the importance of the analysis of organic molecules.
4. Understand the qualitative analysis of mixtures, the functions of various reagents and reaction Mechanisms.
5. Evaluate the properties of synthesized organic products.

**Separate the following types of mixture and analyze only one of the components present as desired by the Teacher / Examiner.**

**1. Mixture Analysis:**

1. Soluble and insoluble
2. Acidic and Neutral
3. Less acidic and neutral
4. Basic and neutral

**2. Two Stage Preparations:**

1. Acetylsalicylic acid from methylsalicylate
2. 1,3,5 – Tribromobenzene from Aniline
3. *p*-Nitroaniline from acetanilide
4. *p*-Bromoaniline from acetanilide
5. Antharquinone from phthalic anhydride

**Scheme of valuation**

1. Organic preparation: 10
2. Viva voce : 10
3. Record: 05
4. Organic analysis: 35
  - Pilot separation - 5 marks
  - Special elements present / absent - 5 marks
  - Aromatic/ aliphatic – 2.5 marks
  - Saturated/ unsaturated – 2.5 marks
  - Functional group present - 10 marks
  - Derivative - 10 marks

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	learnt the separation of binary organic mixtures	3	K2
CO-2	Prepare the derivative of the organic functional groups	6	K3
CO-3	Know the methods of qualitative analysis of organic compounds.	2	K4
CO-4	Understand the single stage preparation of organic compounds	1	K2
CO-5	Learnt microlevel analysis.	9	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

## References Books :

1. Vogels **text book of practical Organic Chemistry**, 5th Edition, 1989.
2. B.S. Furniss, A.J. Hannaford, P.W.G. Smith, and A.R. Tatchell, **Vogel's Text book of Practical Organic Chemistry**, 5<sup>th</sup>Ed., Pearson publication.
3. V. Vengataswaran, **Basic Principle of Practical Chemistry**–Sultan Chand and Sons, New Delhi, 1997.  
Vishwanathan Printer and Publishers (P) Ltd., Chennai, 2007

## Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE PRACTICAL – II**  
**INORGANIC CHEMISTRY PRACTICAL – I**

**Semester: II**

**Hours /week : 3**

**Course code: 21P2CHP02**

**Credit : 3**

**Course Objectives:**

1. To carry out the titrimetric and gravimetric analyses.
2. To learn simple single stage preparations of some inorganic complex.
3. To estimate the amount of metal ion present in the environment quantitatively by volumetric and gravimetric analysis.
4. To understand the concepts and systematic procedure in gravimetric analysis.
5. To analyze the synthesis method for in-organic co-ordination complexes.

**1. Titrimetry and Gravimetry**

A mixture of solution(s) should be given for estimation

1. Cu (V) Ni (G/C)
2. Cu (V) Zn (G/C)
3. Fe (V) Mg (G/C)
4. Fe (V) Ni (G/C)

Note: V - Volumetric  
G - Gravimetric  
C - Complexometric

**2. Preparations of complexes**

1. Tetramminecopper(II)sulphate
2. Prussian blue
3. Hexathiourealead(II) nitrate
4. Hexamine nickel (II) chloride
5. Tristhioureacopper(I) chloride
6. Tristhioureacopper(II) sulphate

**Scheme of valuation**

1. Viva Voce - 10 marks
2. Record - 05 marks
3. Practical: 45 marks

**Results:**

- <1% - 45 marks
- 1-2% - 35 marks
- 2-3% - 25 marks
- 3-4% - 20 marks
- >4% - 15 mark

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Learnt principles behind volumetric and gravimetric techniques.	9	K2
CO-2	Learnt qualitative analysis of rare metals.	1	K2
CO-3	Prepare some inorganic metal complexes.	9	K3
CO-4	Learnt experimental conditions and setup for the general methods of preparation of complexes.	2	K2
CO-5	Synthesis method for in-organic co-ordination complexes.	3	K5

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### References Books :

1. A.I. Vogel, **A Text Book of Quantitative Inorganic Analysis**, 3rd Edn., London, Longman Group.
2. G. Svehla, Vogel's, **Textbook of Macro and Semimicro Qualitative Inorganic Analysis**, 5<sup>th</sup> Ed. Longman, London, 1979.
3. V. Ramanujam, **Inorganic Semi-micro Qualitative Analysis**, 3<sup>rd</sup> Ed., National Publishing Company, Chennai, 1990.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**



**CORE PRACTICAL – III**  
**PHYSICAL CHEMISTRY PRACTICAL – I**

**Semester: II**

**Course code: 21P2CHP03**

**Hours /week : 3**

**Credits : 3**

**Course objectives:**

1. To learn some non-electrical physical chemistry experiments.
2. To learn the technique of developing phase diagram of some binary systems.
3. To learn the determination methods of physical constants of substances.
4. To apply the basic concepts of conduct metric titrations to determine the ionic strength.
5. To get knowledge about the heat of solution, determination of molecular weight and distribution Coefficient.

**Non- Electrical**

1. Simple eutectic system of diphenylamine and naphthalene.
2. Kinetic of acid hydrolysis of ester.
3. Determination of equilibrium constant for the reaction between  $KI + I_2 \rightleftharpoons KI_3$
4. Comparison of strengths of two acids from kinetic study
5. Estimation of KI by partition method
6. Determine the rate constant of the reaction between Potassium Iodide and Potassium persulphate at room temperature.
7. Kinetics of Iodination of Acetone.
8. Effect of impurity on CST of phenol – water system and determination of Concentration of sodium chloride / succinic acid.
9. Rast Micro Method of Determining  $K_f$  and Molecular Weight.
10. Kinetics of primary salt effect.

**Scheme of valuation**

1. Viva voce - 10 marks
2. Record - 05 marks
3. Practical: 45 marks

<1% - 45 marks

1-2% - 35 marks

2-3% - 25 marks

3-4% - 20 marks

>4% - 15 mark

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand the effect of ionic strength on the rate constant	3	K2
CO-2	Understand surface catalysis and adsorption concepts.	6	K2
CO-3	Apply phase rule for experimentation.	8	K3
CO-4	Know the kinetics of chemical reaction	2	K4
CO-5	apply the basic concepts of conduct metric titrations to determine the ionic strength.	3	K3

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### References Books :

- 1.V. Venkateswaran, R.Veerawamy, A.R. Kulandaivelu, **Basic Principles of Practical Chemistry**, 2<sup>nd</sup>Ed., New Delhi, Sultan Chand & sons, 1997.
2. Daniel et al. **Experimental Physical Chemistry**, 7<sup>th</sup>Ed., New York, Mc Graw Hill, 1970.
3. A. Findlay, **Practical Physical Chemistry**, 7<sup>th</sup> Ed., London, Longman, 1959.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

## CORE COURSE-VI

### ORGANIC REACTIONS AND NATURAL PRODUCTS

**Semester-III**

**Hours /week: 6**

**Course code: 21P3CH06**

**Credits : 5**

#### **Course Objectives**

1. To understand the different organic reactions and their applications in synthesis.
2. To know about versatile knowledge of rearrangements.
3. To learn the Oxidizing and Reducing agents and their applications.
4. To analyze the function of proteins.
5. To knowledge about steroids.

#### **UNIT - I Reagents in Organic Synthesis**

Reagents and their uses – LDA, DCC, DDQ, DIBAL, 9-BBN, NBS, n-BuLi, 1,3- dithiane (umpolug), Osmium tetroxide, Selenium dioxide, trimethylsilylchloride, trimethylsilyliodide, Baker's yeast, Gilman Reagents, organolithiums, Grignards, and Wilkinson's Catalyst.

#### **UNIT – II Oxidation and reduction reactions**

- 2.1 Study of the following reactions with mechanism- Oxidation of alcohols by  $\text{CrO}_3$ , DCC,  $\text{MnO}_2$ , DMSO, Acetic anhydride and oxalyl chloride, Oxidation of aryl methane, oxidation of methylene group alpha to carbonyl, allylic oxidation of olefins, oxidative cleavage of glycols, ozonolysis.
- 2.2 Catalytic hydrogenation, Homogenous and heterogenous catalytic reductions, Dissolving metal reductions including Birch reduction, MPV reduction, Raney nickel, Metal hydride reductions-  $\text{NaBH}_4$ ,  $\text{LiAlH}_4$ ,  $\text{BH}_3$ , and Sodium cyano borohydride.

#### **UNIT – III Molecular Rearrangements**

- 3.1 Mechanism to nucleophilic, electrophilic, and free radical molecular rearrangements. Carbon-carbon rearrangements: Wagner-Meerwein, Pinacol – Pinacolene, Demjanov, Favorskii, Benzil-Benzilic acid, Benzidine rearrangements.
- 3.2 Carbon-nitrogen rearrangements: Hoffmann, Curtius, Lossen, Schmidt and Beckmann rearrangements. Carbon-oxygen rearrangements: Bayer-Villiger, and Wittig rearrangements.

#### **UNIT - IV Proteins and nucleic acids**

- 4.1 Classification of proteins; Primary, secondary and tertiary structures of proteins and their functions- – Mechanism of Enzyme action.
- 4.2 Nucleic acids - nucleosides and nucleotides, their chemistry including synthesis; RNA and DNA; Functions of nucleic acids,Chargaff rule.

## UNIT - V Chemistry of Natural Products

Synthesis and structural elucidation of the following:

Alkaloids : Reticulene, Reserpine, Morphine

Terpenoids : Zingiberene, Squalene, Lanosterol

Steroids : Cholesterol, Oestrone, Progesterone and Testosterone

### Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand the different organic reactions.	8	K2
CO-2	Describe the versatile knowledge of rearrangements.	1	K3
CO-3	Classify the basic ideas of oxidizing and reducing agents.	6	K3
CO-4	Evaluate the importance of alkaloids in medicinal field and its synthesis.	3	K5
CO-5	Describe the steroids and its synthesis.	5	K3

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Tewari, N. (2011). **Advanced Organic Reaction Mechanism** (III Edition). Kolkata: Books and Allied (P) Ltd.
2. Sanyal, S. N. (2014). **Reactions, Rearrangements and Reagents** (IV Edition). New Delhi: Bharathi Bhawan (Publishers and Distributors).
3. Chatwal, G. R. (2015). **Organic Chemistry of Natural Products** Vol. II. New Delhi: Himalaya Publishing House.
4. Finar, I. L. (2013). **Organic Chemistry Vol. II: Stereochemistry and the Chemistry of Natural Products** (V Edition). New Delhi: Pearson Education, Ltd.

### Reference Books:

1. Mukherji, S. M., & Singh, S. P. (2014). **Reaction Mechanism in Organic Chemistry** (III Edition). New Delhi: Laxmi Publications Pvt. Ltd.
2. Chatwal, G. R. (2015). **Organic Chemistry of Natural Products. Vol. I.** New Delhi: Himalaya Publishing House.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE COURSE – VII**  
**THERMODYNAMICS AND SPECTROSCOPY**

**Semester-III**

**Hours /week: 5**

**Course code: 21P3CH07**

**Credits : 5**

**Course Objectives**

1. To study the classical Maxwell-Boltzman and quantum statistics.
2. To study irreversible thermodynamics.
3. To study the fundamentals of Quantum Chemistry and its application to Chemical Bonding.
4. To learn principles of IR and Raman Spectroscopy.
5. To understand the theory of NMR and ESR spectroscopy.

**UNIT – I Statistical Thermodynamics**

- 1.1 Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics – comparison and application.
- 1.2 Partition Functions – evaluation of Translational, Vibrational, Rotational and Electronic partition Function-Thermodynamic Functions in terms of partition Function –Statistical expression for equilibrium constant-Heat capacities of Monoatomic crystals – Einstein and Debye theory of heat capacities.

**UNIT – II Irreversible Thermodynamics**

Postulates of Local equilibrium – Entropy production – Entropy Production in Heat flow – Entropy production in matter flow – Prigogine's principle of minimum entropy production – Forces and Fluxes – Linear force – flux relation – phenomenological equation – microscopic reversibility and Onsager's reciprocity relations.

**UNIT - III Quantum Chemistry – III**

Valence Bond theory of Hydrogen molecule – Comparison of MO and VB theories – Concept of Hybridisation –  $sp$ ,  $sp^2$  and  $sp^3$  hybridisation – Huckel Molecular orbital (HMO) theory for conjugated  $\pi$ - system – applications to simple systems – (Ethylene, butadiene and benzene) – Self consistent field approximation – Hartree's and Hartree – Fock Self Consistent field theory – Slater type orbitals – Slater rules.

**UNIT – IV IR and Raman Spectroscopy**

4.1 IR Spectra- Theory of Rotational-Vibrational spectra – harmonic and anharmonic oscillators – hot band, overtones – Fermi resonance, combination bands, rotation – vibration spectra of diatomic and polyatomic molecules, calculation of force constant, effect of isotopic substitution on vibrational frequencies – transition for the rigid rotor – coupling of rotation and vibration – linear and perpendicular bands – PQR branches – FT-IR spectroscopy.

4.2 Raman Spectra - Polarization of light and Raman Effect– elastic and inelastic scattering – pure rotational and rotational-vibrational Raman spectra.

### UNIT – V NMR and ESR Spectroscopy

5.1 NMR spectroscopy – theory – nuclear zeeman effect- chemical shift – Spin-spin coupling – NMR of simple AX and AMX type molecules – Calculation of coupling constants – $C^{13}$ -NMR – a brief discussion of Fourier Transformation.

5.2 ESR Spectroscopy – Theory – hyperfine interactions – Spin densities – McConnell relationship – selection rules in ESR – ‘g’ value and coupling constants.

#### Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	Knowledge Level
CO-1	interpret and validate the concepts of statistical thermodynamics in various thermodynamic functions.	4	K5
CO-2	understand the basics of non- equilibrium thermodynamics.	1	K2
CO-3	apply Huckel Molecular orbital (HMO) theory for conjugated $\pi$ - system.	4	K3
CO-4	apply group theory to interpret the IR and Raman spectra of molecules.	8	K3
CO-5	Understand the theory of NMR spectra and ESR spectra.	5	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

#### Text Books:

- 1.Kuriakose J C and Rajaram J C, **Thermodynamics**, Shoban Lal Co., Jalandar,1999.
- 2.Prasad R K, **Quantum Chemistry**, 5th Edition, Wiley Eastern Ltd, New Delhi, 1992.
- 3 .Anderson J M, **Mathematics of Quantum Chemistry**, 1st Edition, W.A. Benjamin Inc.,Massachusetts, 2005.
4. Banwell C N, **Molecular Spectroscopy**, 2nd Edition, TATA McGraw Hill Co., New Delhi, 2010.

#### Reference Books:

1. Levine I N, **Quantum Chemistry**, 6th Edition, Prentice Hall of India, Pvt. Ltd., 2009.
2. Atkins P and Ronald Friedman, **Molecular Quantum Mechanics**, 5th Edition, Oxford University Press, New York, 2011.
3. McQuarrie D A, **Statistical Thermodynamics**, 1st Indian Edition, Viva Books Private Ltd., New Delhi,2003.
3. Barrow G M, **Introduction to Molecular Spectroscopy**, Tata McGraw - Hill, New Delhi, 1993.
4. G. Aruldas, **Molecular Structure and Spectroscopy**, Prentice Hall of India, 2001

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**



**CORE ELECTIVE– III**  
**ELECTROCHEMISTRY AND PHOTOCHEMISTRY**

**Semester: III**

**Hours /week : 5**

**Course code: 21P3CHE03**

**Credits : 5**

**Course Objectives:**

1. To understand the theories of kinetics of electrochemical reactions.
2. To study the concepts and principles of electrochemistry.
3. To apply the electrochemical principles in batteries, understand the fundamentals of corrosion.
4. To describe and explain photochemical and photophysical processes using Jablonski diagram and their quantum yield expressions.
5. To study the selection rules for electronic transitions and develop quantum mechanical formulation of Franck-Condon principle.

**UNIT – I Electrochemistry – I**

1.1 Debye Huckel theory - radius of ionic atmosphere - calculations of thickness of ionic atmosphere - evidences of ionic atmosphere - asymmetry effect - electrophoretic effect - Debye Falkenhagen effect - Wien effect - Debye-Huckel Onsager equation - modification and verification of the equation - Debye-Huckel limiting law.

1.2 Electrode Theories of electrical double layer electrolyte interface - Helmholtz model of double layer - Gouy - Chapman diffused charged model - desorption theory of double layer - Stern's model – electro kinetic phenomena - classification electro-osmosis and electrophoresis - streaming potential and sedimentation potential – Tiselius method of separation of proteins – Membrane potential.

**UNIT – II Electrochemistry – II**

2.1 kinetics of electrode processes – Polarisation and over voltage - derivation and verification of the equations - Butler-Volmer equation - Tafel equation –diffusion current-exchange and equilibrium current density-Hydrogen and oxygen evolution reactions – transfer coefficient and its significance.

2.2. Polarography – Principles, Instrumentation, DME, diffusion, kinetic and catalytic currents, current voltage curves. Amperometric titrations – Theory and types of titration curves. Potentiometry - Principles and Instrumentation.

**UNIT – III Electrochemistry – III**

3.1 Electrochemical corrosion - Theories and types of corrosion - construction of Pourbaix and Evans diagrams – Prevention of Corrosion.

3.2 Electrochemical energy systems – Primary and Secondary batteries – dry cells, lead acid - storage batteries, nickel cadmium battery, mercury cell, silver- zinc cell. Fuel cells – Hydrogen- Oxygen, Proton Exchange Membrane, Solid Oxide.

## UNIT – IV Photochemistry – I

4.1 Absorption and emission of radiation – Franck – Condon principle – decay of electronically excited states – radiative and non –radiative processes – spin allowed and spin forbidden transition. Non – radiative process – theory of radiation less transition – Internal conversion and intersystem crossing. Radiative processes – Fluorescence and Phosphorescence.

4.2 Theory of Fluorescence and Phosphorescence. Factors affecting Fluorescence and Phosphorescence.

## UNIT – V Photochemistry – II

5.1 Prompt and delayed Fluorescence – Fluorescence and structure. Quenching of Fluorescence – static and dynamic quenching – Stern – Volmer equation – concentration dependence of quenching and Excimer formation – quenching by added substance – Exciplex formation and decay. Electronic energy transfer – radiative and non – radiative energy transfer – Long – range and short – range energy transfer.

5.2 Kinetics of photochemical reactions- Hydrogen and Bromine-Hydrogen and Chlorine-. Photovoltaic and photogalvanic cells -solar cells- solar energy conversion.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Apply the principles of electrochemistry to the kinetics of electrode process.	4	K3
CO-2	Outline the various types of electrochemical reactions and their interactions	2	K4
CO-3	create new electrochemical cells and newer electrodes for application.	3	K6
CO-4	understands kinetics of photochemical reaction.	5	K2
CO-5	Know the various physical processes of photochemical reactions.	8	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Samuel Glasstone , **An Introduction to Electrochemistry**, Maurice Press, 2011.
2. K.K.Rohatgi, Mukherjee, **Fundamentals of Photochemistry**, New Age International Pvt. Ltd, 2017.

**Reference Books:**

1. Bockris J O'M and Reddy A K N, **Modern Electrochemistry**, Vol. 1 & 2, 2nd Edition, Plenum Press, New York, 1998.
2. Antoropov L, **Theoretical Electrochemistry**, 2nd Edition, Mir Publishers, Moscow, 1977.
3. Viswanathan B.,M.AuliceScibioh, **Fuel Cells,Principles and Applications**, Universities Press,Hyderabad, India, 2006.
4. B.R. Puri, L.R. Sharma S. Pathania, **Principles of Physical Chemistry**, Vishal Publishing Co. New Delhi 46<sup>th</sup> edition, 2012.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

**CORE ELECTIVE-III**  
**ELECTROANALYTICAL TECHNIQUES**

**Semester: III**

**Hours /week : 5**

**Course code: 21P3CHE07**

**Credits : 5**

**Course Objectives:**

1. To understand the basic concepts of electroanalytical chemistry
2. To study the principles and instrumentation of various electroanalytical techniques
3. To study the methods of Coulometric and Potentiometric
4. To understand the principles of Stripping voltammetry
5. To understand the principle of Impedance technique

**UNIT I Basic Electrochemical principles**

Mass transfer processes – migration, diffusion and convection– planar and spherical diffusion – Reversible and Irreversible processes.

**UNIT II Methods Based on Diffusion**

Principle, instrumentation and applications of the following techniques: Chronoamperometry; Polarography - Ilkovic equation - Square wave polarography; Linear Sweep voltammetry – Randles-Sevcik equation; Cyclic voltammetry - Normal pulse, Differential pulse and Squarewave voltammetry.

**UNIT III Coulometric and Potentiometric**

Methods Galvanostatic and potentiostatic methods. Principle, instrumentation and applications of the following techniques: Controlled potential coulometry and electrolysis; Chronocoulometry; Potentiometry and Chronopotentiometry.

**UNIT IV Stripping voltammetry**

Principle, instrumentation and applications of Anodic stripping voltammetry, Cathodic stripping voltammetry and Adsorptive stripping voltammetry.

**UNIT V Sine wave methods**

(Electrochemical Impedance Spectroscopy) Principle of Impedance technique - Analysis of Faradaic impedance – Bode Diagrams. Dynamic electrode techniques, Principle, instrumentation and applications of RDE and RRDE techniques.

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Discuss about the principle of transfer process.	2	K2
CO-2	Interpret the electroanalytical techniques	3	K5
CO-3	Apply the principles of Methods Galvanostatic and potentiostatic methods.	4	K3
CO-4	Recognize the principle of voltammetry.	5	K1
CO-5	Recognize the importance of Dynamic electrode techniques.	8	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. D.A.Skoog and D.M.West, **Fundamentals of Analytical Chemistry**, Holt Rinehart and Winston Publications, IV Edn,1982.
2. Willard, Merit, Dean and Settle, **Instrumental Methods of Analysis**, CBS Publishers and Distributors, IV Edn.1986

### Reference Books:

1. B. H. Vassos and G.W. Ewing, **Electroanalytical Chemistry**, John Wiley and Sons, NY, 1983.
2. A. J. Bard and L.R. Faulkner, **Electrochemical methods; Fundamentals and applications**, J. Wiley and Sons, NY,1980,
3. J.Wang, **Stripping Analysis**, VCH Publications,1985.
4. A.M. Bond, **Modern Polarographic methods in analytical chemistry**, Macel Decker Inc., 1980.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

## CORE ELECTIVE - III

### INSTRUMENTAL METHODS OF ANALYSIS

**Semester: III**

**Hours /week : 5**

**Course code: 21P3CHE11**

**Credits : 5**

#### **Course Objectives:**

1. To study the theory, instrumentation and application of absorption, emission and reflection spectra.
2. To study the analytical techniques in thermal and magnetic methods.
3. To describe the characteristics of nanomaterials.
4. To study the polarography, amperometry.
5. To study the methods and applications of chromatography.

#### **UNIT -I Absorption, Emission and Reflection Spectroscopy**

1.1 Absorption spectrometry – Beer Lamberts law; Principles of UV visible spectroscopy-photometric titrations; Principles and applications of Fluorimetry, turbidimetry and nephelometry. Flame Photometry – Theory, instrumentation and a few important applications;

1.2 Atomic absorption spectroscopy (AAS) – Theory, instrumentation and applications; Atomic fluorescence.

#### **UNIT- II Thermal and Magnetic Methods of Analysis**

2.1 DTA/DSC – Principle and instrumentation, Different techniques. Application to organic and inorganic compounds.

2.2 TGA – Principle, instrumentation of TGA curves, Application to organic and inorganic compounds.

2.3 Magneto chemical Analysis – Magnetic susceptibility and its measurements, Guoy's, Quink's curie's, and Ranking's balances. Application to simple compounds and ranking's transition metal complexes, Lanthanides and Actinides.

#### **UNIT- III Characterisation of Nanoscale Materials**

3.1 Principles and instrumentation of Atomic Force Microscopy (AFM) – Transmission Electron Microscopy(TEM) Resolution and Scanning Transmission Electron Microscopy (STEM) – Scanning Tunneling Microscopy (STM)

3.2 Scanning Nearfield Optical Microscopy (SNOM). Scanning ion conductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

## UNIT-IV Polarography and Amperometry

4.1 Polarography – Theory. DME, diffusion kinetic and catalytic currents, current voltage curves for reversible and irreversible system, qualitative and quantitative application to inorganic systems.

4.2 Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes – applications.

## UNIT- V Chromatography

Principle, method and applications of column and thin layer chromatographies; Gas liquid chromatography – principle, retention time values, instrumentation, carrier gas, column, detectors – thermal conductivity, flame ionization and electron capture; few applications of GLC; HPLC – theory, instrumentation and applications.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Discuss about the analytical techniques and Chromatography	4	K2
CO-2	Interpret the thermogram of chemical compounds.	2	K5
CO-3	Apply the principles of various electro analytical techniques	3	K3
CO-4	Perform polarography analysis and amperometric titration.	5	K2
CO-5	Recognize the importance of various thermal analysis techniques	9	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

- 1.H.R.Willard, L.L.merrit, J.A.Dean, F.A. Settle : **Instrumental Methods of Analysis** (Van Nostrand Reinhold Co., New York), 6<sup>th</sup> edition.
2. R.D. Braun : **Introduction to Instrumental Analysis** (1987), (McGraw-Hill Book Company), New Delhi.

### Reference Books:

1. G.D.Caristian and J.E. O' Reilly: **Instrumental Analysis:** ( Allyn & Bacon Inc., New York, 2<sup>nd</sup> edition.
2. G.W.Ewing: **Instrument Methods of Chemical Analysis:** (MCGraw-Hill, New York), 5th edition.
3. L.Meites **Handbook of Analytical Chemistry** : ( McGraw-Hill, New York).

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**



**CORE PRACTICAL – IV**  
**ORGANIC CHEMISTRY PRACTICAL – II**

**Semester-III**

**Hours /week : 4**

**Course code: 21P3CHP04**

**Credits : 4**

**Course Objectives:**

1. To understand the organic qualitative separation and identification.
2. To know the concept of functional group identifications.
3. To apply the systematic procedure for estimation.
4. To create ideas and concepts for water treatment process, food science and forensic fields.
5. To know the functional group identifications.

**1. Estimation of the following:**

**4 hours**

Phenol, Aniline, Ethyl methyl ketone, Glucose,

**2. Identification of chromophore / functional groups using UV / IR spectra.**

**2 hours**

**Scheme of valuation**

Procedure writing - **10 marks**

**Results:**

- 1-2% - 50 marks
- 2-3% - 40 marks
- 3-4% - 30 marks
- >4% - 20 marks

**Course Outcomes:**

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Describe the principles of quantitative analysis in organic chemistry	8	K2
CO-2	Identify the functional group of organic compounds.	6	K3
CO-3	Interpret the UV-visible and IR spectra organic compounds.	6	K5
CO-4	know the functional group identifications.	8	K2
CO-5	understand the procedure for estimation of organic compounds	6	K2

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Text Books:**

1. Ganapragasm N S and Ramamurthy C, **Organic Chemistry Lab Manual**, 2nd Edition, Vishwanathan S Printers and Publishers (P) Ltd., Chennai, 2015.
2. Furniss B S, Hannaford A J, Smith P W G, and Tatchell A R, Vogel's **Textbook of Practical Organic Chemistry**, 5th Edition, Pearson publication.

**Reference Books:**

1. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, **Basic Principles of Practical Chemistry**, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.
2. V. K. Ahluwalia, P. Bhagat and R. Agarwal, **Laboratory Techniques in Organic Chemistry**; I. K. International, 2005.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

## CORE PRACTICAL – V

### PHYSICAL CHEMISTRY PRACTICAL - II

Semester: III

Hours /week: 4

Course code: 21P3CHP05

Credits : 4

#### Course Objectives:

1. To understand the interconnection between experimental foundation and underlying theoretical principle
2. To introduce the basic practical skills including safe working practices, laboratory report writing, reliable and repeatable results.
3. To appreciate the merits inherent in both theoretical treatments and experimental Measurements.
4. To understand the various laws in electrochemistry.
5. To evaluate distribution co-efficient influence the solubility of various systems.

#### Conductometry:

1. Estimation of mixture of acids.
2. Determination pK<sub>a</sub> – Ostwald's dilution law.
3. Determination of solubility product-Kohlrausch's law.
4. Estimation of mixture of halides.
5. Determination of equivalent conductivity of a strong electrolyte at different concentration and examine the validity of the Onsager's theory as limiting law at high dilutions.

#### Potentiometry Titrations:

6. Determination of titration of FeSO<sub>4</sub> by using KMnO<sub>4</sub> as Redox titration – KMnO<sub>4</sub> Vs FeSO<sub>4</sub>.
7. Determination of titration of KCl by using AgNO<sub>3</sub> as Precipitation titration – AgNO<sub>3</sub> Vs KCl and AgNO<sub>3</sub> Vs mixture of Halides.

#### Scheme of valuation

Procedure with formula: 10 marks

Practical: 60 marks

Viva : 10 marks

<1% - 60 marks

1-2% - 50 marks

2-3% - 40 marks

3-4% - 30 marks

>4% - 20 marks

**Course Outcomes:**

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	describe the concept electrode potential.	4	K2
CO-2	Develop the ability to apply the knowledge and skills in conductometric and potentiometric titrations and equivalent conductance studies.	9	K6
CO-3	Recognize the link between theory and practical	9	K1
CO-4	Undertake hands on lab work which develop problem solving skills in project and for their successful career	3	K2
CO-5	Apply the knowledge in conductivity of a strong electrolyte	1	K3

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Text Books:**

1. Daniels, Mathews F, Howard J and John Warren W, **Experimental Physical Chemistry**, 7th Edition, McGraw Hill, New York, 1970.
2. Findlay A, **Practical Physical Chemistry**, 7th Edition, Longman, London, 1959.
3. B. Viswanathan, P.S. Raghavan, **Practical Physical Chemistry**, Viva Books Pvt. Ltd., 1st edition, 2014.

**Reference Books:**

1. Venkateswaran V, Veeraswamy R and Kulandaivelu A R., **Basic Principles of Practical Chemistry**, 2nd Edition, Sultan Chand & sons, New Delhi, 1997.
2. J.B.Yadav, “ **Advanced Practical Physical chemistry**”, 20th edn. GOEL publishing House, Krishna Pakashan Media Ltd., (2001).
3. J. N. Gurtur and R. Kapoor, **Advanced Experimental Chemistry**; Vol. 1-Physical, S.Chand and Co. Ltd, New Delhi, 1997.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

**M.Sc. CHEMISTRY**

**SEMESTER-III**

**INTERNSHIP**

**Semester: III**

**Course code: 21P3CHI01**

**Course Objectives:**

1. Students should undergo Internship training to enrich their knowledge about Industry.
2. Students can select nearby Industry/Soil testing/Water testing/Research Laboratory for their internship training under the guidance of Faculty members.
3. The training will commence soon after second semester Examinations.
4. Industry/Laboratory for the internship training must be confirmed before the commencement of third Semester.
5. Student has to spend minimum of 15 working days in the Industry/Laboratory.
6. Students should maintain a work dairy and prepare report of their internship training.
7. Students should submit their report with a letter of completion from the organization duly signed by the authorities.
8. The reports will be used to evaluate the student's performance.

**CORE COURSE– VIII**  
**SOLID STATE AND NUCLEAR CHEMISTRY**

**Semester: IV**

**Hours/week : 6**

**Course code: 21P4CH08**

**Credits : 5**

**Course Objectives:**

1. To understand the chemistry of inorganic chains, rings and clusters.
2. To understand the structure, bonding and properties of Solids.
3. To understand the structure and symmetry of crystalline solids, its defects and applications of band theory.
4. To study the types of Nuclear Reactions.
5. To study the various applications of Radioisotopes.

**UNIT – I Inorganic chains, rings and clusters**

1.1 Boron hydrides – polyhedral boranes, hydro borate ions – a general study of preparation, Properties and structure, styx numbers, Wade’s rules. Concept of multi-centered bond structure of  $B_2H_6$ ,  $B_4H_{10}$ ,  $[B_{12}H_{12}]^{2-}$ ,  $B_6H_{10}$ ,  $B_8H_{12}$ ,  $B_{10}H_{14}$ .

1.2 Carboranes – types such as closo and nido – preparation, properties and Structure. Metallo carboranes – a general study. Metal clusters– Chemistry of low molecularity metal clusters only – structure of  $Re_2Cl_8$ ; multiple metal –metal bonds.

1.3 Inorganic polymers- Silicones-preparation, properties and uses-Phosphonitrilic compounds – Phosphazenes, Polysulphur –nitrogen compounds.

**UNIT – II Solid State-I**

2.1 Ions and Ionic radii-Ionic structures-the radius ratio rules-Lattice energy of ionic crystals and its calculation-kapustinskii’s equation-Born equation-The Born –Haber cycle-polarization and partial covalent bonding-different types of electrostatic interaction.

2.2 Chemical crystallography-Diffraction methods-X-ray: powder method-single crystal method-Electron and neutron diffraction methods-principle and applications.

2.3 Elements of crystallography - space lattices-unit cells-crystal system- SC, BCC and FCC- crystal structures of sodium chloride, cesium chloride, zinc blende, wurtzite, fluorite, antiferite, perovskite and rutile - normal and inverse spinels.

**UNIT-III Solid State-II**

3.1 Structure aspects of solids-Fourier synthesis and analysis-structure factors-scattering factors-super conductivity- low and high temperature super conductors - optical properties of solids-Lasers and phosphors-photovoltaic effect-solar energy.

3.2 Magnetic properties-theory-effects of temperature: curie and curie-weiss laws-Different types-dia,para,ferro,antiferro and ferri magnetism-magnetic hysteresis-Silicate minerals – ortho, pyro, and meta silicates – pyroxene, amphiboles – two dimensional silicates – talc, mica and three dimensional aluminosilicates, feldspar, zeolites, ultramarines- covalent crystals diamond and graphite.

#### UNIT – IV Nuclear Chemistry - I

4.1 Subatomic particles and their properties - nuclear binding energy - nuclear structure - liquid drop model and nuclear shell model - n/p ratio - nuclear forces - modes of radioactive decay - alpha, beta and gamma decay. Q-value of nuclear reaction, coulombic barrier, nuclear cross section, threshold energy and excitation function - different types of nuclear reactions: stripping and pick-up, fragmentation, nuclear fission, nuclear fusion and spallation. Characteristics of fission reactions - product distribution, theories of fission - fissile and fertile isotopes - nuclear fusion and stellar energy.

4.2 Proportional counter, Geiger-Muller counter, scintillation counter and Cherenkov counter-linear accelerators - cyclotron, synchrotron.

#### UNIT – V Nuclear Chemistry - II

5.1 Applications of isotopes - neutron activation analysis - isotopic dilution analysis-uses of tracers in structural and mechanistic studies, agriculture, medicine and industry - radio carbon dating-Radio pharmacology -atomic power projects in India.

5.2 Radiation Chemistry- radiation dosimetry, radiolysis of water, the hydrated electron,- Radiation protection and safety precautions - Disposal of nuclear waste.

#### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	summarize the nature of inorganic chains, rings, cages and clusters.	3	K4
CO-2	recall the types of inorganic crystals and their characteristics.	4	K1
CO-3	knowledge about structures of crystalline solids, importance of crystal defects.	1	K3
CO-4	apply the fundamental aspects of nuclear chemistry.	1	K3
CO-5	Appreciate the applications of nuclear chemistry.	7	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Text Books:**

1. Glasstone S, Source **Book on Atomic Energy**, Affiliated East West Press Pvt. Ltd. New Delhi, 1967.
2. Lee J D, **Concise Inorganic Chemistry**, 5th Edition, ELBS, London, 1998.
3. Huheey J E, Keiter E A and Keiter R L, **Inorganic Chemistry Principles of Structure and Reactivity**, 4th Edition, Harper Collins College Publishers, New York, 1993.
4. G.L. Miessler & D.A. Tarr. **Inorganic Chemistry**, 3rd Edn. Pearson Education, 2016
5. **Solid State Chemistry** – An Introduction, L. Smart and E. Moore, Taylor & Francis Group, 4th Edition, 2012.
6. **Solid State Chemistry**, D. K. Chakrabarty, New Age Science, 2nd Edition, 2010.

**Reference Books:**

1. Friedlander G, Macias E S, Kennedy J W and Miller J M, **Nuclear and Radiochemistry**, 3rd Edition, John Wiley and Sons Inc., London, 1981.
2. Arniker H J, **Essentials of Nuclear Chemistry**, New Age International Publishers, New Delhi, 2005.
3. Keer H V, **Principles of Solid State**, Wiley Eastern Ltd, New Delhi, 1993.
4. B.R. Puri, L.R. Sharma and K.C. Kalia, **Principles of Inorganic Chemistry**, Milestone publishers and Distributor, Delhi, 31st edition, 2010.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**



**CORE COURSE-IX**  
**ORGANIC AND INORGANIC SPECTROSCOPY**

**Semester : IV**

**Hours /week: 5**

**Course code : 21P4CH09**

**Credits : 5**

**Course Objectives:**

1. To understand the principle and applications of UV-Vis and IR Spectroscopy.
2. To study the theory and applications of Mass Spectroscopy.
3. To interpret the structural determination of IR, NMR and Mass Spectroscopy.
4. To Understand and relate the concepts of EPR and Mossbauer spectroscopy.
5. To study the principles of Photoelectron spectroscopy.

**UNIT - I Organic Spectra: UV - VIS, and IR Spectra**

1.1 UV - VIS: Chromophores and effect of conjugation, substituents with unshared electrons and their capability of  $\pi$  - conjugation. Colour in compounds. Calculation of  $\lambda_{\max}$  for organic molecules - Woodward - Fischer rules for dienes, enones. IR: characteristic group frequencies of organic molecule, Factors influencing vibrational frequencies, interpretation of IR spectra of organic molecules.

**UNIT - II ORD-CD and Mass Spectra**

2.1 ORD - CD: Definition, deduction of absolute configuration, octant rule for ketones, Cotton effect,  $\alpha$ -haloketone rule.

2.2 Mass spectra - theory, applications, McLafferty rearrangement, fragmentation pattern, Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

**UNIT - III Spectroscopy & Structure Determination**

3.1 Structure determination of organic compounds by Interpreting IR Spectra Isopropyl benzene, Benzylamine, Methyl benzoate, Methyl phenyl ether, Nitrobenzene. UV-Vis, Absorption Maxima for Nonconjugated and Conjugated Dienes.

3.2 Interpreting  $^1\text{H}$  NMR Spectra - 1,1 Dichloro Ethane, 3-pentanone, Ethyl propionate, 1-chloro-3-iodo propane, Vinyl Acetate, 1-propanol. Interpreting  $^{13}\text{C}$  NMR Spectra - t-Butanol, 2, 2, 4 trimethyl -1, 3-pentanediol, Diethyl phthalate.

3.3 Mass Spectrometry of Small Molecules: Magnetic-Sector Instruments, Interpreting Mass Spectra hexane, Benzyl chloride, Bromoethane, Octane. Mass Spectrometry of Some Common Functional Groups Alcohols, Amines, Carbonyl compounds

#### UNIT - IV EPR Spectroscopy and Mossbauer Spectroscopy:

4.1 Theory: derivative curves; g values; factors affecting the magnitude of g value; zero field splitting; Kramer's degeneracy; EPR spectra of V(II), Mn(II), Co(II), Ni(II) and Cu(II) complexes; covalency of metal - ligand bonding by EPR; John-teller distortions in Cu(II) complexes.

4.2 Mossbauer Spectroscopy - Doppler effect, isomer effect; electron - neutron hyperfine interactions; Quadrupole interactions and magnetic interactions; simple applications to Iron and Tin compounds.

#### UNIT - V Photoelectron Spectroscopy

Photoelectron Spectroscopy - Principle, PES of diatomic molecules and polyatomic molecules (HCl, HBr, HI, CO, NH<sub>3</sub> and H<sub>2</sub>O); Core electron PES; X-ray photoelectron spectroscopy (ESCA) applications.

#### Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	Knowledge Level
CO-1	Understand how different spectroscopes work and their applications in structure elucidations.	8	K2
CO-2	Identify/predict the fragmentation pattern of organic molecules.	6	K3
CO-3	Recognize and distinguish the different molecules by applying the spectroscopies	3	K1
CO-4	Apply the principles of spectroscopy to solve the problems in competitive exams.	2	K3
CO-5	Know about the importance and usefulness of various spectroscopies in organic and inorganic chemistry.	4	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

#### Text Books:

1. Jag Mohan. (2018). **Organic Spectroscopy: Principles and Applications** (II Edition). New Delhi: Narose Publishing House.
2. Silverstein, R. M., Webster, F. X., & Kiemle, D. (2014). **Spectroscopy of Organic Compounds** (VIII Edition). New York: John Wiley & Sons.
3. **Spectroscopy in Inorganic Chemistry**, C.N.R. Rao, J.R. Ferraro, Methven Co., London, 1968.
4. Drago, R.S. (2012). **Physical Methods in Inorganic Chemistry**. New York: East- West Press Pvt. Ltd.

**Reference Books:**

1. Banwell.,(2017). **Fundamentals of Molecular & Spectroscopy** (IV Edition), McGraw-Hill Education (India) Pvt. Limited.
2. P.S. Kalsi ,**Spectroscopy of organic compounds**, Wiley Eastern Ltd., Madras, 1995.
3. A. Abdul Jameel, **Applications of physical methods to inorganic Compounds**, 2007.
4. Y.R Sharma, **Elementary Organic Spectroscopy**, Reprint, Sultan Chand and Sons, 1st edition, 2011
5. Kemp, W. (2017). **Organic Spectroscopy** (III Edition). New York: Palgrave Macmillan.

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

**CORE ELECTIVE-IV**  
**NANO AND GREEN CHEMISTRY**

**Semester:IV**

**Hours/week : 5**

**Course code: 21P4CHE04**

**Credits : 5**

**Course Objectives:**

1. To learn the crystal structures of few inorganic solids.
2. To know the synthetic methods of nanomaterials.
3. To understand the basic principles of green chemistry.
4. To understand the characterization of nanomaterials.
5. To learn nanotechnology and nanodevices.

**UNIT – I Theories and structures of solids:**

Crystal defects-point, line and plane defects- colour centers nonstoichiometric compounds-Electronic structure of solids- free electron and band theory of solids. Types of solids – electrical conductivity and superconductivity - high temperature superconductors-Structure of alloys, intermetallic compounds interstitial compounds, clathrates - metal cluster compounds-Crystal growth methods from chemical reaction, liquid solution, diffusion, fused salt electrolysis and by chemical vapour transport.

**UNIT – II Introduction to Nanomaterials**

Introduction to Nano particles – definitions – classifications of Nanomaterials- Mechanical, thermal, magnetic and biological properties of Nanomaterials.

**UNIT – III Synthesis Methodologies of Nanomaterials**

Introduction –top-down approach (physical method)- laser evaporation method- RF-plasma – pulsed laser method-lithography-mechanical milling-bottom –up approach(chemical methods)hydrothermal method –co-precipitation method-sol-gel method-reverse micelles technique – micro emulsion method – microwave synthesis – electrodeposition.

**UNIT – IV Characterizations of Nanomaterials**

Introduction – structural analysis -X-ray diffraction (XRD) – fourier transform infrared spectroscopy (FT-IR) – scanning electron microscopy (SEM) – transmission electron microscopy (TEM) –chemical composition analysis – Energy dispersive X-ray spectroscopy (EDX)-X-ray photon electron spectroscopy.

**UNIT-V Green chemistry**

5.1 Introduction –Basic principles of green chemistry - tools of green chemistry- atom economy-reaction of atom economy – green solvents, green reactions, microwave induced green synthesis

5.2 Introduction-water based reactions (only)- Nanotechnology synthesis of carbon nanotubes(CNTS)- types –properties and uses.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Acquire knowledge on structures of solids solids.	2	K2
CO-2	Evaluate nanotechnology, the necessary foundation for training in research	3	K5
CO-3	Describe principles of nanoparticle preparation and modification	4	K5
CO-4	Charactersics nanomaterials by using SEM,TEM.	5	K3
CO-5	Recognize the impact of green chemistry on human health and environment.	8	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

- 1.**New Trends in Green Chemistry**, V. K. Ahluwalia, M. Kidwai, II Edn., Anamaya publishers New Delhi(2007).
- 2.C.N.R. Rao, A. Muller, A.K. Cheetam (Eds), **The Chemistry of Nanomaterials**, Vol.1, 2, Wiley – VCH,Weinheim, 2004.
- 3.**Green Chemistry – Environment friendly alternatives-** edited by Rashmi Sanghi & M. M. Srivastava, Narora Publishing House, (2003).
4. **Solid State Chemistry – An Introduction**, L. Smart and E. Moore, Taylor & Francis Group, 4th Edition, 2012.
- 5.**Solid State Chemistry**, D. K. Chakrabarty, New Age Science, 2nd Edition, 2010.
6. Anastas P T, **Text Book on Green Chemistry**, Oxford University Press, UK, 2006.

### Reference Books:

- 1.T. Pradeep, Nano: **The essentials.**, McGrew Hill Education.(2007).
- 2.B S Murty, P Shankar, Baladev, B BRath and J Murday, **Text book of Nano Science and Nano technology**, University Press, 2012.
2. V. K. Ahluwalia and K. Agarwal, **Organic Synthesis, Special Techniques**; 2nd Ed.,Narosa Publishing House, New Delhi, 2007.
4. B.Viswanathan, **Nano materials**, Narosa publishing house, New Delhi, 1st edition, 2009.

5. S. Shanmugam, **Nanotechnology**, MJP Publishers, 2016 .

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE ELECTIVE-IV**  
**EXPERIMENTAL METHODS IN CHEMISTRY**

**Semester:IV**

**Hours/week : 5**

**Course code: 21P4CHE08**

**Credits : 5**

**Course Objectives:**

1. To study in detail the fundamental aspects of various instrumental methods in chemistry
2. To understand the principles and instrumentation of destructive and non-destructive techniques
3. To understand the various techniques in Chromatography
4. To understand the principles and instrumentation of non-destructive techniques
5. To study the various techniques in chromatography

**UNIT I SURFACE IMAGING**

Basic concepts in surface imaging – Principle, Instrumentation and Applications – secondary electron microscopy(SEM), secondary Auger microscopy(SAM), scanning probe microscopy(SPM), scanning tunneling microscopy(STM), transmission electron microscopy(TEM).

**UNIT II CHEMICAL ANALYSIS**

2.1 Non-destructive techniques – X-ray absorption, diffraction and fluorescence spectroscopy – theory, instrumentation and applications.

2.2 Destructive technique – Atomic absorption spectroscopy – principle, instrumentation –EMR sources – cells – furnaces – detectors – interferences and their corrections – applications of AAS.

**UNIT III ELECTROANALYTICAL TECHNIQUES**

3.1 Polarography – Theory, apparatus, DME, diffusion, kinetic and catalytic currents, current voltage curves for reversible and irreversible systems, qualitative and quantitative applications to inorganic systems.

3.2 Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes , applications – Complexometric titrations – chelating agents, types of EDTA titration – direct and back titrations, replacement titrations – masking and demasking reagents.

**UNIT IV SEPARATION METHODS - I**

Normal and Reversed-phase liquid chromatography – Theory and applications – HPLC – principle, instrumentation, apparatus and materials, column efficiency and selectivity, applications – GC chromatography – principle, instrumentation, retention volume, resolution and applications.

**UNIT V SEPARATION METHODS – II**

5.1 Gel chromatography or Gel Permeation Chromatography – Principle, Materials, Gel preparation, column Packing and Detectors – applications and advantages of gel chromatography.

5.2 Ion Exchange Chromatography – Definition, Principle, cation and anion exchangers – regeneration -

column used in separations - Ion exchange capacity and techniques – Applications.

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Discuss about the surface imaging.	2	K1
CO-2	Analyze the Non-destructive techniques and destructive techniques.	3	K4
CO-3	Study the various analytical techniques.	4	K4
CO-4	Perform the various applications in chromatography.	5	K4
CO-5	Recognize various methods in chromatography.	8	K1

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**  
**Text Books**

1. R.Wiesendanger, **Scanning Probe microscopy and spectroscopy**, Cambridge university press, 1994
2. Gurdeep R. Chatwal, Sham K. Anand, **Instrumental methods of chemical analysis**, Himalaya PublishingHouse,2011

### Reference Books:

1. Mahinder Singh, **Analytical Chemistry-InstrumentalTechniques**,Dominant Publishers & Distributers, New Delhi, 1st Edition,2003.
2. H. Kaur, **Instrumental Methods of Chemical analysis**, Pragati Publishers,2006..
3. F.Scholz, **Electroanalytical methods**, Springer,2nd Ed.,2010.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**



**CORE ELECTIVE-IV**  
**INDUSTRIAL ORGANIC SYNTHESIS**

**Semester: IV**

**Hours /week: 5**

**Course code: 21P4CHE12**

**Credits : 5**

**Course Objectives:**

1. Remember the concept of retrosynthesis and the terms involved.
2. Remember about the one group and two group disconnections.
3. Understand the various protection and deprotection of important functional groups.
4. Understand the use of important reagents in organic synthesis.
5. Create the selected name reactions in Organic synthesis.

**UNIT – I**

Introduction to retrosynthesis Synthons, synthetic equivalent, target molecule, functional group interconversion, disconnection approach, importance of the order of events in organic synthesis. Chemoselectivity, one group C-C and C-X disconnection (disconnection of alcohols, alkenes, and carbonyl compounds).

**UNIT - II**

Two group C-C & C-X disconnections 1,3 and 1,5 Difunctionalised compounds,  $\alpha,\beta$ - unsaturated carbonyl compounds, control in carbonyl condensation, synthesis of 3,4,5 and 6 membered rings in organic synthesis. Diels- Alder reaction, Connection in retro synthesis.

**UNIT – III**

Protecting groups Protection of hydroxyl, carboxyl, carbonyl, amino groups. Umpolung reagents, definition of umpolung, acyl anion equivalent, Protection of carbon-carbon multiple bonds. Illustration of protection and deprotection in synthesis.

**UNIT – IV**

Organic Reagents Use of the following reagents in organic synthesis and functional group transformation, 1,3-Dithianes, N-Bromosuccinimide, Organolithium reagents, Sodamide, Organosilicon compounds, Diazomethane, Periodic acids, Pyridinium chlorochromate (Corey's reagent), Lead tetraacetate, Fenton's reagent, Phase transfer catalyst, Crown ethers, Merrifield resin, Wilkinson's catalyst and Baker yeast.

**UNIT – V**

Name reactions in organic synthesis Peterson olefination, McMurry, Shapiro reaction, Bomford-Stevens reaction, Palladium based reactions- Suzuki, Heck, Sonogashira, Hiyama, Stille, Glaser-Eglinton coupling, Henry reaction, Birch reduction, Clemmensen reduction, Dess-Martin oxidation, HofmannLoffler-Freytag reaction, Etard reaction, Baylis Hillman reaction, Wolff- Kishner reduction.

## Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	List concept of retrosynthesis and the terms involved	2	K1
CO-2	State the one group and two group disconnections	3	K3
CO-3	Discuss the various protection and deprotection of important functional groups	4	K2
CO-4	Use of important reagents in organic synthesis	5	K4
CO-5	Investigate the selected name reactions in Organic synthesis.	8	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

### Text Books:

1. Warren,S. (2010). **Organic Synthesis the Disconnection approach**, Wiley and sons,
2. Renuga,S. (2016). **Name reactions and reagents in organic synthesis**, Vishal Publishing Co. Jalandhar-Delhi.
3. Nasir Hussain and Saba Khan, (2016). **Reactions and Reagents**, Himanshu Publications, New Delhi.
4. Clayden, J., Greeves, N. & Warren, S. (2012). **Organic Chemistry** (II Edition). Oxford University Press, Oxford.

### Reference Books:

1. Sanyal, S. N. (2014). **Reactions, Rearrangements and Reagents** (IV Edition). New Delhi: Bharathi Bhawan (Publishers and Distributors).
2. Smith, M. B. (2015). **March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure**(VII Edition). New Jersey: John Wiley & Sons, Inc., Hoboken.

### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong**

**M-Medium**

**L-Low**

**CORE PRACTICAL – VI**  
**INORGANIC CHEMISTRY PRACTICAL – II**

**Semester: IV**

**Hours /week: 4**

**Course code: 21P4CHP06**

**Credits : 4**

**Course Objectives:**

1. To learn the technique of inorganic qualitative analysis.
2. To understand the concept of common ion effect and solubility product.
3. To learn colorimetric analysis.
4. To learn about the qualitative analysis by semi micro-qualitative analysis method.
5. To describe the basic concept and advantages of semi- micro qualitative analysis.

**Semi-micro Qualitative Analysis:**

(Insoluble and Interfering anions may be avoided)

1. Semi-micro qualitative analysis of a mixture containing two common cations and two less common cations.
2. Estimation of copper, ferric, nickel, chromium and manganese ions using photoelectric Colorimeter.

**Scheme of valuation**

**Analysis:**

4 radicals correct with suitable tests: 40 marks

3 radicals correct with suitable tests: 30 marks

2 radicals correct with suitable tests: 20 marks

1 radical correct with suitable tests: 10 marks

**Colorimetric Estimations:**

1-2% - 20 marks

2-3% - 15 marks

3-4% - 10 marks

>4% - 05 marks

**Course Outcomes**

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Identify the common and less common metal ions present in the given mixture	6	K3
CO-2	Separate the metal ions into groups by applying the principle of solubility product.	7	K2
CO-3	Calculate the amount of metal ions present in a solution even in trace quantity	9	K2
CO-4	Apply the principle of colorimetric estimation.	6	K3
CO-5	Adopt safety measures in handling chemicals	9	K4

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

**Text Books:**

1. G. Svehla, **Text Book of Macro and Semimicro Qualitative Inorganic Analysis**; 5th Ed., Longman group Ltd, London, 1987.
2. A. I. Vogel, **Text Book of Quantitative Inorganic Analysis**; 6th Ed., Longman, New Delhi, 2000.

**Reference Books:**

1. V.V. Ramanujam, **Inorganic Semimicro Qualitative Analysis**, The National publishing Co., 3rd edition, 2012
2. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, **Basic principles of Practical chemistry** Sultan Chand and sons, 2nd edition, 2012

**Mapping with Programme Specific Outcomes**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	M	S	S	M	S

**S-Strong****M-Medium****L-Low**

## PROJECT

### DISSERTATION/PROJECT WORK

Semester: IV

Hours/week: 10

Course code: 21P4CHPR01

Credits : 8

#### Course Objectives:

1. Relate and understand the basic aspects of research.
2. Identify current chemical literature and other search engines judiciously.
3. Discover synthetic skills in carrying out research problem.
4. Appraise scientific writing and presentation skill for preparing project reports.
5. Design new research problems and carry out systematically.

#### Format of the Research Report

- I Title Page
- II Introduction (no heading)
- III Review of literature
- IV Scope of the Work
- V Experimental Work
- VI. Results and Discussion
- VII Conclusions and Future work
- VIII. References

#### Scheme of Evaluation

<b>Internal examination</b>	<b>50 marks</b>
Review of literature	10 marks
Experimental work	15 marks
Manuscript preparation	15 marks
Common viva- voce examination	10 marks
<b>External examination</b>	<b>150 marks</b>
<b>External examiner</b>	<b>(100 marks)</b>
Review of literature	20 marks
Experimental work	35 marks
Manuscript preparation	20 marks
Viva voce examination	25 marks
<b>Internal examiner</b>	<b>(50 marks)</b>
Viva voce examination	50 marks

### Course Outcomes

CO No.	Upon completion of this course , students will be able to	PSOs addressed	Knowledge Level
CO-1	Relate and understand the basic aspects of research.	6	K2
CO-2	Identify current chemical literature and other search engines judiciously.	7	K3
CO-3	Discover synthetic skills in carrying out research problem.	9	K4
CO-4	Appraise scientific writing and presentation skill for preparing project reports.	6	K5
CO-5	Design new research problems and carry out systematically.	9	K6

**K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

#### Reference Books:

1. Best J W, Kahn J V, Research in Education, 10th Edition. Pearson Education Inc. 2006, USA.
2. Currano, J and Roth, D (editors), Chemical Information for Chemists: A Primer, Royal Society of Chemistry, 2013.

#### Text Books:

1. Dominoswki, R L, Research Methods, Prentice Hall, 1981.
2. Ebel, H F, Bliefert, C and Russey, W E, The Art of Scientific Writing, VCH, Weinheim, 1988.
3. Dawson, C, Introduction to Research Methods: A practical guide for anyone undertaking a research project 5 th Edition, Robinson, 2019.

#### Mapping with Programme Specific Outcomes

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	S	S	S	M	S	S	S
CO2	S	S	M	S	M	M	M	S
CO3	M	M	M	S	S	S	S	S
CO4	M	M	S	S	M	M	S	S
CO5	S	S	S	S	S	S	S	S

**S-Strong**

**M-Medium**

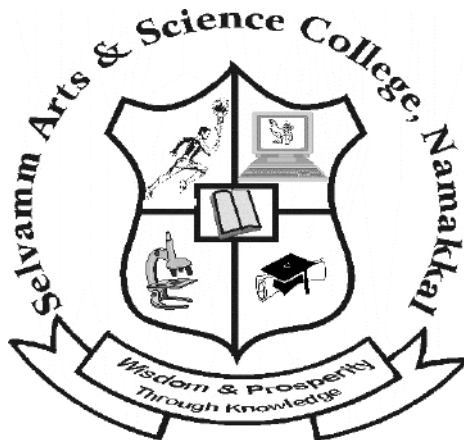
**L-Low**

# **SELVAMM ARTS & SCIENCE COLLEGE**

**(AUTONOMOUS)**

*Affiliated to Periyar University, Salem-11*

Namakkal - 637003.



**MASTER OF COMMERCE (M.Com.)**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**REGULATIONS / SYLLABUS**

(From the Academic Year 2021 -2022)

**MASTER OF COMMERCE (M.Com.)**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**  
**REGULATIONS / SYLLABUS**  
(From the Academic Year 2021 -2022)

**I. Eligibility for Admission**

Candidates seeking admission to the first year of the Master of Commerce degree course shall possess (a) B. Com / B. Com (CA) or (b) Any other degree from B.Com (CS), BBA, BBA (CA), BBM and BLM.

**II. Objectives of the Course**

1. To impart knowledge in advanced concepts and applications in various fields of commerce.
2. To teach the recent developments in the various areas of Commerce.
3. To orient the students in the applied aspects of different advanced business practices.
4. To provide the students the avenues of studies in parallel professional Courses.
5. To equip the students to occupy the important positions in business, industries and related organizations.
6. To inspire the students to apply the knowledge gained for the development of society in general.

**III. Duration of the Course**

The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters.

The duration of each semester will be about 16 weeks. The subjects of study shall be in accordance with the syllabus prescribed from time to time.

**IV. Courses of Master of Commerce of the Programme**

The total number of subjects of study will be 22 including one project work.

The Project Report must be submitted through the supervisor and the Head of the Department on or before 31<sup>st</sup> March of the Second year of the programme.

**V. The Choice Based Credit System (CBCS)**

The PG programme shall be conducted on **Choice Based Credit System (CBCS)**. It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education. The term 'credit' refers to the weightage



given to a course, usually in relation to the instructional hours assigned to it. However, in no instance the credits of a course can be greater than the hours allotted to it. Each **Course** is designed variously under lectures / laboratory or field work / seminar / practical training / Assignments / Report writing to meet effective teaching and learning needs.

## **VI. Evaluation**

The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by a **Continuous Internal Assessment (CIA)** by the course teacher concerned as well as by an end semester examination and will be consolidated at the end of the course. The components for continuous internal assessment are:

Test	: 15 Marks
Assignment	: 5 Marks
Seminar	: 5 Marks
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<b>Total</b>	<b>25 Marks</b>
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In addition to continuous evaluation component, the end semester examination, which will be a written-type examination of 3 hours duration, would form an integral component of the evaluation. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 25: 75.

## **Passing Minimum**

1. The passing minimum for CIA shall be 12 out of 25 marks.
2. The passing minimum for Semester Examination shall be 38 out of 75 marks.

## **VII. Classification of Successful Candidates**

Candidates who obtain 75 percent and above in aggregate shall be declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who secure not less than 60 percent or below 75 are placed in the first class.

Candidates who secure 50 percent or below 60 percent will be placed in the second class.

## VIII. Marks and Grades

The following table gives the marks, grade points, letter grades and classification to indicate the performance of the candidate.

<b>Range of Marks</b>	<b>Grade Points</b>	<b>Letter Grade</b>	<b>Description</b>	<b>Classification</b>
90 - 100	9.0 - 10.0	O	Outstanding	First Class with Exemplary*
80 - 89	8.0 - 8.9	D+	Excellent	First Class with Distinction*
75 - 79	7.5 - 7.9	D	Distinction	
70 - 74	7.0 - 7.4	A+	Very good	First Class
60 - 69	6.0 - 6.9	A	Good	
50 - 59	5.0 - 5.9	B	Average	Second Class
00 – 49	0.0	U	Re - Appear	-
ABSENT	0.0	AAA	ABSENT	-

\*The candidates who have passed in the first appearance and within prescribed semester of a PG programme (Core, Elective, Non-major Elective and Extra – Disciplinary Courses alone) are eligible.

**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**  
**COURSE STRUCTURE UNDER CBCS**  
**DEPARTMENT OF COMMERCE**

(For the students admitted in the Year 2021-22 Batch onwards)

Sem	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
<b>I</b>	Core Course -I	21P1CM01	MARKETING MANAGEMENT	6	5	25	75	100
	Core Course -II	21P1CM02	ACCOUNTING FOR MANAGERIAL DECISIONS	6	5	25	75	100
	Core Course -III	21P1CM03	ADVANCED BUSINESS STATISTICS	6	5	25	75	100
	Core Course -IV	21P1CM04	CORPORATE LAW	6	5	25	75	100
	<b>Elective : I (choose any one course)</b>	21P1CME01	ORGANISATIONAL BEHAVIOUR	6	4	25	75	100
		21P1CME05	BUSINESS ENVIRONMENT					
21P1CME09		GOODS AND SERVICES TAX (GST)						
<b>Total</b>				<b>30</b>	<b>24</b>			<b>500</b>
<b>II</b>	Core Course -V	21P2CM05	ADVANCED COST ACCOUNTING	6	4	25	75	100
	Core Course -VI	21P2CM06	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	4	4	25	75	100
	Core Course -VII	21P2CM07	FINANCIAL MANAGEMENT	6	4	25	75	100
	Core Course -VIII	21P2CM08	E – COMMERCE	4	4	25	75	100
	<b>Elective : II (choose any one course)</b>	21P2CME02	RESOURCE MANAGEMENT TECHNIQUES	4	4	25	75	100
		21P2CME06	INTERNATIONAL BUSINESS					
		21P2CME10	SUPPLY CHAIN MANAGEMENT					
	<b>EDC</b>	21P2CMED01	EXTRA DISCIPLINARY COURSE	4	4	25	75	100
<b>Common</b>	21P2HR01	HUMAN RIGHTS	2	2	25	75	100	
<b>Total</b>				<b>30</b>	<b>26</b>			<b>700</b>
<b>III</b>	Core Course -IX	21P3CM09	BUSINESS RESEARCH METHODS	6	5	25	75	100
	Core Course -X	21P3CM10	ADVANCED CORPORATE ACCOUNTING	6	5	25	75	100
	Core Course -XI	21P3CM11	HUMAN RESOURCE MANAGEMENT	6	5	25	75	100
	Core Course -XII	21P3CM12	PROJECT MANAGEMENT	6	5	25	75	100
	Core Course -XIII	21P3CMIS01	INTERNSHIP	--	#	25	75	100
	<b>Elective : III (choose any one course)</b>	21P3CME03	DIRECT TAXES	6	4	25	75	100
		21P3CME07	CUSTOMER RELATIONSHIP MANAGEMENT					
21P3CME11		CO-OPERATION						
<b>Total</b>				<b>30</b>	<b>24</b>			<b>600</b>
<b>IV</b>	Core Course -XIV	21P4CM13	INDIRECT TAXATION	6	5	25	75	100
	Core Course -XV	21P4CM14	ADVANCED BANKING	6	5	25	75	100

	Core Course -XVI	21P4CM15	SERVICES MARKETING	6	5	25	75	100
	<b>Common</b>	21P4SSS01	SOFT SKILLS	2	1	25	75	100
	<b>Elective : IV (choose any one course)</b>	21P4CME04	INVESTMENT MANAGEMENT	6	5	25	75	100
		21P4CME08	STRATEGIC MANAGEMENT					
		21P4CME12	MANAGERIAL ECONOMICS					
	Core Project-I	21P4CMPR01	PROJECT WORK AND VIVA VOCE	4	4	25	75	100
	Common	21P3EX01	EXTENSION ACTIVITIES*	(40Hrs)	1	-	-	
<b>Total</b>				<b>30</b>	<b>26</b>			<b>600</b>
<b>Grand Total</b>				<b>120</b>	<b>100</b>			<b>2400</b>

\*- 15 Days – II Semester Leave

# - Commended/Highly Commended will be given, based on Reports & Viva Voce Examination.

\*\* - Outside the class hours.

### **Programme Outcomes (PO)**

PO 1: To provide a systematic and rigorous learning and exposure to Banking and Finance related disciplines.

PO 2: To train the student to develop conceptual, applied and research skills as well as competencies required for effective problem solving and right decision making in routine and special activities relevant to financial management and Banking Transactions of a business.

PO 3: To acquaint a student with conventional as well as contemporary areas in the discipline of Commerce.

PO 4: To enable a student well versed in national as well as international trends.

PO 5: To facilitate the students for conducting business, accounting and auditing practices, role of regulatory bodies in corporate and financial sectors nature of various financial instruments.

PO 6: To provide in-depth understanding of all core areas specifically Advanced Accounting, International Accounting, Management, Security Market Operations and Business Environment, Research Methodology and Tax planning.

PO 7: To make students more proficient in areas like Costing, Taxation, G.S.T., and Accountancy.

### **Program Specific Outcomes (PSOs)**

1. The students will be ready for employment in functional areas like Accounting, Taxation, Banking, Insurance and Corporate Law.
2. Ability to start entrepreneurial activities and to create awareness in human rights and economic rights.
3. To inculcate the knowledge of business and the techniques of managing the business with special focus on marketing, Insurance , banking theory law and practices and stock exchange.
4. To create awareness in application oriented research through research for business decisions.
5. To enhance the direct tax, GST and time and value of supply.

<b>Course Code &amp; Title</b>	<b>21PICM01</b>		<b>Hours / Week: 6</b>
	<b>MARKETING MANAGEMENT</b>		
			<b>Credit : 5</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find concept of marketing.		
	To understand development of product strategy.		
	To determine attitude of buyer behaviour.		
	To analyze pricing policies and strategies.		
	To evaluate various promotional aspects.		

### **SYLLABUS CONTENT**

#### **UNIT I Concept of Marketing (15 hours)**

Introduction - Marketing Management - Nature and Scope of Marketing – Marketing Concepts - Marketing Process – Marketing Functions – Marketing Mix - Market Planning - Organizing – Market Environment – Regulated Marketing Structure.

#### **UNIT II Product Development (14 hours)**

Product Planning and Policy – Product Line and Product Mix Strategies – New Product Development-Product Life Cycle - Grading - Standardization - Packaging.

#### **UNIT III Buyer Behavior and Attitude(16 hours)**

Buying Decision - Consumer attitude and Behavior - Meaning - Nature - Factors Influencing Consumer Behaviour - Buying Decision Process – Consumer Protection – Selling – Methods of Selling - Market Segmentation.

#### **UNIT IV Pricing (15 hours)**

Pricing Decision - Factors Affecting Price Determination – Pricing Policies and Strategies – Distribution - Nature - Functions - Channels of Distribution - Types of Channels – Intermediaries – Elimination Middlemen – Challenges.

#### **UNIT V Promotional Aspects (15 hours)**

Promotional Decisions - Promotion Mix - Communication Process - Advertising and Salesmanship – Steps in Selling – Essentials of Salesmanship – Importance of Salesmanship – Qualities of a Good Salesperson - Marketing Research and Information.

**Text Books:**

1. Phillip Kotler, Principles of Marketing, Prentice-Hall India Pvt Ltd, New Delhi.

**Reference Books:**

1. Sherlerkar, Marketing Management, Himalaya Publishing House Pvt Ltd, Mumbai.

2. C.B. Gupta & Rajan Nair, Marketing Management, Sultan Chand & Sons, New Delhi.

3. Dhruv Grewal and Michael Levy, Marketing Management, Mc Graw Hill Education India Private Ltd, New Delhi.

4. Rajan Saxena, Marketing Management, Mc Graw Hill, Noida,U.P.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize concept of marketing.	K1
CO-2	Learn Product Development.	K2
CO-3	Know about Buyer Behaviour.	K3
CO-4	Acquire pricing policies and strategies.	K4
CO-5	Know about Promotional Aspects.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium



<b>Course Code</b>	<b>21PICM02</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>ACCOUNTING FOR MANAGERIAL DECISIONS</b>		<b>Credit : 5</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find basic concept of management accounting.		
	To understand financial statements.		
	To determine fund flow and cash flow analysis.		
	To analyze various types budgeting.		
	To evaluate standard costing.		

### **SYLLABUS CONTENT**

#### **UNIT I Basics Concepts (14 hours)**

Accounting for Managerial Decisions - Meaning, Scope and Importance – Objectives and Functions of Management Accounting - Distinction Between Financial Accounting and Management Accounting - Management Accounting and Cost Accounting.

#### **UNIT II Financial Statements and Ratio Analysis (16 hours)**

Analysis and Interpretation of Financial Statements – Ratio Analysis – Classification of Ratios - Significance of Ratios - Uses and Limitations.

#### **UNIT III Fund Flow and Cash Flow Analysis (15 hours)**

Fund Flow Analysis – Meaning – Importance – Limitations - Cash Flow Analysis(As Per Revised As) – Meaning – Sources and Application of Funds – Managerial Uses

#### **UNIT IV Budgeting (15 hours)**

Budgeting - Meaning and Concept - Essentials of Good Budgeting - Types of Budgets - Sales, Production, Material, Purchase Budgets - Flexible Budgets - Cash Budget - Zero Based Budgeting- Capital Budgeting –Types.

#### **UNIT V Standard Costing (15 hours)**

Standard Costing - Techniques - Variances and their Analysis - Material – Labour - Overhead and Sales Variances.

**Note:** The question may be asked from theory and problem shall be 20% and 80% respectively.

**Text Book:**

1) Maheswari S.N., Management Accounting, Sultan Chand & Sons, New Delhi.

**Reference Books:**

1) A. Murthy & S. Gurusamy, Essentials of Management Accounting , Vijay Nicole , Imprints Private Limited, Chennai – 29.

2) MY Khan and PK Jain, Management Accounting, Mc Graw Hill, New Delhi.

3) Periasamy.P, A Textbook of Financial Cost and Management Accounting, Himalaya publications Pvt. Limited, Mumbai .

4) Reddy and Hari Prasad Reddy, Management Accounting, Margam Publications, Chennai.

5) R.S.N.Pillai & Pagavathi, Management Accounting, S. Chand & Co., New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize basics concepts for accounting for managerial decisions.	K1
CO-2	Learn financial statements and ratio analysis.	K2
CO-3	Know about fund flow and cash flow analysis.	K3
CO-4	Understand budgeting and types of budgets.	K4
CO-5	Know about techniques of standard costing.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	S	M	S	S
<b>CO3</b>	S	S	S	M	S
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	M	S	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21PICM03 ADVANCED BUSINESS STATISTICS</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find concept of statistical analysis.		
	To understand probability distributions.		
	To determine testing of hypothesis.		
	To analyze various parametric tests.		
	To evaluate multivariate analysis.		

### **SYLLABUS CONTENT**

#### **UNIT I Statistical Analysis (15 hours)**

Statistical Analysis - Central Tendency - Dispersion and Skewness - Simple Correlation and Regression Techniques - Charts - Graphs - Diagrams.

#### **UNIT II Probability Distributions (15 hours)**

Probability Distributions - Binomial, Poisson and Normal Distributions - Characteristics and Applications.

#### **UNIT III Testing of Hypothesis (15 hours)**

Testing of Hypothesis - Standard Error and Sampling Distribution - Errors in Testing Hypothesis - Large Samples Test-Tests of Significance - Z Test-Small Samples Test - t Test.

#### **UNIT IV Parametric Tests (15 hours)**

Testing of Hypothesis - Parametric Tests - F -Test - One - way - Two - way -  $\chi^2$  Test and Goodness of fit - Yates Correction - Uses of  $\chi^2$  Test - Introduction of SPSS Package.

#### **UNIT V Multivariate Analysis (15 hours)**

Multivariate Analysis - Partial and Multiple Correlation and Regression - Factor Analysis - Cluster Analysis - Discriminant Analysis.

#### **Note:**

The question may be asked from theory and problem shall be 20% and 80% respectively.

**Text Book:**

1.Gupta.S.P., Statistical Methods, Sultan Chand & Sons Educational Publishers, New Delhi.

**Reference Book:**

1. R.S.N.Pillai & Bagavathi, Practical Statistical, S.Chand & Co. Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize concept of statistical analysis.	K1
CO-2	Learn probability distributions.	K2
CO-3	Know about testing of hypothesis.	K3
CO-4	Understand various parametric tests.	K4
CO-5	Know about multivariate analysis.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	M	S	S	S	M
<b>CO3</b>	S	S	S	M	S
<b>CO4</b>	S	M	S	S	M
<b>CO5</b>	M	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21PICM04</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>CORPORATE LAW</b>		<b>Credit : 5</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find highlight of company law.		
	To understand share capital and membership.		
	To determine meeting and resolutions.		
	To analyze regulation and management of FEMA.		
	To evaluate corporate responsibilities to consumer.		

### **SYLLABUS CONTENT**

#### **UNIT I Introduction to Company Law (16 hours)**

Introduction to Company Act 2013, Importance Highlights - Definition - Features - Kinds of Companies - Memorandum of Association – Contents – Alteration of MOA - Articles of Association - Contents – Alteration of AOA – Differences Between Memorandum of Association and Articles of Association – Prospectus – Statement in Lieu of Prospectus – Misstatement in Prospectus.

#### **UNIT II Share Capital and Membership (14 hours)**

Shares – Types – Bonus shares – Share certificate – share warrant – Dividends - Company Management - Qualifications and Disqualifications of Directors - Powers, Duties and Liabilities of Directors.

#### **UNIT III Meetings and Resolutions (16 hours)**

Meetings - Meaning – Provisions Relating to Various Types of Meeting - Resolution – Meaning – Types – Agenda and Minutes - Liquidation – Meaning – Procedure - Modes of Winding up.

#### **UNIT IV FEMA (14 hours)**

Foreign Exchange Management Act, 1999 – Definitions – Objectives – Features - Regulation and Management of Foreign Exchange – Dealing in Foreign Exchange – Difference between FERA and FEMA.

#### **UNIT V Corporate Responsibilities to Consumers (15 hours)**

Corporate Responsibilities towards Consumers; Definition of Consumer - Consumerism - Consumer Rights - Consumer Protection and Consumerism in India - Consumer Protection Act, 1986 –Grievance Redressal Machinery.

**Text Book:**

1). Kapoor.N.D. Elements of Company Law, Sultan Chand & Co, New Delhi.

**Reference Books:**

- 1) Kapoor.N.D, Elements of Industrial Law, Sultan Chand & Co, New Delhi.
- 2) Dr. S.Gurusamy, Essentials of Financial Services – McGraw-Hill Education (India) Pvt. Ltd., Gaudam Budh Nagar, Noida, U.P – 201 301.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize about introduction to company law.	K1
CO-2	Learn share capital and membership.	K2
CO-3	Know the provisions relating to various types meetings and resolutions.	K3
CO-4	Understand foreign exchange management act, 1999.	K4
CO-5	Know about corporate responsibilities to consumers.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	M	S
<b>CO5</b>	S	S	S	S	M

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21PICME01</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>ELECTIVE : ORGANIZATIONAL BEHAVIOR</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find concept of organizational behaviour.		
	To understand perception of organizational behaviour.		
	To determine functions and factors of personality.		
	To analyze communication barriers and functions.		
	To evaluate organizational goals and functions.		

### **SYLLABUS CONTENT**

#### **UNIT I Introduction to Organizational Behaviour (15 hours)**

Concept - Nature - Features - Importance - Role of OB – Models of OB – Custodial Model – Supportive Model-Team and Team Dynamics.

#### **UNIT II Perception (15 hours)**

Perception - Components - Factors – Models - Learning – Meaning –Nature - Process - Models - Theories – Factors -Types and Techniques.

#### **UNIT III Personality (15 hours)**

Personality - Determinants - Development - Measurement. Attitudes and Values - Nature - Components - Formation – Functions - Individual Behaviour – Positive and Negative Individual Behaviour – Factors Influencing Individual Behaviour

#### **UNIT IV Communication(15 hours)**

Communication - Functions - Process - Barriers - Forms. Stress Management - Forms - Stages - Causes - Effects.

#### **UNIT V Organisation Change (15 hours)**

Organisation Change - Goals - Approaches - Perspectives. Organisation Culture - Characteristics - Types - Functions - Measurement.

**Text Books:**

- 1). L.M. Prasad, Organisational Behaviour, Sultan Chand & Sons, New Delhi.
- 2). K. Aswathappa, Organisational Behaviour, Himalaya Publishing House, Mumbai.

**Reference Books:**

- 1) Saiyadain, Organisational Behaviour, Tata Mc Graw Hill, New Delhi.
- 2) M.N. Mishra, Organisational Behaviour, Vikas Publishing, House Pvt Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to organizational behaviour.	K1
CO-2	Learn various factors of perception.	K2
CO-3	Know about determinants of personality developments.	K3
CO-4	Understand process and barriers of communication.	K4
CO-5	Know about organizational culture.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	S	S	S

**S** – Strong; **M** – Medium



<b>Course Code &amp; Title</b>	<b>21PICME05</b>		<b>Hours / Week: 6</b>
	<b>ELECTIVE : BUSINESS ENVIRONMENT</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find concept of business environment.		
	To understand economic environment.		
	To examine consumer protection.		
	To analyze policy environment.		
	To evaluate social responsibilities of business.		

### **SYLLABUS CONTENT**

#### **UNIT: I Concepts of Business Environment (16 hours)**

Meaning – Nature - Importance and Elements of Business Environment – Components of Business Environment. Business Strategy and its Relation to Environment.

#### **UNIT: II Economic Environment (14 hours)**

Economic Environment, Economic Policies, Economic Planning Legal Environment of Business in India – Political Environment, Social and Cultural Environment, Financial Environment and International Environment.

#### **UNIT: III Consumer Protection (15 hours)**

Consumer Protection Act- Consumer Rights-District Forum - State Commission -National Commission-Consumer Redressal Agencies and Environment Protection.

#### **UNIT: IV Policy Environment (15 hours)**

Policy Environment: Liberalization, Privatization and Globalization, Second Generation Reforms, Industrial Policy and Implementation. Industrial Growth and Structural Changes.

#### **UNIT: V Social Responsibilities of Business (15 hours)**

Social Responsibilities of Business – Meaning and Concept – Various Areas of Social Responsibilities – Corporate Social Responsibility.

**Text Book:**

1.Namita Gopal, Business Environment , McGraw Hill Education(India) Pvt. New Delhi.

**Reference Books:**

1.Cherunilam, Francis, International Business Environment , Himalaya Publishing House Pvt Ltd, Mumbai.

2.Aswathappa.K, Essentials of Business Environment , Himalaya Publishing House Pvt Ltd, Mumbai.

3.S.Sankaran, Business Environment, Margham Publications, Chennai.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize concept of business environment.	K1
CO-2	Learn economic environment.	K2
CO-3	Know about consumer protection.	K3
CO-4	Understand policy environment.	K4
CO-5	Know about social responsibilities of business.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	S	S	M
<b>CO3</b>	S	S	S	M	S
<b>CO4</b>	S	S	S	S	M
<b>CO5</b>	S	S	S	S	S

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21PICME09</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>ELECTIVE : GOODS AND SERVICES TAX (GST)</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>I</b>
<b>Course Objectives</b>	To find basic concept of Goods and services tax.		
	To understand supply and levy and collection of GST.		
	To examine time and value of supply.		
	To analyze input tax credit.		
	To evaluate registration under GST.		

### **SYLLABUS CONTENT**

#### **UNIT – I : BASIC CONCEPTS, DEFINITIONS AND TERMS OF GST (16 hours)**

Meaning and features of goods and Service Tax (GST) - Background, Necessity and implementation of GST - Favorable impacts and difficulties of GST - Important Definitions: Aggregate Turnover, Agriculturist, Business, Place of Business, Inputs, Input Services, Capital Goods, Person, Reverse Charge, Works Contract, Mixed Supply, Goods, Services, Composite Supply and other Definitions under section 2, Important terms; Supply, Nature of Supply, Tax invoice, Bill of Supply, Electronic cash ledger, Electronic Credit Ledger, Electronic Liability Ledger, Supplier, Job work, HSN and Classification of Goods and Services Tax.

#### **UNIT – II : SUPPLY AND LEVY AND COLLECTION (14 hours)**

Meaning and scope of Supply, Tax Liability on composite and mixed supplies - Levy and Collection of Tax on forward charge and reverse charge- Exempt Supply, Inward Supply, Outward Supply.

#### **UNIT – III : TIME AND VALUE OF SUPPLY (15 hours)**

Time and place of supply of goods and services - Determination of value of Taxable supply. Place of Supply, Time of Supply and Value of Supply.

#### **UNIT – IV : INPUT TAX CREDIT (15 hours)**

Input Tax Credit (ITC) – Meaning – Objectives – Features – How to claim Input Tax Credit - Eligibility and Conditions for taking input tax credit, Apportionment of credit and blocked credits, Availability of credit in special circumstances.

## UNIT – V : REGISTRATION (15 hours)

Registration under GST - Persons Liable and exempted from registration - Compulsory registration; Procedures for registration, Deemed Registration, Special Provision to Casual Taxable Person and Non-Resident Taxable Person, Issue of Registration Number (GSTIN) - Amendment, Cancellation and Revocation of Registration.

**Note:** The question may be asked from theory only.

### Reference Books:

1. Indirect Taxes - Vinod K Singania, Taxmann's Publications, New Delhi
2. Indirect Taxes - H.C Mehrotra, Sahitya Bhavan Publications, New Delhi
3. Illustrated Guide to Goods and Service Tax- C A Rajat Mohan- Bharat Publications
4. All About GST- V S Datey- Taxmann Publications.
5. Beginner's Guide to GST- Dr Vandana Bangar and Dr Yogendra Bangar- Aadhya Prakashan Banagar
6. Bare Act CGST

### Course Outcomes:

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize basic concept of goods and services tax.	K1
CO-2	Find out supply and levy and collection of GST.	K2
CO-3	Recognize time and value of supply.	K3
CO-4	Appreciate input tax credit.	K4
CO-5	Identify about registration under GST.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	M

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21P2CM05</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>ADVANCED COST ACCOUNTING</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen concept of cost accounting.		
	To understand about material cost control.		
	To execute various types of overheads.		
	To analyze a range of costing methods.		
	To evaluate marginal costing.		

### **SYLLABUS CONTENT**

#### **UNIT – I Cost Accounting Concepts (14 hours)**

Cost Accounting – Meaning and Definition – Importance – Cost Concept – Differences Between Financial Accounting and Cost Accounting – Classification of Cost - Elements of Cost - Preparation of Cost Sheet.

#### **UNIT – II Material Cost Control (16 hours)**

Material Cost Control – Fixation of Various Stock Levels – Economic Order Quantity – Purchase Procedure – Issue of Materials – Pricing of Material Issues – Inventory Control and Verification. Labour Cost Control – Time Keeping – Wage Payment and Incentive Schemes – Idle Time and Overtime – Labour Turnover.

#### **UNIT – III Overheads (15 hours)**

Overheads – Meaning, Classification According to Functions and Variability – Apportionment and Reapportionment of Overheads – Machine Hour Rate.

#### **UNIT – IV Job, Contract and Process Costing (15 hours)**

Job Costing – Contract Costing – Process Costing – Losses and Gains – Inter Process Profit – Equivalent Production – Joint and Bye Product Costing-Target Costing.

#### **UNIT – V Marginal Costing (15 hours)**

Marginal Costing –Meaning and Concept –Advantages and Limitations –Application of Marginal Costing Techniques –Key Factor –Break Even Analysis.

#### **Note:**

The question may be asked from theory and problem shall be 20% and 80% respectively.

**Text Books:**

- 1.T.S.Reddy and Hari Prasad Reddy, Cost Accounting, Margham Publications, Chennai.
2. A.Murthy & S. Gurusamy, Essentials of Cost Accounting, Tata McGraw Hill Publishing Co Ltd, New Delhi.

**Reference Books:**

- 1.M.Y.Khan & P.K.Jain, Theory and Problems in Cost Accounting, Mc Graw Hill, New Delhi.
2. Arora.M.N, Cost Accounting Principles and Practice, VIKAS Publishing House, New Delhi.
- 3.Iyengar S.P., Cost Accounting, Sultan Chand & Sons, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize concept of cost accounting.	K1
CO-2	Find out material cost control.	K2
CO-3	Recognize various types of overheads.	K3
CO-4	Appreciate methods of costing.	K4
CO-5	Identify marginal costing.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	M

S – Strong; M – Medium

<b>Course Code</b>	<b>21P2CM06</b>		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	<b>SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to security analysis.		
	To understand various types of security analysis.		
	To execute overview of derivatives.		
	To analyze concept of SWAP.		
	To evaluate selection of portfolio.		

### **SYLLABUS CONTENT**

#### **Unit – I Introduction to Security Analysis (11 hours)**

Nature and scope of security analysis: Risk- Meaning, Types, Risk Measurement, Risk Control, Valuation of Debt – Instrument - Equity valuation.

#### **Unit- II Types of Security Analysis (13 hours)**

Fundamental analysis - Economic analysis - Industry analysis - Company analysis - Technical Analysis - Tools of technical analysis - Technical indicators.

#### **Unit- III Derivatives (11 hours)**

Derivatives Characteristics – Types – Hedging instruments- Forward and future contracts –options- Call, Trading and Put options – Write and Exotics options.

#### **Unit- IV SWAP (13 hours)**

SWAP's and Credit derivatives – Characteristics – Currency and interest rate, SWAP – Uses – Equity SWAP – Credit derivatives. Financial Market- Functions.

#### **Unit- V Portfolio Selection (12 hours)**

Portfolio selection- Efficient Market- Hypothesis – Weak, Semi and Strong Market – Portfolio analysis – return and risk of a portfolio with more than two securities – diversification- Markowitz Risk – Return optimization – Simple Sharps optimization- Solution - Random Walk Theory and Dow Theory – CAPM.

**Note:** The questions may be asked from Theory Only.

**Text Books:**

1. Security Analysis and Portfolio Management by Donald E. Fischer, Ronald J. Jordan Prentice Hall of India Pvt. Ltd., New Delhi-110 001.

**Reference Books:**

1. Investment Analysis and Portfolio Management by R.P. Rustagi. Sultan Chand & Sons Educational Publishers, New Delhi.

2. Investment Analysis and Portfolio Management by M. Ranganathan and R. Madhumathi Published by Pearson Education (Singapore) Pvt. Ltd., India Branch, 482 F.I.E. Patparganj Delhi- 110 092.

3. Security Analysis and Portfolio Management by S. Kevin PHI Learning Private Ltd. New Delhi – 110 001, 2008.

4. Investment Management by V.K. Bhalla & S.K. Tuteja. S. Chand & Company Ltd. Ram Nagar, New Delhi – 110 055.

5. Investment Management 13th Edition by V.K. Bhalla. S.Chand & Company Ltd. (AN ISO 9001:2000 COMPANY) Ram Nagar New Delhi-110 005.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to security analysis.	K1
CO-2	Find out various types of security analysis.	K2
CO-3	Recognize overview of derivatives.	K3
CO-4	Appreciate concept of SWAP.	K4
CO-5	Identify selection of portfolio.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	M	S	S	S
<b>CO5</b>	S	S	S	S	M

**S** – Strong; **M** – Medium



<b>Course Code</b>	<b>21P2CM07</b>		<b>Hours / Week: 6</b>
<b>&amp; Title</b>	<b>FINANCIAL MANAGEMENT</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to financial management.		
	To understand cost of capital.		
	To execute capital structure.		
	To analyze investment decisions.		
	To evaluate working capital management.		

### **SYLLABUS CONTENT**

#### **UNIT – I : Introduction to Financial Management (14 hours)**

Financial Management – Meaning and Nature – Scope of Finance, Objectives of Financial Management – Profit Maximization and Wealth Maximization – Finance Functions – Role of Finance Manager.

#### **UNIT –II : Cost of Capital (16 hours)**

Cost of Capital – Meaning and Significance of Cost of Capital, Calculation of Cost of Debts, Equity Shares, Preference Shares and Retained Earnings – Leverages - Concept and Importance, Operating Leverage, Financial Leverage and Combined Leverages.

#### **UNIT – III : Capital Structure (15 hours)**

Capital Structure – Meaning and Feature, Theories of Capital Structure – Factors Determining Capital Structure.

#### **UNIT- IV : Investment Decision (15 hours)**

Investment Decision – Nature of Investment Decision, Importance, Kinds of Investment Decision, Capital Budgeting – Objectives – Advantages - Evaluation Techniques – Pay Back Period, Net Present Value, Internal Rate of Return and Accounting /Average Rate of Return.

#### **UNIT – V : Working Capital, Cash, Receivable, Inventory Management (15 hours)**

Working Capital Management – Concept, Need and Types of Working Capital, Determinants of Working Capital – Management of Cash – Motives of Holding Cash, Objectives of Cash Management, Factors Determining Cash Needs –Management of Receivable and Management of Inventory – Objectives and Various Methods of Inventory Valuation.

**Note:** The question may be asked from theory and problem shall be 40% and 60% respectively.

**Text Books:**

1. Shashi K. Gupta and R.K. Sharma, Financial Management, Kalayani Publishers, New Delhi.
2. S.N. Mageswari, Financial Management, Sultan Chand and Sons, Delhi.

**Reference Books:**

1. Khan- M.Y. and Jain P.K, Financial Management Text and Problems, Tata McGraw Hill Co., New Delhi.
2. Prasanna Chandra, Financial Management Theory and Practice – Tata Mc Graw Hill Co., New Delhi.
3. Pandey I.M., Financial Management, Vikas Publishing House Pvt Ltd, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize introduction to financial management.	K1
CO-2	Find out cost of capital.	K2
CO-3	Recognize capital structure.	K3
CO-4	Appreciate investment decisions.	K4
CO-5	Identify working capital management.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	M	S	S
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	M	S	S	S

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21P2CM08</b>		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	<b>E-COMMERCE</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen evaluation of e-commerce.		
	To understand business models of e-commerce.		
	To execute web technologies.		
	To analyze e-marketing.		
	To evaluate e-security.		

### **SYLLABUS CONTENT**

#### **UNIT – I Evolution of E-Commerce (12 hours)**

E – Commerce – Advantages of E – Commerce – Disadvantages of E - Commerce – E – Commerce Opportunities for Industries – E – Transition Challenges for Indian Corporate Undertakings– Highlights of the IT Act, 2000.

#### **UNIT – II Business Modes for E – Commerce (11 hours)**

Business Modes for E – Commerce – B2C – B2B – C2C – C2B – Brokerage Model – Aggregator Model – Value Chain Model – Manufacturer Model – Advertising Model – Subscription Model – Affiliate Model.

#### **UNIT – III Web Technologies (13 hours)**

Web Technologies – Client Server Application – Telnet – FTP – IRC – ICQ – MIME – Internet Protocol Suite – Internet Naming Conventions – URLs – TCP – Search Engines – Internet Standards and Specifications – ISP – Broad Brand Technologies – HTML – Java script and XML.

#### **UNIT – IV E – Marketing (12 hours)**

E – Marketing – Identifying Web Presence Goals – Online Marketing – E-Advertising – Target Markets – Mobile Commerce – Meaning – Application of Mobile Commerce – Advantage of Mobile Commerce – Wireless Application Protocol.

#### **UNIT – V E – Security (12 hours)**

E – Security – Security on the Internet – Firewall Concepts and Components – E - Payment Systems – Digital Payment Requirements – Digital Token Based E – Payment Systems – Smart Card – E – Cash – E – Cheque – Risk and E – Payment System – Planning the E – Commerce Project.

**Text Book:**

1.P.T. Joseph, S.J, E-Commerce An Indian Perspective , PHI learning Pvt limited, New Delhi

**Reference Books:**

- 1.Kamalesh N. Agarwala, Amit Lal, Deeksha Agarwala, Business on the Net: An Introduction to the What's and How's of E-Commerce; Macmillan, New Delhi.
- 2.Greg Holder, Starting an E-Commerce Business, IDG Books India (P)Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize evaluation of e-commerce.	K1
CO-2	Find out business models of e-commerce.	K2
CO-3	Recognize web technologies.	K3
CO-4	Appreciate e-marketing.	K4
CO-5	Identify e-security.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	M	S	S
<b>CO3</b>	M	S	S	S	S
<b>CO4</b>	S	S	S	S	M
<b>CO5</b>	S	S	S	S	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P2CME02</b>		<b>Hours / Week: 4</b>
	<b>ELECTIVE : RESOURCE MANAGEMENT TECHNIQUES</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to quantitative techniques.		
	To understand transportation and assignment problem.		
	To execute decision theory.		
	To analyze decision theory under risk.		
	To evaluate demand forecasting.		

### **SYLLABUS CONTENT**

#### **UNIT –I Introduction to Quantitative Techniques (12 hours)**

Quantitative Techniques in Business Application - Concept – Need -Linear Programming – Assumptions – Formulation of Linear Programming -- Problems & Solutions – Graphic Method-Simplex Method.

#### **UNIT- II Transportation Problem (13 hours)**

Transportation Problem – IBFS – North West Corner Rule – Least Cost Method – Vogels Approximation Method – Optimum Solution – MODI Method - Assignment Problem – Minimisation – Maximisation – Balanced – Unbalanced.

#### **UNIT – III Decision Theory (11 hours)**

Decision Theory – Ingredients of Decision Theory – Decisions Theory under Uncertainty – Max Mini Criterion - Maxi Max Criterion – Mini Max Regret Criterion.

#### **UNIT – IV Decision Theory under Risk (12 hours)**

Decision Theory Under Risk – Expected Monetary Value – Expected Opportunity Loss – Expected Pay Off Under Perfect Information – Expected Value Under Perfect Information Decision Tree.

#### **UNIT – V Demand Forecasting (12 hours)**

Demand Forecasting – Purpose – Steps – Time Series – Secular Trend – Method of Moving Average – Method of Least Square – Seasonal Indices – Method of Simple Average – Ratio to Moving Average – Ratio to Trend – Method of link Relative.

**Note:** The question may be asked from theory and problem shall be 20% and 80% respectively.

**Text Book:**

- 1.P.K.Gupta, Manmohan & Kantiswarup, Operation Research 9<sup>th</sup> Edition – Sultan Chand & Sons, Chennai.
2. Business Statistics - P.A.Navnithan.

**Reference Books:**

- 1.Vohra N.D, (2005), Quantitative Techniques in Management, Tata Mcgraw Hill, New Delhi.
2. C. R. Kothari, (2006) Quantitative Techniques in Management – Vikas Publishing House Ltd., New Delhi – 14.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to quantitative techniques.	K1
CO-2	Find out transportation and assignment problem.	K2
CO-3	Recognize decision theory.	K3
CO-4	Appreciate decision theory under risk.	K4
CO-5	Identify demand forecasting.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	M	S	S	S	S
<b>CO3</b>	S	S	M	S	S
<b>CO4</b>	S	M	S	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code</b>	<b>21P2CME06</b>		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	<b>ELECTIVE : INTERNATIONAL BUSINESS</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to international business.		
	To understand concept of foreign exchange.		
	To execute structure of India's foreign trade.		
	To analyze foreign direct investment.		
	To evaluate international financial institutions.		

### **SYLLABUS CONTENT**

#### **UNIT – I Introduction to International Business (12 hours)**

Foundations of International Business - Balance of Payment - Balance of Trade – Always Balances - Difference Between Balance of Trade and Balance of Payments.

#### **UNIT – II Foreign Exchange (12 hours)**

Foreign Exchange – Exchange Rate, Mechanism, Risk Management, Transfer of International Payments, Convertibility of Rupee, Current and Capital Accounts; Issues and Perceptions.

#### **UNIT – III Structure of India's Foreign Trade (12 Hours)**

Structure of India's Foreign Trade: Composition and Direction, EXIM Bank, EXIM Policy of India, Regulation and Promotion of Foreign Trade.

#### **UNIT- IV FDI and MNC's (12 hours)**

Foreign Direct Investment and Multinational Corporations – MNC's Culture, MNCs and Less Developed Countries.

#### **UNIT- V International Financial Institutions (12 hours)**

International Liquidity, International Economic Institutions – International Monetary Fund, World Bank, International Finance Corporation, International Development Association, Asian Development Bank - World Trade Organization – Its Functions and Policies.

**Text Book:**

1. Subba Rao. P, (2009), International Business, Himalaya Publishing House Pvt.Ltd, Mumbai.

**Reference books:**

- 1.Charles W. L. Hill & Arun. K. Jain, (2008), International Business, Tata McGraw Hill, New Delhi.
- 2.Aswathappa, (2009), International Business, Tata McGraw Hill, NewDelhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to international business.	K1
CO-2	Find out concept of foreign exchange.	K2
CO-3	Recognize structure of India's foreign trade.	K3
CO-4	Appreciate foreign direct investment.	K4
CO-5	Identify international financial institutions.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	M	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	M	S	S	S
<b>CO4</b>	S	S	S	S	M
<b>CO5</b>	M	S	S	S	S

**S** – Strong; **M** – Medium



<b>Course Code</b>	<b>21P2CME10</b>		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	<b>ELECTIVE : SUPPLY CHAIN MANAGEMENT</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to supply chain management.		
	To understand designing the supply chain network.		
	To execute designing and planning transportation networks.		
	To analyze information technology in the supply chain.		
	To evaluate dimensions of logistics.		

### **SYLLABUS CONTENT**

**UNIT - I Introduction to Supply Chain Management (12 hours)**

Supply chain – Objectives – Importance – Decision Phases – Process View – Competitive and Supply Chain Strategies – Achieving Strategic fit – Supply Chain Drivers – Obstacles – Framework – Facilities – Inventory – Transportation – Information — Pricing.

**UNIT - II Designing the Supply Chain Network (12 hours)**

Designing The Distribution Network – Role of Distribution – Factors Influencing Distribution – Design Options – E-Business and Its Impact – Distribution Networks in Practice – Factors Affecting The Network Design Decisions.

**UNIT - III Designing and Planning Transportation Networks (12 hours)**

Role of Transportation - Modes and Their Performance – Transportation Infrastructure and Policies - Design Options and Their Trade-Offs – Sourcing – In-House or Outsource- Sourcing Planning and Analysis

**UNIT - IV Information Technology in the Supply Chain (12 hours)**

IT Framework – Customer Relationship Management – Internal Supply Chain Management – Supplier Relationship Management – Transaction Management- Future of IT.

**UNIT-V Dimensions of Logistics (12 hours)**

Introduction: A Macro and Micro Dimension – Logistics Interfaces with Other Areas – Approach to Analyzing Logistics Systems – Logistics and Systems Analysis – Techniques of Logistics System Analysis – Factors Affecting the Cost and Importance of Logistics.

**Text Books:**

- 1.Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition. (2007)
- 2.Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press,(2006)
- 3.Supply Chain Management by Janat Shah Pearson Publication (2008)

**Reference Books:**

- 1.Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition, (2008)
2. Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, (2005).

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to supply chain management.	K1
CO-2	Designing the supply chain network.	K2
CO-3	Recognize designing and planning transportation networks.	K3
CO-4	Appreciate information technology in the supply chain.	K4
CO-5	Identify assessing dimensions of logistics.	K5

**K1- Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	M	S	S	S
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	M	S	S	S	S
<b>CO4</b>	S	M	S	S	M
<b>CO5</b>	M	S	M	S	S

**S – Strong; M – Medium**

<b>Course Code</b>	<b>21P2CMED01</b>		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	<b>EDC : FINANCIAL MANAGEMENT</b>		<b>Credit : 4</b>
<b>Class</b>	<b>I-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To listen introduction to financial management.		
	To understand cost of capital.		
	To execute capital structure.		
	To analyze investment decisions.		
	To evaluate working capital management.		

### **SYLLABUS CONTENT**

#### **UNIT – I Introduction to Financial Management (12 hours)**

Financial Management – Meaning and Nature – Scope of Finance, Objectives of Financial Management – Profit Maximization and Wealth Maximization – Finance Functions – Role of Finance Manager.

#### **UNIT –II Cost of Capital (12 hours)**

Cost of Capital – Meaning and Significance of Cost of Capital, Calculation of Cost of Debts, Equity Shares, Preference Shares and Retained Earnings – Leverages - Concept and Importance, Operating Leverage, Financial Leverage and Combined Leverages.

#### **UNIT – III Capital Structure (12 hours)**

Capital Structure – Meaning and Feature, Theories of Capital Structure – Factors Determining Capital Structure.

#### **UNIT- IV Investment Decision (12 hours)**

Investment Decision – Nature of Investment Decision, Importance, Kinds of Investment Decision, Capital Budgeting – Objectives – Advantages - Evaluation Techniques – Pay Back Period, Net Present Value, Internal Rate of Return and Accounting /Average Rate of Return.

#### **UNIT – V Working Capital, Cash, Receivable, Inventory Management (12 hours)**

Working Capital Management – Concept, Need and Types of Working Capital, Determinants of Working Capital – Management of Cash – Motives of Holding Cash, Objectives of Cash Management, Factors Determining Cash Needs –Management of Receivable and Management of Inventory – Objectives and Various Methods of Inventory Valuation.

**Note:** The question may be asked from theory and problem shall be 40% and 60% respectively.

**Text Books:**

1. Shashi K. Gupta and R.K. Sharma, Financial Management, Kalayani Publishers, New Delhi.
2. S.N. Mageswari, Financial Management, Sultan Chand and Sons, Delhi.

**Reference Books:**

1. Khan- M.Y. and Jain P.K, Financial Management Text and Problems, Tata McGraw Hill Co., New Delhi.
2. Prasanna Chandra, Financial Management Theory and Practice – Tata Mc Graw Hill Co., New Delhi.
3. Pandey I.M., Financial Management, Vikas Publishing House Pvt Ltd, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize introduction to financial management.	K1
CO-2	Find out cost of capital.	K2
CO-3	Recognize capital structure.	K3
CO-4	Appreciate investment decisions.	K4
CO-5	Identify working capital management.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	M	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	M	S
<b>CO5</b>	S	M	S	S	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P2HR01 Human Rights</b>		<b>Hours / Week: 2</b>
			<b>Credit : 2</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>II</b>
<b>Course Objectives</b>	To find Introduction to Human Rights.		
	To understand Universal Declaration of Human Rights.		
	To determine Constitutional Guarantee on Human Rights.		
	To analyze Economic Rights.		
	To evaluate Children's Rights.		

### **SYLLABUS CONTENT**

#### **Unit – I Introduction to Human Rights (6 hours)**

Definition of Human Rights - Characteristics – Classification – Theories of Human Rights.

#### **Unit - II Universal Declaration of Human Rights (6 hours)**

Universal Declaration of Human Rights – Preamble of the General Assembly – The International Covenant on Civil and Political Rights – International Convention on Economics – Social and Cultural Rights.

#### **Unit – III Constitutional Guarantee on Human Rights (6 hours)**

Constitutional Guarantee on Human Rights – Fundamental Rights – Directive Principles – Civil and Political Rights.

#### **Unit – IV Economic Rights (6 hours)**

Economic Rights – Rights to Work - Right for Adequate Wages – Reasonable Hours of Work – Conventions on Freedom of Association – Convention on the Abolition of Forced Labour.

#### **Unit – V Children's Rights (6 hours)**

Economic Rights – Children's Rights - Educational Rights – Rights of Inheritance – Right of Divorce – Violation of Human Rights and the U.N.O.

#### **Text Book:**

1. Dr. Sivakami Paramasivam, (2006), Human Rights- A Study, Sriram Computer Prints & Offset, Salem.

#### **Reference book:**

2. Dr. Chandra.U, (2004), Human Rights, Allahabad Law Agency Publications, Allahabad.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize Introduction to Human Rights	K1
CO-2	Find Universal Declaration of Human Rights.	K2
CO-3	Recognize Constitutional Guarantee on Human Rights.	K3
CO-4	Appreciate Economic Rights.	K4
CO-5	Identify Children's Rights.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	M	S	M	S	S
<b>CO3</b>	S	M	S	M	M
<b>CO4</b>	M	S	M	S	M
<b>CO5</b>	S	M	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P3CM09 BUSINESS RESEARCH METHODS</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find introduction to research.		
	To understand sampling techniques.		
	To determine collection of data.		
	To analyze interpretation of data.		
	To evaluate report writing.		

### **SYLLABUS CONTENT**

#### **UNIT – I Introduction to Research (15 hours)**

Meaning of Business Research – Types of Research – Descriptive, Survey Research Exploratory, Empirical, Historical and Case Study – Research Design -Components of the Research Design.

#### **UNIT – II Sampling Techniques(15 hours)**

Sampling Techniques - Census – Sample –Probability and Non Probability Sampling – Size of the Sample.

#### **UNIT – III Collection of Data (15 hours)**

Collection of Data - Primary and Secondary Data – Tools of Collection of Data – Questionnaire – Personal Interview – Interview Schedule – Observation, Pilot Study and Pre-Testing – Introduction to SPSS Package.

#### **UNIT –IV Analysis and Interpretation of Data (15 hours)**

Analysis and Interpretation of Data – Hypothesis – Characteristics of a Good Hypothesis – Formulation and Testing of Hypothesis – Methods of Testing Hypothesis – T -Test – F- Test, CHI Square Test.

#### **UNIT – V Report Writing (15 hours)**

Report Writing – Purpose - Types - Contents of Reports – Planning Report Writing – Steps in Drafting Reports – Research Report Format - Principles of Writing – Documentation – Foot Notes and Bibliography.

**Text Book:**

1. Kothari C. R. (2010), Research Methodology, New Age International Publishers, New Delhi.

**Reference Books:**

1. Thanulingum.N, (2009), Research Methodology- Himalaya Publishing House Pvt Ltd, Mumbai.
2. Krishnaswamy & Obul Reddy,(2009), Research Methodology & Statistical Tools, Himalaya Publishing House Pvt Ltd Mumbai.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to research.	K1
CO-2	Learn sampling techniques.	K2
CO-3	Know about collection of data.	K3
CO-4	Acquire Analysis and interpretation of data.	K4
CO-5	Know about report writing.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	M	S	S	S	S
<b>CO3</b>	S	M	S	S	M
<b>CO4</b>	M	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium



<b>Course Code &amp; Title</b>	<b>21P3CM10 ADVANCED CORPORATE ACCOUNTING</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find final accounts of company.		
	To understand integrations of companies.		
	To determine liquidation of companies.		
	To analyze banking companies.		
	To evaluate insurance companies.		

### **SYLLABUS CONTENT**

#### **UNIT – I Final Accounts (15 hours)**

Final Accounts – Statutory Requirement – Provisions and Reserves as per Companies Act – Managerial Remuneration – Balance Sheet

#### **UNIT – II Integrations (16 hours)**

Acquisition – Amalgamation and Absorption – Reconstruction – Internal and External – Goodwill – Capital Reserve – Purchase Consideration.

#### **UNIT – III Liquidation (14 hours)**

Liquidation of Companies – Mode of Winding up – Statement of Affairs – Liquidator’s Remuneration - Final Statement of Accounts.

#### **UNIT – IV Banking Companies (15 hours)**

Final Statement of Banking Companies – Legal Requirements – Form of Profits and Loss Accounts – Schedules – Financial Statements of Balance Sheet.

#### **UNIT – V Insurance Companies (15 hours)**

Accounts of Insurance Companies – Life Insurance – General Insurance – Fire Insurance – Revenue Accounts and Balance Sheet.

**Note:** The question may be asked from theory and problem shall be 20% and 80% respectively.

**Text Book:**

1. Reddy T.S. and A. Murthy (2010) Advanced Corporate Accounting, Margham Publication, Chennai.
2. Maheshwari. S.N.& Maheshwari. S.K.(2010), Advanced Accountancy. Vol. II Vikas Publishing House, New Delhi.
3. Shuckla. M.C. & Grewal. T.S,(2009): Advanced Accounts S. Chand & Co. New Delhi.

**Reference Books:**

1. Tulsian .P.C, (2009), Corporate Accounting, S.Chand &Co Ltd, New Delhi
2. Gupta. R. L & Radhaswamy .M, (2010), Corporate Accounting, Sultan Chand And Sons, New Delhi.
3. Jain. S.P & Narag.K.L, (2009), Corporate Accounting, Kalyani Publishers, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize final accounts of company.	K1
CO-2	Learn integrations of companies.	K2
CO-3	Know about liquidation of companies.	K3
CO-4	Acquire banking companies.	K4
CO-5	Know about insurance companies.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M
CO2	S	M	S	M	S
CO3	S	S	S	S	S
CO4	M	S	M	S	S
CO5	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P3CM11 HUMAN RESOURCES MANAGEMENT</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find evolution of HRM.		
	To understand human resources planning.		
	To determine motivation, recruitment and selection.		
	To analyze leadership.		
	To evaluate performance appraisal.		

### **SYLLABUS CONTENT**

#### **UNIT – I Evolution of HRM (15 hours)**

HRM – Evolution – Objectives – Importance – Functions – Role of Human Resources Managers - Nature of HRM - Difference between Personnel Management and HRM.

#### **UNIT – II Human Resources Planning (14 hours)**

Human Resources Planning: Meaning and Definition – Importance – Objectives – Characteristics of HR Planning - Job Analysis - Job Evaluation - Objectives – Methods of Job Evaluation.

#### **UNIT – III Motivation, Recruitment and Selection (16 hours)**

Motivation: Meaning – Natures - Characteristics - Importance – Theories of Motivation. Recruitment – Sources of Recruitment – Selection – Stages – Different Types of Test - Training and Development of Resources.

#### **UNIT – IV Leadership (15 hours)**

Leadership: Leadership Styles – Nature and Characteristics –Importance of Leadership – Leadership Theories.

#### **UNIT – V Performance Appraisal (15 hours)**

Performance Appraisal – Features – Advantages - Methods of Performance Appraisal – MBO - Group Dynamics – Organizational Conflict.

**Text Book:**

1. Jayasankaran, J. (2009), Human Resource Management, Margham Publications, Chennai.

**Reference Books:**

1. Biswanath Ghosh, (2002), Human Resource Development and Management, Vikas Publishing House Pvt Ltd, New Delhi.

2. Aswathappa, (2009), Human Resources Management, Tata McGraw-Hill Education (India) Ltd, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize evolution of HRM.	K1
CO-2	Learn human resources planning.	K2
CO-3	Know about motivation, recruitment and selection.	K3
CO-4	Acquire leadership.	K4
CO-5	Know about performance appraisal.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M
CO2	S	S	S	M	S
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P3CM12 PROJECT MANAGEMENT</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find introduction of project management.		
	To understand project festive study.		
	To determine decision model.		
	To analyze project cost control.		
	To evaluate project performance.		

### **SYLLABUS CONTENT**

#### **Unit - I Introduction of Project Management (15 hours)**

Features – Establishment of a New Project - Project Organization – Innovative Project – Need for Project Management – Duties and Responsibility of Project Manager

#### **Unit - II Project Festive Study (14 hours)**

Market or Demand Analysis – Technique Analysis – Financial Analysis of Project

#### **Unit - III Decision Model (16 hours)**

Decision Model – Minimization of Cost – Minimization of Cost – Project Net Work Analysis – PERT Methods – CPM Methods – Merits and Demerits

#### **Unit - IV Project Cost Control (15 hours)**

Cost Forecasting – Cost Monitoring and Control – Cost Estimation Techniques – Man Hour Unit Rate and Operational Cost Estimation.

#### **Unit - V Project Performance (15 hours)**

Project Performance - Indicators- Project Performance Reviews - Benefits – Project Reports – Project Reviews – Preparation of Reports – Field Survey.

**Reference Books:**

- 1.P.C.Kesavarave, (2001) Project Management and Control , Sultan Chands & Sons, New Delhi.
2. S. Southy, (2000) Project Management, Tata McGraw- Hill Education (India) Pvt. Ltd, New Delhi.
3. Prisanna Chandra, (2002) Project Report and Appraisals Tata McGraw- Hill Education (India) Pvt. Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction of project management.	K1
CO-2	Learn project festive study.	K2
CO-3	Know about decision model.	K3
CO-4	Acquire project cost control.	K4
CO-5	Know about project performance.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	M	S	M
<b>CO2</b>	M	S	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	M	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P3CME03 ELECTIVE PAPER :DIRECT TAXES</b>		<b>Hours / Week: 6</b>
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find basic concepts of direct taxes.		
	To understand computation of salary income.		
	To determine income from business and profession.		
	To analyze computation of income from other sources.		
	To evaluate deductions.		

### **SYLLABUS CONTENT**

#### **UNIT – I Basic Concepts (15 hours)**

Basic Concepts – Assessee - Pervious Year - Assessment Year - Income – Definitions – Residential Status – Scope of Total Income – Exempted Incomes U/S 10.

#### **UNIT – II Computation of Salary Income (15 hours)**

Computation of Salary Income – Salary Items – Allowances – Perquisites – Savings Eligible for Deduction -Calculation of House Property Income – Annual Value – Deductions – Exempted House Property Incomes.

#### **UNIT – III Income from Business and Profession (15 hours)**

Income From Business – Expenses Allowed – Expenses Disallowed Computation of Professional Income – Calculation of Capital Gain – Meaning – Types – Exempted Capital Gain.

#### **UNIT – IV Computation of Income from Other Sources (14 hours)**

Computation of Income from Other Sources – Incomes Chargeable Under Other Source – Deductions From Other Source Income – Set Off and Carry Forward of Losses.

#### **UNIT – V Deductions (16 hours)**

Deductions from Gross Total Income – Clubbing of Income – Assessment of Individual – Rates of Income Tax - Powers and Functions of CBDT.

**Note:** The question may be asked from theory and problem shall be 25% and 75% respectively

**Text Books:**

- 1.Gaur.V.P & D.B. Narang, (2010), Income Tax Law and Practice,Kalyani Publishers, New Delhi.
- 2.Reddy.T.S.&Y.S. Hari Prasad Reddy, (2010), Income Tax Law and Practice, Margham Publications, Chennai.
3. A.Jayakumar and N.Hariharan, (2010), Income Tax Law and Practice, Vijay Nicole Imprints Pvt Ltd, Chennai.

**Reference Books:**

1. Dr. Vinod K.Sighania, (2010), Direct Taxes Law And Practice, Taxmann Publications, New Delhi.
2. Dinkar Pagare, (2010), Income Tax Law and Practice, Sultan Chand & Sons, New Delhi.
3. Dr. H.C. Mehrotra & S.P. Goyal, (2010), Income Tax Law and Practice, Satiya Bhava Publication, Agra.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize basic concepts of direct taxes.	K1
CO-2	Learn computation of salary income.	K2
CO-3	Know about income from business and profession.	K3
CO-4	Acquire computation of income from other sources.	K4
CO-5	Know about deductions.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	M	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium



<b>Course Code &amp; Title</b>	<b>21P3CME07 ELECTIVE PAPER : CUSTOMER RELATIONSHIP MANAGEMENT</b>		<b>Hours / Week: 6</b>
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find introduction to CRM.		
	To understand CRM in manufacturing industry.		
	To determine CRM in service institutions.		
	To analyze emerging trends in CRM.		
	To evaluate e – CRM.		

### **SYLLABUS CONTENT**

#### **UNIT - I Introduction to CRM (15 hours)**

Introduction- Customer Relationship Management- Meaning –Need and Importance Measurement- Quantitative Methods- Calculating Relationship Indices- Issues & Problems.

#### **UNIT – II CRM in Manufacturing Industry (15 hours)**

CRM in Manufacturing Industries- Policies- Practices - Evaluation of CRM in Manufacturing Industries- Training of Managers in CRM.

#### **UNIT - III CRM in Service Institutions (15 hours)**

CRM in services – Education - Hospital - Banking -Transport – Insurance.

#### **UNIT- IV Emerging Trends in CRM (15 hours)**

CRM Emerging Trends and Issues – CRM and Knowledge Management.

#### **UNIT- V E – CRM (15 hours)**

E-CRM- Implementation- Procedures –Issues- Advantages- Case Studies.

**Text Books:**

- 1.Venkata Ramana V. and Somayajulu.G, (2005), Customer Relationship Management, Excel Books, New Delhi.
- 2.Peeru Mohammad, (2005), Customer Relationship Management, Vikas Publishing House, Chennai.

**Reference Book:**

- 1.John Anton, (2009), Customer Relationship Management, Prentice Hall

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize introduction to CRM.	K1
CO-2	Learn CRM in manufacturing industry.	K2
CO-3	Know about CRM in service institutions.	K3
CO-4	Acquire emerging trends in CRM.	K4
CO-5	Know about e – CRM.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	S	M	S	S	M
<b>CO4</b>	M	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P3CME11 ELECTIVE PAPER : CO-OPERATION</b>		<b>Hours / Week: 6</b>
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>III</b>
<b>Course Objectives</b>	To find evolution of co-operation.		
	To understand structure of co-operative societies.		
	To determine non-credit co-operative structure.		
	To analyze government and co-operation.		
	To evaluate co-operative movement in foreign countries.		

### **SYLLABUS CONTENT**

#### **Unit: I Evolution of Co-operation (15 hours)**

Co-operation – Meaning – Definition – Formulated and Re-Formulated in ICA- Origin and Growth of Co-Operative Movement in India – Co-Operative Societies – Classification – Role of Co-Operatives in Five Year Plans.

#### **Unit: II Structure of Co-operative Societies (15 hours)**

Co-Operative Organization Structure – Credit Societies – Primary, Central and Apex Banks – Employee Credit Societies, Scope, Objectives and Achievement Multipurpose Co-Operatives — RBI and Co-Operatives – NABARD- Weaknesses of Indian Co-Operating Movement.

#### **Unit: III Non-Credit Co-Operative Structure (15 hours)**

Non-Credit Co-Operative Structure – Need and Features – Marketing Societies – Consumer Co-Operatives – Housing Societies – Industrial Co-Operative Societies – Co-Operative Milk Supply Societies and Unions – Co-Operative Education and Training – Central and State Level Organizations.

#### **Unit: IV Government and Co-operation (15 hours)**

Government and Co-operation: Role of Government in Promotion and Development of Co-operatives – Features – Pros and Cons- Central and State Aid to the Development of Co-Operatives – Practical Problems Faced by Co-Operatives – Democratic Management in Co-Operatives – The Role in Uplifting the Weaker Sections of Society. Need for Changes in Government Policy and Law.

#### **Unit: V Co-operative Movement in Foreign Countries (15 hours)**

Co-operative Movement in Germany, England, Denmark, Italy, Isral and China – International Co-operative Alliance.

**Text Book:**

1. Mathur.B.S, (2001), Co-operation in India, Sahitya Bhawan Publishers & Distributors Pvt Ltd, New Delhi.

**Reference Books:**

1. Bedi. R.D, (2001), Theory, History and Practice of Co-operation, R. Lall Book Depot, Meerat.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize evolution of co-operation.	K1
CO-2	Learn structure of co-operative societies.	K2
CO-3	Know about non-credit co-operative structure.	K3
CO-4	Acquire government and co-operation.	K4
CO-5	Know about co-operative movement in foreign countries.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	S	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	M	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	M	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P4CM13</b>		<b>Hours / Week: 6</b>
	<b>INDIRECT TAXATION</b>		
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find introduction to indirect taxes.		
	To understand customs act.		
	To determine goods and services tax (GST).		
	To analyze supply and charge of GST.		
	To evaluate exemptions and GST council.		

### **SYLLABUS CONTENT**

#### **UNIT – I Introduction to Indirect Taxes (14 hours)**

Indirect Taxes – Introduction – Meaning and Definition – Objectives- Special Features- Types – Canon of Taxations – Merits and Demerits – Difference between Direct Tax and Indirect Tax.

#### **UNIT – II Customs Act (14 hours)**

Customs Act, 1962 – Important Definitions – Objectives – Types – Procedures – Levy and collection of Customs duty – Exemptions – Officers of Customs – Powers to prohibit import and Export of Goods – Prohibited Items of Exports and imports.

#### **UNIT – III Goods and Services Tax (GST) (16 hours)**

GST – Introduction – Concept – Challenges and Opportunities of GST - Benefits – Dimension of GST – Objectives of GST- Action plan of GST council – GST exemption.

#### **UNIT – IV Supply and Charge of GST (16 hours)**

Supply – Meaning – Time of Supply – Value of Supply Sec 15 – Levy and collection - Scope of supply- Inter and Intra state supply.

#### **UNIT – V Exemptions and GST Council (15 hours)**

Procedure for registration – Compulsory registration – cancellation of Registration – provisions relating to issuance of bill of supply instead of Tax invoice.

**Note:** The questions may be asked from theory only.

**Text Book**

- 1.All about GST V.S Datey, Taxman’s Publications New Delhi 2017 Edition.
- 2.Nitya Tax Associates , Taxmann Publications.
- 3.Govindan M.S. Indirect Taxes, Sitaraman and Co, Chennai.

**Reference Books:**

- 1.Dr. Balachandran V (2011) Indirect Taxation, Sultan Chands & Sons, New Delhi.
- 2.Reddy T.S & Y.S Hari Prasad Reddy, (2011) Business Taxation, Marghan Publications, Chennai.
3. Tadey, Indirect Taxation, Taxman, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to indirect taxes.	K1
CO-2	Learn customs act.	K2
CO-3	Know about goods and services tax (GST).	K3
CO-4	Acquire supply and charge of GST.	K4
CO-5	Know about exemptions and GST council.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	S	S	S	M
<b>CO3</b>	M	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P4CM14 ADVANCED BANKING</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find Introduction to Banking.		
	To understand Types of Deposits and E-Banking.		
	To determine Negotiable Instruments.		
	To analyze Payment of Cheques.		
	To evaluate Loans and Advances.		

### **SYLLABUS CONTENT**

#### **UNIT -I Introduction to Banking (15 hours)**

Relationship Between banker and Customer – Definition - Banker and Customer – Meaning and Definition – General Relationship Between Banker and Customer – Obligations of a Banker –Banker’s Rights – Rule in Clayton’s Case – Garnishee Order.

#### **UNIT - II Types of Deposits and E-Banking ( 15 hours)**

Customer’s Accounts with the Banker – Fixed Deposit Accounts – Savings Bank Accounts – Recurring Deposit Accounts – Current Accounts – Special Types of Banker’s Customers – New Deposit Savings Schemes for Indians Abroad – E – Banking – Meaning – Benefits - Mobile Banking – Meaning – Benefits - Mode of online transaction- NEFT- RTGS- IMPS etc and Activities of E- banking- types of cards – difference between debit card and credit cards.

#### **UNIT - III Negotiable Instruments (15 hours)**

Negotiable Instruments Act, 1881 – Definition, Features and Types of Negotiable Instruments –Difference Between Bill of Exchange, Cheque and Promissory Notes - Holder and Holder in Due Course –Endorsements – Meaning, Definition, Legal Provisions and kinds of Endorsements – Crossing of Cheques – Types of Crossing and Their Significance – Different Innovative Financial Services Offered by Commercial Banks.

#### **UNIT – IV Payment of Cheques (15 hours)**

Payment of Cheques – Precautions to be taken by Paying Banker – Statutory Protection – Payment in Due Course – Refusal of Payment – Consequences of Wrongful Dishonour – Collection of Cheques – Legal Status, Statutory Protection - Liability and Duties of Collecting Banker.

#### **UNIT – V Loans and Advances (15 hours)**

Loans and Advances – Types of Loans , lien , Pledge , Hypothecation, Mortgage - Principles of Sound Lending – Style of Credit – Secured Advances – General Principles of Secured Advances – Modes of Creating Charge – Types of Securities – Advances Against Document of Title to Goods, Stock Exchange Securities, Life Insurance Policies, Fixed Deposit Receipts and Book Debts.

**Text Books:**

1. Varshney P.N, (2006), Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. Prof. Gordon.E. & Dr. Natarajan K, (2006), Banking Theory, Law and Practice, Himalaya Publishing House, Mumbai.

**Reference Books:**

1. Dr. S. Gurusamy, (2009), Banking Theory Law and Practice, McGraw- Hill Education (India) Pvt. Ltd, New Delhi.
2. Sankaran S, (2007), Money Banking and International Trade, Margham Publications, Chennai.
3. Jhigan M.L, (2009), Money, Banking and Public Finance International Trade, Vrinda Publications(P) Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to banking.	K1
CO-2	Learn types of deposits and e-banking.	K2
CO-3	Know about negotiable instruments.	K3
CO-4	Acquire payment of cheques.	K4
CO-5	Know about loans and advances.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium



<b>Course Code &amp; Title</b>	<b>21P4CM15 SERVICES MARKETING</b>		<b>Hours / Week: 6</b>
			<b>Credit : 5</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find introduction to service marketing.		
	To understand banking services.		
	To determine transport services.		
	To analyze tourism services.		
	To evaluate courier services.		

### **SYLLABUS CONTENT**

#### **UNIT I Introduction to Services and Service Marketing (16 hours)**

Services – The Concept – Salient Features and Function of Marketing Services – Significance of Services Marketing – Emerging Key Services - Benefits and Limitations of Marketing of Services. Buyers Market and Sellers Market.

#### **UNIT II Banking Services (14 hours)**

Bank Marketing – Concept- Importance of Banking Services – Market Segmentation – Market Mix for Bank services – The Product Mix– Promotion Mix – Place Mix – MIS in Banking Organization.

#### **UNIT III Transport Services (15 hours)**

Transport Marketing – Concept – Marketing Management of Rail Transport – Road Transport - AIR Transport – Water Transport – Product Planning and Development – Marketing Mix for Transport Enterprises - Electronic Fund Transfer (EFT) System – Electronic Fund Transfer, NEFT,RTGS,IFSC - Electronic Fund Transfer System Vs Traditional System – Requirements – Service Charges.

#### **UNIT IV Tourism Services (15 hours)**

Tourism Marketing – The Concept – Users of Tourism Services – Product Planning and Development – Marketing Mix for Tourism Marketing – Merits and Demerits of Tourism Marketing

#### **UNIT V Courier Services (15 hours)**

Courier Service Marketing – Conceptual Frame Work – Rationale Behind Courier Service – Marketing Mix for Courier Service – Telecommunication Service Marketing – Concept – Importance – Marketing Mix for Telecommunication Service.

**Text Book:**

1. Vasanthi Venugopal & Raghu, V.N, (2009), Services Marketing, Himalaya Publishing House, Mumbai.
2. Jha. S. M, (2009), Services Marketing, Himalaya Publishing House, Mumbai.
3. Dr.Balaji.B, (2010), Services Marketing and Management, S. Chand & Co. Ltd, New Delhi.

**Reference Books:**

1. Rajendra Nargundkar, (2008), Services Marketing: Text & Cases, McGraw-Hill (India) Pvt. Ltd, New Delhi.
2. Valarie. A, Zeithaml, (2006), Services Marketing (SIE), McGraw-Hill (India) Pvt. Ltd, New Delhi.
3. Dr.L.Natarajan,(2017), Services Marketing , Margham Publications, Chennai

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize Introduction to Service Marketing.	K1
CO-2	Learn Banking Services.	K2
CO-3	Know about Transport Services.	K3
CO-4	Acquire Tourism Services.	K4
CO-5	Know about Courier Services.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	M	M	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P4CME04 ELECTIVE PAPER: INVESTMENT MANAGEMENT</b>		<b>Hours / Week: 6</b>
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find investments concepts.		
	To understand SEBI and financial system in India.		
	To determine risk and return.		
	To analyze investment alternatives.		
	To evaluate investment companies in India.		

### **SYLLABUS CONTENT**

#### **UNIT – I Investments Concepts (15 hours)**

Investment - Definition – Classification – Speculation – Distinction Between Investment and Speculation -Factors Favoring Investments – Features of Sound Investment.

#### **UNIT – II SEBI and Financial System in India (15 hours)**

SEBI Act, 1992 – Objectives – Powers – Functions – Organization – Role of SEBI in Securities Market - Financial System – Functions – Components - Development of the Financial Systems in India - Structure of Financial Markets.

#### **UNIT – III Risk and Return (15 hours)**

Risk and Return - Meaning – Causes of Risk, Factors Causing Internal Risks in Investments, External Business Risks – Protection Against Market Risk. Concept of Return – Measurement of Return – Portfolio Management.

#### **Unit –IV Investment Alternatives (15 hours)**

Investment Alternatives - Investor Classification – Corporate Bonds – Features of Bonds – Types - Convertible Bonds.

#### **UNIT – V Investment Companies in India (15 hours)**

Investment Companies in India – Types of Mutual Fund – Operation in India – SEBI and RBI Guidelines for Mutual Funds - Sources of Investment Information - Economic and Political Factors – Industry Information – Company Information – Security Market Information.

**Note:** The questions may be asked from theory only.

**Text Books:**

1. Avadhani V.A, (2008), Investment Management, Himalaya Publishing House, Mumbai.
2. Preeti Singh, (2003), Investment Management Security Analysis and Portfolio Management, Himalaya Publishing House, Mumbai.

**Reference Books:**

1. Dr. L. Natarajan, (2009), Investment Management, Security Analysis and Portfolio Management, Margham Publications, Chennai.
2. R. P. Rustagi, (2000), Investment Management, Sultan Chand & Sons, New Delhi.
3. V. K. Bhalla, Investment Management, S. Chand & sons, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize investments concepts.	K1
CO-2	Learn SEBI and financial system in India.	K2
CO-3	Know about risk and return.	K3
CO-4	Acquire investment alternatives.	K4
CO-5	Know about investment companies in India.	K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M
CO2	M	S	S	M	S
CO3	S	S	S	S	M
CO4	S	S	M	S	S
CO5	M	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P4CME08 ELECTIVE PAPER: STRATEGIC MANAGEMENT</b>		<b>Hours / Week: 6</b>
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find introduction to strategic management.		
	To understand strategy formulation.		
	To determine functional strategies.		
	To analyze strategy implementation.		
	To evaluate evaluation and control.		

### **SYLLABUS CONTENT**

#### **UNIT: I Introduction to Strategic Management (15 hours)**

Defining Strategy – Strategic Management – Mission and Purpose – Objective – Goals – Stages – Functional Level Strategies – Environment Analysis – Environmental Scanning and Industry Analysis.

#### **UNIT: II Strategy Formulation (15 hours)**

Strategy Formulation and Choice of Alternatives: Stability, expansion, Retrenchment and combination strategies.- Process of Strategic Choice – Generic Competitive Strategies – Cost Leadership – Differentiation Focus – Value Chain Analysis – Bench Making.

#### **UNIT: III Functional Strategies (15 hours)**

Functional Strategies: Marketing – Production – Research and Development – Financial – Operations – Purchasing – Logistics – Human Resource Management – Information Systems Strategies.

#### **UNIT: IV Strategy Implementation (15 hours)**

Strategy Implementation – Inter Relationship Between Strategy Formulation and Implementation – Reengineering and Strategy Implementation – Issues in Strategy Implementation – Resource Allocation.

#### **UNIT: V Evaluation and Control (15 hours)**

Evaluation and Control in Strategic Management – Measuring Performance – Type of Controls – Primary Measures of Divisional and Functional Performance – Strategic Information System – Guidelines for Proper Control.

**Text Books:**

- 1.Pearce, (2008), Strategic Management: Formulation, Implementation and Control –McGraw-Hill Education (India), New Delhi.
- 2.S.Sankaran, (2010), Business Policy and Strategic Management, Margham Publications, Chennai.

**Reference Book:**

- 1.Azhar Kazmi, (2010), Strategic Management and Business Policy, McGraw – Hill Education (India) Ltd, New Delhi.

**Course Outcomes:**

<b>CO.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level(s)</b>
CO-1	Realize introduction to strategic management.	K1
CO-2	Learn strategy formulation.	K2
CO-3	Know about functional strategies.	K3
CO-4	Acquire strategy implementation.	K4
CO-5	Know about evaluation and control.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	M	S	S	M	S

**S** – Strong; **M** – Medium

<b>Course Code &amp; Title</b>	<b>21P4CME12</b>		<b>Hours / Week: 6</b>
	<b>ELECTIVE PAPER: MANAGERIAL ECONOMICS</b>		
	<b>Credit : 4</b>		
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>
<b>Course Objectives</b>	To find introduction to managerial economics.		
	To understand demand analysis and forecasting.		
	To determine production and cost analysis.		
	To analyze market structure.		
	To evaluate decision making theories.		

### **SYLLABUS CONTENT**

#### **Unit – I Introduction to Managerial Economics (15 hours)**

Managerial Economics – Meaning – Nature, Features and Applications - Scope of Managerial Economic – Firms Objectives – Role of Managerial Economist - Development of Entrepreneurship and Management in India – Professionalization of Management.

#### **Unit – II Demand Analysis and Forecasting (15 hours)**

Demand Analysis – Price and Demand - Demand Determinants – Demand Distinctions and Demand Forecasting Methods – Elasticity of Demand – Its Significance in Business Decisions.

#### **Unit – III Production and Cost Analysis (15 hours)**

Production Functions - Cost Analysis – Various Concepts of Costs – Cost – Output Relationship – Cost Control and Cost Reduction.

#### **Unit – IV Market Structure (15 hours)**

Markets – An Overall View of Market Forms – Meaning of Perfect and Imperfect Markets – Modern Pricing Methods – Pricing Methods – Price Discounts and Differentials – Price Forecasting.

#### **Unit – V Decision Making Theories (15 hours)**

Managerial Decision Making – Risk and Uncertainty – Managerial Problems – Linear Programming – Methods – Game Theory – Criticism of Game Theory – National Income – Difficulties in Measurement of National Income.

**Text Book:**

1. S.Sankaran, (2009), Managerial Economic, Margham Publications, Chennai.

**Reference Books:**

1. R.L. Varsney & Maheswari, Managerial Economics, Sultan Chand & Sons, New Delhi.

2. P.L. Metha, Managerial Economics, Sultan Chand & Sons, New Delhi.

**Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	Knowledge Level(s)
CO-1	Realize introduction to managerial economics.	K1
CO-2	Learn demand analysis and forecasting.	K2
CO-3	Know about production and cost analysis.	K3
CO-4	Acquire market structure.	K4
CO-5	Know about decision making theories.	K5

**K1**- Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

COs	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	S	S	S	M	S
<b>CO3</b>	S	M	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	M	S	S	M	S

**S** – Strong; **M** – Medium



<b>Course Code</b>	21P4CMPR01		<b>Hours / Week: 4</b>
<b>&amp; Title</b>	PROJECT WORK AND VIVA VOCE		
			<b>Credit : 4</b>
<b>Class</b>	<b>II-M.Com</b>	<b>Semester</b>	<b>IV</b>

## PROJECT WORK

### Marks Allotted

Dissertation	75
Viva Voce	25
Total	100

### Guidelines for Project Work

#### (a) Topic:

The topic of the project work shall be assigned to the candidate before the end of second semester by the respective teacher guides or by a committee of senior teacher in the department.

#### (b) No. of copies of the Project Report:

The students should prepare two copies of the project report and submit the same for the evaluation. After evaluation one copy is to be retained in the college library and one copy can be returned to the student.

#### (c) Format to be followed:

The formats / certificate for project report to be submitted by the students are given below:

#### Format for the preparation of project report:

- (a) Title page
- (b) Bonafide Certificate
- (c) Acknowledgement
- (d) Table of contents
- (e) Text of the project
- (f) Bibliography
- (g) Appendix

**Format of the Title Page:**

**TITLE OF THE PROJECT REPORT**

Project Report Submitted in part fulfillment of the requirement for the Award of the Degree of Master of Commerce To Periyar University, Salem-636 011.

By  
Name of the Student :  
Register Number :  
Name of the Supervisor :  
College / University Department :  
Year :  
Format of the Certificate:

**CERTIFICATE**

This is to certify that the Project Report entitled \_\_\_\_\_  
\_\_\_\_\_ submitted in part fulfillment of the requirement for the award of the degree of Master of Commerce from the Periyar University, Salem is a record of bonafied project work carried out by \_\_\_\_\_ under my supervision and guidance that no part of the project report work has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Date :  
Place:

Signature of the Supervisor

Signature of the Head of the Department

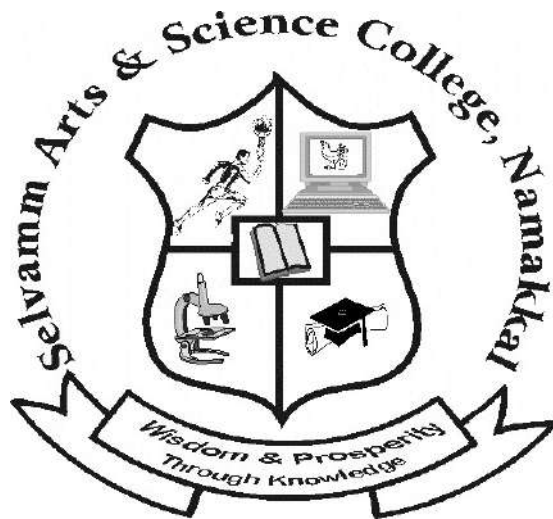
# **Selvamm Arts and Science College (Autonomous)**

**(Nationally Re-Accredited by NAAC)**

**UGC recognized 2(f) and 12(B) Institution Affiliated to**

**Periyar University, Salem.**

**Namakkal – 637 003.**



**Department of Computer Science**

**Master of Science (Computer Science)**

**Effective from 2021-2022**



Selvam Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc. Computer Science

**Vision**

To prepare the students to take up a career in the highly competitive IT industry, Education field as well as carry out research and development.

**Mission**

To produce best quality computer science and IT professionals and researchers by providing state-of-the-art training, hands on experience.

**Programme Outcomes (PO) for M.Sc (Computer Science)**

**PO 1: Application :** Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.

**PO 2: Analysis:** Perform analysis to assess, interpret, and create innovative ideas through practical experiment.

**PO 3: Solution Finding:** Facilitate to enter multidisciplinary path to solve day-to-day problems.

**PO 4: Progression in Career:** Prepare students for prominent career in industry, banks offices and for further academic study.

**PO 5: Research Capability:** Able to do the experiments with proper procedure, appropriately record and Analyze the results.

**PO 6: Expressing their talents:** Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.

**PO 7: Individual sustainability:** Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.

**PO 8: Competency:** Attain competency in job market / entrepreneurship.



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc. Computer Science

## **REGULATIONS FOR M. Sc (COMPUTER SCIENCE)**

### **PROGRAMME WITH SEMESTER SYSTEM**

**(Effective from the academic year 2021-22 and thereafter)**

## **REGULATIONS**

### **1. OBJECTIVE OF THE PROGRAMME**

To develop the Post Graduates in Computer Science with strong knowledge of theoretical Computer Science subjects who can be employed in research and development Units of industries and academic institutions.

### **2. CONDITION FOR ADMISSION**

A candidate who has passed B.Sc Computer Science/ B.C.A/ B.Sc Computer Technology/B.Sc Information Science/ B.Sc Information Technology degree or any of the degree of any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc Computer Science degree examination of Periyar University after a course of study of two academic years.

### **3. DURATION OF THE PROGRAMME**

The programme for the degree of **Master of Science in Computer Science** shall consist of **Two Academic years** divided into four semesters. Each semester consist of 90 working days.

### **4. REVISION OF REGULATIONS AND CURRICULUM**

The Autonomous board may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

### **5. (A). PASSING MINIMUM – THEORY**

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks out of 100 (CIA –13 marks out of 25 and EA – 38 marks out of 75 ) in the semester examination in each theory paper.



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**5. (B). PASSING MINIMUM – PRACTICAL**

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks put together out of 100 (CIA – 20 marks out of 40 and EA – 30 marks out of 60) in the semester examination in each practical paper.

**6. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class. All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

**7. QUESTION PAPER PATTERN FOR M.Sc (CS)**

**7.1.(A). THEORY - QUESTION PAPER PATTERN [EA] (TOTAL MARKS: 75)**

S.No.	Type	No. of questions to be answered	Marks
1	Objective	10 compulsory questions, each carrying 1 mark	10
2	Paragraph about 2 – 3 pages	5 either or type questions ,each carrying 5 marks	25
3	Essay type about 5 pages	5 either or type questions ,each carrying 8 marks	40
<b>Total Marks</b>			<b>75</b>

**(b). THEORY - INTERNAL MARKS DISTRIBUTION [CIA] (Total Marks:25)**

- CIA – I - 5
- CIA - II - 5
- Model - 5
- Assignment /Snap Test - 5
- Seminar - 5



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**7.2 (a). PRACTICAL – MARKS DISTRIBUTION & QUESTION PAPER PATTERN  
(Max. Marks: 100)**

[EXTERNAL [EA]: 60 MARKS & INTERNAL [CIA]: 40 MARKS]

PRACTICAL - EXTERNAL MARKS DISTRIBUTION (Total Marks: 60)

For each practical question the marks should be awarded as follows (External):

- i) Algorithm / Flowchart :: 20%
- ii) Writing the program in the main answer book :: 30%
- iii) Test and debug the program :: 30%
- iv) Printing the correct output :: 20%

(Marks may be proportionately reduced for the errors committed in each of the above)

**PRACTICAL - INTERNAL MARKS DISTRIBUTION (Total Marks: 40)**

- Record :: 15 Marks
- Internal Practical examinations :: 25 Marks

**PRACTICAL QUESTION PAPER PATTERN**

1. One Compulsory Question from the given list of practical : 30 Marks
2. One Either / OR type Question from the given list of practical : 30 Marks

**PROJECT**

Evaluation (External)	: 150 Marks
Viva-voce (joint)	: 50 Marks

**8. REGULATIONS OF PROJECT WORK**

- a. Students should do their five months [Dec To Apr] Project work
- b. The Candidate should submit the filled in format as given in Annexure-I to the Department for approval during the 1<sup>st</sup> week of January in their Project semester.
- c. Each internal guide shall have maximum of eight Students.



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc. Computer Science

- d. Periodically the project should be reviewed minimum three times by the advisory Committee.
- e. The Students should prepare three copies of the project record and submit the same to the college on 30th April for the evaluation by examiners. After evaluation one copy is to be retained in the College Library and one copy is to be submitted to the College and the student can hold one copy.
- f. A sample format of the project record is enclosed in Annexure-II.
- g. Format of the Title page and certificate are enclosed in Annexure III.
- h. The Students should use OHP / Power Point Presentation during their Project Viva - Voce Examinations.

**9. COMMENCEMENT OF THIS REGULATION**

These regulations shall take effect from the academic year 2019-20, i.e., for students who are to be admitted to the first year of the course during the academic year 2019- 20 and thereafter.

**10. TRANSITORY PROVISION**

Candidates who were admitted to the PG course of study during 2019-20 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2023. Thereafter, there will be permitted to appear for the examination only under the regulations then in force





Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc. Computer Science

<b>SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL</b>									
<b>COURSE STRUCTURE UNDER CBCS</b>									
<b>DEPARTMENT OF COMPUTER SCIENCE</b>									
<b>(For the students admitted in the Year 2021-22 Batch onwards)</b>									
Sem	Part	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
<b>I</b>	A	Core Course – I	21P1CS01	Design and Analysis of Algorithms	5	4	25	75	100
	A	Core Course – II	21P1CS02	Theory of Computation	5	5	25	75	100
	A	Core Course – III	21P1CS03	C# Programming	5	4	25	75	100
	A	Core Course – IV	21P1CS04	Advanced Software Engineering	5	5	25	75	100
	A	Core Elective : I (choose any one course)	21P1CSE01	Computer Architecture	5	4	25	75	100
			21P1CSE02	System Software					
			21P1CSE03	Principles of Programming Languages					
A	Core Practical - I	21P1CSP01	C# Programming	5	2	40	60	100	
<b>Total</b>					<b>30</b>	<b>24</b>			<b>600</b>
<b>II</b>	A	Core Course – V	21P2CS05	Advanced Java Programming	5	4	25	75	100
	A	Core Course – VI	21P2CS06	Web Programming	5	5	25	75	100
	A	Core Elective : II (choose any one course)	21P2CSE04	Advanced Database Management System	5	4	25	75	100
			21P2CSE05	Software Testing					
			21P2CSE06	Graph Theory					
	A	Core Practical – II	21P2CSP02	Advanced Java Programming	4	2	40	60	100
	A	Core Practical – III	21P2CSP03	Web Programming Lab	4	2	40	60	100
	A	EDC	21P2xxxxxx	Extra Disciplinary Course	5	4	25	75	100
A	Common	21P2HR01	Human Rights	2	2	25	75	100	
<b>Total</b>					<b>30</b>	<b>23</b>			<b>700</b>
<b>III</b>	A	Core Course – VII	21P3CS07	Cloud Computing and Big Data Analytics	5	5	25	75	100
	A	Core Course – VIII	21P3CS08	Mobile Application Development	5	5	25	75	100
	A	Core Course – IX	21P3CS09	Soft Computing	4	4	25	75	100
	A	Core Course – X	21P3CS10	Cryptography and Information Security	4	4	25	75	100
	A	Core Elective : III (choose any one course)	21P3CSE07	Bioinformatics	4	4	25	75	100
			21P3CSE08	Digital Image Processing					
			21P3CSE09	Augmented Reality					
	A	Core Practical – IV	21P3CSP04	Data Analytics Lab	3	2	40	60	100
	A	Core Practical – V	21P3CSP05	Mobile Application Development	3	2	40	60	100
	A	Common	21P3SSS01	Soft Skills	2	1	25	75	100
A	Common	21P3CSI01	Internship	*	#	-	-	-	
<b>Total</b>					<b>30</b>	<b>27</b>			<b>800</b>
<b>IV</b>	A	Core Course – XI	21P4CS11	Machine Learning Techniques	5	5	25	75	100
	A	Core Course – XII	21P4CS12	Python Data Analytics	5	5	25	75	100
	A	Core Elective : IV (Dynamic	21P4CSE10	Blockchain Technologies	5	4	25	75	100



Selvam Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc. Computer Science

	Syllabus)							
A	Core Practical – VI	21P4CSP06	Python Data Analytics	5	3	40	60	100
A	Core Project	21P4CSPR01	Project and Viva –Voce	10	8	50 (Viva-Voce)	150 (Evaluation)	200
B	Common	21P4EX01	Extension Activities	(40)*	1	-	-	
<b>Total</b>				<b>30</b>	<b>26</b>			<b>600</b>
<b>Grand Total</b>				<b>120</b>	<b>100</b>			<b>2700</b>

\* Internship- 15 Days - II Semester leave

- Report will submit in III Semester # - Commended /Highly Commended will be given, based on Report & viva voce Examination. \*\*- Outside the class hours

xxxxxx-corresponding from other department

**List of Elective courses (choose one from each Group)**

Course	Course Code	Title of the Course
<b>Core Elective - I</b>	21P1CSE01	Computer Architecture
	21P1CSE02	System Software
	21P1CSE03	Principles of Programming Languages
<b>Core Elective - II</b>	21P2CSE04	Advanced Database Management System
	21P2CSE05	Software Testing
	21P2CSE06	Graph Theory
<b>Core Elective - III</b>	21P3CSE07	Bioinformatics
	21P3CSE08	Digital Image Processing
	21P3CSE09	Augmented Reality
<b>Core Elective - IV</b>	21P2CSE10	Block Chain Technologies

**List of Extra Disciplinary Courses to other PG Programmes**

Course Code	Course
21P2CSED01	Fundamentals of Computers and Communication
21P2CSED02	Principles of Information Technology
21P2CSED03	E-Commerce



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc. Computer Science

ANNEXURE – I

**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**

College Name :  
Course :  
Student Name :  
Register Number :  
Title of the Project :  
Place :  
Date:

Name of the Internal Guide :  
Qualification :  
Teaching Experience :  
Place :  
Date :

Signature of Internal Guide

Principal



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science

**ANNEXURE - 10**

COLLEGE BONAFIDE CERTIFICATE

ACKNOWLEDGEMENT

CONTENTS

ABSTRACT

1. INTRODUCTION

Page No.

OVERVIEW

PROJECT DESCRIPTION

2. SYSTEM STUDY

EXISTING SYSTEM

PROPOSED SYSTEM

3. SYSTEM SPECIFICATION

HARDWARE REQUIREMENTS

SOFTWARE REQUIREMENTS

SOFTWARE DESCRIPTION

4. SYSTEM DESIGN

INPUT DESIGN

OUTPUT DESIGN

CODE DESIGN

DATABASE DESIGN

5. TESTING AND IMPLEMENTATION

6. CONCLUSION AND FUTURE ENHANCEMENT

7. BIBLIOGRAPHY

8. APPENDICES

DATA FLOW DIAGRAM

TABLE STRUCTURE

SCREEN SHOTS

8.4. SAMPLE CODING



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science

**ANNEXURE - III**

**A. Format of the title page**

TITLE OF THE PROJECT

A project report submitted in partial fulfillment of the requirements for the degree of

Master of Science in Computer Science

to

SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

NAMAKKAL

By

STUDENT NAME

REG. No.

Under the guidance of

Staff Name and Qualification

College  
Emblem

**Selvamm Arts and Science College**

**(Autonomous)**

(Affiliated to Periyar University)

(Nationally Re-Accredited by NAAC)

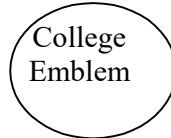
Salem Road, Pappinaickenpatti Post, Nallipalayam (Via),  
Namakkal - 637 003.



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc -Computer Science

**B. Format of the Certificate**

SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS)  
PLACE with PIN CODE



MONTH – YEAR  
PROJECT WORK

TITLE OF THE PROJECT  
Bonafide Work Done by

STUDENT NAME  
REG. No.

A Project submitted in partial fulfillment of the requirements for the  
degree of Master of Science in Computer Science  
SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

INTERNAL GUIDE

HEAD OF THE DEPARTMENT

Submitted for the Viva-Voce Examination held on

Internal Examiner

External Examiner



Selvam Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc -Computer Science

**Programme Specific Outcome (PSO) for M.Sc. (Computer Science)**

<b>PSO-1</b>	Able to apply knowledge of computing fundamentals, computing specialization and domain knowledge for the abstraction and conceptualization of computing models from defined problems and requirements
<b>PSO-2</b>	An ability to use current techniques, skills, and tools necessary for computing practice.
<b>PSO-3</b>	Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics of varying complexity
<b>PSO-4</b>	Students will be able to use the techniques, skills and modern hardware and software tools necessary for innovative software solutions.
<b>PSO-5</b>	Student will get ability to identify, critically analyze, formulate and develop computer application
<b>PSO-6</b>	To attain deep knowledge and understanding the principles of programming for applying in broad range of languages and open source platforms.
<b>PSO-7</b>	Able to analyze customer requirements, create high level design, implement and document robust and reliable software systems
<b>PSO-8</b>	Develop inter-disciplinary and multi-disciplinary domain skills
<b>PSO-9</b>	Promote continuous learning and innovation in research
<b>PSO-10</b>	To Enhance skills and adapt new computing technologies for attaining professional excellence and carrying research.



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
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**CORE I: Design and Analysis of Algorithms**

**Semester: I**  
**Code: 21P1CS01**

**Hours: 5**  
**Credits: 4**

**Course Objectives**

- To learn the Analysis of Algorithms.
- Analyze the concept of algorithms and asymptotic performance of algorithms.
- Analyze of sorting and searching algorithms.
- Apply important algorithmic design strategies.
- To Gain Knowledge of algorithm design methods

**Unit -I**

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.

**Unit-II**

Mathematical Analysis of Non Recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization.

**Unit-III**

Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute force string matching – Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree Traversal and Related Properties.

**Unit-IV**

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap Sort – Dynamic Programming – Warshall's and Floyd's Algorithms – Optimal Binary Search Trees – Greedy Techniques : Prim's Algorithm – Kruskal's Algorithm - Dijkstra's Algorithm – Huffman trees.

**Unit-V**

Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset sum problem – Branch and bound technique – Assignment problem – Knapsack problem – Traveling salesman problem.





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**Text Book:**

1. A.A.Putnambekar,"Design and Analysis of Algorithms", Second Revised Edition, Technical Publications, Pune, 2009

**Reference books:**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.

CO. Number	Course Outcome	Knowledge Level
CO1	Understanding the basic concepts of algorithms and analyze the performance of algorithms.	K1,K2
CO2	Examining the concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.	K2,K3
CO3	Learning the mathematical foundation in analysis of algorithms, Knowledge of various algorithm design techniques for developing algorithms.	K4
CO 4	Distinguishing various searching, sorting and graph traversal algorithms.	K4
CO 5	Analyze and Experiment different Backtracking techniques and problems	K4,K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	M	M	M	S	M	S	M	M	M
CO2	S	M	M	M	S	M	M	S	S	M
CO3	S	M	S	M	M	M	M	M	M	S
CO4	M	M	S	S	M	M	S	M	S	M
CO5	M	M	M	S	M	S	S	M	S	M

**S - Strong M - Medium**



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**CORE II: Theory of Computation**

**Semester: I**

**Hours: 5**

**Code: 21P1CS02**

**Credits: 5**

**Course Objectives:**

- Be able to construct finite state machines and the equivalent regular expressions.
- Be able to prove the equivalence of languages described by finite state machines and regular expressions.
- Be able to construct pushdown automata and the equivalent context free grammars.
- Be able to prove the equivalence of languages described by pushdown automata and context free grammars.
- Be able to prove the equivalence of languages described by Turing machines and Post machines

**Unit - I**

Automata: The Methods and Madness: Why Study Automata Theory? – The central concepts of automata theory. Finite Automata: Deterministic Finite Automata – Non-Deterministic Finite Automata – An Application: Text Search – Finite Automata with Epsilon-Transitions.

**Unit - II**

Regular Expressions and Languages: Regular Expressions – Finite Automata and Regular Expressions – Applications of Regular Expressions - Algebraic Laws for Regular Expressions. Properties of Regular Languages: Proving Languages not to be Regular – Decision Properties of Regular Languages – Equivalence and Minimization of Automata.

**Unit - III**

Context-Free Grammars and Languages: Context-Free Grammars- Parse Trees. Pushdown Automata: Definition of the Pushdown Automata – The Languages of a PDA – Equivalence of PDA's and CFG's - Deterministic Pushdown Automata.

**Unit - IV**

Introduction to Turing Machines: Problems that computers cannot solve- The Turing Machine – Programming Techniques for Turing Machines – Extensions to the Basic Turing Machine – Restricted Turing Machines – Turing Machines and Computers.

**Unit - V**

Intractable Problems: The Classes P and NP- An NP Complete Problem. Additional Classes of Problems: Complements of Languages in NP – Problems Solvable in Polynomial Space.



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**Text book:**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, 2<sup>nd</sup> Edition, Pearson Education, 2001.

**Reference books:**

- 1.S.P.Eugene Xavier, “Theory of Automata, Formal Languages and Computation”, New Age International, 2004.
2. A.M.Natarajan, A.Tamilarasi, P.Balasubramani, “Theory of Computation” , New Age International, 2003.

<b>CO. Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO1	Understand the key notions, such as algorithm, computability, decidability, and complexity through problem solving	K1, K2
CO2	Apply the Theory of Computation, state and explain the relevance of the Context Free Grammar	K3
CO3	Analyze and design finite automata, pushdown automata,	K4, K5
CO4	Apply and analyze turing machines, formal languages, and grammars	K3,K4
CO5	Able to design and work on Intractable problems	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

<b>PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO</b>										
CO1	S	S	M	M	M	S	M	S	S	S
CO2	M	M	S	M	S	M	M	M	M	S
CO3	S	S	S	M	M	S	S	M	S	S
CO4	S	M	M	S	M	S	M	S	S	M
CO5	M	M	S	S	M	M	S	S	M	M

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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**CORE III: C# Programming**

**Semester: I**  
**Code: 21P1CS03**

**Hours: 5**  
**Credits: 4**

**Course Objectives:**

- To learn the C#.NET Framework.
- To know about literals, operators and decision making in C#
- To get the knowledge of looping, methods and strings
- To understand structures, enumerations and inheritance
- To learn about interface, console I/O and exceptions

**Unit - I**

Introducing C# - Understanding .NET: The C# Environment - Overview of C#

**Unit - II**

Literals, Variables and Data Types - Operators and Expressions - Decision Making and Branching

**Unit - III**

Decision Making and Looping - Methods in C# - Handling Arrays - Manipulating Strings

**Unit - IV**

Structures and Enumerations - Classes and Objects - Inheritance and Polymorphism

**Unit - V**

Interface: Multiple Inheritance - Operator Overloading - Delegates and Events - Managing Console I/O Operations - Managing Errors and Exceptions.

**Text Book:**

1. E. Balagurusamy, "Programming in C#", Third Edition, 2011

**Reference books:**

1. David S. Platt, "Introducing Microsoft .NET", Microsoft Press, SAARC Edition, 2001
2. Microsoft, "C# Language Specifications", Microsoft Press, 2001



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CO. Number	Course Outcome	Knowledge Level
CO1	Understanding and Analyzing programming language C #	K1,K4
CO2	Examine the Use of programming language C # for various programming technologies	K3
CO3	Able to apply looping, methods and strings	K3
CO4	Experimenting structures, enumerations and inheritance in C#	K5, K6
CO5	Able to demonstrate interface and error handling concepts in C#	K1,K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	M	M	S	M	M	S	M	M	M	M
CO2	M	S	M	S	M	M	M	S	S	M
CO3	M	S	M	S	M	S	S	M	M	S
CO4	S	S	M	S	M	M	S	M	M	S
CO5	M	S	S	M	S	M	M	M	S	M

**S - Strong M - Medium**



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**CORE IV: ADVANCED SOFTWARE ENGINEERING**

**Semester: I**  
**Code: 21P1CS04**

**Hours: 5**  
**Credits: 5**

**OBJECTIVES:**

- To understand Software Engineering Architectures
- To gain knowledge of the Software Reuse, Distributed Systems and System Engineering
- To understand Real-time Software Engineering approaches
- To be familiar with DevOps practices
- To understand DevOps Building, Deployment and Testing

**UNIT-I**

Introduction: Professional Software Development – Software Engineering Ethics. Software Processes: Software Process Models – Process Activities – Coping with Change – Process Improvement. Architectural Design: Architectural Design Decisions – Architectural Views – ArchitecturalPatterns.

**UNIT-II**

Software Reuse: The Reuse Landscape – Application Frameworks – Software Product Lines – Application System Reuse. Distributed Software Engineering: Distributed Systems – Client-Server Computing – Architectural Patterns for Distributed Systems – Software as a Service.

**UNIT-III**

Systems Engineering: Socio technical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution. Real-time Software Engineering: Embedded System Design – Architectural Patterns for Real- time Software – Timing Analysis –Real-timeOperatingSystems.

**UNIT-IV**

What is DevOps?: Why DevOps? – DevOps Perspective – DevOps and Agile – Team Structure – Coordination – Barriers. The Cloud as a Platform: Features if the Cloud – DevOps Consequences of the Unique Cloud Features. Operations: Operation Services – Service Operation Functions – Continual Service Improvement – Operations and DevOps.



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**UNIT-V**

The Deployment Pipeline: Overall Architecture: Do DevOps Practices Require Architectural Change – Overall Architectural Structure – Quality Discussion of Microservice Architecture – Amazon’s Rules for Teams – Microservice Adoption for Existing Systems. Building and Testing: Moving a System through deployment Pipeline – Crosscutting Aspects – Development and Pre-commit Testing – Build and Integration Testing UAT/Staging/Performance Testing – Production – Incidents. Deployment: Strategies for Managing a Deployment – Logical Consistency – Packaging – Deploying to Multiple Environments – Partial Deployment – Rollback – Tools.

**TOTAL: 45 HOURS**

**TEXT BOOKS:**

1. Ian Sommerville - Software Engineering, 10th edition, Pearson Education, 2018.  
(Unit – 1: Pg.No: 17-30,43-71,167-183. Unit – 2: Pg.No: 437-463, 490-519. Unit – 3: 551-579, 610-638.)
2. Len Bass, Ingo Weber and Liming Zhu, —DevOps: A Software Architect,,s Perspective], Pearson Education, 2016.  
(Unit – 4: 22-44, 48-67, 70-85. Unit – 5: 88-101, 104-125, 128-151.)

**REFERENCES:**

1. Roger S. Pressman - Software Engineering A Practitioner’s Approach, 6<sup>th</sup> edition, McGraw Hill, 2005.
2. Rajib Mall, Fundamentals of Software Engineering, 3 rd edition, PHI Learning Pvt. Ltd., 2009.
3. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.
4. Michael Huttermann, DevOps for Developers Integrate development and operations, Agile Way, Apress, 2012.
5. Jennifer Davis, Katherine Daniels – Effective DevOps, OReilly, 2016.



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CO. Number	Course Outcome	Knowledge Level
CO-1	Understanding the fundamental principles of Software Engineering	K1
CO-2	Categorizing and examining the applications of Distributed Software Engineering and Architectural Patterns	K2, K3
CO-3	Organizing the key principles of System Engineering and Real-time Software Engineering	K4
CO-4	Master in Basics of DevOps Testing	K5
CO-5	Master key principles in Building and Testing Deployment Pipeline in DevOps	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	S	M	S	M	M	M	S	M
CO-2	M	S	M	S	S	M	M	S	S	M
CO-3	S	M	M	M	S	M	S	M	M	S
CO-4	M	S	M	S	M	S	S	S	M	M
CO-5	S	M	S	S	M	S	S	M	S	S

**S - Strong M - Medium**





Selvamm Arts and Science College (Autonomous), Namakkal  
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**Lab - I: C# Programming**

**Semester: I**

**Hours:5**

**Code: 21P1CSP01**

**Credits:2**

**Course Objectives:**

- Understand code solutions and compile C# projects within the .NET Framework
- Construct classes, methods, and assessors, and instantiate objects.
- Understand and implement string manipulation and events in C#
- To know exception handling within .NET application environment.
- Create and manipulate GUI components in C#.

**List of Practical Programs**

1. Branching and Looping
2. Arrays, Strings and methods
3. Structures and Enumerations
4. Classes and Objects
5. Inheritance
6. Polymorphism
7. Interfaces
8. Multiple Interfaces
9. Operator Overloading
10. Exceptions Handling

<b>CO Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO-1	Understanding and Analyzing C# programs within .NET Framework	K1,K4
CO-2	Able to Construct classes, methods, and assessors, and instantiate objects	K2
CO-3	Implementing string manipulation, events in C#	K3
CO-4	Able to implement exception handling within .NET application environment	K4
CO-5	Able to Create and manipulate GUI components in C#	K5, K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



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The mapping of course outcomes with programme outcomes is tabulated as follows

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO-1	M	M	M	M	M	S	M	M	M	M
CO-2	M	S	M	S	M	M	M	M	S	M
CO-3	M	S	M	S	M	S	S	M	M	S
CO-4	S	S	M	S	M	M	S	M	M	S
CO-5	S	M	M	S	S	M	S	S	M	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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**CORE V: Advanced Java Programming**

**Semester: II**

**Hours: 5**

**Code: 21P2CS05**

**Credits: 4**

**Course Objectives:**

- To impart Exception handling, multithreading and Applets in java .
- To know Input/output and Networking concepts
- To familiarize on Applet, Event Handling and AWT.
- To open up concepts of AWT controls, java beans and swing
- To pave the way to know java database connectivity, servlets and RMI

**Unit – I**

Exception Handling – Multithreaded Programming – I/O, Applets and other Topics.

**Unit – II**

Input / Output: Exploring java .io - Networking.

**Unit – III**

The Applet Class – Event Handling – Introducing the AWT: Working with Windows, Graphics and Text.

**Unit – IV**

Using AWT Controls, Layout Managers and Menus – Java Beans-A tour of Swing.

**Unit – V**

Java Database Connectivity – Servlets – Remote Method Invocation.

**Text books:**

1. Herbert Schildt, “The Complete Reference – JAVA 2”, Fifth Edition, 2002.

(Unit I, II, III & IV)

2. Muthu, “Programming with Java”, Vijay Nicole Imprints Private Ltd., 2004. (Unit V)

**Reference Books:**

1. Deitel H.M. & Deitel P.J, “Java How To Program”, Prentice-Hall of India, Fifth Edition, 2003.
2. Cay.S. Horstmann, Gary Cornel, “Core Java 2 – Vol. II- Advanced Features”, Pearson Education, 2004.



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CO. Number	Course Outcome	Knowledge Level
CO-1	To implement, compile, test and run Java programs comprising more than one class, to address a particular software problem	K3
CO-2	Demonstrate and Interpreting the principles of object oriented programming	K2,K3
CO-3	Demonstrate the ability to use simple data structures like arrays in a Java Program.	K3
CO-4	Linking the concept of package, interface, multithreading and Testing the file handling in java.	K4, K5
CO-5	Ability to make Programming to use the members of classes found in the Java API (such as the Math class).	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	S	M	S	M	S	M	S	M
CO-2	M	S	M	S	M	M	S	M	S	M
CO-3	M	M	M	S	S	M	S	M	M	S
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	S	M	S	S	M	S	S	M	M	S

**S - Strong M - Medium**



Selvam Arts and Science College (Autonomous), Namakkal  
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**CORE VI: Web Programming**

**Semester: II**

**Hours: 5**

**Code: 21P2CS06**

**Credits: 5**

**Course Objectives:**

- To understand of XHTML
- To understand CSS, Java Script and Java Script Objects.
- To show understanding of the logic behind advanced web applications.
- To learn about XML and RSS
- To learn about PHP Concepts

**Unit- I**

**Introduction to XHTML:** Introduction – Editing XHTML – First XHTML Example – W3C XHTML Validation Service – Headings – Linking – Images – Special Characters and Horizontal Rules – Lists – Tables – Forms. **Cascading Style Sheets (CSS):** Introduction – Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element Dimensions – Box Model and Text Flow – Media Types – Building a CSS Drop-Down Menu.

**Unit- II**

**JavaScript: Introduction to Scripting:** Introduction – Simple Program – Modifying Our First Program – Obtaining User Input with prompt Dialogs – Memory Concepts – Arithmetic – Decision Making. **Control Statements:** Introduction – Algorithms – pseudocode – Control Structures – if Selection Statement – if..else Selection Statement – Formulating Algorithms – Assignment Operators – Increment and Decrement Operator.

**Unit-III**

**JavaScript Objects:** Introduction – Introduction to Object Technology – Math Object – String Object – Date Object – Boolean and Number Objects – document Object – window Object – Using Cookies – Final JavaScript Example – Using JSON to Represent Objects.

**Unit-IV**

**XML and RSS:** Introduction – XML Basics – Structuring Data – XML Namespaces – Document Type Definitions (DTDs) – W3C XML Schema Documents – Extensible Stylesheet Language and XSL Transformations – RSS.



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**Unit-V**

**PHP:** Introduction – PHP Basics – String Processing and Regular Expressions – Form Processing and Business Logic – Connecting to a Database – Using Cookies – Dynamic Content – Operator Precedence Chart.

**Text Book:**

1. P.J. Deitel and H.M. Deitel, “Internet and World Wide Web - How to Program”, Pearson International Edition, 4th Edition, 2012.

(Unit – 1: 116-143,157-182 Unit – 2: 193-218,226-256 Unit – 3: 382-423 Unit – 4: 488-512,517-525,543-550 Unit – 5: 872-916)

**Reference Books:**

1. Prof. Deven Shah, “Complete Guide to Internet and Web Programming”, Kogent Learning Solutions Inc., Dreamtech Press, 2013.
2. Chris Bates, ”Web Programming Building Internet Applications”, Wiley Publications, Third Edition, 2018

CO. Number	Course Outcome	Knowledge Level
CO-1	Demonstrate understanding of (X)HTML+CSS programming	K1,K3
CO-2	Discuss the advanced dynamic web projects	K2
CO-3	Understanding and Organizing Java script objects	K1, K4
CO-4	Testing the program in XML and RSS	K5
CO-5	Able to write program and collaborating with PHP	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	S	S	M	S	M	M	S	M	M
CO-2	M	M	M	M	M	S	M	M	S	S
CO-3	M	M	S	S	M	M	S	M	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	S	M	S	S	M	S	S	S	M	S

**S - Strong M - Medium**



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**Lab II: Advanced Java Programming**

**Semester: II**

**Hours: 4**  
**Credits: 2**

**Code: 21P2CSP02**

**Course Objectives:**

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
- Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
- Design and develop Web applications
- Designing Enterprise based applications by encapsulating an application's business logic.
- Designing applications using pre-built frameworks.

**List of Practical Programs**

1. Implementation of Multi threading concepts
2. Implementation of Exception handling concepts
3. Implementation of I/O Streams
4. Program using AWT
5. Implementation of Swing
6. Implementation of Event handling
7. Network Programming using TCP / UDP
8. Program using Java Beans
9. Program using JDBC
10. RMI

<b>CO. Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO-1	Implementing Multi threading, Exception Handling and I/O Streams	K3
CO-2	Expressing AWT Packages in java programs	K2
CO-3	Experimenting the implementation of Swing and Event Handling	K3,K5
CO-4	Ability to use TCP/IP in network programming	K1,K2
CO-5	Programming Java Beans, JDBC and RMI using java programming	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



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The mapping of course outcomes with programme outcomes is tabulated as follows

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	M	S	M	M	S	M	S	S
CO-2	M	S	M	S	M	M	S	M	S	M
CO-3	M	M	S	S	S	M	S	S	M	S
CO-4	M	S	M	S	M	S	M	M	M	S
CO-5	S	M	S	S	S	S	S	S	M	S

**S - Strong M - Medium**





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**Lab III: Web Programming Lab**

**Semester: II**

**Hours: 4**

**Code: 21P2CSP03**

**Credits: 2**

**Course Objectives:**

- Understand the table handling tags, Frames and Frameset for designing web pages
- Develop the colorful web pages using Image, Anchor and Multimedia Files
- Understand Javascript, Event Handling and JSON
- Use XML and XSLT
- Create applications using PHP COOKIE and SESSION

**List of Practical Programs**

1. A Program to illustrate body tag, pre tags, text Font tag, Heading Tag, Text Formatting, Lists
2. A Program to illustrate Image tag, Anchor Tag, Html Frames, Forms and Embed Multimedia files
3. A Program for Web page creation with all types of Cascading style sheets
4. Write a Program in Java Script Using different types of Event Handling
5. A Program to create a web page using java script and Validate user Forms
6. Write a Program using JavaScript Object Notation (JSON)
7. Write a program to demonstrate XML Document Creation and XSLT
8. Write a program to demonstrate Internal DTD and External DTD creation in XML
9. Write a PHP program to store current date-time in a COOKIE and display the „Last visited on“ date-time on the web page upon reopening of the same page.
10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.



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CO. Number	Course Outcome	Knowledge Level
CO-1	Able to handle tags to create web pages	K1,K3
CO-2	Acting out Image, Anchor and Multimedia Tags	K2
CO-3	Validating Javascript event handling tags	K5
CO-4	Testing the program in XML and XSLT	K5
CO-5	Able to adopt PHP Cookies and Session	K1,K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	M	M	M	S
CO-3	M	S	S	S	M	M	S	M	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	S	M	S	S	M	S	S	S	M	S

**S - Strong M - Medium**



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**CORE VII: Cloud Computing and Big Data Analytics**

**Semester: III**

**Hours: 5**

**Code: 21P3CS07**

**Credits: 5**

**Course Objectives:**

- To introduce the concepts of Cloud Computing as a new computing paradigm.
- The students will have an opportunity to explore the Cloud Computing various terminology, principles and applications.
- Understand the Big Data Platform and its Use cases
- Understand Neural Network and Back Propagation Rules
- The students will implement analytical concepts in R programming

**Unit-I**

**Introduction to Cloud Computing:** Evolution of Cloud Computing- Why Cloud Computing?- Cloud Essentials- Business and IT Perspectives- Cloud Computing Definition- Benefits and Challenges of Cloud Computing- Limitations- Usage Scenarios and Applications- Business Models around Cloud- Cloud Computing Characteristics- Cloud Adoption. **Cloud Models:** Introduction- From Collaborations to Cloud- Cloud Models- Cloud Application Architecture- Cloud Computing Architecture- Value of Cloud Computing – Cloud Infrastructure Models- Cloud Infrastructure Self-service – Scaling a Cloud Infrastructure.

**Unit-II**

**Standards and Security :**Introduction- Legal and Regulatory Issues- Cloud Security Challenges- Cloud Data Security- Network Security- Host Security- Database Management- Risk Tolerance in Cloud. **Cloud Licensing and Major Players:** Introduction- Cloud Data Centre- Moving into the Cloud- Issues in Cloud Computing- Know Your Software Licenses- Service Level of Cloud Applications- Major Player in Cloud Computing- Eucalyptus- Nimbus- Open Nebula-CloudSim.

**Unit-III**

**Wholeness of Big Data:** Introduction – Understanding Big Data – Capturing Big Data – Benefiting from Big Data – Management of Big Data – Organizing Big Data – Analyzing Big Data – Technology challenges for Big Data. **Big Data sources and Applications:** Big Data Sources – Machine-to-Machine (M2M) Communications - Big Data Applications - **Big Data Architecture:** Standard Big Data Architecture - Big Data Architecture Examples.



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**Unit-IV**

**Data Preparation: An Introduction to Data Mining and Predictive Analytics:** What is Data Mining? – What is Predictive Analytics? – Data Miners – The Need for Human Direction of Data Mining – The Cross-industry Standard process for data mining: CRISP-DM – Fallacies of Data Mining – What tasks can Data Mining accomplish. **Data Preprocessing:** Why do we need to preprocess the data? – Data Cleaning – Handling Missing Data – Identifying Misclassifications – Graphical Methods for identifying outliers – Measures of Center and Spread – Data Transformation – Min-Max Normalization – Z-Score Standardization – Decimal Scaling – Transformations to achieve normality – Numerical Methods for identifying outliers – Flag Variables – Transforming Categorical Variables in to Numerical Variables – Binning Numerical Variables – Reclassifying Categorical Variables – Adding a Index Field – Removing Variables that are not useful – Variables that should probably not be removed – Removal of Duplicate Records – A Word about ID Fields.

**Unit-V**

**Classification: K-Nearest Neighbor Algorithm:** Classification Task – K-Nearest Neighbor Algorithm – Distance Function – Combination Function – Quantifying Attribute relevance: Stretching the Axes – Database Considerations – K-Nearest Neighbor algorithm for estimation and prediction – Choosing K – Application of K-Nearest Neighbor Algorithm using IBM/SBSS Modeler. **Decision Trees:** What is a Decision Tree? – Requirements for using Decision trees – Classification and Regression Trees – C4.5 Algorithm – Decision Rules – Comparison of the C5.0 and CART algorithms applied to real data. **Neural Networks:** Input and Output Encoding – Neural Networks for Estimation and Prediction – Simple Example of a Neural Network – Sigmoid Activation Functions – Back-Propagation – Gradient – Descent Method – Back-Propagation Rules – Example of Back-Propagation – Termination Criteria – Learning Rate – Momentum Term – Sensitivity Analysis – Application of Neural Network Modeling.

**Text Books**

1. M.N.Rao , “Cloud Computing” , PHI Learning Pvt. Ltd., 2015.
2. Anil Maheshwari, “Big Data”, Mc Graw Hill Education, 2017.
3. Daniel T. Larose, Chantal D. Larose, “ Data Mining & Predictive Analytics”, Wiley Publications, Second Edition, 2015.



**Reference Book**

1. Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi , “ Mastering Cloud Computing” McGraw Hill Education,2017.
2. Paul C. Zikopoulos, Chris Eaton, Dirl deRoos, Thomas Deutsch, George Lapis, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data” McGraw Hill Education (India) Private Limited, 2015.
3. Seema Acharya, Subhasini Chellappan, "Big Data and Analytics" Wiley 2015.

CO. Number	Course Outcome	Knowledge Level
CO-1	Introduce the broad perceptive of cloud architecture and model.	K1,K4
CO-2	Identify Big Data and its Business Implications.	K1,K2
CO-3	Access and Process Data on Distributed File System	K3
CO-4	Predicting appropriate data mining algorithms to solve real world problems	K2,K5
CO-5	Apply Machine Learning Techniques using R.	K3

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	M	M	S	S
CO-3	S	M	S	S	M	M	S	S	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	M	M	M	S	M	M	S	S	M	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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**CORE VIII: Mobile Application Development**

**Semester: III**

**Code: 21P3CS08**

**Hours: 5**

**Credits: 5**

**Course Objectives:**

- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Able to create mobile applications
- Create Feature-Rich applications
- Understands SQLite databases.

**Unit-I**

**Getting Started with Your First Android Application:** Developing Spectacular Android Application: Why Develop for Android? – Android Development Basics – Hardware Tools – Software Tools. **Prepping Your Development Headquarters:** Developing the Android Developer inside You – Assembling your Toolkit – Tuning up your Hardware – Installing and Configuring your Support Tools – Installing Android Studio – Installing Java 7 – Adding SDK Packages – Navigating the Android SDK – Specifying Android Platforms – Using SDK tools for Everyday development.

**Unit-II**

**Building and Publishing your First Application:** Your First Android Project – Starting a New Project in a Android Studio – Responding to Errors – Setting up an Emulator – Running the Hello Android App – Understanding Project Structure. **Creating the User Interface:** Creating the Silent Mode Toggle Application – Laying out the Application – Adding an Image to your Application – Creating a Launcher icon for the Application - Previewing the Application in the Visual Designer.

**Unit-III**

**Coding Your Application:** Understanding Activities and the Activity Lifecycle – Creating your First Activity – Working with the Android Framework Classes – Installing Your Application – Material Design – Responding to Errors – Thinking Beyond the Application Boundaries – Testing whether your Application Works – What about Automated Testing. **Understanding Android Resources:** Understanding Resources – Working with Resources – Different Strokes for Different Folks.

**Unit-IV**

**Turning Your Application in to an App Widget:** Working with App Widgets in Android – Working with Intents and Pending Intents – Creating the App Widget – Placing your Widget on the Home Screen. **Publishing your App to the Google Play Store:** Creating a Distributable file – Creating a Google Play Developer Profile – Pricing Your Application – Getting Screen Shot for Your Application – Uploading your Application to the Google Play Store – Watching the Number of Installs Soars.



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**Unit-V**

**Creating a Feature-Rich Application:** Handling User Input: Creating the User Input Interface - Getting Choosy with Dates and Times – Creating an Alert Dialog – Validating Input – **Getting Persistent with Data Storage:** Finding Places to put data – Understanding how the SQLite Content Provider Works – Creating Your Application’s SQLite Databases – Using Content Provider URIs – Dealing with CRUD – Implementing the Save Button – Implementing the List View – Reading Data in to the Edit Page.

**Text Book:**

1. Michael Burton, “Android App Development for Dummies”, 3rd Edition, Wiley Publication, 2018.

**Reference Book:**

1. Donn Felker and Joshua Dobbs, “Android Application Development for Dummies” Wily Publishing Inc, 2011.

CO. Number	Course Outcome	Knowledge Level
CO-1	Describe mobile application models/architectures and patterns.	K2
CO-2	Apply mobile application models/architectures and patterns to the development of a mobile software application.	K3,K4
CO-3	Apply a mobile development framework to the development of a mobile application.	K3,K5
CO-4	Describe the components and structure of a mobile development framework	K1,K2
CO-5	Ability to create Feature rich applications in Android	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	M	M	S	M	M	S	M	M
CO-2	M	M	S	S	M	S	M	M	S	S
CO-3	M	S	S	S	M	M	S	S	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	M	M	M	S	M	S	S	S	M	S

**S - Strong M - Medium**



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**CORE IX: Soft Computing**

**Semester: III**

**Code: 21P3CS09**

**Hours: 4**

**Credits: 4**

**Course Objectives:**

- To understand the learning methods.
- To understand the Neural Network Architecture
- To know the algorithm based on soft computing
- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

**Unit – I**

Fundamentals of Neural Networks : Basic Concepts of Neural Networks – Human Brain – Model of an Artificial Neuron – Neural Network Architectures – Characteristics of Neural Networks – Learning Methods – Taxonomy of Neural Network Architectures – History of Neural Network Research – Early Neural Network Architectures – Some Application Domains.

**Unit - II**

Back Propagation Networks : Architecture of a Back Propagation Network – Back Propagation Learning – Illustration – Applications – Effects of Tuning Parameters of the Back Propagation Neural Network – Selection of Various Parameters in BPN – Variations of Standard Back Propagation Algorithm.

**Unit - III**

Adaptive Resonance Theory: Introduction – ART1 – ART2 – Applications.

**Unit – IV**

Fuzzy Set Theory: Fuzzy versus Crisp – Fuzzy Sets – Fuzzy Relations. Fuzzy Systems: Fuzzy Logic-Fuzzy Rule Based System- Defuzzification Methods.

**Unit – V**

Fuzzy Back propagation Networks: LR-type Fuzzy numbers-Fuzzy Neuron-Fuzzy BP Architecture-Learning in Fuzzy-Inference by Fuzzy-Applications.

**Text Book:**

1. S. Rajasekaran, G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications", Prentice Hall of India, 2003.





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**Reference Books:**

1. James A. Freeman, David M. Skapura, “Neural Networks – Algorithms, Applications and Programming Techniques”, Pearson Education.
2. Fredric M. Ham, Ivica Kostunica, “Principles of Neuro Computing for Science of Engineering”, Tata McGraw Hill.
3. Simon Haykin, “Neural Networks – A Comprehensive Foundation”, PHI.

CO. Number	Course Outcome	Knowledge Level
CO-1	Understand importance of soft computing.	K1,K2
CO-2	Analyze different soft computing techniques like Genetic Algorithms	K4
CO-3	Implement algorithms based on soft computing	K3
CO-4	Understands Fuzzy Logic , Neural Networks and their combination	K2,k3
CO-5	Applying and Experimenting soft computing techniques to solve engineering or real life problems.	K3,k5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	M	S	M	S
CO-3	M	M	S	S	M	M	S	S	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	M	S	M	S	M	S	M	S	M	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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M.Sc -Computer Science  
**CORE X: Cryptography and Information Security**

**Semester: III**

**Code: 21P3CS10**

**Hours: 4**

**Credits: 4**

**Course Objectives:**

- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
- To be able to encrypt data using cryptography techniques.
- To familiarize Digital Signature Standard and provide solutions for security.
- To learn about Intrusion, Malicious Software and Digital Forensics.

**Unit-I**

Introduction: Security – Elements of Information Security – Security Policy – Security Techniques – Steps for Better Security – Category of Computer Security – The Operational Model of Network Security – Security Services – Basic Network Security Terminology – Security Attacks – Open Source Tools. Data Encryption Techniques: Introduction – Encryption Methods – Cryptography – Substitution Ciphers – Transposition Ciphers – Cryptanalysis – Steganography.

**Unit-II**

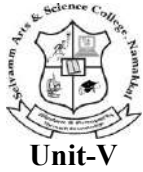
Data Encryption Standards: Introduction – Block Ciphers – Block Cipher Modes of Operation – Feistel Ciphers – Data Encryption standard – Simplified Data Encryption Standard – Triple DES – DES Design Criteria – Other Block Ciphers – Differential Cryptanalysis – Linear Cryptanalysis – Weak Keys in DES Algorithms. Advanced Encryption Standard: Introduction – Advanced Encryption Standard (AES) – Overview of Rijndael – Key Generation – Encryption – Decryption – Galois Field of Multiplication – Advantages of AES - Comparison of AES with Other Ciphers – Simplified AES.

**Unit-III**

Symmetric Ciphers: Introduction – Blowfish Encryption Algorithm – RC5 – RC4 – RC6 – Comparison between RC6 and RC5 – IDEA. Public Key Cryptosystems: Introduction – Public Key Cryptography – RSA Algorithm.

**Unit-IV**

Digital Signatures: Introduction – Algorithms for Digital Signature – Digital Signature Standard (DSS) – Attacks on Digital Signature – Authentication Protocols. Electronic Mail Security: Introduction – Pretty Good Privacy (PGP) – MIME – S/MIME – Comparison of PGP and S/MIME. Web Security: Introduction – Secure Socket Layer – SSL Session and Connection – SSL Record Protocol – Change Cipher Spec Protocol – Alert Protocol – Handshake Protocol – Secure Electronic Transactions.



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**Unit-V**

Intrusion: Introduction – Intrusion Detection – Intrusion Detection System – Anomaly-based Intrusion Detection Systems – Misuse-based Intrusion Detection Systems – Distributed Intrusion Detection System – Base Rate Fallacy – Password Management Practices – Limitations of Intrusion Detection Systems – Challenges of Intrusion Detection. Malicious Software: Introduction – Malicious Code – Viruses – Worms – Trojans or Trojan Horses – Spyware – Ransomware – Bots – Best Practices – Digital Immune System – Attacks – Different Parts of World Wide Web . Digital Forensics: Introduction to Cyber Crime/Attack – Cyber Attack Examples – Introduction to Digital Forensics – Types of Digital Forensics – Digital Forensics Process – Areas of Application of Computer Forensics – Understanding the Suspects – Examples of Computer Forensics – Free Space and Slack Space – Incident Response – Weaknesses – Chain of Custody (COC) – Digital Forensic Tools.

**Text Books**

1. V.K.Pachghare , “Cryptography and Information Security” , PHI Learning Pvt. Ltd., Third Edition 2019.

**Reference Book**

1. William Stallings, “Cryptography and Network Security, Principles and Practices ”, Pearson Education, Fourth Edition, 2006.
2. Behrouz A. Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. C.K. Shyamala, N. Harini and Dr.T.R. Padmanabhan: Cryptography and Network Security, Wiley India Pvt. Ltd.

CO. Number	Course Outcome	Knowledge Level
CO-1	Able to maintain the Confidentiality, Integrity and Availability of a data.	K2,K4
CO-2	Design a security solution for a given application	K6
CO-3	Use symmetric and asymmetric key algorithms for cryptography	K3
CO-4	To examine the issues and structure of Authentication Service and Electronic Mail Security	K5
CO-5	Understanding of Intrusion, Malicious Software and Digital Forensics.	K1,K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



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The mapping of course outcomes with programme outcomes is tabulated as follows

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO-1	S	M	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	S	M	S	S
CO-3	S	M	S	S	M	M	S	M	S	M
CO-4	M	S	M	S	S	S	M	M	S	S
CO-5	M	S	M	S	M	M	S	S	M	S

**S - Strong M - Medium**



Selvam Arts and Science College (Autonomous), Namakkal  
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M.Sc -Computer Science  
**Lab IV: Data Analytics Lab**

**Semester: III**  
**Code: 21P3CSP04**

**Hours: 3**  
**Credits: 2**

**Course Objectives:**

- Understand the fundamentals of R Programming.
- Use mathematical and statistical manipulations in R using the functions that perform the specialized task in R.
- Design and manage the various data structures, frames in R.
- Illustrate the advanced statistical methods in R.
- Understand clustering and classification algorithms.

**Develop R Script for the following list of practicals:**

1. To Perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND).
2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames.
3. To Perform Matrix Manipulation
4. To perform statistical operations (Mean, Median, Mode and Standard deviation).
5. To perform data pre-processing operations.
6. To perform histogram using dataset.
7. To perform decision tree
8. To perform Regression
9. To perform K-Means clustering operation.
10. To perform KNN classification using dataset.

<b>CO. Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO-1	Able to handle R programming concepts	K1,K3
CO-2	Implement mathematical and statistical manipulations in R	K3
CO-3	Able to design and manage the various data structures, frames in R	K2,K5
CO-4	Implement advanced statistical methods in R	K3
CO-5	Experimenting clustering and classification algorithms	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



Selvamm Arts and Science College (Autonomous), Namakkal  
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The mapping of course outcomes with programme outcomes is tabulated as follows

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO-1	M	S	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	M	S	M	S
CO-3	M	S	S	S	M	M	S	S	S	M
CO-4	S	S	M	S	S	S	M	M	S	S
CO-5	S	M	S	S	M	S	S	S	M	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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M.Sc -Computer Science  
**Lab V: Mobile Application Development**

**Semester: III**  
**Code: 21P3CSP05**

**Hours:3**  
**Credits: 2**

**Course Objectives:**

- Know the components and structure of mobile application development frameworks for Android.
- To inculcate working knowledge of Android Studio development tool
- Develop rich user Interfaces by using layouts and controls.
- Create high performance Android applications for marketplace.
- Deploy applications to the Android marketplace for distribution.

**List of Practical Programs**

1. GUI Components, Fonts and Colors
2. Layout Managers and Event Listeners
3. Options Menu
4. Status Bar Notifications
5. Silent Mode Toggle Application
6. Calculator Application
7. Alert upon Receiving a Message
8. Create Alarm Clock
9. GPS Location Information
10. Validating Input

CO Number	Course Outcome	Knowledge Level
CO-1	Understand the components and structure of Android framework	K1,K2
CO-2	Able to inculcate working knowledge of Android Studio development tool	K3
CO-3	Design rich user interfaces by using layouts and controls	K3,K5
CO-4	Develop well defined and qualified android applications	K5
CO-5	Able to deploy applications to the Android marketplace for distribution	K2,K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



Selvam Arts and Science College (Autonomous), Namakkal  
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The mapping of course outcomes with programme outcomes is tabulated as follows

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO-1	M	S	S	M	S	M	S	S	M	M
CO-2	M	M	S	M	M	S	M	S	M	S
CO-3	S	S	S	S	S	M	S	S	S	M
CO-4	S	M	M	S	S	M	M	S	S	S
CO-5	S	M	S	S	M	S	S	S	M	S

**S - Strong M - Medium**





Selvamm Arts and Science College (Autonomous), Namakkal  
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CORE XI: Machine Learning Techniques

**Semester: IV**

**Hours: 5**

**Code: 21P4CS11**

**Credits: 4**

**Objectives:**

- To understand machine learning models, cost functions, vectors and matrices
- To familiarize on data pre processing and Artificial Neural Network
- To know Linear Regression and Decision Tree
- To provide understanding on Support Vector Machines and Bayesian Classification
- To introduce and accelerate Deep Learning Concepts

**Unit- I:**

Introduction to Machine Learning: What is Machine Learning? Where is Machine Learning Used? Applications of Machine Learning – Types of Machine Learning. Model and Cost Function: Introduction – Representation of a Model – Cost Function Notation for Measuring the Accuracy of a Hypothesis Function - Measuring Accuracy of a Hypothesis Function – Minimizing the Cost Function for a Single Variable, Two Variable Function – Role of Gradient Function in Minimizing a Cost Function. Basics of Vectors and Matrices: Introduction – Notations – Types of Matrices – Matrix Operations – Determinant, Inverse of a Matrix.

**Unit- II:**

Data Preprocessing: Overview of Data Preprocessing – Data Cleaning, Integration, Transformation – Data Reduction or Dimensionality Reduction. Artificial Neural Network: Introduction – Evolution of Neural Network – Biological Neuron – Basics of Artificial Neural Network – Activation Functions – McCulloch-Pitts Neuron Model.

**Unit- III:**

Linear Regression: Introduction to Supervised Learning and Regression – Statistical relation between Two Variables and Scatter Plots – Steps to establish a Linear Regression – Evaluation of Model Estimators. Decision Tree: Introduction to Classification and Decision Tree – Problem Solving using Decision Tree – Basic Decision Tree Learning Algorithm – Popularity of Decision Tree Classifiers – Steps to Construct a Decision Tree – Classification using Decision Tree – Issues in Decision Tree – Rule Based Classification – Pruning the Rule Set.

**Unit- IV:**

Support Vector Machines: Introduction to Support Vector Machines – Linear Support Vector Machines – Optimal Hyperplane – Basics of Vector – Radial Basic Functions. Bayesian Classification: Introduction to Bayesian Classifiers – Naïve Bayes Classifier – Bayesian Belief Network – k-Nearest Neighbor (KNN) – Measuring Classifier Accuracy.

**Unit- V:**

Deep Learning: Making a Network Deeper – A Brief History of Deep Learning – Accelerating Deep Learning – Practical Uses of Deep Learning – The Future of Deep Learning.



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**Text Book:**

1. Anuradha Srinivasaraghavan, Vincy Joseph, “Machine Learning” Wiley Publications, 2019.
2. Koki Saitoh, “Deep Learning from the Basics”, Packt Publishing, 2021.

**Reference Book :**

1. Michael Bowles, ”Machine Learning in Python: Essential Techniques for Predictive Analysis” John Wiley & Sons, Inc. ,Crosspoint Boulevard Indianapolis.
2. Sebastian Raschka, ”Python Machine Learning” ,Packt Publishing,2015.
3. Francois Chollet, “Deep Learning with Python”, Manning Publicationd Co., 2018.

CO. Number	Course Outcome	Knowledge Level
CO-1	Understanding machine learning models, cost functions, vectors and matrices	K2,K3
CO-2	Experimenting data pre processing and Artificial Neural Network	K3,K5
CO-3	Interpreting Linear Regression and Decision Tree	K1,K2
CO-4	Understanding and Illustrating Support Vector Machines and Bayesian Classification	K4
CO-5	Expressing Deep Learning Concepts	K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	S	M	S	M	S	S	M	S
CO-2	M	S	M	S	M	S	S	M	S	S
CO-3	S	M	S	S	M	M	S	S	S	M
CO-4	M	S	M	M	S	S	S	M	S	M
CO-5	M	S	S	S	M	S	M	S	M	S

S - Strong M - Medium



Selvamm Arts and Science College (Autonomous), Namakkal  
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M.Sc -Computer Science  
**CORE XII: Python Data Analytics**

**Semester: IV**      **Code: 21P4CS12**      **Hours: 5**      **Credits: 5**

**Course Objectives:**

- To learn about Data Analysis process using Python.
- To explain NumPy Library basics and manipulation techniques in python.
- To explain Pandas Data Analysis Library, Mapping, Sorting, Ranking and Correlation.
- To familiarize with depth knowledge on Pandas Library.
- To learn about Data manipulation with matplotlib.

**Unit-I**

**An Introduction to Data Analysis:** Data Analysis – Knowledge Domains of the Data Analyst – Understanding the nature of the data – Data Analysis process – Quantitative and Qualitative Data Analysis – Open Data – Python and Data Analysis. **Introduction to the Python World:** Python Programming Language – Python 2 and Python 3 – PyPI-The Python Package Index – SciPy.

**Unit-II**

**The NumPy Library:** NumPy: A Little History – The NumPy Installation – Nddarray: The Heart of the Library – Basic Operations – Indexing, Slicing and Iterating – Conditions and Boolean Arrays – Shape Manipulation – Array Manipulation – General Concepts – Structured Arrays – Reading and Writing Array Data on Files.

**Unit-III**

**The Pandas Library – An Introduction:** Pandas: The Python Data Analysis Library – Installation of Pandas – Testing your Pandas Installation – Getting Started with Pandas - Introduction to Pandas Data Structures – Other Functionalities on Indexes – Operations between Data Structures – Function Application and Mapping-Sorting and Ranking-Correlation and Covariance-“Not a Number “ Data-Hierarchical Indexing and Leveling.

**Unit-IV**

**Pandas:Reading and Writing Data:** I/O API Tools –CSV and Textual Files - Reading Data in CSV or Text Files - Reading and Writing HTML Files - Reading Data from XML - Reading and Writing Data on Microsoft Excel Files - JSON Data - The Format HDF5 – Pickle - Python Object Serialization - Interacting with Databases - Reading and Writing with a NoSQL Database:MongoDB

**Unit-V**

**Data Visualization with matplotlib:** The matplotlib Library – Installation - IPython and IPython QtConsole - The matplotlib Architecture – pyplot - The Plotting Window - Using the kwargs - Adding Elements to the Chart - Saving your Charts - Handling Date Values - Chart Typology - Line Charts – Histograms - Bar Charts - Pie Charts - Advanced Charts - The mplot3d Toolkit – Multi - Panel Plots.



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**Text Books**

2. Fabio Nelli , “Python Data Analytics” , with Pandas, NumPy, and Matplotlib ,Second Edition,2018.

**Reference Book**

4. Wes McKinney, “Python for Data Analysis, Data Wrangling with Pandas, NumPy and IPython”, O’Reilly, Second Edition, 2018.
5. Jake Vanderplas, “Python Data Science Handbook, Essential Tools for working with data”, O’Reilly, Second Edition, 2017
6. Peters Morgan, “Data Analysis from Scratch with Python, Step by Step Guide”, AI Sciences, First Edition, 2016.

<b>CO. Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO-1	Able to work on Data Analysis process using Python.	K2,K4
CO-2	Apply concepts on NumPy Library and manipulation techniques in python	K6
CO-3	Able to use Pandas Data Analysis Library, Mapping, Sorting, Ranking and Correlation.	K3
CO-4	To examine CSV, Textual Files, JSON Data, Format HDF5, NoSQL Database	K5
CO-5	Understanding and Examining Data manipulation with matplotlib.	K1,K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

<b>PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO</b>										
CO-1	S	M	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	S	M	S	S
CO-3	S	M	S	S	M	M	S	M	S	M
CO-4	M	S	M	S	S	S	M	M	S	S
CO-5	M	S	M	S	M	M	S	S	M	S

**S - Strong M - Medium**



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**Core Practical – VI: Python Data Analytics**

**Semester: IV**

**Hours: 3**

**Code: 21P4CSP06**

**Credits: 3**

**Course Objectives:**

- To learn about Python Basics and Data Analysis
- To know NumPy Library basics and manipulation techniques
- To explain Pandas Data Analysis Library and Data Frames
- To familiarize with depth knowledge on reading CSV and Excel files using Pandas
- To learn about chart creation using Matplotlib

**List of Practical**

1. Write a Python Program to print Prime Number using provided range.
2. Write a Python Program to implement String Functions and Operations.
3. Write a Python Program to Arithmetic Operations in NumPy Array.
4. Write a Python Program to sort a given array in ascending order using NumPy Library.
5. Write a Python Program to Creating a Pandas Data Frame.
6. Write a Python Program to Displaying Pandas Data Frame.
7. Write a Python Program to Reading CSV Files using Pandas.
8. Write a Python Program to Reading Excel Files using Pandas.
9. Write a Python Program to Creating Pie Chart using Matplotlib.
10. Write a Python Program to Creating Bar Chart using Matplotlib.

<b>CO. Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO-1	Implementing Python Basics and Data Analysis	K2,K4
CO-2	Experimenting NumPy Library basics and manipulation techniques	K3
CO-3	Executing and Testing Pandas Data Analysis Library and Data Frames	K3,K5
CO-4	Execute reading CSV and Excel files using Pandas.	K5
CO-5	Implement chart creation using Matplotlib.	K1,K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**



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The mapping of course outcomes with programme outcomes is tabulated as follows

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
CO-1	S	M	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	S	M	S	S
CO-3	S	M	S	S	M	M	S	M	S	M
CO-4	M	S	M	S	S	S	M	M	S	S
CO-5	M	S	M	S	M	M	S	S	M	S

**S - Strong M - Medium**



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M.Sc -Computer Science  
Elective – I : Computer Architecture

**Semester: I**  
**Code: 21P1CSE01**

**Hours: 5**  
**Credits: 4**

**Course Objectives:**

- To conceptualize the basics of organizational and architectural issues of a digital computer.
- To understand the instruction codes.
- To understand CPU and RISC.
- To know about peripheral devices and data transfer mode
- Able to know about memory organization and multiprocessors

**Unit-I**

**Digital Logic Circuits:** Digital Computers-Logic Gates-Boolean Algebra-Map Simplification - Combinational Circuits - Flip-Flops - Sequential Circuits. **Digital Components:** Integrated Circuits – Decoders – Multiplexers – Registers - Shift Registers - Binary Counters- Memory Unit.

**Unit-II**

**Basic Computer Organization and Design:** Instruction Codes-Computer Registers-Computer Instructions-Timing and Control-Instruction Cycle-Memory –Reference Instructions- Input-Output and Interrupt- Complete Computer Description-Design of Basic Computer-Design of Accumulator Logic.

**Unit-III**

**Central Processing Unit:** Introduction-General Register Organization-Stack Organization- Instruction Formats-Addressing Modes-Data Transfer and Manipulation-Program Control-Reduced Instruction Set Computer (RISC).

**Unit-IV**

**Input-Output Organization:** Peripheral Devices-Input-Output Interface-Asynchronous Data Transfer-Modes of Transfer-Priority Interrupt-Direct Memory Access (DMA)-Input-Output Processor (IOP)-Serial Communication.

**Unit-V**

**Memory Organization:** Memory Hierarchy-Main Memory-Auxiliary Memory-Associative Memory-Cache Memory-Virtual Memory-Memory Management Hardware.



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**Multiprocessors:** Characteristics of Multiprocessors-Interconnection Structures-  
 Interprocessor Arbitration-Interprocessor Communication.

**Text Book:**

1.M.Morris Mano, "Computer System Architecture"-Third Edition, Dorling Kindersley  
 Pvt.Ltd-2007

**Reference Book:**

1. William Stallings, "Computer Organization and Architecture Designing For Performance",  
 Prentice Hall, Eighth Edition.

CO. Number	Course Outcome	Knowledge Level
CO-1	Understand Digital Logic Circuit, Digital Components and Basic structure of computer.	K1,K2
CO-2	Computer Organization Design and Reference Instructions	K2
CO-3	Ability to articulate Central Processing Unit and Program Control	K2,K3
CO-4	Explore to design memory organization that uses banks for different word size operations.	K4
CO-5	Reviewing the concept of I/O organization, Types of Memory and Interprocess Communication	K5

**K1 - Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 - Create**

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	S	S	M	S	M	M	S	S	M
CO-2	M	M	M	S	M	S	M	M	S	S
CO-3	M	S	S	S	M	M	S	M	S	M
CO-4	S	S	M	S	S	S	M	M	S	M
CO-5	S	M	S	S	M	M	S	S	M	S

**S - Strong M - Medium**





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**ELECTIVE I: System Software**

**Semester: I**

**Hours: 5**

**Code: 21P1CSE02**

**Credits: 4**

**Course Objectives:**

- To explain the basic concepts of language processing
- To understand the basics of assemblers
- To educate macros
- To explain basics of compilers and interpreters
- To narrate linkers and software tools for program development

**Unit - I**

Language processors – Language processing activities and fundamentals – Language specification – Development Tools – Data Structures for Language processing- Scanners and Parsers.

**Unit - II**

Assemblers: Elements of Assembly language programming - Overview of the Assembly process - Design of a Two-pass Assembler - A single pass Assembler for the IBM PC.

**Unit - III**

Macros and Macro processors – Macro definition, call, and expansion – Nested macro calls – Advanced macro facilities - Design of a macro preprocessor - Compilers: Aspects of compilation.

**Unit - IV**

Compilers and Interpreters – Memory allocation - Compilation of Expressions and Control structures - Code optimization – Interpreters.

**Unit - V**

Linkers: Linking and Relocation concepts – Design of a linker – Self relocating Programs – A linker for MS DOS - Linking for over-lays – loaders - Software tools: Software tools for program development - Editors - Debug monitors - Programming environments – User interfaces.



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**Text Book:**

1. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Tata McGraw-Hill, Second Revised Edition, , New Delhi- 1999.

**Reference Books:**

1. L. L. Beck, “System Software An Introduction to System Programming”, 3rd edition, Addison-Wesley , 1996.

CO. Number	Course Outcome	Knowledge Level
CO-1	Understand and Distinguish different software into different categories	K1,K4
CO-2	Design and predict one pass, two pass or multi pass assembler	K2
CO-3	Design, Analyze and Implement loader and linker and understand about compilers and interpreters	K3,K4
CO-4	Design and Experiment macro processors	K5
CO-5	Critique the features of Modern Editing /Debugging Tools	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	S	M	S	M	M	S	M	M
CO-2	M	M	S	M	M	S	M	M	S	S
CO-3	S	M	S	S	M	M	S	S	S	M
CO-4	S	S	M	S	M	S	M	M	S	S
CO-5	M	M	M	S	M	M	S	S	M	S

**S - Strong M - Medium**



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**ELECTIVE I: Principles of Programming Languages**

**Semester: I**  
**Code: 21P1CSE03**

**Hours: 5**  
**Credits: 4**

**Course Objectives:**

- To understand the role of programming languages
- To learn the properties of languages
- Increase the ability to learn new programming languages
- Increase the capacity to express programming concepts and choose among alternative ways to express things
- Make good use of debuggers and related tools

**Unit – I**

**Language Design Issues:** History-Role of Programming languages - environments - Impact of machine Architectures – Language Translation Issues: Programming language Syntax- Stages in Translation - formal Translation models - recursive descent Parsing

**Unit – II**

**Modeling Language Properties:** Formal Properties of Languages - Language Semantics - Elementary data Types: Properties of Types and Object- Scalar Data Types - Composite Data Types

**Unit – III**

**Encapsulation:** Structure data types - Abstract data types - Encapsulation by sub programs Type Definitions Inheritance: - Polymorphisms

**Unit –IV**

**Functional Programming:** Programs as Functions- Functional Programming in an Imperative Language - LISP – Functional Programming with static typing - delayed evaluation- Mathematical functional programming- recursive functions and lambda calculus – **Logic programming:** Logic and Logic Programs - Horn Clauses - Prolog - Problems with logic programming

**Unit- V**

**Formal Semantics:** Sample small language - operational Semantics - Denotation Semantics - Axiomatic Semantics - Program correctness. **Parallel Programming:** Parallel Processing and programming languages - threads - Semaphore - monitors-message passing - parallelism Non Imperative Languages.



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**Text Books :**

1. Terrence W Pratt, Marvin V Zelkowitz, “Programming Languages - Design and Implementation”, PHI Publications, 4th edition, 2008
2. Kenneth C. Louden , Programming Languages-Principles and Practice” , Cengage Learning Publications , Second Edition, 2008

**Reference Books:**

1. Daniel P Friedman, Mitchell Wand, Christopher T Haynes, “Essentials of Programming Languages”, Second Edition, PHI Publishers, 2005

CO. Number	Course Outcome	Knowledge Level
CO-1	Master analyzing and identifying semantic issues associated with function implementations.	K1,K3
CO-2	Master implementation techniques for interpreted functional languages.	K3
CO-3	Extending the use of object-oriented languages.	K2
CO-4	Explaining the familiar with design issues of object-oriented and implementing functional languages.	K3,K4
CO-5	Be familiar with design issues of object-oriented and testing the functional languages.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	S	S	S	M	M	S	S	M
CO-2	S	M	M	S	M	M	S	M	M	S
CO-3	M	S	M	S	M	M	M	S	S	S
CO-4	M	M	S	M	S	M	M	S	S	S
CO-5	S	M	M	S	M	M	S	M	S	S

**S - Strong M - Medium**



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**Elective II: Advanced Database Management System**

**Semester: II**

**Hours: 5**

**Code: 21P2CSE04**

**Credits: 4**

**Course Objectives:**

- To describe a sound introduction to the discipline of database management systems.
- To enhance knowledge to advanced SQL.
- To demonstrate the principles OODBMS
- To impart Web databases and internet database systems
- To introduce mobile data bases

**Unit – I**

Advanced Data Modeling - Advanced SQL - Database design.

**Unit – II**

Advanced Database concepts: Transaction management and concurrency control - Database performance tuning and query optimization, distributed database management systems.

**Unit – III**

Object Oriented Databases – Introduction – Evolution of object oriented concepts- Object Oriented Concepts – Characteristics of an Object Oriented Data models – OODM and previous models -OODBMS – How Object Orientation affects Database Design – Advantages and Disadvantages of OODBMS. Databases in Electronic Commerce.

**Unit –IV**

Web databases: Internet technologies and databases - Uses of internet databases - Web to database Middleware - Server side Extensions – The web browser - Internet database systems : special considerations - Database Administration.

**Unit – V**

Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Spatial Databases.



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**Text Books:**

1. Peter Rob and Carlos Coronel, “Database Systems – Design, Implementation and Management” , Cengage Learning, 7<sup>th</sup> Edition, 2007
2. Peter Rob and Carlos Coronel, “Database Systems Design, Implementation and Management”, Thompson Learning, Course Technology, 5th Edition, 2003.
3. Ramez Elmasri, Shamkant B.Navathe, “Fundamentals of Database Systems” ,Pearson Education

**Reference Books:**

1. Thomas M. Connolly, Carolyn E. Begg, “Database Systems – A Practical Approach to Design , Implementation , and Management”, Third Edition , Pearson Education, 2003.
2. Gary W. Hansen and James V. Hansen, “Database Management and Design”, Prentice Hall of India Pvt. Ltd, 1999.

CO. Number	Course Outcome	Knowledge Level
CO-1	Able to describe the discipline of database management systems.	K1,K2
CO-2	Enhanced knowledge in advanced SQL.	K3
CO-3	Able to demonstrate the principles OODBMS	K1,K3
CO-4	Be familiar Web databases and internet database systems	K4
CO-5	Experimenting in mobile data bases	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	M	S	M	M	M	S	S	M
CO-2	M	S	M	M	S	S	M	M	M	M
CO-3	S	M	S	M	S	S	S	M	M	S
CO-4	M	S	S	M	S	M	M	M	S	S
CO-5	S	M	S	S	M	S	M	M	S	M

**S - Strong M - Medium**



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**ELECTIVE II: Software Testing**

**Semester: II**  
**Code: 21P2CSE05**

**Hours: 5**  
**Credits: 4**

**Course Objectives:**

- To introduce the basic concepts of software testing
- To understand the principles of testing
- To introduce the types of testing
- To understand software life-cycle
- To know testing techniques, test design, test management and Know the tools supports testing

**Unit - I**

**Principles of testing:** Context of Testing in Producing Software - Test in Time - Test the Tests First. **Software Development Life Cycle Models:** Phases of Software Project – Quality, Quality Assurance and Quality Control – Testing, Verification and Validation - Life Cycle Models. **Types of Testing:** White Box Testing - Black Box Testing.

**Unit – II**

**Types of testing:** Integration Testing -System and Acceptance Testing - Performance Testing.

**Unit - III**

Regression Testing - Ad hoc Testing - Usability and Accessibility Testing - Test Planning, Management, Execution and Reporting.

**Unit - IV**

**Testing of object-oriented systems** - Organization Structures for Testing Teams: Dimensions of Organization Structures - Structures in Single Product Companies - Structures for Multi Product Companies. Test Metrics and Measurements.

**Unit - V**

**Software Test Automation:** Test Automation – Terms Used in Automation – Skills Needed for Automation - Scope of Automation -Design and Architecture for Automation- Generic Requirements for Test Tool/ Framework - Selecting a Testing Tool - Automation for Extreme Programming Model.



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**Text Book:**

1. Srinivasan Desikan and Gopalasamy Ramesh, “Software Testing for Principles and Practices”, Pearson Education, South Asia, 2006.

**Reference Book:**

1. Marine L.Hutcheson, “Software Testing Fundamentals”, Wiley Dreamtech, New Delhi, 2003.

CO. Number	Course Outcome	Knowledge Level
CO-1	Remembering the fundamental concepts and understanding the testing.	K1,K2
CO-2	Determining the principles of software testing	K3
CO-3	Able to explain and implement types of testing	K4
CO-4	Able to organizing how to test throughout the software life-cycle.	K1,k4
CO-5	Explaining the static test techniques, test design, test measuring and know the tools supports testing	K2,k5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	M	S	M	S	M	S	S	M
CO-2	M	S	M	M	S	S	M	M	M	M
CO-3	S	M	S	M	M	S	S	M	M	S
CO-4	M	S	M	M	S	M	S	M	S	S
CO-5	S	M	S	S	M	S	M	S	S	M

**S - Strong M - Medium**





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**ELECTIVE II: Graph Theory**

**Semester: II**

**Hours: 5**

**Code: 21P2CSE06**

**Credits: 4**

**Course Objectives:**

- To understand different types of graphs.
- To know fundamental circuits and cut sets
- Able to understand different types of matrices
- Understand spanning tree
- To understand various types of algorithms

**Unit - I**

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits – Connectedness – Components – Euler Graphs – Hamiltonian Paths and Circuits – Trees – Properties of trees – Distance and Centers in Tree – Rooted and Binary Trees.

**Unit - II**

Spanning trees – Fundamental Circuits – Spanning Trees in a Weighted Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and Separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and Geometric Graphs – Planer Graphs – Different Representation of a Planer Graph.

**Unit- III**

Incidence matrix – Submatrices – Circuit Matrix – Path Matrix – Adjacency Matrix – Chromatic Number – Chromatic partitioning – Chromatic polynomial - Matching - Covering – Four Color Problem – Directed Graphs – Types of Directed Graphs – Digraphs and Binary Relations – Directed Paths and Connectedness – Euler Graphs – Adjacency Matrix of a Digraph.

**Unit -IV**

Algorithms: Connectedness and Components – Spanning tree – Finding all Spanning Trees of a Graph – Set of Fundamental Circuits – Cut Vertices and Separability – Directed Circuits.

**Unit-V**

Algorithms: Shortest Path Algorithm – DFS – Planarity Testing – Isomorphism



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**Text Book:**

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, PHI, 2003.

**Reference Book:**

1. R.J. Wilson, “Introduction to Graph Theory”, Fourth Edition, Pearson Education, 2003.

CO Number	Course Outcome	Knowledge Level
CO-1	Remembering how to Solve problems using basic graph theory.	K1,K3
CO-2	Identify and determining the induced subgraphs, cliques, matchings, covers in graphs.	K2,K4
CO-3	Solve problems involving vertex and extending the edge connectivity	K5
CO-4	Able to illustrate the planarity and crossing numbers.	K2
CO-5	Solve problems involving vertex and edge coloring, Reviewing the Model real world problems using graph theory	K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	S	M	S	M	S	M	M	M
CO-2	M	M	S	S	M	M	S	M	M	M
CO-3	M	S	M	S	M	S	M	S	M	S
CO-4	S	M	M	S	M	M	S	S	M	S
CO-5	M	S	S	M	M	S	S	M	S	M

**S - Strong M - Medium**



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**Elective - III : Bioinformatics**

**Semester: III**

**Hours: 4**

**Code: 21P3CSE07**

**Credits: 4**

**Course Objectives:**

- To give students an introduction to the basic practical techniques of bioinformatics.
- Emphasis will be given to the application of bioinformatics
- To know biological databases to problem solving in real research problems.
- The students will become familiar with the use of a wide variety of internet applications, biological database
- Will be able to apply these methods to research problems.

**Unit-I**

Bioinformatics - Definition - Biological & Specialized Databases - Nucleic acid sequence databases: GenBank, EMBL, DDBJ - Protein sequence databases: SWISS-PROT, TrEMBL, PIR\_PSD - Genome Databases at NCBI, EBI, TIGR, SANGER - Virtual Library.

**Unit-II**

Bioinformatics servers - NCBI - EBI - GENOMENET - Bibliographic resources and literature databases - PUBMED, MEDLINE, AGRICOLA - Database Searching techniques - ENTREZ - Data Mining - techniques & tools - Data Warehousing - Top Down & Bottom up approaches.

**Unit-III**

Sequence patterns & representation - consensus, regular expression, contigs, motifs and blocks - Sequence Analysis - FASTA - BLAST - Scoring matrices - PAM and BLOSUM - Pairwise alignments - Multiple sequence alignments - CLUSTALW and Pileup - dendrograms and its interpretation.

**Unit-IV**

Phylogenetic analysis - taxonomy and phylogeny - molecular evolution - Data used in Taxonomy and Phylogeny - Phylogenetic trees - Definition and description - types of trees - tree construction - tree analysis - homologous - orthologous - paralogous - Phylip and phylogenetic analysis.

**Unit-V**

Application of Bioinformatics - Drug designing - Drug discovery cycle - Role of



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Bioinformatics in drug design - Target identification - lead discovery - Structure-based drug design - Modeling of target- small molecule interactions.

**Text books:**

1. Attwood, T.K. and Parrysmith, D.J, Introduction to Bioinformatics. Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2001.
2. Mani, K. and Vijayaraj, N ,Bioinformatics - A practical approach. Aparna Publications, New Delhi, 2004.
3. Harshawardhan Bal - Bioinformatics - Principles and Applications, 1st Edition 2005, TMH, New Delhi.

**Reference books:**

1. Bryan Bergersen, M.D. 2003. Bioinformatics computing. Pearson Education (Singapore) Pvt. Ltd., New Delhi.
2. Rastogi, S.C., Menderatta, M. and Rastogi, P. 2004. Bioinformatics - concepts, skills and applications, CBS Publishers & Distributors, New Delhi.

CO. Number	Course Outcome	Knowledge Level
CO-1	The students will be able to describe the contents and properties of the most important bioinformatics databases	K1,K2
CO-2	Performs text- and sequence-based searches	K3
CO-3	Able to explain the major steps in pair wise and multiple sequence alignment	K2,K4
CO-4	Understands data used in Bioinformatics	K2
CO-5	Experimenting the applications of Bioinformatics	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO										
CO-1	M	M	S	S	S	M	M	S	S	M
CO-2	S	M	M	S	M	M	S	M	M	S
CO-3	M	S	M	S	M	M	M	S	S	S
CO-4	M	M	S	M	S	M	M	S	S	S
CO-5	S	M	M	S	M	M	S	M	S	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science  
**Elective III: Digital Image Processing**

**Semester: III**  
**Code: 21P3CSE08**

**Hours: 4**  
**Credits: 4**

**Course Objectives:**

- To study the image fundamentals and mathematical transforms necessary for image processing
- To study the image enhancement techniques
- To study on image segmentation techniques
- To study image restoration procedures.
- To study the image compression procedures.

**Unit – I**

Introduction: What is Digital Image Processing? – Examples of Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image processing System – Digital Image Fundamentals: Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image sensing and Acquisition – Image Sampling and Quantization – Some Basic Relationships between Pixels.

**Unit – II**

The Image, its Mathematical Background: Overview – Linear Integral Transforms. Data Structures for Image Analysis: Level of Image Data Representation – Traditional Image Data Structures – Hierarchical Data structures. Image Pre-processing: Pixel Brightness Transformations - Geometric transformations – Local pre-processing: Image smoothing, Edge Detectors – Image Restoration.

**Unit – III**

Segmentation: Thresholding – Edge Based Segmentation: Edge Image Thresholding, Border tracing - Region Based Segmentation – Matching – Shape Representation and Description: Region Identification – Contour Based Shape Representation and Description- Chain codes, Simple Geometric Border Representation - Region Based Shape Representation and Description, Simple Scalar Region Descriptors.

**Unit – IV**

Object recognition: Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Fuzzy Systems- Mathematical Morphology – Basic Morphological concepts – Binary Dilation and Erosion.



Selvam Arts and Science College (Autonomous), Namakkal  
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**Unit – V**

Image Data Compression: Image Data Properties – Discrete Image Transforms in Image Data Compression – Predictive Compression Methods – Vector Quantization – Hierarchical and Progressive Compression Methods – Comparison of Compression Methods – Coding –JPEG Image Compression.

**Text Books:**

1. Rafael C. Gonzalez, Richard E.Woods, “Digital Image Processing”, Prentice Hall, Third Edition, 2008..
2. Sonka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning, 2009

**Reference Books:**

1. Anil.K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall, 1989.
2. Chanda & Majumdar, “Digital Image Processing and Analysis”, Prentice Hall ,3rd Edition.

CO Number	Course Outcomes	Knowledge Level
CO-1	Review the fundamental concepts of a digital image processing system	K1,K2
CO-2	Analyze images in the frequency domain using various transforms	K4
CO-3	Evaluate the techniques for image enhancement and image restoration	K5
CO-4	Categorize various compression techniques	K3,K4
CO-5	Interpret Image compression standards and representation techniques	K2,K3

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	S	S	S	M	M	S	S	M
CO-2	S	M	M	S	M	S	S	M	M	S
CO-3	S	S	M	S	M	S	M	S	S	S
CO-4	M	M	S	M	S	M	M	S	S	S
CO-5	S	M	M	S	M	M	S	M	S	S

**S - Strong M - Medium**



Selvam Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science  
**Elective III: Augmented Reality**

**Semester: III**  
**Code: 21P3CSE09**

**Hours: 4**  
**Credits: 4**

**Objectives:**

- To make students know the basic concept and framework of augmented reality.
- Learn in detail on tracking techniques
- To teach students the principles and multidisciplinary features of augmented reality.
- To teach camera calibration to students
- To teach students the technology for managing large scale environment in real time.

**Unit-I**

**Introduction to Augmented Reality:** Definition and Scope -A Brief History of Augmented Reality –Examples - Related Fields. **Displays:** Multimodal Displays -Visual Perception -Requirements and Characteristics.

**Unit-II**

**Tracking:** Tracking, Calibration, and Registration -Coordinate Systems - Characteristics of Tracking Technology- Stationary Tracking Systems- Mobile Sensors- Optical Tracking- Sensor Fusion

**Unit-III**

**Computer Vision for Augmented Reality:** Marker Tracking- Multiple-Camera Infrared Tracking- Natural Feature Tracking by Detection- Incremental Tracking- Simultaneous Localization and Mapping- Outdoor Tracking.

**Unit-IV**

**Calibration and Registration:** Camera Calibration- Display Calibration- Registration. **Visual Coherence:** Registration -Occlusion- Photometric Registration- Common Illumination-Diminished Reality-Camera Simulation

**Unit-V**

**Situated Visualization:** Challenges- Visualization Registration- Annotations and Labeling. **Interaction:** Output Modalities- Input Modalities- Tangible Interfaces- Multi-view Interfaces

**Text Book:**

1. Dieter Schmalstieg, Tobias Hollerer, “Principles and Practice: Augmented Reality” Addison Wesley,2016.



## Selvam Arts and Science College (Autonomous), Namakkal

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#### References:

1. Sherman, William R. and Alan B. Craig, "Understanding Virtual Reality – Interface, Application, and Design", Morgan Kaufmann, 2002.
2. Fei GAO, "Design and Development of Virtual Reality Application System", Tsinghua Press, March 2012.

CO Number	Course Outcomes	Knowledge Level
CO-1	Analyse the components of AR systems	K4
CO-2	Assess and compare technologies in the context of AR systems design .	K2,K5
CO-3	Develop novel interaction schemes by integrating appropriate technologies	K3
CO-4	Be familiar with the literature in AR	K1,K2
CO-5	Building of the virtual environment and modalities of interaction and modeling.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	S	S	S	M	M	S	S	M
CO-2	S	M	S	S	M	S	S	M	M	S
CO-3	M	S	M	S	S	S	M	S	M	S
CO-4	M	M	S	M	S	M	S	S	S	M
CO-5	S	S	M	S	M	M	S	M	S	S

**S - Strong M - Medium**





Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science  
CORE ELECTIVE - IV: Blockchain Technologies

Semester: IV

Hours: 5

Code: 21P4CSE10

Credits: 4

### Objectives

- To provide understanding of distributed systems function of Blockchain
- To understand Decentralization techniques and applications using blockchain
- To provide knowledge on Cryptographic techniques and algorithms
- To familiarize on Crypto currency and Bitcoin Payments
- To learn about difficulties, limitations, privacy and development of alternative digital coins

#### Unit I:

**Blockchain: Distributed systems:** CAP Theorem – Byzantine Generals Problem – Consensus. **The history of blockchain:** Electronic Cash. **Introduction to blockchain:** Various technical definitions of blockchains – Generic elements of a blockchain – Features of a Blockchain – Applications of Blockchain technology – Tiers of blockchain technology. **Types of blockchain:** Public blockchains – Private blockchains – Semi-private blockchains – Sidechains – Permissioned ledger – Distributed ledger – Shared ledger – Fully private and proprietary blockchains – Tokenized blockchains – Tokenless blockchains – Consensus in blockchain - CAP theorem and blockchain-Benefits and limitations of blockchain.

#### Unit II:

**Decentralization:** Decentralization using blockchain - Methods of decentralization – Routes to decentralization - Blockchain and full ecosystem decentralization- Smart contract - Decentralized organizations- Decentralized autonomous organizations -Decentralized autonomous corporations - Decentralized autonomous societies- Decentralized applications-Platforms for Decentralization. **Cryptography and Technical Foundations:** Introduction – Mathematics - Cryptography - Confidentiality - Integrity – Authentication - Cryptographic primitives – Asymmetric Cryptography.

#### Unit III:

**Cryptography and Technical Foundations : Public and private keys:** RSA – Encryption and decryption using RSA – Elliptic Curve Cryptography (ECC) - Discrete logarithm problem – How to generate public and private key pairs – how to encrypt and decrypt using RSA with OpenSSL – ECC Using OpenSSL – Cryptographic primitives- Hash functions - Elliptic Curve Digital signature algorithm (ECDSA).

#### Unit IV:

**Bitcoin:** Bitcoin definition - Transactions - The transaction life cycle - The transaction structure - Types of transaction. **Blockchain:** The structure of a block -The structure of a block header -The genesis block - The bitcoin network -Wallets. **Bitcoin payments:** Bitcoin investment and buying and selling bitcoins - Bitcoin installation- Bitcoin programming and the command-line interface - Bitcoin improvement proposals (BIPs).



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**Unit V:**

**Alternative Coins:** Theoretical foundations - Alternatives to Proof of Work – Difficulty Adjustment and retargeting algorithms. Bitcoin limitations - Privacy and anonymity - Extended protocols on top of bitcoin - Development of altcoins - Namecoin - Litecoin -Primecoin – Zcash.

**Text book:**

1. Imran Bashir, “Mastering Blockchain Distributed ledgers, decentralization and smart contracts”, Packt Publishing 2017

**Reference Book:**

1. Arvind Narayanan, Joseph Bonneau, “Bitcoin and cryptocurrency technologies: a comprehensive introduction”, Princeton University Press, 2016.

CO. Number	Course Outcome	Knowledge Level
CO-1	Understanding distributed system functions of Blockchain	K2,K3
CO-2	Implementing Decentralization techniques and applications using blockchain	K4
CO-3	Examining and Experimenting Cryptographic techniques and algorithms	K3,K5
CO-4	Understanding and Summarizing Crypto currency and Bitcoin Payments	K2
CO-5	Experimenting and Predicting difficulties, limitations, privacy and development of alternative digital coins	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	S	M	S	M	S	M	M	S
CO-2	M	M	S	S	M	S	S	M	S	S
CO-3	S	M	S	S	M	M	S	M	S	M
CO-4	S	S	M	S	S	S	S	M	S	S
CO-5	M	S	M	S	M	S	M	S	M	S

S - Strong M - Medium



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science

M.Sc -Computer Science  
**Extra Disciplinary Courses**

**Fundamentals of Computers and Communication**

**Semester: II**

**Hours: 5**

**Code: 21P2CSED01**

**Credits: 4**

**Objectives:**

- Understanding the concept of input and output devices of Computers
- Learn the functional units and classify types of computers, how they process information
- To know how individual computers interact with other computing systems and devices.
- Understand an operating system and its working, and solve common problems related to operating systems Learn basic word processing, Spreadsheet and Presentation.
- Study to use the Internet and Database management.

**Unit I**

Introduction : What is Computer ?– Components of a Computer – Computer Software – Categories of Computers . The Components of the systems Unit : System Unit- Processor – Memory . Input : What is input? – What are input devices – keyboard- mouse - Scanners and Reading Devices – Biometric input. Output: What is output? – Display devices – Flat panel Displays – Printers.

**Unit II**

Operating Systems and Utility programs : System Software – Operating Systems – Operating System Functions-Operating System Utility Programs- Types of Operating Systems –Stand Alone Operating Systems – Network Operating Systems – Embedded Operating System - Stand Alone Utility Programs.

**Unit III**

Using Word : Learning Word Basics- Formatting a Word Document. Using Excel : Creating a simple spreadsheet – Working with functions and formulas- Creating Charts. Using Powerpoint : Creating and Viewing Presentations.

**Unit IV**

Internet and World Wide Web : Internet – How the internet works – WWW- E-Commerce – Other Internet Services – Communications and Networks : Communications – Uses of Computer communications – Networks – Communication over the telephone



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network – Communication devices – Home networks.

**Unit V**

Database Management : Databases , data and information - The hierarchy of data – Maintaining data – File processing versus databases – database management systems – relational , object oriented and multidimensional databases – web databases – data base administration .

**Text Book:**

1. Gary B.Shelly, Thomas J. Cashman, Misty E.Vermaat – Introduction to Computers –Cengage Learning , 2008 (Unit- I,II,IV & V)
2. Diane Koers, “Microsoft Office XP fast & easy”, PHI, 2001. (Unit - III)

**Reference Books:**

1. “Understanding Computers – Today and Tomorrow “, Deborah Morely, Charles S.Parker, 11<sup>th</sup> Edition , Thomson Course Technology
2. “Fundamentals of Computer Science and Communication Engineering”, Alexis Leon,Mathew’s Leon, Vikas Publishing House, New Delhi , 1998.

CO. Number	Course Outcome	Knowledge Level
CO-1	Remembering the components of a computer and computer software	K1
CO-2	Understand Input devices and output devices.	K2
CO-3	Ability to analyze operating systems and utility programs	K4
CO-4	Testing and implementing the use Word Document and PowerPoint presentations with animation effects for project purpose	K3,K5
CO-5	Able to create and maintain database applications	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	M	S	S	M	M	S	M	S	M
CO-2	M	M	S	M	M	M	S	S	S	M
CO-3	S	M	M	M	S	S	M	S	M	M
CO-4	M	S	M	S	S	M	S	M	S	S
CO-5	S	M	S	M	M	S	S	M	S	S

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
Department of Computer Science  
M.Sc -Computer Science

**Extra Disciplinary Courses**  
**Principles of Information Technology**

**Semester: II**

**Hours: 5**

**Code: 21P2CSED02**

**Credits: 4**

**Course Objectives**

- Able to know Business and Information Technology in the Modern Organization
- Understands the significance of Hardware, input and output technology, System Software
- Able to understand networks, telecommunication applications and Internet Evolution
- To know about Inter- organizational systems.
- Able to know the Information Systems Development

**Unit – I**

Business Environment : Business and Information Technology – business in the information age – about information technology – what is an information system – Information Technology in the Modern Organization.

**Unit – II**

Computer Hardware – Significance of Hardware – Central Processing Unit – Computer Memory – Computer Hierarchy – Input Technologies – Output Technologies – Strategic Hardware issues – Computer Software: Software History and Significance – System Software – Application software – Software issues – Programming languages – Enterprise Software

**Unit – III**

Managing Organizational Data and Information : Basics of data arrangement and Access – Traditional file environment – modern approach: database management systems – logical data models – data warehouses – Telecommunication and networks – The telecommunication system – networks – telecommunication applications – Internet Evolution of the internet – Operation of the internet – WWW – Intranets and Extranets.

**Unit – IV**

Functional , Enterprises and Inter organizational systems: Information system to support business functions – transaction processing information systems – accounting and finance system – marketing and sales system – production and operations management system –



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Integrated information system and enterprises resource planning – inter organizational – Global information system – Electronic Commerce.

**Unit – V**

Information Systems Development : Information system planning – Traditional systems development life cycle – alternative methods for system development – system development outside the IS department – building Internet and Intranet applications – Implementing :Ethics,Impacts and Security.

**Text Book:**

1.Turban, Rainer, Potter ,” Introduction to Information Technology” , Second Edition ,Wiley India , 2007

**Reference Book:**

1. V.Rajaraman ,” Introduction to Information Technology”, Prentice Hall of India.

CO. Number	Course Outcome	Knowledge Level
CO-1	Remembering the Business and Information Technology in the Modern Organization and Significance of Hardware, input and output technology	K1
CO-2	Understanding how to Manage Organizational Data and assessing the information.	K2,K5
CO-3	Able to understand networks, telecommunication applications and Internet evolution of the internet and executing operation of the internet, Intranets and Extranets.	K2,K3
CO-4	Describes Inter- organizational systems.	K4
CO-5	Collaborating the information systems development	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	M	M	M	S	S	M	S	M	S	M
CO-2	M	S	S	S	M	M	M	M	S	M
CO-3	M	M	M	S	S	S	S	M	M	S
CO-4	M	M	S	S	M	M	S	M	M	S
CO-5	S	M	S	M	M	S	M	S	S	M

**S - Strong M - Medium**



Selvamm Arts and Science College (Autonomous), Namakkal  
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### **Extra Disciplinary Courses**

#### **E-Commerce**

**Semester: II**  
**Code: 21P2CSED03**

**Hours: 5**  
**Credits: 4**

#### **Course Objectives:**

- Understand the components and roles of the Electronic Commerce environment.
- Able to know how businesses sell products and services on the Web,
- Understands E-Commerce payment systems,
- Able to identify and reach customers on the Web
- Understands Web marketing approaches and elements of branding.

#### **Unit -I**

Electronic Commerce – Electronic Commerce Framework – The Anatomy of Electronic Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce organization Applications – Components of 1-Way – Network Access Equipment.

#### **Unit - II**

Architecture Framework for Electronic Commerce – World Wide Web as the Architecture – Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumer’s Perspective and Merchant’s Perspective.

#### **Unit - III**

Electronic Payment Systems : Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Smart Card and Credit Card based Electronic payment systems – Risk and Electronic Payment systems – Designing Electronic Payment Systems

#### **Unit - IV**

Electronic Data Interchange – EDI Applications in Business – EDI : Legal, Security and privacy issues and Electronic Commerce – Standardization and EDI – EDI Software Implementation.

#### **Unit - V**

Internet and World Wide Web: Origin of the Internet – New uses for the Internet – Commercial use of the Internet - Growth of the Internet – Advertising on the Internet.



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**Text Books:**

1. Kalakota and Whinston , “Frontiers of Electronic Commerce”, Pearson Education.
2. Gray P.Scheider, “Fourth Annual Edition Electronic Commerce” , Thomson Course Technology - 2003.

**Reference Book:**

1. Kamalesh K.Bajaj, Debjani Nag, “E-Commerce - The Cutting Edge of Business” , TMH Publications , 2005.

CO. Number	Course Outcome	Knowledge Level
CO-1	Explain the components and understanding the roles of the Electronic Commerce environment.	K1,K2
CO-2	Highlighting the businesses sell products and services on the Web	K1
CO-3	Able to describe the qualities of an effective Web business presence.	K5
CO-4	Understand and collaborating the E-Commerce payment systems	K2
CO-5	Analyze web marketing approaches and organizing the elements of branding	K3,K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

The mapping of course outcomes with programme outcomes is tabulated as follows

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1	S	S	M	S	S	M	S	M	S	M
CO-2	M	S	S	M	M	S	S	M	S	M
CO-3	S	M	M	M	S	M	S	M	M	S
CO-4	M	S	M	S	M	M	M	S	M	M
CO-5	S	M	S	M	S	S	S	M	M	S

**S - Strong M - Medium**



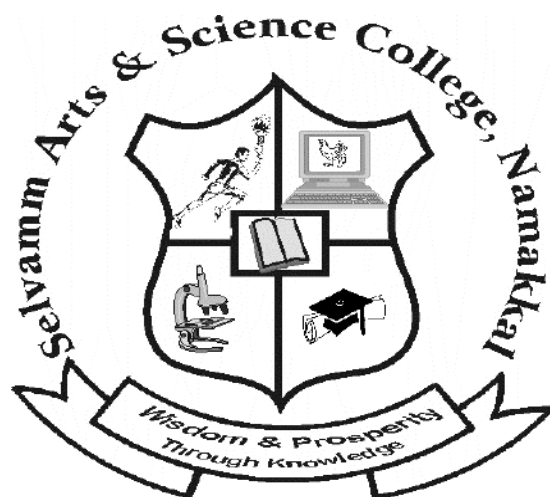
**SELVAMM ARTS AND SCIENCE COLLEGE  
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**Affiliated to Periyar University (Salem)**

**NAMAKKAL-637 003**



**M.Sc. ELECTRONICS AND COMMUNICATION**

**Syllabus and Regulations**

**Under Choice Based Credit System (CBCS)**

**(Effect from 2021-2022)**

# **M. Sc. ELECTRONICS AND COMMUNICATION**

## **Regulations**

### **Effect from 2021-2022**

#### **1. CONDITION FOR ADMISSION**

A candidate who have passed B.Sc. Electronics and Communication/B.Sc (Electronics) / B.Sc (Physics) / B.Sc (Instrumentation) /B.Sc. (Industrial Electronics). / B.Sc (Biomedical Instrumentation) / B.Sc. (Computer Science) / B.Sc. Information Science/ B.C.A. degree of this University or any of the above degree of any other university accepted by the syndicate as equivalent there to, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc Electronics and Communication degree examination of this university after a course of study of two academic years.

#### **2. DURATION OF THE COURSE:**

The course for the degree of Master of Electronics and Communication shall consist of two academic years divided in to four semesters. Each semester consist of 90 working days.

#### **3. COURSE OF STUDY**

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

#### **4. EXAMINATIONS**

The examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. Extra Disciplinary Course (EDC) is introduced in the second semester. The Students should select any one EDC paper offered by other departments. Practical examinations for PG course should be conduct

at the end of the odd/ even semester. At the end of fourth semester viva-voce will be conducted on the basis of the dissertation / project report submitted by the student. The Viva – voce will be conducted by one internal and one external examiner jointly.

## **5. SCHEME OF EXAMINATIONS**

The scheme of examinations under CBCS (Choice Based credit System) for different semesters shall be as follows.

### **QUESTION PAPER**

Theory-Question Paper Pattern [EA] (Total Marks: 75)

PART – A (10x 1 = 10Marks)

(Answer ALL questions)

PART – B (5x 5 = 25 Marks)

(Answer ALL questions) & either is choice)

PART – D (5x 8 = 40 Marks)

(Answer ALL questions) & either is choice)

Theory Internal Mark Distribution [CIA] (Total Marks: 25)

- Seminar :5 Marks
- Assignment :5 Marks
- Internal Examinations :15 Marks

## **7. Project & Viva Voce (100 Marks)**

### **a. Topic**

The topic of the dissertation shall be assigned to the candidate before the end of first semester and a copy of the same should be submitted to the University for Approval.

### **b. Advisory committee**

Each guide shall have a maximum of five students in science and maximum of seven for all Arts subjects. There will be an advisory committee consisting of the guide as chairman and one member from the same department or allied departments of the college and a third member should be from other college preferably from Aided / Government colleges in the case of self financing college and vice – versa.

**c. Plan of work**

The student should prepare a plan of work for the dissertation, get the approval of the advisory committee and should be submitted to the university during the second semester of their study. In case the student wants to avail the facility from other University / Laboratory, they will undertake the work with the permission of the guide and acknowledge the alien facilities utilized by them. The duration of the dissertation research shall be a minimum of three months in the fourth semester.

**d. Dissertation workout side the college of study**

In case the student stays away for work from the college for more than one month, specific approval of the University should be obtained.

**e. No. of Copies/ Distribution of Dissertation**

The students should prepare three copies of dissertation and submit the same for the evaluation by examiners. After evaluation one copy is to be retained in the college library and one copy is to be submitted to the University (Registrar) and one copy can be held by the student.

**f. Format to be followed**

The formats / certificate for dissertation to be submitted by the students are given below:

Format for the preparation of project work:

- a. Title page
- b. Bonafide certificate
- c. Acknowledgement
- d. Table of content

## CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
1	Introduction	
2	Review of literature	
3	Materials and methods	
4	Results	
5	Discussion	
6	Summary	
7	Reference	

### FORMAT OF THE TITLE PAGE:

#### TITLE OF THE PROJECT

Dissertation submitted in part fulfillment of the requirement for the degree Master Of Science in Electronics & Communication to the Selvamm Arts & Science College (Autonomous), Namakkal-637003.

By

Student Name :

Register Number :

Department :

Year :

Format of the certificate:

CERTIFICATE

This to certify that the Project work entitled.....Submitted in part fulfillment of the requirement degree of Master of Science in Electronics&Communication to the Selvamm Arts &Science College(Autonomous), Namakkal it is Affiliated to Periyar University, Salem is a record of bonafide research work carried out by.....under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part of full in any scientific or popular journals or magazines.

Date:

Place:

Chairman, Advisory Committee.....

Approved by

Chairman:

Members:

- 1.
- 2.

External Examiner

Guidelines for approval of PG guides for guiding students in their research for submitting dissertation.

1. M.Sc. / M.A. (Part fulfillment) Guide:

The person seeking for recognition as guide should have.

- M.Phil / M.A/ M.Sc degree with first class / second class
- Should have 3 years of active teaching / research experience.

2. They should have published at least one research paper in a National journal authored solely or jointly. Procedure for submitting application for approval as guides

- a. The University will on request give prescribed application form.
- b. The filled in applications should be submitted before the close of said date by the University.
- c. All such applications should be routed through the Principal of their respective institutions with specific recommendations.
- d. All relevant proofs should be submitted along with the applications.

### 3. Approval

The committee constituted for the purpose will scrutinize the applications and recommend for approval / rejection. Orders will then be passed by the authority of the university and communicated to each member individually through the Principal.

## **8. REGULATIONS OF PROJECT WORK**

- a. Students should do their three months Project work in Company / Institutions.
- b. The Candidate should submit the format which includes the topic of the dissertaton, and the same should be submitted Department for approval.
- c. Each internal guide shall have maximum of FIVE Students.
- d. Periodically the project should be reviewed minimum three times by the advisory Committee consisting of guide and one member from the same department and the third member (Minimum five years experience) should be from other institution /organization
- e. The Students should use OHP / Power Point Presentation during their Project Viva Voce Examinations.

## **9. PASSING MINIMUM**

The candidate shall be declared to have passed the examination if the candidate secures not less than 50% marks in the Board examination in each paper / practical. However Submission of a record notebook is a must. For the project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should compulsorily attend viva-voce examination to secure pass in that paper.

## **10. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class. All other

successful candidates shall be declared to have passed in Second Class. Candidates who

obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance. Candidates who pass all the examinations prescribed for the course in

first instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.

These regulations shall take effect from the academic year 2019-20 i.e., for students who are to be admitted to the first year of the course during the academic year 2019-20 and thereafter.

## **11. TRANSITORY PROVISION**

Candidates who were admitted to the PG course of study before 2012-2013 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2015. Thereafter, there will be permitted to appear for the examination only under the regulations then in force.

## **12. OBJECTIVES**

1. The syllabus of M.Sc., Electronics and Communication is enriched and necessary changes have been made in the course pattern and papers. This will enable the students to acquire through knowledge both in theory and practical.
2. Since, the course is paraprofessional enough practical training is necessary when the student goes to industries. Hence at the end of every semester the practical papers are included in the syllabus to meet out this demand.
3. After successful completion of this course a student can pursue higher engineering courses like M.E / M.Tech /M.S with good GATE Score.

The thrust in given is the curriculum by considering various recent developments in Electronics & Communication, Bio-medical Instruments and Networking. This exposure will make the students to be eligible for service .



## **Vision**

To be recognized by the society at large as a full- fledged department, offering quality higher education in the Electronics and Communication Engineering field with research focus catering to the needs of the public and staying in tune with the advancing technological revolution and challenging cultural changes.

## **Mission**

Establish a unique learning environment to enable the students to face the challenges of the Electronics and Communication Engineering field. Promote the establishment of centers of excellence in niche technology areas to nurture the spirit of innovation and creativity among faculty and students.

## **Programme Outcomes (POs)**

- PO 1: Application :** Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
- PO 2: Analysis:** Perform analysis to assess, interpret, and create innovative ideas through practical experiment.
- PO 3: Solution Finding:** Facilitate to enter multidisciplinary path to solve day-to-day problems.
- PO 4: Progression in Career:** Prepare students for prominent career in industry, banks offices and for further academic study.
- PO 5: Research Capability:** Able to do the experiments with proper procedure, appropriately record and Analyze the results.
- PO 6: Expressing their talents:** Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.
- PO 7: Individual sustainability:** Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
- PO 8: Competency:** Attain competency in job market / entrepreneurship.

**M.Sc. ELECTRONICS AND COMMUNICATION**  
(For the students admitted in the Year 2021-22 Batch onwards)

Sem	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
I	Core Course-I	21P1EL01	Advanced Electronic Circuits	5	5	25	75	100
	Core Course-II	21P1EL02	8051 Microcontroller	5	5	25	75	100
	Core Course-III	21P1EL03	Embedded In 'C'	5	4	25	75	100
	Core Elective-I	21P1ELE01	Tele communication and Fiber optics	5	4	25	75	100
		21P1ELE02	Instrumentation and control systems					
	Core Practical: I	21P1ELP01	Applied Electronics Lab	5	3	40	60	100
	Core Practical: II	21P1ELP02	8051 Microcontroller Lab	5	3	40	60	100
<b>Total</b>				<b>30</b>	<b>24</b>			<b>600</b>
II	Core Course-IV	21P2EL04	Android Development Tools & Application	5	5	25	75	100
	Core Course-V	21P2EL05	Industrial and Power Electronics	5	5	25	75	100
	Core Elective-II	21P2ELE03	Microwave and Radar Communication	4	4	25	75	100
		21P2ELE04	Bio medical Instrumentation					
	EDC	21P2xxxxxx	Extra Disciplinary Course	4	4	25	75	100
	Common	21P2HR01	Human Rights	2	2	25	75	100
	Core Practical: III	21P2ELP03	Android Development Tools & Application Lab	5	2	40	60	100
	Core Practical: IV	21P2ELP04	Industrial and Power Electronics Lab	5	2	40	60	100
	<b>Total</b>				<b>30</b>	<b>24</b>		

Sem	Course	Course Code	Title of the Course	Hrs.	Credit	Internal Mark	External Mark	Total Marks
III	Core Course-VI	21P3EL06	Embedded System Using PIC	5	5	25	75	100
	Core Course-VII	21P3EL07	Automotive Electronics	5	5	25	75	100
	Core Course-VIII	21P3EL08	Programming in JAVA	5	5	25	75	100
	Core Elective: III	21P3ELE05	Advanced Wireless System	5	4	25	75	100
		21P3ELE06	Analysis and Processing of Signals					
	Core Practical V	21P3ELP05	Embedded Systems Lab	5	3	40	60	100
	Core Practical VI	21P3ELP06	JAVA Programming Lab	3	3	25	75	100
	Internship	21P3ELI01	Internship	*	#	-	-	-
Soft Skills	21P3SSS01	Soft Skills	2	1	40	60	100	
<b>Total</b>				<b>30</b>	<b>26</b>			<b>700</b>
IV	Core Course - IX	21P4EL09	VLSI Design and VHDL Programming	6	5	25	75	100
	Core Course - X	21P4EL10	Digital Signal Processing	6	5	25	75	100
	Core Elective - IV	21P4ELE07	Industrial Automation using PLC	5	4	25	75	100
		21P4ELE08	Signal and Systems					
	Core Practical – VII	21P4ELP07	Digital Signal Processing Lab	5	3	40	60	100
	Project Work	21P4ELPR01	Project Work & Viva Voce	8	8	50	150	200
	Extension Activities	21P4EX01	Extension Activities (II & III Semester)	(40)**	1	-	-	-
	<b>TOTAL FOR SEM IV</b>				<b>30</b>	<b>26</b>		
<b>Total</b>				<b>120</b>	<b>100</b>			<b>2600</b>

\*- 15 Days – IV Semester Leave

# - Commended/Highly Commended will be given, based on Reports & Viva Voce Examination.

\*\* - Outside the class hours.

xxxxxx – To choose the corresponding department.

Semester	I	<b>Advanced Electronic Circuits</b>	Hours	5
Course Code	21P1EL01		Credits	5

**Course Objectives:**

- ❖ To learn the basic concepts of Diode circuit analysis.
- ❖ To understand the working principles and characteristics of BJT , FET,
- ❖ To learn the Thyristor and Power Electronics.
- ❖ To study oscillators and power amplifiers using transistor.
- ❖ To learn the Oscillators and Multivibrators

**UNIT – I: DIODE CIRCUIT ANALYSIS**

Diode theory – DC load line analysis – Small Signal analysis – Dynamic Resistance – AC load line analysis – Diode array – Diode capacitance – Schottky diode – Zener Diode – PIN diode – IMPACT diode – Tunnel diode – Gunn diode – Photodiodes – LASER diode.

**UNIT – II: BIPOLAR JUNCTION TRANSISTOR AND FIELD EFFECT TRANSISTOR**

Bipolar junction transistors construction and operation – Transistor biasing –types of configuration – breakdown in transistors – Bias stability – Method of Transistor biasing – Bias compensation - Field Effect transistor – construction – operation –characteristic parameter of JFET - Resistance variation of JFET - Comparison of JFET with BJT. Applications of JFET– MOSFET enhancement and depletion - Comparison of MOSFET with JFET

**UNIT – III: THYRISTORS**

Introduction to Thyristors – construction, characteristics, working principles & Applications of SCR, LASCR, TRIAC, DIAC, SCS, IGBT, UJT and PUT.

## **UNIT - IV: AMPLIFIERS**

Introduction – classification of amplifiers – Single stage amplifiers (CE, CB &CC) – Small signal analysis of single stage BJT amplifiers – FET amplifiers (CS & CD) –classification of amplifiers based on biasing condition ( Class A, Class B, Class C, Push Pull, Complementary Symmetry Push Pull amplifier – Multistage amplifier – Tuned amplifier – RF amplifier – Video amplifier.

## **UNIT – V: OSCILLATORS**

Introduction – Classification and design – Condition for oscillation (Barkhausen Criterion) – LC oscillator – Hartley oscillator – Colpitts oscillator – Tuned Collector oscillator – RC oscillator – Wien Bridge oscillator – Phase Shift oscillator –Crystal oscillator – Frequency stability of oscillators – Multivibrators – Astable, Monostable and Bistable – Schmitt Trigger .

### **TEXT BOOKS:**

1. Allen Mottershead – Electronic Devices and Circuits – Prentice Hall of India Private Ltd, New Delhi. ISBN-81-203-0124-2.
2. S.Salivahanan, N.Suresh Kumar and A.Vallavaraja – Electronic Devices and Circuits - Tata McGraw Hill Publishing Company Ltd, New Delhi.ISBN 0-07-463386-4.

### **REFERENCE BOOKS:**

1. Donald L.Schilling and Charles Belove – Electronic Circuits – 3rd Edition –McGraw Hill International Edition. ISBN 0-07-100602.
2. David A.Bell - Electronic Devices and Circuits - 4rd Edition - Prentice Hall of India. ISBN -81-203-2358-0.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand and analyze about the various diode characteristics and applications.	K2,K4
CO-2	Comprehend the characteristics of various types of rectifiers and analyze the regulations with its applications.	K2,K4
CO-3	Design the transistors and implementing the biasing concepts and study the amplifications with its application	K3,K4
CO-4	Analyze the transistor characteristics, types of amplifiers and the various types of feedback circuits.	K1,K4,K5
CO-5	Develop an ability to differentiate the oscillators and its applications .	K2,K6
<p>*<b>K1</b>: - Knowledge/Remembering;    <b>K2</b>:-Comprehension/Understanding;  <b>K3</b>: - Application/Applying;        <b>K4</b>:-Analysis/Analysing  <b>K5</b>: - Evaluation / Evaluating       <b>K6</b>:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5
COs↓					
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	M	M	S	S	M
CO4	M	S	M	M	S
CO5	S	S	M	S	S

S- Strong

M-Medium

L-Low

Semester	I	<b>8051 Micro Controller</b>	Hours	5
Course Code	21P1EL02		Credits	5

### **Course Objectives:**

- To understand the Embedded system with SoC
- To learn the 8051 and advanced processor architectures of real time applications
- To create 8051 programming and analyzing hardware connections
- To learn Timers, Interrupts, Peripherals
- To learn the real world applications

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### **UNIT I:INTRODUCTION TO EMBEDDED SYSTEM**

Embedded System – Processor Embedded into a System – Embedded Hardware Units and Device in a System - Embedded Software in a System – Example of Embedded System- System On a Chip (Soc) -Complex System Design and Processor - Design Process in Embedded System - Design Process and Design Example - Classification of Embedded System Designer.

### **UNIT II:8051 & ADVANCED PROCESSOR ARCHITECTURES REAL WORLD INTERFACING**

8051 Architecture – Real World Interface- Introduction to Advanced Architecture – Processor and Memory Organization – Performance Memory – Memory - Types Memory - Maps and Address Processor Detector - Memory Selection.

### **UNIT III:8051 PROGRAMMING IN C & HARD WARE CONNECTION**

Data Types and Time Delay in 8051 C - I/O Programming in 8051 C – Logic Operators in 8051 C – Data Conversion Programs in 8051c – Accessing Code ROM Space in 8051C - Data Serialization Using 8051 C - Pin

Description of the 8051 - Design and Test of 8051 Trainer Explaining the INTEL Hex File.

#### **UNIT IV: TIMER, INTERRUPTS & PERIPHERALS**

Programming 8051 Timer – Counter Programming – Basics of Serial Communication – 8051 Connection to RS232 – 8051 Serial Programming in Assembly and C – 8051 Interrupts – Interrupt Priority – Interrupt Programming in C.

#### **UNIT V: REAL WORLD APPLICATIONS**

LCD Interfacing – Keyboard Interfacing – Parallel and Serial ADC Interfacing – DAC Interfacing – Sensor Interfacing and Signal Conditioning – RTC Interfacing – Relays and Opt Isolator Interfacing – Stepper Motor Interfacing - DC Motor Interfacing and PWM – Simple Programs.

#### **TEXT BOOKS:**

1. Embedded System Architecture Programming and Designs – 2<sup>nd</sup> Edition Raj Kamal.
2. “The 8051 Microcontroller and Embedded Systems Using Assembly and C” by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D.
3. McKinlay, PHI, 2nd Edition 2006.

#### **REFERENCE BOOK:**

1. Ayala, Kenneth, “The 8051 Microcontroller”, Upper Saddle River, New Jersey Prentice Hall India, 2000.



**Course outcomes (COs)**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Understand and analyze about the Embedded system and system on chip.	<b>K2,K4</b>
<b>CO-2</b>	Applying Embedded techniques and creating real world applications	<b>K3,K6</b>
<b>CO-3</b>	Ability to write the 8051 c Programming and Analysing hardware circuit connections	<b>K4,K5</b>
<b>CO-4</b>	Understand and analyze peripherals devices	<b>K2</b>
<b>CO-5</b>	Develop an ability to create real world application .	<b>K6</b>
<p><b>*K1:</b> - Knowledge/Remembering; <b>K2:-</b>Comprehension/Understanding;  <b>K3:</b> - Application/Applying; <b>K4:-</b>Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating <b>K6:-</b> Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	PSO1	PSO2	PSO3	PSO4	PSO5
<b>COs↓</b>					
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	M	M	S	S	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S- Strong

M-Medium

L-Low

Semester	I	<b>Embedded C</b>	Hours	5
Course Code	21P1EL03		Credits	4

### **Course Objectives:**

- To Perform effectively as entry level Embedded Systems professionals.
- To understand the software techniques and simulations.
- To create the projects using object oriented programming with C
- To create an Embedded system operating systems.
- To apply the connections to develop interfacing with Embedded systems.
- Develop and maintain applications written using Embedded C.

### **UNIT-I: Embedded systems in C & 8051 microcontroller family**

Introduction -What is an embedded system-The external interface of the Standard 8051-Reset requirements-Clock frequency and performance- Memory issues-I/O pins-Timers-Interrupts-Serial interface-Power consumption

### **UNIT-II: Reading switches**

Introduction--Installing the Keil software and loading the project-Configuring the simulator Building the target Running the simulation-Dissecting the program -Aside: Building the hardware- Basic techniques for reading from port pins- Example: Reading and writing –bytes- The need for pull-up resistors - Dealing with switch bounce.

### **UNIT-III Adding structure &Real Time**

Introduction -Object-oriented programming with C -The Project Header (MAIN.H)- The Port Header (PORT.H)- Creating ‘hardware delays’ using Timer 0 and Timer 1-The need for ‘timeout’ mechanisms - Creating loop timeouts-Creating hardware timeouts

## UNIT-IV Creating an Embedded operating system

Introduction - The basis of a simple embedded OS- Introducing sEOS- Using Timer 0 or Timer 1- Alternative system architectures- Important design considerations when using sEOS -Implementing a Multi-State (Timed) system- Implementing a Multi-State (Input/Timed) system

## UNIT-V Serial interface

Introduction What is RS-232?- The basic RS-232 protocol- Asynchronous data transmission and baud rates -Flow control- The software architecture- Using the on-chip UART for RS-232 communications- Memory requirements.

### TEXT BOOKS:

- 1.Embedded C –Michael J.Pont.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Knowledge to Design and Interfacing using Embedded C	K1
CO-2	Installing and Reading software and create programmes	K3,K6
CO-3	Managing and Creating Programs	K4,K6
CO-4	Creating ,Applying operating systems and connecting serial Interfacing of embedded systems.	K3,K6
CO-5	Design and Interfacing using Embedded C	K6
*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding; K3: - Application/Applying; K4:-Analysis/Analysing K5: - Evaluation / Evaluating K6:- Synthesis / Creating		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	PSO1	PSO2	PSO3	PSO4	PSO5
<b>COs↓</b>					
CO1	S	S	S	S	M
CO2	S	M	S	M	S
CO3	M	S	S	S	S
CO4	S	S	S	S	M
CO5	M	S	M	M	S

S- Strong

M-Medium

L-Low

Semester	I	<b>Elective : I Telecommunication and Fiber Optics</b>	Hours	5
Course Code	21P1ELE01		Credits	4

**Course Objectives:**

- To learn about telecommunication system, and Transmission systems
- To learn the digital switching system, transmission networks, and fiber optic communication.
- To understand the Call Processing techniques and frequency signaling.
- To learn link budget, WDM, solitons and SONET/SDH network.
- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.

**UNIT – I: TELECOMMUNICATION & TRANSMISSION SYSTEMS**

Signal characteristics – Elements of Communication – Switching System – Criteria for Design of Telecommunication System – Types and Advantage of Telecommunication Standards – Telephone System – Characteristics and Limiting Factors of Subscriber Loop Design – Space Division Multiplexing – Frequency Division Multiplexing – Time Division Multiplexing.

**UNIT - II: DIGITAL SWITCHING SYSTEM**

Evaluation of Digital Switching System – Digital Transmission and its Advantages – Digital Signal Encoding Formats – Asynchronous and Synchronous Transmission - Space Division Switching – Time Division Switching – Analog TDS and Digital TDS – Space & Time Switching – Time & Space Switching – STS&TST Switching.

**UNIT – III: CALL PROCESSING**

Basic Steps of Call Processing – Hardware Configuration of Digital Switching System – Software Organization – Early Electronic Switching System (ESS) – Signaling Techniques: Classification in Channel Signaling: DC

Signaling – Multi Frequency AC Signaling – Voice Frequency AC Signaling – PCM Signaling – Common Channel Signaling.

#### **UNIT – IV: TELEPHONE & TRANSMISSION NETWORK ORGANIZATION**

Network Planning – Types of Networks – Numbering Plan – Asynchronous and Synchronous Time Division Multiplexing – Wave Length Division Multiplexing – Dense WDM – Digital Subscriber Line Technology – SONET/SDH: SONET Network Layers – Frame Format – SONET Multiplexing– SONET Topologies – SDH.

#### **UNIT – V: OPTICAL FIBER COMMUNICATION**

A basic fiber optic system – Frequencies – Fiber Optic Cables – Refraction – Numerical Aperture – Graded Index Cables – Single Mode – Multi Mode – Cable Constructions – Cable Losses – Connectors – Light Sources – Light Detector.

#### **TEXT BOOKS:**

1. Robert J Schoen beck “Electronic Communications Modulation and Transmission”, PHI, 1999
2. “Telecommunication Switching and Networks” by P. Gnanasivam, PHI, 2004

#### **REFERENCE BOOK:**

1. W. C. Y. Lee, “Mobile Communication Engineering”, 2<sup>nd</sup> edition, McGraw-Hill, 1998

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Remembering history of wireless communication and small techniques.	K1
CO-2	Understanding and creating multiplexing and demultiplexing, encoding and decoding of different signals.	K2,K6
CO-3	Ability to processing and Applying call with configuration	K4,K6
CO-4	Ability to analysis telephone and transmission network organization	K3,K6
CO-5	They get wide knowledge on fiber optics communication.	K6
<p>*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding;            K3: - Application/Applying; K4:-Analysis/Analysing            K5: - Evaluation / Evaluating K6:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5
COs↓					
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	M	M	S	S	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S- Strong

M-Medium

L-Low

Semester	I	<b>Elective II: Instrumentation and Control Systems</b>	Hours	5
Course Code	21P1ELE02		Credits	4

**Course Objectives:**

- To impart the concept of measurements , transducers and digital instruments
- To understand the basic concepts of Transducer and concepts of control systems.
- To learn time response analysis & design specifications
- To learn Time response analysis and design specifications.
- To acquire knowledge on stability, frequency analysis and compensator.

**UNIT I: QUALITIES OF MEASUREMENTS & DIGITAL INSTRUMENTS**

Introduction – performance characteristics – static characteristics -Error in measurements – Types of Error- sources of errors- Dynamic characteristics -Digital Multimeter – Digital Frequency Meter – Digital Phase Meter – Digital Capacitance Meter

**UNIT II: TRANSDUCER**

Introduction – Electrical transducer-Selecting a transducer- Resistive Transducer- Inductive Transducer – Capacitive Transducer – strain guage- Load Cell- Piezoelectric – Photo Electric Transducers –LVDT – thermo electric transducer

**UNIT III: CONCEPTS OF CONTROL SYSTEM**

Introduction – Open And Closed Loop Systems –Differential equation and Transfer Function of Electrical System – Block Diagram Algebra And Reduction – Signal Flow Graphs – Mason’s Gain Formula – Feedback and Non feedback systems-Control of the effects of disturbance signal by use of feedback



#### **UNIT IV: TIME RESPONSE ANALYSIS & DESIGN SPECIFICATIONS**

Introduction- standard test signals- Step Input Analysis for First and Second Order System – Steady State Error and Error constants –Effect of adding a Zero to a system-Design Specifications of Second order system

#### **UNIT V: STABILITY, FREQUENCY ANALYSIS AND COMPENSATORS:**

Concept of Stability - Routh Hurwitz Criterion – Root Locus Method — Bode Diagrams – Polar Plot.-Cascade and Feedback Compensation -Lag, Lead and Laglead Compensator

#### **Text Books:**

1. .S.Kalsi, “Electronic Instrumentation”, Tata McGraw Hill Education Private Limited, Third Edition, 2010.
2. I.J.Nagrath, M. Gopal “Control System Engineering”, New Age International (P) Ltd Publishers, Fifth Edition, 2008.

#### **References Books:**

- 1.A.K.Sawhney, “A Course in Electrical and Electronic Measurements & Instrumentation”, Dhanpat Rai Publications, 2001.
2. Katsuhiko Ogata, “Modern Control Engineering”, Prentice-Hall of India private Limited, Fourth Edition, 2002.
3. A.Nagoor Kani,” Control Systems”RBA Publications.first edition 1998

**Course outcomes (COs)**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Understanding the principle and working of various sensors and transducers.	<b>K3</b>
<b>CO-2</b>	Able to design signal conditioning circuit for various transducers.	<b>K2,K6</b>
<b>CO-3</b>	Able to identify or choose a transducer for a specific measurement application	<b>K4,K6</b>
<b>CO-4</b>	Ability to analysis stability of control system	<b>K4</b>
<p><b>*K1:</b> - Knowledge/Remembering; <b>K2:-</b>Comprehension/Understanding;  <b>K3:</b> - Application/Applying; <b>K4:-</b>Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating <b>K6:-</b> Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>					
<b>COs↓</b>	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M
CO2	S	M	S	M	S
CO3	M	S	S	S	S
CO4	S	S	S	S	M
CO5	M	M	S	S	S

S- Strong

M-Medium

L-Low

Semester	I	<b>Applied Electronics Lab</b>	Hours	5
Course Code	21P1ELP01		Credits	3

**Course Objectives:**

- To measure the frequency of oscillators.
  - To learn the types of Multivirators.
  - To design the modulation and demodulation techniques.
  - To learn the characteristics of TRIAC,DIAC and SCR
  - To design and implement feedback amplifier circuits.
- 

**ANY TEN EXPERIMENTS**

1. Construction of Hartley Oscillator and COLPITT'S Oscillator.
2. Construction of Phase Shift Oscillator and WEIN Bridge Oscillator.
3. Crystal Oscillator
4. Construction of Astable, Monostable and Bistable Multivibrators using Transistor.
5. AM Modulation and Demodulation.
6. FM Modulation and Demodulation.
7. Pulse Amplitude Modulation.
8. Pulse Width Modulation.
9. Pulse Position Modulation
10. AC Voltage Controller using TRIAC and DIAC
11. SCR Characteristics.
12. Two stage RC Coupled Amplifier
13. Class -B Push- Pull Amplifier

**Text book:**

Lab Manual Prepared by Department of Electronics and Communication.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO1	Measured the Various types of oscillators	<b>K2</b>
CO2	Design various Multivibrators and implement them using observe their frequency responses.	<b>K3</b>
CO3	Analyze the concepts of SCR and observe its characteristics.	<b>K4</b>
CO4	Describe analog pulse modulation techniques and digital modulation technique.	<b>K5</b>
CO5	Understand the construction, operation and characteristics of Amplifier which can be used in the gain and frequency responses.	<b>K2&amp;K4</b>
<b>K1:</b> - Knowledge/Remembering; <b>K2:</b> -Comprehension/Understanding; <b>K3:</b> - Application/Applying; <b>K4:</b> -Analysis/Analysing <b>K5:</b> - Evaluation / Evaluating <b>K6:</b> - Synthesis / Creating		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	S
CO2	M	S	S	M	S
CO3	S	S	M	M	S
CO4	M	S	M	S	S
CO5	M	M	S	S	S

S- Strong

M-Medium

L-Low

Semester	I	<b>8051 Microcontroller Lab</b>	Hours	5
Course Code	21P1ELP02		Credits	3

**Course Objectives:**

- To study programming based 8051 microcontroller.
  - To study 8051 microcontroller based ALP using arithmetic, logical and shift operations.
  - To study modular and Dos/Bios programming using 8051 microcontroller.
  - To study to interface 8051 with I/O and other devices.
  - To study parallel and serial communication using 8051 micro controller.
- 

**ANY TEN EXPERIMENTS:**

1. Addition, Subtraction of Two 16 bit numbers.
2. Multiplication and Division of Two 16 bit numbers
3. Finding the square of a given number.
4. Finding the Factorial of a given number.
5. Ascending and Descending order of an in array.
6. Keyboard interface
7. ADC Interface.
8. DAC Interface.
9. Traffic Light control system Interface.
10. Stepper Motor Interface.
11. DC Motor Control Interface.
- 12 .LCD Interfacing.
13. Object Counter.

**Text book:**

Lab Manual Prepared by Department of Electronics and Communication

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO1</b>	Demonstrate ability to handle arithmetic operations using assembly language programming in 8051 and training boards.	<b>K2</b>
<b>CO2</b>	Design and implement 8051 microcontroller based systems	<b>K6</b>
<b>CO3</b>	Understand the concepts related to I/O and memory interfacing.	<b>K2</b>
<b>CO4</b>	Design interfacing circuits with 8051.	<b>K6</b>
<b>CO5</b>	Demonstrate ability to handle sorting operations and using assembly language programming.	<b>K2&amp;K6</b>
<p>*<b>K1</b>: - Knowledge/Remembering; <b>K2</b>:-Comprehension/Understanding;  <b>K3</b>: - Application/Applying; <b>K4</b>:-Analysis/Analysing  <b>K5</b>: - Evaluation / Evaluating <b>K6</b>:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	II	<b>Android Development Tools &amp; Application</b>	Hours	5
Course Code	21P2EL04		Credits	5

**Course Objectives:**

- To learn Android features and its application
- To understand the development of Android its types and Configuration
- To acquire knowledge about Android environment and its process states
- To create the new project for development of recent trends of social needs
- To learn the real time applications.

**UNIT – I: Introduction to Android:**

Background – Platform for Mobile Development – Native Android Applications – Android SDK Features – Open Handset Alliance – Android in Mobile

**Introducing the Development Framework**

Android Software Stack – The Dalvik Virtual Machine – Android Application Architecture.

**UNIT – II: Developing for Android**

Downloading and Installing the Android SDK – Developing with Eclipse – Using the Android Developer tools Plug-In for Eclipse – Support Package. First Android Application: New Android Project – Android Virtual Device – Launch Configurations – Running and Debugging Android Application – Types of Android Applications – Android Development Tools.

**UNIT – III: Mobile and Embedded Devices**

Hardware-Imposed Design Considerations- User’s Environment - Developing for Android – Introduction to Android Development Tools. Applications and Activities: Role of Android Application – Application Manifest File –Manifest

Editor in Android Application Lifecycle – Application’s priority and its process states.

#### **UNIT – IV: Audio, Video and Camera**

Playing Audio and Video – Manipulating Raw Audio – Creating a Sound Pool – Using Audio Effects – Camera for taking Pictures – Recording Video – Adding Media to the Media Store.

#### **UNIT – V: Real time Applications**

Bluetooth – Network and Internet Connectivity –Wi-Fi – Transferring Data using Wi-Fi Direct – Near Field Communication (NFC) – Online ticket booking – Online payment options – e-Electronics & Simulations – Online shopping – Government oriented applications – Bank Applications – Other Applications.

#### **TEXT BOOK:**

1. Reto Meier. 2012. Professional Android 4 Application Development. Wiley India Pvt Ltd.

#### **REFERENCE BOOKS:**

1. Paul Deitel, Harvey Deitel, Abbey Deitel and Michael Morgano. **Android for Programmers An AppDriven Approach.**
2. Frank Ableson, W., Robi Sen, Chris King and Enrique Ortiz, C. 2012. **Android in Action.** [Third Edition]. Manning Publications, U.S.
3. Charlie Collins and Michael Galpin. 2012. **Android in Practice.** Manning Publications Co.
4. Zigurd Mednieks and Laird Dornin. 2011. **Programming Android.** O’Reilly Media, Inc, New York.
5. Google Play store.



### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	Understanding of the specific requirements, possibilities and challenges when developing for a mobile context.	<b>K1</b>
<b>CO-2</b>	Apply mobile application models/architectures and patterns to the development of a mobile software application.	<b>K2,K6</b>
<b>CO-3</b>	Describe the components and structure of a mobile development framework (Google's Android Studio).	<b>K4,K6</b>
<b>CO-4</b>	Use Intent, Broadcast receivers and Internet services in Android App.	<b>K3,K6</b>
<b>CO-5</b>	Create and develop real time applications.	<b>K6</b>
* <b>K1</b> : - Knowledge/Remembering; <b>K2</b> :-Comprehension/Understanding; <b>K3</b> : - Application/Applying; <b>K4</b> :-Analysis/Analysing <b>K5</b> : - Evaluation / Evaluating <b>K6</b> :- Synthesis / Creating		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S
CO2	M	S	S	M	S
CO3	S	M	M	S	M
CO4	M	S	M	S	S
CO5	M	M	S	M	M

S- Strong

M-Medium

L-Low

Semester	II	<b>Industrial and Power Electronics</b>	Hours	5
Course Code	21P2EL05		Credits	5

**Course Objectives:**

- To Learn the Overview and Working Principles of Thyristors AC Voltage Controller & Controllers, and DC Choppers.
- To acquire knowledge about voltage controller with various parameters
- To learn the Thyristor Commutation Techniques.
- To learn and to create different kinds of switches and converters.
- They should know the typical applications to motor drives.

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**UNIT - I : THYRISTORS AND CONTROLLED RECTIFIERS**

Thyristor Characteristics – Two Transistors Model of Thyristor – Thyristor Type – Series Operation & Parallel Operation of Thyristors – Principle of Phase Controlled Converter Operation Single Phase Semi Convertors.

**UNIT – II: AC VOLTAGE CONTROLLER**

Principle of ON-OFF Control – Principle of Phase Control – Single Phase Bidirectional Controllers with Resister Loads – Single Phase Controller With Inductor Loads – Three Phase Half Wave Controller – Three Phase Full Wave Controllers – Cyclo Converters.

**UNIT – III: THYRISTOR COMMUTATION TECHNIQUES AND POWER TRANSISTOR**

Natural Commutation – Forced Commutation – Self Commutation – Impulse Commutation – Resonant Pulse Commutation – Complimentary Commutation – External Pulse Commutation – Load Side Commutation – Line Side Commutation. Power Transistor – Power MOSFET – Steady State Characteristics and Switching Characteristics – SITS – IGBTs.

## **UNIT – IV: DC CHOPPERS AND STATIC SWITCHES**

DC Choppers – Introduction – Principle of Step – Down Operation – Principle of Step up Operation – Switching Mode Regulators – Thyristors Chopper Circuits. Static Switches Mode Regulators – Single Phase AC Switcher – Three Phase AC Switching – Three Phase Reversing Switches - Solid State Relays.

## **Unit – V:DC DRIVES**

Basic Characteristic of DC Motor – Operating Modes – Single Phase Half Wave Conversion Driver – Single Phase Semiconductor Drivers – Single Phase Full Converter – Single Phase Dual Converter Drivers, Three Phase Half Wave Converter Drivers.

### **TEXT BOOKS:**

1. Muhammad H. Rashid – Power Electronics Circuits, Devices, and Applications -2nd edition – Prentice Hall of India Private Ltd, New Delhi. ISBN - -81-203-06869-7.
2. MD. Singh and K.B. Khanchandani - Power Electronic - Tata MC Graw Hill Publishing Company Ltd, New Delhi. ISBN -0-07-463369-4

### **REFERENCE BOOKS:**

1. PC Sen - Power Electronic – Tata MC Graw Hill Publishing Company Ltd, New Delhi. ISBN -0-07-462400-8.
2. G.K DUBEY, SR DORADLA, A JOSHI & RMK SINHA- Thyristorised Power Controllers – New Age International Publishers. ISBN -0 85226 190 X.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	Understand the principle of operation of power electronic control of electric drive system	<b>K2</b>
<b>CO-2</b>	Analyses the differentiation of voltage controllers and voltage regulators	<b>K4</b>
<b>CO-3</b>	Analyses the commutation Techniques and power transistor	<b>K4</b>
<b>CO-4</b>	Assess the performance of speed –torque characteristics of phase controlled and chopper controlled motor drives	<b>K5</b>
<b>CO-5</b>	Identify and select the speed and current control strategies of drives	<b>K6</b>
<p>*<b>K1</b>: - Knowledge/Remembering;<b>K2</b>:-Comprehension/Understanding;  <b>K3</b>: - Application/Applying;      <b>K4</b>:-Analysis/Analysing  <b>K5</b>: - Evaluation / Evaluating      <b>K6</b>:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	M	M	S	S	S

S- Strong

M-Medium

L-Low

Semester	II	<b>Elective III</b> <b>Microwave and Radar Communication</b>	Hours	4
Course Code	21P2ELE03		Credits	4

**Course Objectives:**

- An understanding of microwave waveguides, passive & active devices, tubes and network analysis
- To understand Microwave amplifiers and oscillators.
- Methods and limitation of different microwave parameter measurement.
- To understand the principles of Radar navigation system and its applications
- An understanding of RADARs and its applications.

**UNIT I: INTRODUCTION TO MICROWAVES**

Introduction –Maxwell’s equation-ampere’s Law Faradays Law -Gauss law-Wave equation-TE –TM wave equation-Wave guides-Rectangular wave guides-propagation of waves in rectangular wave guides-TE-and TM modes-Propagation of TM waves in rectangular wave guides.

**UNIT II: MICROWAVE AMPLIFIERS AND OSCILLATORS**

Klystrons-Two cavity Klystron –Multi cavity Klystron-Reflex klystron-Power output and frequency characteristics - Efficiency of reflex Klystron – Travelling wave tube (TWT)-Application of TWT - Backward wave oscillator - Magnetron- Cavity Magnetron-sustained oscillation in Magnetron-characteristics and applications of magnetron.

**UNIT III: MICROWAVE ANTENNAS**

Quantitative theory of short dipole antenna- characteristics of grounded quarter wave and ungrounded half wave antenna-radiation resistance and radiation pattern –folded dipole and its application-helical rhombic -Yagi antenna-horn antenna and parabolic reflectors.

## **UNIT IV : PRINCIPLES OF RADAR**

Introduction-Block diagram of RADAR – Applications of RADAR – Range equation minimum detectable signal-Receiver Noise-S/N Ratio – transmitter power –maximum ambiguous range –system losses. Receiver: Duplexer-Local Oscillator-Mixer - Line pulse modulator - Displays- PPI.

## **UNIT V: FM RADAR AND MTI**

Doppler effect -CW radar-FM CW radar - Multiple frequency CW radar moving target indicator (MTI) - Non coherent MTI - Pulsed Doppler Radar FM altimeter-Tracking –Sequential lobbing – Conical Scan –Monopulse tracking radar.

### **TEXT BOOKS:**

1. M.Kulkarni, “Microwave and Radar Engineering”, Umesh Publications, 5th Edition, 2014 (Unit I-II)
2. K.D.Prasad, “Antenna and Propagation”, Sathyapragasan Publication, 6 th Edition, 2012 (Unit III)
3. Merrill Scholnik, “Radar and Navigation”, Tata McGraw Hill Publications, 3th Edition, 1992 (Unit IV- V)

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	Analyze the wave propagation in TE, TM or TEM modes, in structures such as rectangular waveguides	<b>K1</b>
<b>CO-2</b>	Understanding the types of Klystrons and oscillators	<b>K2</b>
<b>CO-3</b>	Differentiate the types of Microwave Antenna and Arrays	<b>K4,K6</b>
<b>CO-4</b>	Analyze the Performance of Radar and its types	<b>K3,K6</b>
<b>CO-5</b>	Compare the types of CW Radar and FM CW radar	<b>K6</b>
<p>*<b>K1</b>: - Knowledge/Remembering;      <b>K2</b>:-Comprehension/Understanding;  <b>K3</b>: - Application/Applying;          <b>K4</b>:-Analysis/Analysing  <b>K5</b>: - Evaluation / Evaluating        <b>K6</b>:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	S
CO4	M	S	M	M	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	II	<b>Elective IV</b> <b>Biomedical Instrumentation</b>	Hours	4
Course Code	21P2ELE04		Credits	4

**Course Objectives:**

- ❖ To understand the cardio vascular activities and blood flow of human body.
- ❖ To acquire knowledge of working principles of Electrodes and Recorders
- ❖ To gain knowledge of Patient monitoring system
- ❖ To know about the Electronic operation theatre equipment and bio medical instrumentation.
- ❖ To learn the advance Instrumentation.

**UNIT I: Bioelectric Potential and Cardiovascular System**

Resting and Action potential – Propagation of Action potentials – The Bioelectric potentials – The Heart and Cardiovascular system – The Heart – Blood pressure – Characteristics of Blood Flow – Components of the Man – Instrument System.

**UNIT II: Biomedical Electrodes and Recorders**

Recording electrodes – Skin contact impedance – Electrodes for ECG, EEG and EMG – Microelectrodes – Pacemakers – Defibrillators – Recorders – Electrocardiograph– Electroencephalograph and Electromyography.

**UNIT III: Patient Monitoring System**

System Concept – Measurement of Heart rate – Measurement of Temperature –Blood pressure measurement – Measurement of Respiration rate – Computer aided ECG analysis – Computer Catheterization laboratory – Computerized Patient Monitoring System.



#### **UNIT IV: Operation Theatre Equipment**

Anesthesia Machine – Blood Flow meters – Gas Analysers – Blood Gas Analysers – X-Ray machine – radiography and Fluoroscopy – Image Intensifiers – Angiography.

#### **UNIT V: Advanced Biomedical Instrumentation**

Computer in Medicine – Lasers in Medicine – Endoscopes – Computer Tomography – Thermography – Ultrasonic Imaging Systems – Magnetic Resonance Imaging.

#### **Text Books:**

1. Dr. M.Arumugam – Biomedical Instrumentation – 2nd Edition – Anuradha Agencies Publishers.
2. Leslie Cromwell, Fred J.Weibell & Erich A. Pfeifter– Biomedical Instrumentation and Measurements – 2nd Edition - Pearson Education. ISBN-81-297-0028-X.
3. R.S. Khandpur – Hand Book of Biomedical Instrumentation – TMGH Publishing Ltd, New Delhi. ISBN 0-07-451725-2.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the physiology of biomedical system	K2
CO-2	The origin of bio potentials and explain the role of bio potential electrodes;	K2,K6
CO-3	The design of cardiac pacemakers, neurostimulators and defibrillators.	K4,K6
CO-4	Measure biomedical and physiological information	K3,K6
CO-5	Ability handle microscope, thermometer, x-ray machine.	K4
* <b>K1</b> : - Knowledge/Remembering; <b>K2</b> :-Comprehension/Understanding; <b>K3</b> : - Application/Applying; <b>K4</b> :-Analysis/Analysing <b>K5</b> : - Evaluation / Evaluating <b>K6</b> :- Synthesis / Creating		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	M	S	S	S
CO3	S	S	M	S	M
CO4	M	S	M	M	S
CO5	M	S	S	M	M

S- Strong

M-Medium

L-Low

Semester	II	<b>Android Development Tools &amp; Application Lab</b>	Hours	5
Course Code	21P2ELP03		Credits	2

**Course Objectives:**

- Create a "Hello World" Android Application
- Creating robust mobile applications and learn how to integrate them with other services
- Creating intuitive, reliable mobile apps using the android services and components
- Create a seamless user interface that works with different mobile screens
- Create a simple User Interface

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**ALL THE EXPERIMENTS:**

1. Creating an app to display Hello World.
2. Creating an Android Simple Login Application.
3. Creating Calculator App in Android.
4. Creating simple Home Screen Widget in Android.
5. Creating Android Chat App in Android.
6. Creating Simple Android Camera Application.
7. Creating Basic List View Demo in Android.
8. Creating Google Map in Android.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Demonstrate their understanding of the fundamentals of Android operating systems	K2
CO-2	Demonstrate their skills of using Android software development tools	K2,K6
CO-3	Ability to develop software with reasonable complexity on mobile platform .	K4
CO-4	Ability to deploy software to mobile devices	K3,K6
CO-5	Demonstrate their ability to debug programs running on mobile devices	K4,K6
* <b>K1</b> : - Knowledge/Remembering; <b>K2</b> :-Comprehension/Understanding; <b>K3</b> : - Application/Applying; <b>K4</b> :-Analysis/Analysing <b>K5</b> : - Evaluation / Evaluating <b>K6</b> :- Synthesis / Creating		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	S	S	S	S
CO3	S	S	M	S	M
CO4	M	S	M	M	S
CO5	M	S	S	M	S

S- Strong

M-Medium

L-Low

Semester	II	<b>Industrial &amp; Power Electronics Lab</b>	Hours	5
Course Code	21P2ELP04		Credits	2

**Course Objectives:**

- To make the students to design triggering circuits of SCR.
- To introduce power electronics components from which the characteristics of SCR, TRIAC, IGBT and MOSFET are obtained.
- To perform the experiments on various converters.
- To expose students to operation and characteristics of power semiconductor devices and passive components, their practical application in power electronics.
- To provide a practical exposure to operating principles, design and synthesis of different power electronic converters.

**ANY TEN EXPERIMENTS:**

1. Firing angle control of SCR and TRIAC
2. Half Wave Gate Controlled Rectifier using one SCR.
3. Single Phase Half Controlled Full Wave Rectifier using two SCR's and two Diodes
4. Switching Regulators.
5. Forced Commutation.
6. Single Phase Inverter.
7. Zero Voltage Switches.
8. Illumination Control using SCR & TRIAC.
9. Speed Control of Single Phase Induction Motor using Thyristors.
10. Speed Control of DC Motor using Thyristors.
11. Speed Torque Characteristics of a DC Motor.
12. Study of a Three Phase Rectifier using Power Diodes.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Analyze the characteristics of MOSFET, IGBT, SCR and SCR firing CKTs,	K4
CO-2	Analysis of AC-AC, DC-AC converters and also converter fed to AC&DC drives	K4
CO-3	Applying the SCR in Half and Full wave Rectifiers	K3
CO-4	Analyzing the Commutation and switches	K4
CO-5	Demonstrate the Speed control and DC Motors.	K4,K6
* <b>K1</b> : - Knowledge/Remembering; <b>K2</b> :-Comprehension/Understanding; <b>K3</b> : - Application/Applying; <b>K4</b> :-Analysis/Analyzing <b>K5</b> : - Evaluation / Evaluating <b>K6</b> :- Synthesis / Creating		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S
CO2	M	S	S	S	M
CO3	S	M	M	S	M
CO4	M	S	M	M	S
CO5	M	S	S	M	S

S- Strong

M-Medium

L-Low

Semester	II	<b>Communication Systems</b>	Hours	4
Course Code	21P2ELED01		Credits	4

**Course Objectives:**

- To learn the fundamentals of basic laws.
- The fundamentals of signals & linear time invariant systems used in communication systems. Knowledge of probability, random variables & random processes
- In depth knowledge of different types of analog communication system and different modulation techniques used in these systems.
- Analysis of noise and its impact on different modulation techniques.

**UNIT – I: BASIC CONCEPTS AND LAWS**

Introduction - Resistance – Capacitance – Inductance – Ohm’s and Kirchhoff’s laws – Semiconductors – Amplifiers – Piezoelectricity– Transducer – Microphone – Speakers – Laser – Digital signals.

**UNIT-II: INTRODUCTION TO COMMUNICATION SYSTEMS**

Introduction – Communication Systems - Amplifiers –Modulation - Need for Modulation – Theory of Amplitude Modulation– Frequency and Phase Modulation (Description Only) – Comparison – Armstrong Method - Description of SSB – Phase Shift Method.

**UNIT –III: ANTENNAS AND RADIO RECEIVERS**

Elementary Consideration – Radiation Mechanisms Elementary Doublet - Antenna Parameters and their Definitions - Effects of Antenna Height - Folded Dipole and its Applications - Parabolic Reflectors - Helical Antenna - Superhetrodyne Receiver -Radio Frequency Section Characteristics - Communication Receivers (Block Diagram Only) - FM Receiver (Block Diagram)

## **UNIT- IV: TELEVISION**

Introduction to Television Theory – Details of Indian Standard– Black and White Transmission – Plumbicon – Scanning -TV Tuner Block Diagram - Transmission and Reception of Color TV.

## **UNIT –V: RADAR AND SATELLITE COMMUNICATION**

Radar: Radar Fundamentals - Basic Principles- Factors Governing Radar Performance - Satellite Communication: General Principles - Classification Description – Tracking - Satellite Space Craft System - Existing Satellite Systems and Organizations –Coaxial Cable System – Optical Communication System.

### **TEXT BOOKS:**

1. Taub and Schilling, “Principles of Communication Systems”, 2nd Edition, New Delhi: Tata McGraw Hill Ltd, 1998.
2. Anuradha De, “Optical Fiber & Laser, Principles & Applications”, New Age International Publishers.
3. Joseph C, Palais, “Fiber Optic Communications”, Fourth Edition, Prentice Hall International Inc,
4. Agarwal, D.C, “Fiber Optic Communication” 2nd Edition, Wheeler Publishing, 1998.
5. Roy Blake, “Wireless Communication Technology”, First Reprint, 2001, Thomson Asia P Ltd. Singapore.

### **REFERENCE BOOKS:**

1. Taub and Schilling, “Electronic Communications”, Bell & Howell Company, 1992.
2. J. G. Proakis, “Digital Communication”, 4th Edition, Tata McGraw-Hill.
3. G. Keiser, “Optical Fiber Communications”, 3rd Edition, Tata McGraw-Hill.



### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	Analyze analog communications in time domain and frequency domain.	<b>K4</b>
<b>CO-2</b>	Distinguish between different analog modulation techniques	<b>K3</b>
<b>CO-3</b>	Understand the importance of noise considerations in communication systems.	<b>K2</b>
<b>CO-4</b>	Understand the fundamental concepts of television transmitter and receiver systems.	<b>K2</b>
<b>CO-5</b>	Understand and analysis the fundamentals of Satellite communication.	<b>K2,K6</b>
<p>*<b>K1</b>: - Knowledge/Remembering; <b>K2</b>:-Comprehension/Understanding;  <b>K3</b>: - Application/Applying; <b>K4</b>:-Analysis/Analysing  <b>K5</b>: - Evaluation / Evaluating <b>K6</b>:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	M	S	S	S
CO3	S	S	M	S	M
CO4	M	S	M	M	S
CO5	M	S	S	M	M

S- Strong

M-Medium

L-Low

Semester	II	<b>Cellular Phone Servicing</b>	Hours	4
Course Code	21P2ELED02		Credits	4

**Course Objectives:**

- To learn the concepts of cellular phone servicing.
- To learn the GSM and Bluetooth
- To understand the basic cellular system concepts.
- To have an insight into the various propagation models and the speech coders used in mobile communication.
- To understand the multiple access techniques and interference education techniques in mobile communication.

**UNIT I: BASICS**

Working of a Telephone - Local Exchange - Initiating a call - Calling a Number - Making a Connection - Answering a Call - Conversation - Ending a Call - Hook Switch - Transmitter - Receiver - Ringer - Cellular Mobile Telephone System - Mobile Phone Service Area - Mobile Fraud Call.

**UNIT II: ACCESS TECHNOLOGIES**

GSM - CDMA - GPRS - EDGE - WCDMA - UMTS - HSDPA - Satellite Phones - GPS - Mobile Browsers - WAP.

**UNIT III: MOBILE OPERATION SYSTEM**

Types of Wireless Options – Batteries - Memory Cards – Messaging - Ring Tones - Keypad Types - Display Types - Handset Form Factor – SMS Abbreviations - Mobile OS.

## **UNIT IV: MOBILE HARDWARE & SOFTWARE SYSTEM**

Hardware/Software Repairing - Various Locks - Installation of : UFS Driver, UFS Suite & Flashing Files - IMEI Number Detection - Mobile GSM Utility Codes (Any Five of Nokia Hand Set)

## **UNIT V: OTHER MOBILE SERVICE TOOLS**

Ultrasonic Cleaner - Computer Connectors - SIM Card Reader - Memory Card Reader - Mobile Virus - Virus Prevention - Removing Virus - Health Hazards with Mobiles - SAR.

## **REFERENCE BOOKS:**

1. Modern Mobile phone Introduction & Servicing - Manahar Lotia - BPB - (Unit - I)
2. Modern Mobile Phone Repair using Computer Software & Service Devices - Manahar Lotia - BPB - 120/- (Units I, IV & V)
3. Modern Mobile Phone Unlocking & Utility Codes For GSM & CDMA Phones - Manahar Lotia - BPB - Rs.99/- (Unit - IV).
4. Mobile Telephony - Digit Magazine - Supplement - Jan 2006 - Jasubhai Digital Media Publications. (Unit II & III)
5. Blue Tooth Technology – CSR Prabhu & A Prathap Reddi – PHI

**Course outcomes (COs):**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Understand the History of Communication And communication process between receiver and transmitter.	<b>K2</b>
<b>CO-2</b>	Learnt knowledge of the mobile system specifications.	<b>K1</b>
<b>CO-3</b>	Analyzing the mobile data capacity and storage capacity in GB Level.	<b>K4</b>
<b>CO-4</b>	Evaluate currently available mobile phone apps related to the prevention for health care.	<b>K5</b>
<b>CO-5</b>	Analyzing the power source in battery and identify the problem in activation the internet web page process.	<b>K4</b>
<p><b>K1:</b> - Knowledge/Remembering    <b>K2:-</b> Comprehension/Understanding;  <b>K3:</b> - Application/Applying;        <b>K4:-</b>Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating       <b>K6:-</b> Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	PSO1	PSO2	PSO3	PSO4	PSO5
<b>COs↓</b>					
CO1	M	S	M	M	S
CO2	M	S	S	S	M
CO3	S	S	M	S	S
CO4	M	S	M	M	S
CO5	M	S	S	M	S

S- Strong

M-Medium

L-Low

Semester	III	<b>Embedded System Using PIC</b>	Hours	5
Course Code	21P3EL06		Credits	5

**Course Objectives:**

- To Introduce the Building Blocks of Embedded System
- This subject presents the architecture & programming of PIC16F877 microcontroller and micro C/OS-II RTOS functions
- To Introduce Bus Communication in processors, Input/output interfacing.
- To Introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool
- To learn the application of Embedded system.

**UNIT I: INTRODUCTION TO EMBEDDED SYSTEMS**

Definition and Classification – Overview of Microprocessor – Microcontroller and DSP –Complex System Design and Processor – Hardware Unit in an Embedded System - Software Embedded into a System – Exemplary Applications – Embedded Systems on a Chip and in VLSI Circuit

**UNIT II: PIC 16F87X MICROCONTROLLERS**

Device Overview – Architecture – Memory Organization – Status Register – Option Register – INTCON Register – PCON Register – I/O Ports – Data EEPROM – Flash Memory.

**UNIT III: PERIPHERAL FEATURES OF 16F87X MICROCONTROLLERS**

TIMER0 Module – TIMER1 Module – TIMER2 Module – Capture/ Compare/ PWM Modules – I<sup>2</sup>C Transmission and Reception – USART – ADC Module - Special Features of the CPU: Oscillator Selection – Power ON Reset – Power Up Timer – Oscillator Start up Timer – Brown Out Reset – Interrupts – Watchdog Timer – SLEEP –Simple Programs

## **UNIT IV: BASIC DESIGN USING A REAL-TIME OPERATING SYSTEM**

Overview – Principles – General operation – Short Interrupt Routines – Tasks for Priority and Encapsulation – Recommended Task Structure – Creating and Destroying Tasks – Underground Tank Monitoring System.

## **UNIT V: Applications**

Blind temperature controller – Single digit counter / timer – Remote relay control – Designing a 2 digit timer with a PIC micro – Hardware – Operation – Software.

### **TEXT BOOKS:**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, 2013. Unit-I.
2. PIC 16F87X data book, Microchip Technology Inc., 2001. Unit -II, III.
3. An Embedded Software Primer, David E.Simon. Unit-IV, V.

### **REFERENCE BOOKS:**

1. John Peatman, “Design with PIC Microcontrollers”, Pearson Education, 2004
2. Rajkamal, “Embedded Systems Architecture, Programming and Design”, TATA McGraw-Hill, Third reprint, 2004.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Acquire a basic knowledge about fundamentals of microcontrollers	K1
CO-2	The learnt internal architecture of the PIC microcontroller	K1
CO-3	Ability to understand the peripheral features of PIC microcontroller.	K2
CO-4	Ability to design real time operating systems	K4
CO-5	Develop programming skills in embedded systems for various applications.	K6
<p><b>K1:</b> - Knowledge/Remembering    <b>K2:-</b> Comprehension/Understanding;  <b>K3:</b> - Application/Applying;        <b>K4:-</b>Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating       <b>K6:-</b> Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	M	M	S	S	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S-Strong

M-Medium

L-Low

Semester	III	<b>Automotive Electronics</b>	Hours	5
Course Code	21P3EL07		Credits	5

**Course Objectives:**

- To know fundamentals of Automotive Electronics, fuel injection and ignition systems.
- To provide knowledge about application of electronics in Automobile engineering.
- To impart knowledge about automotive engines.
- To learn the Electrical System
- To learn the advanced technologies.

**UNIT I: Fundamentals of Automotive**

Automotive Fundamental – Evolution – Physical Configuration – Automotive Systems - Engine – Engine Block – Cylinder Head – 4 Stroke Cycle - Engine Control – Ignition System – Ignition Timing – Suspension – Brakes – Steering System.

**UNIT II: Ignition Systems**

Starting Systems - Requirements of the Starting Systems - Ignition Systems: Fundamentals – Types – Generation – Timing – Fuel Consumption – Conventional Ignition Components – Plug Leads – Ignition Coil Cores - Introduction to Electronic Ignition system.

**UNIT III: Fuel Injection**

Overview of Programmed Ignition - Electronics Control of Carburetion – Basics – Areas of Control - Fuel Injection - System Overview - Advantages of Fuel Injection.



## **UNIT IV: Chassis Electrical System**

Chassis Electrical Systems: Anti-lock Brakes – Introduction – Requirements of ABS – General System Description – ABS components – Anti-lock Brake System Control-Traction Control – Functions – System Operation – Safety Systems : Central Locking - Electric Windows – Airbags and Belt Tensioners.

## **UNIT V: Technologies**

Introduction to CAN – LIN- Flexray – J 1850 – KWP 2000 – MOST – Bluetooth.

### **Text Books**

1. William B. Ribbens, “***Understanding Automotive Electronics***”, Society of Automotive Engineers Inc, 6<sup>th</sup> Edition, 2003.
2. Tom Denton, “***Automobile Electrical and Electronic Systems***”, Elsevier Publications Ltd., 3<sup>rd</sup> Edition, 2004.
3. [www.flexray.com](http://www.flexray.com)
4. [www.can-cia.org](http://www.can-cia.org)
5. [www.interfacebus.com](http://www.interfacebus.com)

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understanding to know the fundamentals of automotive electronics	K2
CO-2	Application of handled the machinery ignition system	K3
CO-3	Applying knowledge on the fuel ingestion of industrial machinery	K3
CO-4	Understood the concepts of Chassis electrical systems	K2
CO-5	An Analysing recent technologies of Automotive Electronics.	K4

**K1:** - Knowledge/Remembering    **K2:-** Comprehension/Understanding;  
**K3:** - Application/Applying;        **K4:-**Analysis/Analysing  
**K5:** - Evaluation / Evaluating       **K6:-** Synthesis / Creating

### Mapping with Programmes Specific Outcomes

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	M	M	S	S	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S-Strong

M-Medium

L-Low

Semester	III	<b>Programming in JAVA</b>	Hours	5
Course Code	21P3EL08		Credits	5

**Course Objectives:**

- This subject will help to improve the analytical skills of object oriented programming
- Formal introduction to Java programming language
- Overall development of problem solving and critical analysis
- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

**UNIT I: Fundamentals of Object Oriented Programming:**

Object Oriented Paradigm- Basic Concepts of Object Oriented Programming-Benefits of OOP-Applications of OOP. Java Evolution- Java History- Java Features –How Java Differs from C and C++- Java and Internet – Java and World Wide Web-Web Browsers-Hardware and Software Requirements- Java Support System-Java Environment.

**UNIT II: Overview of Java Language:**

Simple Java Program-More of Java- Java Program Structure-Java Tokens –Java Statements-Implementation of Java Program. **Constants, Variables and Data Types:** Introduction-Constants-Variables-Data Types-Declaration of Variables-Scope of Variables-Symbolic Constants-Type Casting.

**UNIT III: Operators and Expressions:**

Arithmetic Operators –Relational Operators-Logical Operators-Assignment Operators-Increment and Decrement Operators-Conditional Operators-Bitwise Operators-Special Operators-Arithmetic Expressions-Evaluation Expressions-Precedence of Arithmetic Operators-Type Conversions in Expressions.

#### UNIT IV:

**Decision Making and Branching:** Decision Making with If Statement – Simple If Statement – Then If ...Else Statement-Nesting of If ...Else Statement – The Else If Ladders-The Switch Statement-The Operator. **Decision Making and Looping:** The While Statement-The Do Statement-The For Statement-Jumps In Loops –Labeled Loops.

#### UNIT V:

**Classes, Objects and Methods:** Defining a Class- Fields Declaration- Methods Declaration –Creating Objects- Accessing Class Members- Constructors-Method Overloading –Static Members-Nesting of Methods-Inheritance: Extending a Class.

#### TEXT BOOK:

1. E. Balagurusamy, "Programming with Java" A primer: Third Edition

#### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the Fundamentals of Object Oriented Programming	K2
CO-2	Gain knowledge on java language and concepts.	K1
CO-3	Ability to analyze the operators and expressions involved in java programming.	K4
CO-4	Create the program of Decision Making and Branching	K6
CO-5	Ability to define Classes, Objects and Methods	K4

**K1:** - Knowledge/Remembering    **K2:-** Comprehension/Understanding;  
**K3:** - Application/Applying;        **K4:-**Analysis/Analysing  
**K5:** - Evaluation / Evaluating       **K6:-** Synthesis / Creating

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>COs↓</b>					
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	M	M	S	S	M
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	S	M	S	S

S-Strong

M-Medium

L-Low

Semester	III	<b>Elective: V Advanced Wireless Systems</b>	Hours	5
Course Code	21P3ELE05		Credits	4

**Course Objectives:**

- To learn knowledge on advanced wireless systems
- To enhance the knowledge on transmission of wireless signals.
- To make the students to analyze the cellular concepts
- To make the students to analyze the wireless networks,.
- Acquiring Knowledge about optical networks and switching

**UNIT I: Introduction to Wireless Communication Systems:**

Evolution of Mobile Radio Communication - Applications - Comparison of common wireless Communication Systems - Trends in Cellular Radio and Personal Communications - Modern wireless Communication Systems.

**UNIT II: Wireless Transmission:**

Frequencies for Radio transmission- Signals- Antennas - Signal Propagation – Multiplexing- Modulation- Spread Spectrum – Medium access control: Specialized MAC – SDMA- FDMA- TDMA - CDMA - FHMA - Radio Packet.

**UNIT III :The Cellular Concept :**

System Design fundamentals : Introduction - Frequency Reuse - Channel Assignment Strategies - Interference and System capacity - Trunking and Grade of Service - Improving coverage & Capacity in Cellular Systems.

**UNIT – IV: ATM and wireless networks**

Main Features – Addressing, Signaling And Routing, ATM Header Structure – Adaptation Layer, Management And Control BISDN, Interworking

With ATM, Wireless Channel, Link Level Design, Channel Access, Network Design And Wireless Networks

### **UNIT – V: Optical Networks and Switching**

Optical Links – WDM Systems, Cross-Connects, Optical LAN's, Optical Paths And Networks, TDS And SDS: Modular Switch Designs – Packet Switching, Distributed, Shard, Input and output buffers

#### **Reference books:**

- 1.Odore W.Rapport - Wireless Communications - Principals and Practice , Second Edition , 2002, Pearson Education.(Unit I)
2. Jochen Schillr - Mobile Communication, Addison Wesley, 2000.(Unit II &III)
3. Jean warland and pravin varaiya, “High performance communication networks”, 2nd edition, Harcourt and Morgan Kauffman, London, 2000 (Unit IV – V)

#### **Course outcomes (COs)**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Analysis to design cellular network with given quality of service constraints	<b>K4</b>
<b>CO-2</b>	Analyze and design receiver and transmitter diversity techniques.	<b>K4</b>
<b>CO-3</b>	Apply cellular concepts to evaluate the signal reception performance in a cellular network	<b>K3</b>
<b>CO-4</b>	Understanding the level of ATM and wireless network	<b>K2</b>
<b>CO-5</b>	Describe and differentiate four generations of wireless standard for cellular networks.	<b>K5</b>
<b>K1:</b> - Knowledge/Remembering <b>K2:-</b> Comprehension/Understanding; <b>K3:</b> - Application/Applying; <b>K4:-</b> Analysis/Analysing <b>K5:</b> - Evaluation / Evaluating <b>K6:-</b> Synthesis / Creating		

### Mapping with Programmes Specific Outcomes

<b>PSO→</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>COs↓</b>					
<b>CO1</b>	M	S	M	M	S
<b>CO2</b>	S	M	S	S	M
<b>CO3</b>	M	S	M	S	S
<b>CO4</b>	S	S	M	S	M
<b>CO5</b>	S	M	S	M	S

S-Strong;

M-Medium

L-Low



Semester	III	<b>Elective: VI Analysis and Processing of Signals</b>	Hours	5
Course Code	21P3ELE06		Credits	4

**Course Objectives:**

- To study the concepts and properties associated with the signals and systems.
- To familiarize with the techniques suitable for analyzing and synthesizing both continuous and discrete time systems.
- To learn the Calculating the inverse DFT
- To learn the FFT and FIR Filters.
- To analyze the Application of processing signals.

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**UNIT:I SIGNAL AND SYSTEMS:**

Signals: Classification of signals-Continuous time signals-Discrete time signals-Singularity function.

Systems: Classification of Systems- Continuous time signals-Discrete time signals-Representation of systems.

**UNIT:II CONVOLUTION AND CORRELATION:**

Discrete convolution-Properties of Convolution-Linear Convolution-Circular Convolution-Graphical Method-Linear Convolution Vs Circular Convolution.

Correlation: Cross correlation-Auto Correlation

**UNIT:III DFT**

DFT-Properties of the DFT-Notation and formula of the real DFT-DFT basic functions-Synthesis and analysis of DFT-Synthesis and calculating the inverse DFT-Application of the DFT.

#### **UNIT:IV FFT&FILTERS:**

FFT-Radix 2FFT Working principle of FFT-Speed and precision Comparison-FIR Filter: Introduction-Design techniques: Fourier series method-Frequency sampling method IIR Filters:Introduction-Design techniques-Impulse invariant method-Bilinear transformation method.

#### **UNIT:V APPLICATIONS:**

Audio processing-Human hearing-Timbre-Sound quality Vs Data rate-High fidelity audio-Compounding –Speech synthesis and Recognition-Image formulation and Display;Digital Image structure-Cameras and End Eyes-Television video signals-Other image acquisition and display-Brightness and contrast adjustments-Warping.

#### **Text Books:**

- 1.S.Salivahanan,A.Vallavaraj, C.Gnanapriya “Digital Signal Processing”,TMH,2th Edition,2010(Unit I-IV)
- 2.Steven,W.Smith,”The Scientist and Engineers guide to DSP”,California Technical Publishing ,California,1999(Unit V)

#### **Reference Book:**

- 1.John.G.Proakis and Dimitrios G.Manolaks.”Digital Signal Processing”,PHI Publication,2003.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	Compare various types of signals and systems.	<b>K2</b>
<b>CO-2</b>	Compute and interpret convolution and correlation systems for random process.	<b>K3</b>
<b>CO-3</b>	Use discrete time Fourier transform to analyze discrete time signals and systems.	<b>K3</b>
<b>CO-4</b>	Structure for realization of IIR and FIR filters.	<b>K4</b>
<b>CO-5</b>	Demonstrate the production of speech, voice recognition and image capturing.	<b>K6</b>
<b>K1:</b> - Knowledge/Remembering <b>K2:-</b> Comprehension/Understanding; <b>K3:</b> - Application/Applying; <b>K4:-</b> Analysis/Analysing <b>K5:</b> - Evaluation / Evaluating <b>K6:-</b> Synthesis / Creating		

### Mapping with Programmes Specific Outcomes

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	M	S	M	S	S
<b>CO2</b>	S	M	S	S	M
<b>CO3</b>	M	S	S	S	S
<b>CO4</b>	S	S	M	S	S
<b>CO5</b>	S	M	S	S	S

S-Strong;

M-Medium

L-Low

Semester	III	<b>Embedded Systems Lab</b>	Hours	5
Course Code	21P3ELP05		Credits	3

**Course Objectives:**

- To learn the arithmetic logic programs
- To learn the interfacing and counters
- Learn how to develop basic applications in the Lab View graphical programming environment.
- Create applications using a state machine design pattern, read and write data to file.
- To learn the Object counters

**Any Ten Experiments:**

1. Arithmetic and Logic Programs.
2. Square Wave Generation using Ports.
3. Key Interfacing.
4. LED Interfacing.
5. Seven Segment Display Interfacing.
6. Solid State Relay Interfacing using Interrupts.
7. Traffic Light Control System.
8. ADC Interfacing.
9. DAC Interfacing.
10. Stepper Motor Interfacing.
11. LCD Interfacing.
12. Object Counter.
13. Water Level Controller.

**Course outcomes (COs)**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Acquire a basic knowledge about fundamentals of microcontrollers .	<b>K1</b>
<b>CO-2</b>	Develop and implement the program written in PIC assembly language instructions.	<b>K2, K5</b>
<b>CO-3</b>	Analyze the functioning of hardware devices and interfacing them into Processor.	<b>K4</b>
<b>CO-4</b>	Develop programming skills in embedded systems for various applications.	<b>K6</b>
<b>CO-5</b>	Evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler	<b>K5</b>
<p><b>*K1:</b> - Knowledge/Remembering; <b>K2:</b>-Comprehension/Understanding;  <b>K3:</b> - Application/Applying;      <b>K4:</b>-Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating      <b>K6:</b>- Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	PSO1	PSO2	PSO3	PSO4	PSO5
<b>COs↓</b>					
CO1	M	S	S	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	III	<b>JAVA Programming Lab</b>	Hours	3
Course Code	21P3ELP06		Credits	3

### **Course Objectives:**

- To write programs using abstract classes.
  - To write programs for solving real world problems using java collection frame work.
  - To write multithreaded programs.
  - To write GUI programs using swing controls in Java.
  - To introduce java compiler and eclipse platform.
  - To impart hands on experience with java programming.
- 

### **ALL THE EXPERIMENTS:**

1. Write a Java Program to convert decimal to Hexadecimal
2. Write a Java Program to calculate Area of Rectangle
3. Write a Java Program to display prime numbers.
4. Write a Java Program to Reverse a number using for while loop.
5. Write a Java Program to display Fibonacci series using loops.
6. Write a Java Program to find the smallest of three numbers using conditional operator.
7. Write a Java Program to make a calculator using switch case.
8. Write a Java Program to swap two numbers using bitwise operator.
9. Write a Java Program to perform function overloading.
10. Write a Java Program to reverse in a string.

## Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Able to write programs for solving real world problems using java collection frame work..	K2
CO-2	Able to write programs using abstract classes.	K2
CO-3	Able to write multithreaded programs.	K2
CO-4	Able to write GUI programs using swing controls in Java.	K2,K6
CO-5	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes	K3
<p>*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding;            K3: - Application/Applying; K4:-Analysis/Analysing            K5: - Evaluation / Evaluating K6:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5
COs↓					
CO1	M	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	M
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	IV	<b>VLSI Design and VHDL Programming</b>	Hours	6
Course Code	21P4EL09		Credits	5

**Course Objectives:**

- To learn performance optimization techniques in VLSI signal processing
- Introduces VHDL concepts and constructs
- Use of VHDL design units which include entities, architectures, packages and configurations.
- Acquire knowledge about data flow modeling and statements.
- Describes VHDL applications to design digital hardware.

**UNIT I: CMOS CIRCUITS & PROCESSING TECHNOLOGY**

MOS Transistor – Switches – CMOS Logics – Inverter – Combinational Logic – NAND Gate – NOR Gate Compound Gates – Multiplexer – SI Semiconductor Technology Overview – Wafer Processing – Oxidation – Epitaxy Deposition – Ion Implantation – Diffusion – SI Gate Insulator Process – CMOS Technology - n-well Process – p well Process – Twin-Tub Process – Silicon on Insulator – CMOS Process Enhancements

**UNIT II: INTRODUCTION AND BASIC CONCEPT OF VHDL**

History of VHDL – Capabilities of VHDL – Hardware Abstraction – Basic Terminology – Entity Declaration - Architecture Body Declaration – Basic Language Elements – Identifiers – Data Objects – Data Operators.

**UNIT III: MODELING TECHNIQUES OF VHDL**

Behavioral Modeling: Entity Declaration – Architecture Declaration – Process Statements- Variable Assignment Statements – Signal Assignments Statements – Wait Statement – If Statement – Case Statement – Null Statement – Loop Statement – Exit Statement – Next Statement – Assertion Statement – Report Statements – More on Signal Assignment Statement – Multiple Process – Postponed Process.



#### **UNIT IV: DATA FLOW STYLE OF MODELING**

Concurrent Signal Assignment Statement Versus Signal Assignment – Delta Delay Revisited – Multiple Drivers – Conditional Signal Assignment Statement – Selected Signal Assignment Statement – Unaffected Value – Block Statement- Concurrent Assertion Statement – Value of the Signal. Structural Modeling: Component Declaration – Component Instantiation – Resolving Signal Value.

#### **UNIT V: ADVANCED FEATURES IN VHDL**

Generics – Configuration – Configuration Specification – Configuration Declaration – Default Rules – Conversion Functions – Direct Instantiation – Incremental Binding – Sub Programs – Sub Program Overloading – Operator Overloading – Signatures – Default Value of Parameters –Package Declaration – Package Body – Design File – Design Libraries – Order of Analysis – Implicit Visibility – Explicit Visibility – Attributes in VHDL.

#### **TEXT BOOKS:**

1. Neil H.E. Westw Kamaran Eshraghin, “Principles of CMOS VLSI Design”
2. J.Bhasker, “VHDL Primer”, Low Price Edition, 2001 PHI 3.Charles H. Roth, and Jr.”Digital System Design Using VHDL”, Brooks/Cole Thomson Learning PWS Publishing, ISBN-981-240-052-4

#### **BOOK FOR REFERENCE:**

1. Neil H.E.Weste, TLW “Principles of CMOS VLSI Design” Addison Welsley NewDelhi.

**Course outcomes (COs)**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Ability to implement program based on application	<b>K2</b>
<b>CO-2</b>	Understand and use major syntactic elements of VHDL - entities, architectures, processes, functions, common concurrent statements, and common sequential statements	<b>K2</b>
<b>CO-3</b>	Design and develop the combinational and sequential circuits using behavioral modeling	<b>K6</b>
<b>CO-4</b>	Demonstrate timing and resource usage associated with modeling approach	<b>K2,K6</b>
<b>CO-5</b>	Simulation, synthesis and implementation of HDL code Implementation of code on FPGA/CPLD	<b>K6</b>
<p><b>*K1:</b> - Knowledge/Remembering; <b>K2:</b>-Comprehension/Understanding;  <b>K3:</b> - Application/Applying;     <b>K4:</b>-Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating   <b>K6:</b>- Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>COs↓</b>					
CO1	M	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	IV	<b>Digital Signal Processing</b>	Hours	6
Course Code	21P4EL10		Credits	5

**Course Objectives:**

- This course is designed to give students the required knowledge for DFT, FFT.
- To make students aware about the meaning and implications of the properties of systems and signals.
- To make the students learn, Theory of DSP, design of DSP applications and introduction to DSP Processors.
- At the completion of this course, the student should have in depth knowledge of processing digital signals.
- To learn the MATLAB Program.

**UNIT I: INTRODUCTION TO PROGRAMMABLE DSPS AND ARCHITECTURE**

Multiplier and Multiplier Accumulator (MAC) – Modified Bus Structure and Memory Access Schemes – Multiple Access Memory – Multi Ported Memory – VLIW Architecture – Pipelining – Special Addressing Modes in PDSP's – ON Chip Peripheral – Architecture of TMS 320 C5X.

**UNIT II: ASSEMBLY LANGUAGE INSTRUCTION AND PROGRAMMING**

Syntax – Addressing Modes – Load / Store Instruction – Addition/Subtraction Instruction – Move Instruction – Multiplication Instruction – NORM Instruction – Program Control Instruction –Peripheral Control – Program for Familiarization of the Addressing Modes – Program for Familiarization of the Arithmetic Instruction –Real Time Signal Processing Program.

### **UNIT III: ARCHITECTURE AND ADDRESSING MODES**

Introduction – Overview of TMS 320C3X devices – Internal Architecture – CPU – CPU Register File – Memory Organization – Cache Memory – Peripheral – Data Format – Addressing Modes – Groups of Addressing Modes – Assembly Language Instruction – Processing Real Time Signal

### **UNIT IV: APPLICATION PROGRAMS IN C3X**

TMS320C3X Starter Kit(DSK) - Addressing Modes - Generation and Finding the Sun of Series - Convolution of Two Sequences - Processing Real time Signals with C3X Kit.

### **UNIT V: MATLAB WITH PROGRAMMING**

Desktop Tools – Command Window – Launch Pad – Help Browser – Workspace Browser – Editor/Debugger – Discrete Convolution – Stability Test – Fast Fourier Transform – Butterworth Analog Filter: Low-Pass Filter - Up Sampling a Sinusoidal Signal – Down Sampling a Sinusoidal Sequence.

### **C TEXT BOOK:**

1. Venkataramani B, Bhaskar M., “Digital Signal Processors - Architecture, Programming and Applications”, First Reprint, TATA McGraw Hill, 2003.

### **REFERENCE BOOKS:**

1. Salivahanan S, Vallavaraj A, Gnanapriya C, “Digital Signal Processing”, Tata McGraw Hill Publishing, 2003.
2. Rudra Pratap, “Getting Started with MATLAB”, Version 6, Oxford University Press, 2004.

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understanding the DSP Architecture and memory access.	K2
CO-2	Analyzing the Logical instruction and real time programs.	K4
CO-3	Understanding the addressing modes and memory	K2
CO-4	Have an in-depth knowledge of use of digital systems in real time applications	K2,K6
CO-5	Creating the program of MATLAB.	K6
<p>*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding;            K3: - Application/Applying; K4:-Analysis/Analysing            K5: - Evaluation / Evaluating K6:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	M
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

Semester	IV	<b>Elective : VII Industrial Automation Using PLC</b>	Hours	5
Course Code	21P4ELE07		Credits	4

**Course Objectives:**

- The basic components of a PLC system.
- The fundamental operating principles behind using a PLC.
- Discussion on programming PLCs.
- The PLC as part of a complete Local Area Network The PLC and the operator interface.
- To learn the Motor controls

**UNIT I: INTRODUCTION TO PLC, LADDER DIAGRAM FUNDAMENTALS**

Introduction to PLC – PLC Vs Microcontroller – Basic Components and their Symbols – Control Transformers – Fuses – Switches – Relays – Fundamentals of Ladder Diagram – Basic Diagram Framework – Wiring Reference Designators – Boolean Logic & Relay Logic – AND-OR & OR-AND – Ground Test.

**UNIT II: PROGRAMMABLE LOGIC CONTROLLER & FUNDAMENTAL PROGRAMMING**

PLC Configurations – System Block Diagram – Update – Solve the Ladder – Physical Components Vs Program Components – Light Control – Internal Relays – Disagreement Circuit - Majority Circuits – Oscillators – Holding Contacts - Always ON & OFF Contacts –Ladder Diagrams Having Complex Rung.

### **UNIT III: ADVANCED PROGRAMMING TECHNIQUES AND OVERVIEW OF MNEMONIC PROGRAMMING CODE**

Ladder Program Execution Sequence – One Shot– JK-Flip Flop – Counters – Sequencers – Timers – Master Control Relays and Control Zones – AND Ladder Rung – Entering Normally Closed Contacts – OR Ladder Rung – Simple Branches – Complex Branches.

### **UNIT IV: WIRING TECHNIQUES, ANALOG I/O & SENSORS**

PLC Power Connection – Input Wiring – Inputs Having a Single Common – Output Wiring – Relay Outputs – Analog (A/D) Inputs – Analog (D/A) Output – Sensor Output Classification – Connecting Discrete Sensors to PLC Inputs – Proximity Sensors – Optical Proximity Sensors.

### **UNIT V: MOTOR CONTROLS**

Introduction - AC motor Stator – Typical of AC motor Application – Variable Speed of AC motor drive – DC motor Controller – DC motor Control with AC power Source – Full wave Rectifier DC motor Supply – SCR DC motor control-In plant Tanning.

#### **TEXT BOOK:**

1. John R. Hackworth, Frederick D. Hackworth, Jr., “Programmable Logic Controllers, Programming Methods and Applications”, New Delhi: Pearson Education, 3rd edition.

#### **REFERENCE BOOK:**

John. W .Webb, Renoald A. Rein, “Programmable Logic Controller Principles and Application”, Prentice Hall India, 5th Edition

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understanding the Fundamentals of PLC	K2
CO-2	Understand the basics of PLC programming.	K2
CO-3	Develop PLC program for low level industrial applications.	K6
CO-4	Analyze the Analog Input, Output and Various types of Sensors	K4
CO-5	Applying knowledge gained about PLCs and SCADA systems to real-life industrial applications.	K3
<p>*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding;            K3: - Application/Applying; K4:-Analysis/Analysing            K5: - Evaluation / Evaluating K6:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	M
CO4	M	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low



Semester	IV	<b>Elective : VIII Signals and Systems</b>	Hours	5
Course Code	21P4ELE08		Credits	4

**Course Objectives:**

- Be able to describe signals mathematically and understand how to perform mathematical operations on signals.
- Be able to solve a linear constant coefficient differential equation using Laplace transform techniques.
- Be able to compute the Fourier series or Fourier transform of a set of well-defined signals from first principles
- Understand the application of Fourier analysis to ideal filtering.
- Also familiar with commonly used signals such as the unit step, ramp, and impulse function, sinusoidal signals, complex exponentials and their operations.

**UNIT – I: INTRODUCTION TO SIGNAL AND SYSTEM**

Signals: Definition – Classification of signals – Basic operations on signals – Types of signals. Systems: Definition –Classification of systems – Properties of systems – Properties of continuous-time linear time-invariant (LTI) system – Properties of

Discrete- LTI system.

**UNIT – II: LAPLACE TRANSFORM**

Definition – Representation of signals using Laplace transform– Region of Convergence (ROC) – Properties of Laplace transform– Initial value and final value theorem – Inverse of the Laplace transform – Analysis of passive networks using Laplace transform –Solution of differential equations using Laplace transform –Relationships between Laplace transform (LT) and continuous-time Fourier transform (CTFT).

### **UNIT – III: FOURIER SERIES**

Continuous-time Fourier series (CTFS): Definition – Dirichlet condition – Fourier series representation of continuous-time periodic signal – Trigonometric Fourier series – Problems – Exponential Fourier series – Problems – Properties of CTFS. Discrete-time

Fourier series (DTFS): Definition – Fourier series representation of discrete-time periodic signal – Calculation of DTFS coefficient – Properties of DTFS.

### **UNIT – IV: FOURIER TRANSFORM**

Continuous-time Fourier Transform (CTFT): Definition – Dirichlet condition – CTFT representation of aperiodic signal – Properties of CTFT – Problems. Discrete Time Fourier Transform (DTFT): Definition – DTFT representation of aperiodic signal – Properties of DTFT – Problems.

### **UNIT – V: Z -TRANSFORMS**

Z-Transforms (Double and Single sided) – ROC conditions – Properties – Initial and final value theorems – Relationship between the Z-transform and discrete-time Fourier transform – Relationship between the Z-plane and S-plane – Methods of inverse Z-transforms– Power series method (long-division) – Partial-fraction method – Residual method.

#### **Text Book:**

1. Poornachandra S., “Signals and System”, Vijay Nicole imprints Pvt. Ltd., 2004

### Course outcomes (COs)

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand mathematical description and representation of continuous and discrete time signals and systems.	K2
CO-2	Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.	K2
CO-3	Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.	K2,K4
CO-4	Analyze system properties based on impulse response and Fourier analysis.	K4
CO-5	Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems.	K3,K6
<p>*K1: - Knowledge/Remembering; K2:-Comprehension/Understanding;            K3: - Application/Applying; K4:-Analysis/Analysing            K5: - Evaluation / Evaluating K6:- Synthesis / Creating</p>		

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	S
CO4	S	S	M	S	S
CO5	M	S	S	M	S

S- Strong

M-Medium

L-Low

Semester	IV	<b>Digital Signal Processing Lab</b>	Hours	5
Course Code	21P4ELP07		Credits	3

**Course Objectives:**

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- Understand the mathematical operation on discrete signals.
- Students can able to develop DSP algorithms for convolution, correlation, DFT, filtering of signals.
- Sketch the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals.

**Any Ten Experiments:**

1. Arithmetic Operations
2. DFT Computations
3. FFT Computations
4. Convolution of Two Discrete Signals
5. Correlation of Two Discrete Signals
6. Waveform Generation
7. ADC and DAC.
8. Generation of Signals
9. Amplitude Modulation & FFT Response
10. Impulse, Step, Exponential & Ramp Functions
11. Frequency Sampling Method.
12. Sampling Storing Method.
13. Design of FIR Filter
14. Design of IIR Filter

**Reference book:**

Lab manual prepared by Department of Electronics and Communication.

**Course outcomes (COs)**

O No.	Upon completion of this course, students will be able to	Knowledge Level
<b>CO-1</b>	understand about the basic signal generation	<b>K2</b>
<b>CO-2</b>	Design IIR filters and FIR Filters	<b>K6</b>
<b>CO-3</b>	Calculate linear and circular convolution of discrete sequences.	<b>K5</b>
<b>CO-4</b>	Experiment concepts of DSP and its applications using MATLAB Software	<b>K5</b>
<b>CO-5</b>	Demonstrate their abilities towards DSP processor based implementation of DSP systems	<b>K6</b>
<p><b>*K1:</b> - Knowledge/Remembering; <b>K2:</b>-Comprehension/Understanding;  <b>K3:</b> - Application/Applying;      <b>K4:</b>-Analysis/Analysing  <b>K5:</b> - Evaluation / Evaluating      <b>K6:</b>- Synthesis / Creating</p>		

**Mapping with Programmes Specific Outcomes:**

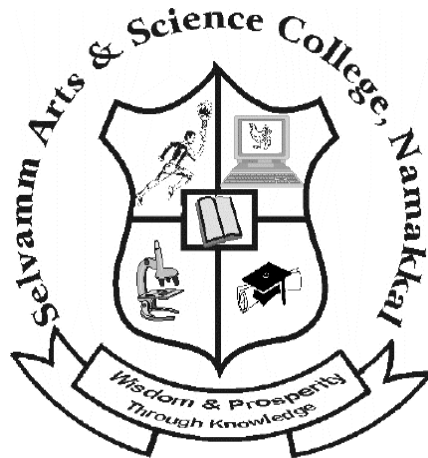
<b>PSO</b> →	PSO1	PSO2	PSO3	PSO4	PSO5
<b>COs</b> ↓					
CO1	S	M	S	M	S
CO2	M	M	S	M	S
CO3	M	S	M	S	M
CO4	S	S	M	S	S
CO5	M	M	S	M	S

S- Strong

M-Medium

L-Low

**Department of English**  
**Selvamm Arts & Science College (Autonomous)**  
**Nationally Accredited by NAAC**  
**Affiliated to Periyar University, Salem**



**PG Syllabus**

**M.A. English Literature**

**Choice Based Credit System (CBCS)**

**(Effect From 2021 - 2022)**

# **Department of English**

## **Regulations for Admission- M.A. English**

Normally B.A. English (Branch XII) Students are admitted to M.A. English. Students must have a minimum pass of 40 percent in B.A., English.

The M.A. English Programme consists of Four Semesters making a total of twenty one theory papers and a project with Viva-Voce, carrying 100 marks in the IV semester.

Each paper carries 100 marks

Duration of writing exam paper in 3 hours

The minimum pass mark would be 50%

### **Note:**

The syllabus for M.A. English is based on the UGC model curriculum. It ensures a certain competence in using the English language and studying English texts. It also makes the students employ the advanced language skills, critical understanding and human values derived from it for their future lives and careers. The revised syllabus aims at sensitizing the students to the rich use of the language as an effective tool of communication. It also enlightens the students on the literary movements, the favoured genres and the growth of the literary forms.

### **Vision**

To enrich the young minds with great literary works and enhance the moral values of the students.

### **Mission**

To impart education with the virtues of ethical values, sense of equality and peace in young minds and enable them to reach intellectual maturity to become inspired leaders nationally and globally.

## Programme Outcomes

PO.NO	Upon completion of MA degree programme, the Post Graduates will be able to
PO 1	Possess complete exposure to British Literature, World Literature
PO 2	Prepare for NET/SET examinations.
PO 3	Gain an insight into research and research methodology.
PO 4	Acquire a thorough knowledge on the emerging trends of literary criticism and theories. The vast canvas of literature is well comprehended in the right perspective.
PO5	Designed to help postgraduate students develop and research composition, argument, and writing skills that will enable them to improve their written abilities for higher studies and academic endeavours.

## Programme Specific Outcomes

PO 1	Comprehend various forms of literature like prose, poetry, drama and fiction
PO 2	Apprehend different cultures and cultural sensibilities around the world
PO 3	Perspectives of literary movements that existed in different ages.
PO 4	Develop the knowledge of grammatical system of English language.
PO5	Define literary theory and terms in criticism.
PO6	Develop four language skills LSRW
PO7	Write analytically in different formats like essays, reviews, research papers etc.
PO8	Scope of employability and entrepreneurship in the field of Media and Journalism, Teaching, Public Relations, Human Resource, Civil Service, Creative Writing etc.



**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**

**COURSE STRUCTURE UNDER CBCS**

**DEPARTMENT OF ENGLISH**

**(For the students admitted in the Year 2021-22 Batch onwards)**

Sem	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
<b>I</b>	Core-I	21P1EN01	Chaucer and Elizabethan Age	6	5	25	75	100
	Core-II	21P1EN02	The Restoration and the Augustan Age	6	5	25	75	100
	Core-III	21P1EN03	The Romantic Age	6	5	25	75	100
	Core-IV	21P1EN04	The Victorian Age	6	5	25	75	100
	Elective-I	21P1ENE01	Children Literature	6	4	25	75	100
<b>Total</b>				<b>30</b>	<b>24</b>	<b>--</b>	<b>--</b>	<b>500</b>
<b>II</b>	Core-V	21P2EN05	Shakespeare	5	4	25	75	100
	Core-VI	21P2EN06	American Literature	5	4	25	75	100
	Core-VII	21P2EN07	Indian Writing in English	5	4	25	75	100
	Elective-II	21P2ENE02	Science Fiction	4	4	25	75	100
	Core Practical-I	21P2ENP01	Effective Communication	5	4	25	75	100
	EDC	21P2xxxxxx	Extra Disciplinary Course	4	4	25	75	100
	Common	21P2HR01	Human Rights	2	2	25	75	100
<b>Total</b>				<b>30</b>	<b>26</b>	<b>--</b>	<b>--</b>	<b>700</b>
<b>III</b>	Core-VIII	21P3EN08	Research Methodology	6	5	25	75	100
	Core-IX	21P3EN09	Eco Studies in Literature	6	5	25	75	100
	Core-X	21P3EN10	Voices of Women	6	5	25	75	100
	Core-XI	21P3EN11	Language and Linguistics	6	4	25	75	100
	Elective-III	21P3ENE03	Literary Theory and Criticism	6	4	25	75	100
		21P3ENE04	New Literature in english					
	Common	21P3ENI01	Internship	*	#	--	--	--
<b>Total</b>				<b>30</b>	<b>23</b>			<b>500</b>

<b>IV</b>	Core-XII	21P4EN12	Comparative Literature	6	5	25	75	100
	Core-XIII	21P4EN13	Post Colonial Literature	6	5	25	75	100
	Core-XIV	21P4EN14	20 <sup>th</sup> Century Literature	6	5	25	75	100
	Elective -IV	21P4ENEO4	English Language Teaching	5	5	25	75	100
		21P4ENE05	Film Studies					
	Common	21P4SSA01	Soft Skills	2	1	25	75	100
	Core Project_I	21P4ENPR01	Project Work & Viva - Voce	5	5	25	75	100
	Common	21P4EX01	Extension Activities (II & III Semester)	(40)* *	1	--	--	
<b>Total</b>				<b>30</b>	<b>27</b>			<b>600</b>
<b>TOTAL CREDITS</b>					<b>100</b>			<b>2,300</b>

\*- 15 Days – IV Semester Leave

# - Commended/Highly Commended will be given, based on Reports & Viva Voce Examination.

\*\* - Outside the class hours.

XXXXX – To choose the corresponding department.

## Semester I

**Course : Chaucer and Elizabethan Age**  
**Credits : 5**

**Course Code: 21P1EN01**  
**Hours/Week : 6**

### Course Objectives:

- ✓ To understand historical, social, religious, economical and political background of the Chaucer and Elizabethan ages through different genres.
- ✓ To stimulate intellectual thinking of students.
- ✓ To expose students to classical English poetry.
- ✓ To introduce students to representative texts by major writers of the period.
- ✓ To expose students to early English Literature

### Syllabus

#### Unit - I Poetry

Geoffrey Chaucer : Prologue to the Canterbury Tales  
John Donne : The Ecstasy  
Thomas Nashe : *A Litany in Time of Plague*

#### Unit - II Poetry

Henry Howard, Earl of Surrey : *My friend, the things that do Attain*  
Thomas Wyatt : I find No Peace  
Edmund Spenser : Epithalamion

#### Unit - III Criticism

Philip Sydney : An Apology for Poetry

#### Unit - IV Prose

Francis Bacon : Of Travel, Of Ambition,  
Of Garden , Of Friendship

#### Unit - V Drama

Christopher Marlowe : Tamburlaine the Great  
Thomas Kyd : The Spanish Tragedy  
Ben Jonson : Volpone

#### Prescribed Text Books:

- ✓ Bacon, Francis. *Bacon Essays*. Edited by Matheson, Oxford University Press, 1927.
- ✓ Chaucer, Geoffrey. *Prologue to the Canterbury Tales*. Oxford University Press, 1994.
- ✓ Jonson, Ben. *The Alchemist*. Later Printing Edition. Harper Publishers, 1988.
- ✓ Marlowe, Christopher. *Tamburlaine the Great*. Macmillan, 2001.
- ✓ Reference Books:
- ✓ Bisson, Lillian. *Chaucer and the Late Medieval World*, New York: St. Martin's Press, 1998.
- ✓ Christopher C. Readings in Modern Literature Vol I, Ammon Publications. 2004.
- ✓ Daiches, David. *A Critical History of English Literature*. Allied Publishers, 2005.

- ✓ King, Bruce. *Seventeenth Century English Literature*. Macmillan, 1982.
- ✓ Marlowe, Christopher. *Tamburlaine the Great*, Nick Hern Books, London, 1997.

### Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Understand the different social set up and cultural context in British Literature.	K 1
CO 2	Identify the distinctive literary works flourished in a modern perspective.	K 2
CO 3	Evaluate the time of adventure and discovery in which new ideas and experience were sought after.	K 3
CO 4	Understand the accomplishment of the literary predecessor in English drama.	K 4
CO 5	Analyse the various literary works and their meanings	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	S	S	M	M
CO 2	S	M	M	S
CO 3	M	S	M	M
CO 4	M	M	S	S
CO 5	S	M	M	M

**S – Strong M- Medium H - High**

## Semester I

**Course : The Restoration and the Augustan Age**

**Course Code: 21P1EN02**

**Credits : 5**

**Hours/Week : 6**

### Course Objectives:

- ✓ To introduce various genres and themes.
- ✓ To analyze the ways in which the authors of the Restoration construed literary values.
- ✓ To familiarize the resources of this literature.
- ✓ To enable students to read and appreciate the poems of this age.
- ✓ To cultivate among students a sense of understanding in order to make them better human beings by exposing them to literature.

## Syllabus

### Unit I – Poetry

John Milton : Paradise Lost - Book -IX

### Unit II – Poetry

John Donne : No Man Is an Island

John Milton :L'*Allegro* and Il *Penseroso*

Thomas Gray : Elegy Written in a Country Churchyard

### Unit III – Prose

Dr. Johnson : Life of Milton

John Bunyan : The Pilgrim's Progress

### Unit IV – Drama

R.B. Sheridan : The School for Scandal

John Dryden :All for Love

### Unit V – Novel

Oliver Goldsmith :The Vicar of Wakefield

Jonathan Swift : Gulliver's Travels (Part I & II)

### Prescribed Text Books:

- ✓ Bunyan, John. *The Pilgrim's Progress*. Penguin Publishers, 2008.
- ✓ Milton John. *Paradise Lost : IX*. Penguin Publishers, 27 Feb 2003.
- ✓ Sheridan, R.B. *The School For Scandal*. Peacock Books, 2001.
- ✓ Swift, Jonathan. *Gulliver's Travels*. Penguin Publishers, 2003.
- ✓ Reference Books:
- ✓ Bond, Donald. *Critical Essays from the Spectator by Joseph Addison*. Oxford University Press, 1970.
- ✓ Bantley, Doctor. *Critical Remarks on Capt. Gulliver's Travels*. Gale, 2018.
- ✓ Macaulay, Lord. *The Pilgrim's Progress with a Critical Essay*. Nabu Press, 2010.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	Gain a deeper insight into the literary aspects of poetry.	K1
CO 2	Understand the literary sensibility of the period.	K2
CO 3	Appreciate the uniqueness of the literary and stylistic features of the 17th century prose.	K3
CO 4	Understand the dramatic and theatrical conventions of Restoration drama.	K4
CO 5	Appreciate the text in terms of themes, techniques and culture	K5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	S	S	M	M
CO 2	M	M	S	S
CO 3	M	S	M	M
CO 4	S	M	S	M
CO 5	M	S	M	M

**S – Strong M- Medium H – High**

## Semester –I

**Course : The Romantic Age**  
**Credits : 5**

**Course Code: 21P1EN03**  
**Hours/Week : 6**

### Course Objectives:

- ✓ To learn about classicism and romanticism and explore the influence of French Revolution.
- ✓ To address the works of several major writers from Romantic Age.
- ✓ To learn about romanticism.
- ✓ To introduce writings with dominant debates of the period like religious, social, philosophical, political.
- ✓ To familiarizes the students with various genres and aesthetic aspects of romantic age.

### Syllabus

#### Unit I – Poetry

William Wordsworth	: Ode on the Intimations of Immortality
Samuel Taylor Coleridge	:Kubla Khan
John Keats	: Ode To Physic, Ode on a Grecian Urn
P.B. Shelley	: Dejections Near Naples

#### Unit II – Poetry

William Wordsworth	: Loadamia
Samuel Taylor Coleridge	: Christabel
P.B. Shelley	: Ode to the West Wind

#### Unit III – Prose & Criticism

Charles Lamb	: A Dissertation upon Roast Pig
William Hazlitt	: On Going a Journey

#### Unit IV – Drama

P.B. Shelley	:Prometheus Unbound
Colley Cibber	:The Careless Husband

#### Unit V - Novel

Jane Austen	:Emma
Charles Dickens	:A Tale of Two Cities

#### Prescribed Text Books:

- ✓ Austen, Jane. *Pride and Prejudice*. Fingerprint Publishing, 2013.
- ✓ Wordsworth, William. *Ode on the Intimations of Immortality*. Oxford University Press, 2013.

#### Reference Books:

- ✓ Coleridge, S.T. *Rime of Ancient Mariner*. Vintage Publications, 1971.
- ✓ Fergus, Jan. *The Professional Woman Writer*. The Cambridge Companion to Jane Austen, Edited by Edward Copeland & et al, Cambridge University Press, 1997.
- ✓ Singh, Bhupal. *An Anthology of English Romantic Writers*, Swastik Publications, 2011.

- ✓ Swinden Patrick ed. *Shelley: Shorter poems and Lyrics*. London Macmillan Press Ltd. 2000.
- ✓ Wordsworth, William. *Selected Poems*. Penguin Classics, 2004.

### Course Outcomes

On the successful completion of the course, students will be

CO Number	Course Outcome	Knowledge Level
CO 1	Understand and appreciate the unique poetic expression of poets.	K1
CO 2	Refine the aesthetic sense, individual taste and expression. Familiarize themselves with social and political changes	K2
CO 3	Familiarize the variety of themes and styles in prose writings.	K3
CO 4	Comprehend the narrative techniques.	K4
CO 5	Acquire the style of various writers.	K5

**K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create**

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H - High**



## Semester \_ I

**Course : The Victorian Age**  
**Credits : 5**

**Course Code : 21P1EN04**  
**Hours/Week : 6**

### Course Objectives:

- ✓ To study the lives of Victorian age, their education, society, strength and weakness.
- ✓ To familiarizes the students with various genres and aesthetic aspects of Victorian age.
- ✓ To expose students to the English poetry and its emergence.
- ✓ To get a clear image of Victorian Britain to know the intellectual and the cultural achievements of this period.
- ✓ To acquire the growth of literature which came to fruition in Victorian England.

### Syllabus

#### Unit-I Poetry

Alfred Tennyson :Tithonus  
Robert Browning :A *Grammarian's Funeral*  
Mathew Arnold : A Wish

#### Unit – II Poetry

Robert Browning : My Last Duchess  
Christiana Rossetti :After Death  
Thomas Hardy : The Darling Thrush

#### Unit - III Prose

Lytton Strachey : Eminent Victorians  
Macaulay :Oliver Goldsmith

#### Unit- IV Drama

W. S. Gilbert : Broken Hearts

#### Unit - V Fiction

Emily Bronte :Wuthering Heights  
George Elliot : Middle March

#### Prescribed Text Books:

- ✓ Brontee Emily, *Wuthering Heights*, Cambridge, Cambridge University Press, 1975.
- ✓ Hardy, Thomas. *Tess of the D'Urbervilles*. Rupa publications India Pvt., Ltd., 1999.
- ✓ Ruskin John. *Sesame and Lilies*. Edited by Albert E. Robert, Trinity Press. 1995.
- ✓ Reference Books:

- ✓ Arnold, Matthew. *A Wish*. The Medici Society Publications, 1922.
- ✓ Strachey, Lytton. *Introduction and Notes Eminent Victorians* . Oxford University Press, 1988.
- ✓ Catherine W. Reilly. *Winged Word: Anthology of Victorian Women's Poetry and Verse*. Laxmi Publications, 2002.
- ✓ Arnold, Matthew. *The Poems of Matthew Arnold*. Elibran Classics, 2005.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO1	Get thorough knowledge on poetry and its components like figure of speech, metaphor, simile etc.	K1
CO2	Organize his own literary ideas and helpful to compose own poetry with enough metrical qualities.	K2
CO3	Get familiarity with theatrical and stage performance and knowledge of dialogue delivery.	K3
CO4	Get extraordinary vocabulary skills and knowledge of sentence construction through prose forms.	K4
CO5	Improve reading skills and art of characterization through fiction	K5

**K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create**

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	M	M	M
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	M	S	M	M

**S – Strong M- Medium H - High**

## Semester \_ I

**Course : Children Literature**

**Course Code : 21P1ENE01**

**Credits : 4**

**Hours/Week : 6**

### Course Objectives:

- ✓ To introduce the body of written works and accompanying illustrations produced in order to entertain or instruct young people.
- ✓ To encompass a wide range of works in Children Literature.
- ✓ To bring to the students of literature acknowledged classics of world literature, picture books and easy-to-read stories written exclusively for children
- ✓ To expose fairy tales, lullabies, fables, folk songs, and other primarily orally transmitted materials.
- ✓ To make the students to understand the life history of the writers

### Syllabus

#### UNIT I

Hans Christian Anderson : The Little Mermaid  
Grimms Brothers : Rapunzel

#### UNIT II

Lewis Carroll : Alice in Wonderland

#### UNIT III

Ruskin Bond : The Ruskin Bond Omnibus

#### UNIT IV

R.K.Narayan : Swami and Friends

#### UNIT V

Roald Dahl : Matilda

#### ✓ Prescribed Text Books:

- ✓ Anderson,Hans. *Hans Anderson Fairy Tales*. Wilco Publishing House. 2005.
- ✓ Bond, Ruskin. *The Ruskin bond Omnibus*. Ruba Publishers. 2004.
- ✓ Carroll, Lewis. *Alice in Wonderland*. Mahaveer Publishers. 2007.
- ✓ Narayan.R.K.*Swami and Friends*. Indian Thoughts Publications. 2008.
- ✓ Tiwari, Shubha.*Children and Literature*. Atlantic publishers. 2006.
- ✓ Reference Books:
  - ✓ Brooks, Felicity. *Usborne Classics Retold: Tales of King Arthur*. Usborne Publishers.2007.

- ✓ Carolyn, Daniel. *Voracious Children Who Eats Whom in Children's Literature*. Routledge .2006.

### Course Outcomes

On the successful completion of the course, students will be

CO Number	Course Outcome	Knowledge Level
CO 1	Acquaint students with the major writers of children's literature, to help they evaluate the literary qualities and the popular appeal of the books for children.	K1
CO 2	Enable the students to evaluate the literary qualities and the popular appeal of Children's Literature	K2
CO 3	Motivate the students to instill the habit of reading in children and make them understand the importance of reading	K3
CO 4	Explain the role of children's literature in the development of reading and writing skills.	K4
CO 5	Explore the category of children's literature and its interaction and impact on children.	K5

**K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create**

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	S	S
CO 2	S	M	M	S	S
CO 3	S	M	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H - High**

## Semester II

**Course – Shakespeare**

**Credits : 4**

**Course Code: 21P2EN05**

**Hours/Week : 5**

### **Course Objectives:**

- ✓ To help the students to acquire an overall insight of the world of drama, research and present the background, historical context, the importance of theatre and its role in the society.
- ✓ To expose the students to the universality of the art and philosophy of the English bard, Shakespeare.
- ✓ To have a sound knowledge of dramatic types– Tragedy, Comedy, Tragi-Comedy and Romance.
- ✓ To know the belief of supernaturalism in his period.
- ✓ To understand the themes & techniques of Shakespearian plays & sonnets.

## **Syllabus**

### **Unit-I (Introduction to Shakespeare)**

The Elizabethan and Jacobean Stage – Conditions, Theatre and Audience

Shakespeare's source and Pre- Shakespearian dramatists

Characteristics of Shakespearian comedy, Tragedy, Historical plays, Problem Plays, Last Romances

### **Unit- II**

Measure for Measure

### **Unit- III**

Hamlet

### **Unit- IV**

Antony and Cleopatra

### **Unit- V**

Shakespeare's sonnets – 18, 30, 60, 104,116,

### **Prescribed Text Books:**

- ✓ Shakespeare, William. *Hamlet*. Manimekala Publishing House. 1973.
- ✓ Shakespeare, William. *Antony and Cleopatra*. Manimekala Publishing House. 1985.
- ✓ Rowse, A.L. *Shakespeare's Sonnets*. Macmillan, 1964.
- ✓ Shakespeare, William. *Measure for Measure*. Manimekala Publishing House. 1990.
- ✓ Reference Books:
- ✓ Bradley, A.C. *Shakespearian Tragedy: Lectures on Hamlet, Othello, King Lear*,
- ✓ *Macbeth*. 2ed. London: Macmillan, 1905.
- ✓ Chambers, K. *The Elizabethan Stage*. 4 Volumes. Oxford: 2nd Clarendon Press, 1923.
- ✓ Dillon, Janette. *The Cambridge Introduction to Shakespeare's Tragedies*. Cambridge: Cambridge University Press, 2007.
- ✓ Hopkins, Lisa. *Beginning Shakespeare*. Manchester: Manchester University Press.2005.
- ✓ Halliday, F. E. *A Shakespeare Companion*. Baltimore: Penguin, 1964.

## Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	Identify the organizing elements of Shakespearean drama.	K1 & K2
CO 2	Identify, explicate, and respond to key themes and elements in Shakespearean drama, as presented in both written and spoken form.	K2 & K4
CO 3	Explicate the effect that drama has on the understanding of ideas and the ethos of a culture, specifically Shakespeare's effect on the whole of the West.	K2 & K3
CO 4	Prepare for and perform selections from Shakespearean plays in a Readers Theatre format.	K3 & K4
CO 5	Understand the Shakespearean style of writing and Expositions.	K2

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

## Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	M	M	M
CO 2	S	M	M	S	M
CO 3	M	S	S	M	M
CO 4	M	M	S	S	S
CO 5	M	S	S	M	M

**S – Strong M- Medium H - High**

## Semester II

**Course - American Literature**  
**Credits : 4**

**Course Code: 21P2EN06**  
**Hours/Week : 5**

### Course Objectives:

- ✓ To enable the students to review and recognise the body of literary works from America.
- ✓ To make the students to understand the American spirit and analyse various literary innovations and their culture.
- ✓ To improve the knowledge of the roots in American Literature.
- ✓ To analyse various literary innovations and their impact.
- ✓ To understand United State's national identity.

### Syllabus

#### Unit I – Poetry

Edgar Allan Poe : The Raven  
Walt Whitman : Out of the Cradle Endlessly Rocking.

#### Unit II – Poetry

James Russell Lowell : The *Cathedral*  
Emily Dickenson : Hope is the thing with feathers  
Robert Frost : West Running Brooks

#### Unit III – Prose

*Ralph Waldo Emerson* : The American Scholar  
Henry David Thoreau : Walden

#### Unit IV – Drama

Samuel Shepard : *Curse of the Starving Class*  
Edward Albee : Who's Afraid of Virginia Woolf?

#### Unit V – Novel

Nathaniel Hawthorne : The Scarlet Letter  
Ralph Waldo Ellison : Invisible Man

### Prescribed Text books:

- ✓ Fisher, William J, K B. Vaid, H. Willard Reninger, and Relph Samuelson.  
*American Literature of the Nineteenth Century: an Anthology.*  
Eurasia publ. House (pvt.) Ltd., New Delhi, 1984.
- ✓ Hawthorne, Nathaniel. *The Scarlet Letter*. Maple Press, 2010.
- ✓ Ellison, Ralph Waldo. *Invisible Man*. Penguin UK, 2009.
- ✓ Reference books:
- ✓ Das, Ajay. *Great American Poets*. First Editon, Bhasker Publications, 2010.
- ✓ Subbian, C. *American Literature: An Anthology of Poems*. Emerald Publishers, 2010.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	Analyse and understand the American spirit, tradition and society as identified from the work.	K1
CO 2	Enrich them with the classic books and writers that make up the American literary canon and their contexts.	K2
CO 3	Learn about life style and American culture.	K3
CO 4	Learn to comprehend and analyse historical movements in dramatic literature, life and dreams of America as reflected in the literary works.	K4
CO 5	Identify the varied responses that are earned through reading of the creative	K5

***K1-Rememeber, K2-Understand, K3-Apply, K4-Aanlyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	M	S	S
CO 2	S	S	S	S	M
CO 3	S	S	M	M	M
CO 4	M	M	S	M	S
CO 5	M	M	S	M	S

**S – Strong M- Medium H - High**



## Semester II

**Course : Indian Writing in English**

**Course Code : 21P2EN07**

**Credits : 4**

**Hours/Week : 5**

### **Course Objectives:**

- ✓ To enable the students to acquire knowledge of Indian Writing.
- ✓ To acquire knowledge through the study of various literary genres poetry, prose, drama, short stories and fiction.
- ✓ To help them to appreciate Indianness in Indian Writing.
- ✓ To equip with knowledge and skills to read and comprehend the text.
- ✓ To understand the nuances of Indian Writing in English.

### **Syllabus**

#### **Unit I – Poetry**

Rabindranth Tagore :Gitanjali (1-10)

#### **Unit II- Poetry**

Sarojini Naidu : The Coromandal Fishers

Toru Dutt : My Vocation

R.Parthasarathy : Home Coming

Sri Aurobindo : Surreal Science

#### **Unit III – Prose**

Ananda Coommaraswamy :The Dance of Shiva

#### **Unit IV- Drama**

Vijay Tendulkar :Ghashiram Kotwal

Girish Karnad : Tughlag

#### **Unit V – Fiction**

Raja Rao : Kanthapura

Khushwant Singh : Train to Pakistan

### **Prescribed Text Books:**

- ✓ Tagore, Rabindranath. *Gitanjali*. Macmillan Publications, 1912.
- ✓ Karnad, Girish. *Tughlag*. Penguin India Publishers, 1922.
- ✓ Reference Books:
- ✓ Radice, William. *Gitanjali Rabindranath Tagore*. Penguin Publishers, 2011.
- ✓ Reena, Sablok. *The Emergence of the Indian Best Seller and their Metro Fiction*. Atlantic Publishers. 2008.
- ✓ Chandra, Mohan. *Raja Rao – A Critical Study*. Baskar Publication, 1982.

## Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	Introduce the learners to the Indian Writing in various genres	K1 & K2
CO 2	Insight into Hindu mythology and Imbibe an interest to read and appreciate Indian Writing in English.	K2 & K4
CO 3	Students will understand how well the Indian culture is reflected in Literature. And Enhance the skill for reading.	K2 & K3
CO 4	Present the Indian way of Dramatic sequence and Effectively understand and communicate ideas related to the Indian Writing	K3 & K4
CO 5	Insight into poverty and exploitation.	K2

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

## Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	S	S
CO 2	S	M	S	S	M
CO 3	S	S	M	S	M
CO 4	M	S	S	M	S
CO 5	M	S	S	M	M

**S – Strong M- Medium H - High**

## Semester II

**Course : Science Fiction**

**Course Code: 21P2ENE02**

**Credits : 4**

**Hours/Week : 4**

### Course Objectives:

- ✓ To identify, analyze, interpret and describe the critical ideas, values and themes of fiction.
- ✓ To educate students through fiction with the contemporary forms of culture.
- ✓ To assist students to write analytically in the variety of forms including research papers, reflective writings.
- ✓ To understand the themes & techniques of Science Fiction.
- ✓ To understand the difference between Science vs Fiction

### Syllabus

#### Unit - I

George Orwell : 1984

#### Unit - II

Aldous Huxley : Brave New World

#### Unit - III

Isaac Asimov : I, Robot

#### Unit - IV

J.K. Rowling : Harry Potter and Deathly Hallows

#### Unit - V

Kazuo Ishiguro : Never Let Me Go

### Prescribed Text Books:

- ✓ Huxley, Aldous. *Brave the New World*. Penguin Publishers, 30 May 2000.
- ✓ Rowling, J.K.. *Harry Potter and Deathly Hallows*. Penguin publishers, 1982.
- ✓ Orwell, George. *1984*. Fingerprint Publishing, 25 Feb 2003.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	Familiarize with Science Fiction.	K1
CO 2	Understand fiction with the contemporary forms of culture	K2
CO 3	Analyze the historical and super natural elements.	K3
CO 4	Appreciate the subjectivity.	K4
CO 5	Judge the life history of the author	K5

**K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-**

**Create**

**Mapping with Programme Specific Outcomes**

<b>PSO</b> <b>CO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
CO 1	S	S	M	S	S
CO 2	M	S	S	S	M
CO 3	S	M	M	S	M
CO 4	M	M	S	S	M

**S – Strong M- Medium H – High**

## Semester II

**Course : Effective Communication**

**Course Code: 21P2ENP01**

**Credits : 4**

**Hours/Week : 5**

### **Course Outcomes:**

- ✓ To develop the LSRW Skills in students
- ✓ To train students to converse in English in day to day situations
- ✓ To hone the writing skills in students by regular practical exercises
- ✓ To expose the students to various personal and social skills, to make them understand their individual behaviour
- ✓ To develop, creativity, thinking skills and oratorical skills.

## Syllabus

### **Unit I - Writing Skills**

Letter writing formal- application for jobs and informal letter writing, circular writing, report writing, minutes recording, preparation of agenda, dialogue writing, essay writing and writing simple speeches e.g. Welcome Address, Vote of Thanks etc.,

### **Unit II - Power Point Presentation**

1. Preparation
2. Usage of PPT
3. Dress code
4. Body Language
5. Knowledge of the Subject
6. Clarity of Expression & Modulation

### **Unit - III**

#### **A) Group Discussion & Public Speaking**

1. Group Discussion
2. Dress & Appearance
3. Motivation
4. Importance of being calm, friendly & cool
5. Importance of Listening
6. Leadership qualities
7. Knowledge of the subject
8. Delivery
9. Body language
10. Voice modulation
11. Language: simple, specific, intelligible, concrete & sensuous
12. Brevity
13. Humour

**Note:** Students are to be trained to group-discuss current affairs, National Issues, International developments, Social Issues, Systems of Government, Human rights etc.

## **B) Public Speaking Skills:**

- a) Preparation
- b) Knowledge of the subject
- c) Dress and Appearance
- d) Delivery: Body Language, Brevity, Brevity, Humor, Accuracy and Eloquence
- e) Use of Anecdotes
- f) Sensing the Audience
- g) Overcoming fear
- h) Time-management
- i) Encountering a hostile atmosphere

## **Unit IV - Mini Project**

Viva : 15 Marks

(Defending the Thesis and establishing its authenticity)

Total 15 Marks.

## **Unit V**

Interview and Preparation of a CV (Curriculum Vitae)

### **Prescribed Text Books:**

- ✓ Gibaldi, Joseph. *MLA Handbook*. 8th ed., The Modern Language Association of America. 2016.
- ✓ Jyakaran.I, *Everyone's Guide to Effective Writing*, Chennai: 2 M Publishing Internal, 2000.
- ✓ Lingua Forum, *Lingua Essays for TOEFL/IELTS*, New Delhi: Dream tech Press, 2003.
- ✓ Pamela J. Sharpe, *How to prepare for the TOEFL test*, New Delhi: Galgotia Publications Private Limited, 2001.
- ✓ Syamala. V, *Effective English Communication for You*, Chennai: Emerald Publishers, 2002.

### **Reference Books:**

- ✓ V.Sasikumar & P.V.Dhamija. *Spoken English- A Self-Learning Guide to Conversation Practice*. Noida: JBA, n.d. Print.
- ✓ J.Sethi & P.V.Dhamija. *A Course in Phonetics and Spoken English*. 2nd Edition, Reprint 2011. ed. Delhi: JBA, 2013. Print.
- ✓ Wilkinson, Andrew M. *Spoken English*. Edgbaston [Eng.: University of Birmingham, 1966. Print.
- ✓ Cheepen, Christine, and James Monaghan. *Spoken English: A Practical Guide*. London: Pinter, 1990. Print.

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome	Knowledge Level
CO 1	To develop the students' speaking skills to enable them to use general, social and professional language	K1
CO 2	To review how spoken English is used in a range of authentic contexts.	K2
CO 3	To explore the differences between the grammars of spoken and written English	K3
CO 4	To introduce and critically survey recent developments in materials and methodology for the analysis, teaching and testing of spoken English.	K4
CO5	Criticize the work of Art of the different authors	K5

***K1-Rememeber, K2-Understand, K3-Apply, K4-Aanlyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	S	M
CO 2	M	S	M	M	M
CO 3	S	M	S	S	M
CO 4	M	S	S	M	S

**S – Strong M- Medium H – High**

### Semester III

**Course : Research Methodology**

**Course Code: 21P3EN08**

**Credits : 5**

**Hours/Week : 6**

#### **Course Objectives**

- To orient the students towards the basics of research.
- To familiarize the student with the use of various tools and techniques of research
- To familiarize the student with the nature, dimensions and methods of research.
- To empower the student with the knowledge and skills needed to undertake a research project, to present a research paper in the conference and to publish a scholarly article.
- To highlight the significance of systematic planning and execution of research activity

#### **Syllabus**

##### **UNIT - I**

**Research:** *Definition, Aim/Objectives, Fundamentals, General Characteristics.*

##### **Conducting Research**

**Types of Research:** *Quantitative Research, Qualitative Research, Descriptive Research, Analytical Research, Applied Research, Fundamental Research, Exploratory Research, Conclusive Research, Surveys and Case Studies, Hypothesis*

##### **UNIT - II**

Literary Review - Approaches to Research - Using Library - Writing Drafts - Taking Notes

##### **UNIT - III**

Plagiarism: Definition, Types, Consequences  
Mechanics of Writing: Spelling, Punctuation, Italics, Name of the Person, Numbers, Abbreviations, Title of the Sources, Quotations.

##### **UNIT - IV**

Format of the Research Paper  
Language and Style suitable for Thesis

##### **UNIT - V**

Documentation: Works Cited - In Text Citations, Citations in forms other than print - Compiling a Working Bibliography  
Harvard and APA System

##### **Books Prescribed:**

- Gibaldi, Joseph. *MLA Handbook for writers of Research Papers*, New Delhi: EWP, 2022 (09<sup>th</sup> Edition)
- *Thesis and Assignment Writing* – Anderson, Duston, Poole – Fourth Edition

##### **Reference Books:**

- *MLA Handbook for Writers of Research Papers* – Joseph Gibaldi – Seventh & Eighth Edition
- *Research Methodology in English* – Kalpana Seth
- *Research Genres: Explorations and Applications* – John M. Swales
- *Amalraj .D - Research Methodology*



### Mapping with Programme Specific Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Develop an understanding on various kinds of research, objectives of doing research, research process, research designs and sampling	K 1
CO 2	Have basic knowledge on qualitative research techniques	K 2
CO 3	Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis	K 3
CO 4	Have basic awareness of data analysis-and hypothesis testing procedures	K 4
CO 5	Acquire the knowledge to write project on their own	K 5

***K1-Rememeber, K2-Understand, K3-Apply, K4-Aanlyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester III

**Course : Eco Studies in Literature**      **Course Code**      : 21P3EN09

**Credits**    : 5

**Hours/Week**    : 6

### Course Objectives:

- To enable the students acquiring with ecological idea
- To understand eco system with literature and literary appreciates and eco perspectives
- To Engage with environmental issues through literary narratives
- To Explore environmental issues via historical narratives
- To develop critical awareness about sustainability practices

### Syllabus

#### Unit I Eco Study-Definition

Environmental literary Criticism, Eco-Critics- William Howarth,  
Cheryll Glotfelty, Timothy Morton

#### Unit II Poetry

- |               |                    |
|---------------|--------------------|
| W.H.Davies    | -Leisure           |
| John Masfield | - Sea fever        |
| Gieve Patel   | -On killing a Tree |

#### Unit III Prose

- |                |                                       |
|----------------|---------------------------------------|
| Charles C.Mann | - State of the Species                |
| Rachel Carson  | - A Fable for Tomorrow:silent Reading |

#### Unit IV Drama

- |             |                          |
|-------------|--------------------------|
| Tagore      | - Muktha Dhara           |
| Henry Ibsen | - An Enemy of the People |

#### Unit V Fiction

- |                |                       |
|----------------|-----------------------|
| John Steinbeck | - The Grapes of Wrath |
| JG Ballard     | - The Drowned World   |

#### Reference Books

- ✓ Buell, Lawrence.The Environmental Imagination: Thoreau, Nature Writing and The
- ✓ Formation of American Culture Cambridge, MA and London, England, Harvard UP, 1995

<b>CO Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO 1	Obtain a literary acumen to answer MCQS OF NET/SET Examination	K 1
CO 2	Initiate discussions on Environmental issues	K 2
CO 3	Acquaint themselves with some other literary works in eco studies	K 3
CO 4	Get a board perspectives of the various observation on nature	K 4
CO 5	Be aware of the various factors that affect the Environment	K 5

***K1-Rememeber, K2-Understand, K3-Apply, K4-Aanlyses, K5-Evaluate, K6-Create***

**Mapping with Programme Specific Outcomes**

<b>PSO</b> <b>CO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	S	S	S	M	S
<b>CO 2</b>	S	M	M	S	S
<b>CO 3</b>	M	S	M	M	M
<b>CO 4</b>	M	M	S	S	S
<b>CO 5</b>	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester \_ III

**Course : Voices of Women Course Code: 21P3EN10**

**Credits : 5 Hours/Week : 6**

### Course Objectives:

- Identify conceptual and theoretical issues faced by women in the third world.
- To equip students to steer clear of misconceptions regarding women and to evolve a human perspective about them.
- To arouse a keen interest in analyzing critically the diversity of women's experiences across the world and to marvel at their creative skills.
- To perceive gender as a social construct
- To recognize the difference between silence and silencing.

### Syllabus

#### Unit I Poetry

Eunice D.Souza	-	Bequest
Sylvia Plath	-	Mirror
Maya Angelou	-	Still I Rise
Annie Louisa Walker	-	Women's Rights

#### Unit II Prose

Virginia Woolf	-	Shakespeare's Sister
Mary Wollstonecraft	-	A Vindication of the Rights of Women

#### Unit III Drama

Mahes Dattani	-	Tara
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#### Unit IV Short story

Charlotte Perkins Gilman	-	The Yellow Wallpaper
Alice Walker	-	The Flowers
Gabriel García Márquez	-	Death Constant Beyond Love

#### Unit V Fiction

Kate Chopin	-	The Awakening
Alice Walker	-	Meridian

#### Reference Books

Walker, Alice. "Meridian". London: Harcourt Brace, 1985. 231-243. Print.

## Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Students have to become experiences unique to women and to the fundamental precepts of the feminist movement and to identify the polyphonic quality of women's voices	K 1
CO 2	Understand the women's studies and institutionalization	K 2
CO 3	Make aware of Women in Indian Society	K 3
CO 4	Understand the women development agents.	K 4
CO 5	Critically analyze the life style and challenges of women.	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

## Mapping with Programme Specific Outcomes

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester - III

**Course : Language and Linguistics**

**Course Code: 21P3EN11**

**Credits : 4**

**Hours/Week : 6**

### **Course Objectives:**

- To draw the attention of the students of the area of Language and Linguistics
- To make them Understand the history of linguistics and changes of languages through periods
- To describe the structure of the speech organs and their function and the basic methods of articulation
- To formalize linguistic facts into concise rules and diagrams.

Grasp the complexity of language as a communication system factors.

### **Syllabus**

#### **Unit- I:**

Origin of Language  
The growth of Vocabulary  
Change of Meaning  
Characteristics of American English  
Characteristics of Indian English

#### **Unit- II:**

What is Language?  
Spoken and Written Language  
Human Language and Animal Communication  
Social aspects of Language

#### **Unit-III:**

What is linguistics?  
Levels of Linguistics  
Co-ordination and subordination  
Phrase structure  
TG grammar

#### **Unit-IV:**

Phonology – Classification and Description of i) Vowels ii) consonants  
Syllable, Word Stress, Sentences stress and Intonation

**Unit-V:**

Phonetic Transcription

Stress Marking of Individual Words

**Text books:**

F.T. Wood: An Outline History of English Language

A.C. Baugh: History of English language

<b>CO Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO 1	Understand language structures and functioning of the language.	K 1
CO 2	Classify ancient and traditional perspectives of language use in the society.	K 2
CO 3	Analyse the Grammatical Theories of Western countries as well as India	K 3
CO 4	Evaluate the relationship between language and society	K 4
CO 5	Understand the application of linguistics on other related disciplines	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

**Mapping with Programme Specific Outcomes**

<b>CO \ PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

### Semester - III

**Course : Literary Theory and Criticism**

**Course Code : 21P3ENE03**

**Credits : 4**

**Hours/Week : 6**

#### **Objectives:**

- To acquaint the students with the modern trends in literary theory
- To enable the students to understand the literary critical thoughts that is impelled in English Literature.
- To introduce the students literary criticism from the beginning to the twentieth century
- To sensitize the students to transition from humanistic to Modern to Post modern critical traditions
- To make them understand how theory can be used as a methodology for

#### **Syllabus**

##### **UNIT- I**

Wordsworth	:	Preface to the Lyrical Ballads
Coleridge	:	Biographia Literaria Chapters 14, 17

##### **UNIT - II**

I.A.Richards	:	Four Kinds of Meaning
Mark Schorer	:	From Techniques as Discovery

##### **UNIT - III**

W. K Wimsat	:	Intentional Fallacy
& A.C Beardley		
Terry Eagleton	:	Capitalism, Modernism, Post Modernism

##### **UNIT - IV**

M.H.Abrams	:	The Deconstructive Angel
H. Louise Gardener	:	The Sceptre and the Torch

##### **UNIT V**

Allen Tate	:	Tension in Poetry
Cleanth Brooks	:	Irony as a Principle of Structure

#### **Prescribed Books :**

1. Enright, D.J and Earnest De Chickera .English Critical Texts.New Delhi, Oxford UP, 1975, print



- David Lodge: (ed.) Modern Criticism and Theory- A Reader (Pearson, 2005)

**Reference Books:**

- A Glossary of Literary Terms – M.H.Abrams and G.G.Harpham (latest edition)
- An Introduction to the Study of Literature – William Henry Hudson
- Beginning Theory – Peter Barry

**Course Outcomes**

CO Number	Course Outcome	Knowledge Level
CO 1	Familiarize students with the literary premises and intellectual background pertinent to important eras of the literary and critical theory.	K 1
CO 2	Explore possible applications of critical theory to various literary texts.	K 2
CO 3	Develop students’ knowledge of the terms used in the criticism of literature.	K 3
CO 4	Demonstrate in-depth knowledge of foundational critical texts.	K 4
CO 5	Historicize and contextualize foundational theoretical and critical texts.	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

**Mapping with Programme Specific Outcomes**

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester - III

**Course : New Literature in English**  
**Credits : 4**

**Course Code : 21P3ENE04**  
**Hours/Week : 6**

### Course Objectives:

- ✓ To introduce students to the emergent body of literature being produced by writers from the countries, that have emerged with the literature of their own
- ✓ To create an awareness about the various issues discussed by different writers with local and global social conditions
- ✓ To prepare the students to make an attempt to read the works comparatively, in relation to one another along with their literary and cultural traditions.
- ✓ To create literary sensibility in students and expose them to artistic and innovative use of language by writers and to various worldviews
- ✓ To enhance literary and linguistic competence of students.

## Syllabus

### Unit I Poetry

Wilfred Campbell : The Winter Lakes (Canada)  
David Rubadiri : A Negro Labourer in Liverpool (Africa)  
Shaw Neilson : The Bard and the Lizard (Australia)

### Unit II Prose

Tagore : Sadhana Chapter I – III  
V.S Naipaul : Area of Darkness

### Unit III Drama

Soyinka : The Road  
Tony Morrison : The Bluest Eye

### Unit IV Fiction

Chinua Achebe : Things Fall Apart  
Patrick White : Voss

### Unit V Criticism

Margaret Atwood : Ice Women v. Earth Mothers : the Stone Angel and The Absent Venus.  
Stuart Hall : Cultural Identity of Diaspora

### Prescribed Text

- Poems are from an Anthology of Commonwealth poetry by C.D. Narasimhaiah)
- From "Readings in Commonwealth Literature Ed. William Walsh Clarendon Press, Oxford 1973, 228-240 pp.

## Reference Book

- The Reader's Companion to World Literature by Lillian Herlands Hornstein (Editor), Calvin S. Brown (Editor), G.D. Percy (Editor)
- On Literature by Umberto Eco, Martin L. McLaughlin (Translator)

CO Number	Course Outcome	Knowledge Level
CO 1	Learnt the use of Language rather than usage of English	K 1
CO 2	Develop their critical thinking capabilities focused through the course	K 2
CO 3	Exposing a range of contexts where the language is used to meet a variety of real life	K 3
CO 4	Integrating knowledge and skills	K 4
CO 5	focus on readability, teach-ability and testability - to think beyond the text	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-***

***Create***

### Mapping with Programme Specific Outcomes

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	M	S
CO 2	S	M	S	M	S
CO 3	M	S	S	M	M
CO 4	M	S	M	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## SEMESTER IV

**Course : Comparative Literature**

**Course Code : 21P4EN12**

**Credits : 5**

**No of Hours : 6**

### **Course Objectives:**

- To Introduce Comparative Literature as a discipline and giving a general history of its development
- Introduce the language, culture, folklore and literatures of India and their studies in a comparative framework
- To expose learners to the Scope, Methodology, Application of theories in Comparative Literature
- To apply Genre, Thematology, Literary Influence and Reception Studies into texts and non -Literary texts.
- To Understand Western and Eastern Comparative Methods

### **Syllabus**

#### **UNIT - I**

Definition-Scope and Methodology-Application- General,  
Comparative and National Literature –French and American  
School

#### **UNIT –II**

Influence and Literary  
Fortune Epoch, Period,  
Generation  
Thematology-Comparing works on the basis of themes

#### **UNIT –III**

Genres- Comparing works on the basis of forms  
Translation Study, Periodisation, Reception and  
Survival

#### **UNIT –IV**

Literature and Society, Literature and Religion  
Literature and Psychology -Comparative Literature in India

## UNIT –V (Practical)

A Comparative study of Anita Desai's Fire on the Mountain and Tony Morrison's Beloved

### Reference Books:

1. Bassnett, Susan. Comparative Literature: A Critical Introduction. Oxford: Blackwell
2. Ulrich Weisseten Comparative Literature and Literary Theory Survey and Introduction Indiana University

### Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Demonstrate comprehensive knowledge of literary relational aspects of influences and similarities	K 1
CO 2	Compare different literatures in different genres	K 2
CO 3	Explain 'comparison' as a method of study and literatures as content in their cultural and linguistic diversity	K 3
CO 4	Demonstrate the knowledge that comparative literature is a distinct study of multiple literatures with mutual influences crossing all types of boundaries	K 4
CO 5	Apply required literary tools to understand and appreciate texts for comparative study	K 5

**K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create**

### Mapping with Programme Specific Outcomes

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester : IV

**Course : Post Colonial Literature**

**Course Code: 21P4EN13**

**Credits:5**

**Hours/Week: 6**

### **Objectives:**

- ✓ To introduce colonization and its impacts on the Colonized countries across the globe
- ✓ To study the evolution of Post-Colonial Literature
- ✓ To study the themes and forms of Post-Colonial Literature
- ✓ To introduce the style of the various writers of the Post- Colonial countries
- ✓ To Identify and discuss key postcolonial authors and texts in their historical and cultural contexts

### **Syllabus**

#### **Unit I – Poetry**

David Diop	:	Africa
A. D. Hope	:	Australia
Bernard Dadie	:	I Thank You God

#### **Unit II – Prose**

Chinua Achebe	:	The Novelist as Teacher
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#### **Unit III – Drama**

Judith Thompson	:	Pink
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#### **Unit IV – Novel**

Chinua Achebe	:	Things Fall Apart
Chimamanda Ngozi Adichie	:	Half of a Yellow Sun

#### **Unit V – Short Story**

Margaret Laurence	:	The Loons
James Sinclair Ross	:	The Lamb at Noon
Doris Lessing	:	The Grass is Singing

#### **Text book:**

An Anthology of Commonwealth Poetry - C.D. Narasimhaiah  
Norton Anthology of African Literature, Fifth Edition, W.W. Norton and Company, London

**Reference books:**

Cook, David. African Literature: A Critical View London: Longmans Green.

King Bruce. New English Literature, London: Macmillan.

**Course Outcomes**

<b>CO Number</b>	<b>Course Outcome</b>	<b>Knowledge Level</b>
CO 1	Identify key questions, authors, and literary forms in postcolonial literature	K 1
CO 2	Think critically about these texts in relation to postcolonial theory	K 2
CO 3	Situate these works in their larger cultural contexts	K 3
CO 4	Develop interpretative skills of close reading	K 4
CO 5	Offer nuanced interpretations, articulate coherent arguments, and develop research skills through your written essays	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

**Mapping with Programme Specific Outcomes**

<b>PSO CO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester : IV

**Course : Twentieth Century Literature**

**Course Code : 21P4EN14**

**Credits:5**

**Hours/Week: 6**

### **Course Objectives:**

- ✓ To read and analyze a survey of texts written by 20th Century British writers, from the period 1890-2001;
- ✓ To demonstrate thorough knowledge of the major literary movements of the period, the texts discussed and class and the socio-cultural conditions of British society in which they were produced;
- ✓ To locate texts within the cultural and historical framework of their time;
- ✓ To prepare clear, well-organized essays on topics related to the works studied and be able to apply basic principles of selected critical theory to their chosen topics.
- ✓ To locate texts within the cultural and historical framework of their time

### **Syllabus**

#### **Unit I – Poetry**

W. H. Auden : In Memory of W. B. Yeats

W. B. Yeats : The Second Coming

#### **Unit III – Prose**

C.P.Snow : Two Cultures

#### **Unit IV – Drama**

Bernard Shaw : The Apple Cart

Wole Soyinka : The Strong Breed

#### **Unit IV Short Story**

Rudyard Kipling : The Jungle Book

Agatha Christie : Strange Jest from Three Blind  
Mice and other Stories

Willa Cather : Double Birthday

#### **Unit V – Fiction**

Virginia Woolf (1882-1941) : To the Lighthouse

Rebecca West : The Judge

#### **Reference books:**

- ✓ Shaw, Bernard - The Apple Cart, the Orient Longmans Edition
- ✓ D.J. Enright Ernst De Chickera – English Critical Texts, Indian Edition
- ✓ Blamires, H. Twentieth-Century English Literature. London: Macmillan, 1991.



- ✓ Gray, Martin. A Dictionary of Literary Terms. London: Longman, 1992.
- ✓ Hayward, J., ed. The Penguin Book of English Verse. London: Penguin, 1956.
- ✓ Bradbury, Malcolm. The Modern British Novel. London: Penguin, 2001.
- ✓ Dodsworth, Martin, ed. The Twentieth Century. London: Penguin, 1994.
- ✓ Pálffy, István. English Drama in the 20th Century. Bp.: Nemz. Tankvk., 1993.

### Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Apply knowledge of the historical and cultural contexts of the Literature	K 1
CO 2	Identify key elements that are distinctive to literary achievement of writers in the Romantic, Victorian and Modernist periods	K 2
CO 3	Reflect and write analytically about the literary works and their contexts	K 3
CO 4	Develop their own skills of literacy critical analysis	K 4
CO 5	Understand and deploy a range of terms and concepts integral to literary studies	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester \_ IV

**Course : English Language Teaching      Course Code : 21P4ENE05**

**Credits: 5    Hours/Week      : 5**

### **Course Objectives:**

- To make student to understand the background of Teaching English in India.
- To make learners to understand different methods of teaching English and assess them.
- To help the students to acquire recent trends in ELT
- To expose learners to practice teaching with an application of various testing skills and teaching methodologies.
- To develop students ability to use English in day-to-day life and real life situation

### **Syllabus**

#### **UNIT –I (Teaching English in India)**

Background to Teaching of English in India- Role of Mother Tongue  
-Second Language Acquisition Research

#### **UNIT – II (Methods of ELT)**

Grammar Translation Method                      -                      Direct Method -Situational  
Language Teaching -                                      Bilingual Method - Communicative  
Language Teaching Method

#### **UNIT – III (Recent Trends in ELT)**

Neuro Linguistics Programme - Suggestopedia - The Lexical  
Approach - Multi-Skill Approach - Structural Approach - Multiple  
Intelligence

#### **UNIT – IV (Teaching Skills)**

Teaching LSRW Skills - Teaching of Literature - Drama - Prose- Poetry  
-Fiction - Teaching of Grammar and Composition

#### **UNIT – V (Practical)**

Audio visual aids for English Class Room  
Online Teaching Tools  
Classroom Teaching Practice

#### **Books Prescribed:**

- ✓ Nagarajan, Geetha: English Language Teaching Approaches, Methods and Techniques, Calcutta; Orient Longman Limited.

#### **Reference Books:**

- ✓ Jack C. Richards and Theodore S. Rodgers. 2006. Approaches and Methods in Language Teaching Second Edition, Cambridge: Cambridge University Press
- ✓ Corder, S.Pit: Error Analysis and Inter language, Oxford: Oxford University Press, 1985.
- ✓ Hornby, A.S: The Teaching of Structural Words and Sentences Patterns, Oxford: Oxford University Press, 1979.
- ✓ Baruah, T.C.    : The English Teacher's Handbook, Delhi: Sterling Publishers Private Limited, 1991.

### Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Understand the different motivations and expectations which learners bring to learning English	K 1
CO 2	Compare and contrast current approaches to the methodology of language teaching with learners' experience in other areas of formal learning, and can	K 2
CO 3	Demonstrate in their own teaching their awareness of any differences which may emerge	K 3
CO 4	Aware of the ways in which English language teaching relates to learners' general educational development and, where relevant, to the curriculum as a whole	K 4
CO 5	Heighten the awareness of correct usage of English Language in Communication	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	S	M	M	S	S
CO 3	M	S	M	M	M
CO 4	M	M	S	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

## Semester \_ IV

**Course : Film Studies**

**Course Code : 21P4ENE06**

**Credits: 5**

**Hours/Week : 5**

### **Course Objectives:**

- ✓ To understand the fundamental disciplines inherent in motion picture, television, and web production etc...
- ✓ Acquire broad knowledge and appreciation of the history of film, television, and new media.
- ✓ Develop and refine collaboration and storytelling skills to communicate effectively, and demonstrate these skills in the execution of media projects.
- ✓ Professional competency in the methods of producing, directing, editing, cinematography, production design.
- ✓ Awareness of, and experimentation with, the evolving nature of the film and television industry .
- ✓ Specialization in at least two core production disciplines with substantial proficiency in at least one.

### **UNIT I**

History of Cinema in India; Major landmarks in India Cinema

### **UNIT 2**

Kinds of Films Historical Patriotic Documentary Thrillers.

### **UNIT 3**

Art of Film Making: Some Important Techniques Acting/  
Photography/Direction/Scriptwriting

### **UNIT 4**

Films and Entertainment Films and Social Responsibility

### **UNIT 5**

Review of Films

### **Prescribed Texts:**

- Ed. Bill Nichols, 1993 ,Movies and Methods Vol. I, Edition Seagull Books, Calcutta.
- Ed. Bill Nichols, 1993, Movies and Methods Vol. II, Edition Seagull Books, Calcutta.
- Susan Hayward, 2004, Key Concepts in Cinema Studies, Routledge, London.

### **Reference Books :**

- Louis Giannetti, 1972, Understanding Movies, Prentice Hall, New Jersey.
- Ed. S. Vasudevan, 2000, Making Meaning in Indian Cinema, OUP, New Delhi.

### Course Outcomes

CO Number	Course Outcome	Knowledge Level
CO 1	Students will demonstrate that the critical study of cinema inform their filmmaking and that the study and practice of film production enhance their work as film scholars and analysts.	K 1
CO 2	2. Students will demonstrate that they understand the pre-production, production, and postproduction filmmaking process	K 2
CO 3	3. Students will demonstrate the relationship between film form and aesthetic effect through both film analysis and the creation of motion pictures.	K 3
CO 4	4. Students will be able to conduct film research and compose cogent, persuasive, and valid essays about film.	K 4
CO 5	5. Students will demonstrate a broad knowledge of film history, national cinemas and modes of production.	K 5

***K1-Remember, K2-Understand, K3-Apply, K4-Analyses, K5-Evaluate, K6-Create***

### Mapping with Programme Specific Outcomes

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	M
CO 2	S	M	M	S	S
CO 3	M	S	M	S	M
CO 4	M	S	M	S	S
CO 5	M	S	M	S	M

**S – Strong M- Medium H – High**

**SELVAMM ARTS AND SCIENCE COLLEGE**  
**(AUTONOMOUS)**

Nationally Accredited by NAAC  
UGC recognized 2(f) and 12(B) Institution  
Affiliated to Periyar University, (Salem)  
Namakkal – 637 003



**MASTER OF SCIENCE IN MATHEMATICS**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**

**SYLLABUS**

**Effective from 2021-2022**

## **VISION**

Problem solving, understanding, reasoning and sense-making are at the heart of mathematics teaching and learning and are central to mathematical proficiency.

## **MISSION**

To nurture pupils to become effective and creative problem solver in applying mathematical knowledge and skills in a dynamic world of modern technology.

### **Programme Outcomes (POs)**

**PO 1:Application:** Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.

**PO 2:Analysis:** Perform analysis to assess, interpret, and create innovative ideas through practical experiment.

**PO 3:Solution Finding:** Facilitate to enter multidisciplinary path to solve day-to-day problems.

**PO 4: Progression in Career:** Prepare students for prominent career in industry, banks offices and for further academic study.

**PO 5:Research Capability:** Able to do the experiments with proper procedure, appropriately record and analyze the results.

**PO 6:Expressing their talents:** Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.

**PO 7:Individual sustainability:** Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.

**PO 8:Competency:** Attain competency in job market / entrepreneurship.

Selvamm Arts and Science College (Autonomous)

**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**

**MASTER OF SCIENCE**

**M.Sc. MATHEMATICS**

**UNDER CBCS**

**(With effect from 2021 – 2022)**

**1. Objectives of the course**

Mathematics to-day is penetrating all fields of human endeavor and therefore it is necessary to prepare the students to cope with the advanced developments in various fields of Mathematics. The objectives of this course are the following:

- (a) To import knowledge in advanced concepts and applications in various fields of Mathematics.
- (b) To provide wide choice of elective subjects with updated and new areas in various branches of Mathematics to meet the needs of all students.

**2. Eligibility for Admission:**

A candidate who has passed B.Sc., Mathematics / B.Sc., Mathematics (Computer Applications) degree of this University or any of the above degree of any other University accepted by the Syndicate equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the Master of Science (M.Sc.) Degree Examination in Mathematics of this University after a course of study of two academic years.

**3. Duration of the Course:**

The course of study of Master of Science in Mathematics shall consist of two academic years divided into four semesters with 100 credits. Each Semester consists of 90 working days.

**4. Course of Study:**

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.



**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**  
**COURSE STRUCTURE UNDER CBCS**  
**DEPARTMENT OF MATHEMATICS**  
**(For the students admitted in the Year 2021-2022 Batch onwards)**

Sem	Course	Course Code	Title of the Course	Hrs.	Credit	CIA	ESE	Total Marks
<b>I</b>	Core Course -I	21P1MA01	Linear Algebra	6	5	25	75	100
	Core Course-II	21P1MA02	Real Analysis	6	5	25	75	100
	Core Course - III	21P1MA03	Ordinary Differential Equations	6	5	25	75	100
	Core Course-IV	21P1MA04	Classical Dynamics	6	5	25	75	100
	<b>Elective : I (choose any one course)</b>	21P1MAE01	Graph Theory	6	5	25	75	100
		21P1MAE02	Tensor Analysis and Relativity Theory					
21P1MAE02		Combinatorics						
<b>Total Hrs &amp; Credits</b>				<b>30</b>	<b>25</b>			<b>500</b>
<b>II</b>	Core V	21P2MA05	Abstract Algebra	6	5	25	75	100
	Core VI	21P2MA06	Complex Analysis	6	5	25	75	100
	Core VII	21P2MA07	Partial Differential Equations	6	5	25	75	100
	<b>Elective II</b>	21P2MAE04	Statistical Methods.	5	4	25	75	100
		21P2MAE05	Number Theory and Cryptography					
		21P2MAE06	Difference Equations					
	EDC	21P2xxxxxx		5	4	25	75	100
	21P2HR01	Human Rights	2	2	25	75	100	
<b>Total Hrs &amp; Credits</b>				<b>30</b>	<b>25</b>			<b>600</b>
<b>III</b>	Core VIII	21P3MA08	Topology	6	5	25	75	100
	Core IX	21P3MA09	Measure and Integration	6	5	25	75	100
	Core X	21P3MA10	Integral Equations and Calculus of Variations	6	5	25	75	100
	Core XI	21P3MA11	Fluid Dynamics	5	4	25	75	100
	<b>Elective III</b>	21P3MAE07	Optimization Techniques	5	4	25	75	100
		21P3MAE08	Nonlinear Differential Equations					
		21P3MAE09	Control Theory					
Skill	21P3SSS01	Soft Skills	2	1	25	75	100	
-	21P3MAI01	Internship*	-	#	-	-	-	
<b>Total Hrs &amp; Credits</b>				<b>30</b>	<b>24</b>			<b>600</b>
<b>IV</b>	Core XII	21P4MA12	Functional Analysis	6	5	25	75	100
	Core XIII	21P4MA13	Differential Geometry	6	5	25	75	100
	Core XIV	21P4MA14	Numerical Analysis	6	5	25	75	100

Elective IV	21P4MAE10	Mathematical Modeling	6	5	25	75	100
	21P4MAE11	Probability Theory					
	21P4MAE12	Stochastic Process					
Project	21P4MAPR01	Project & Viva Voce	6	5	-	-	100
-	21P4EX01	Extension Activities(ERP)	(40)**	1	-	-	-
<b>Total Hrs &amp; Credits</b>			<b>30</b>	<b>26</b>			<b>600</b>
<b>TOTAL</b>			<b>120</b>	<b>100</b>			<b>2300</b>

\* - Internship –15 Days (II Semester Leave –Report will submit in III Semester)

# - Commended / Highly Commended will be given based on Report & Viva Voce Examination.

\*\*Outside the Class Hours

xxxxxx- Corresponding Department ED Course Code.

<b>List of Elective courses (choose one from each Group)</b>		
<b>Course</b>	<b>Course Code</b>	<b>Title of the Course</b>
<b>Core Elective -I</b>	21P1MAE01	Graph Theory
	21P1MAE02	Tensor Analysis and Relativity Theory
	21P1MAE02	Combinatorics
<b>Core Elective – II</b>	21P2MAE04	Statistical Methods.
	21P2MAE05	Number Theory and Cryptography
	21P2MAE06	Difference Equations
<b>Core Elective – III</b>	21P3MAE07	Optimization Techniques
	21P3MAE08	Nonlinear Differential Equations
	21P3MAE09	Control Theory
<b>Core Elective – IV</b>	21P4MAE10	Mathematical Modeling
	21P4MAE11	Probability Theory
	21P4MAE12	Stochastic Process

<b>EDC Course Offered to Other Departments</b>		
<b>Semester</b>	<b>Course Code</b>	<b>Title of the Course</b>
<b>II</b>	21P2MAEDC01	<b>Operation Research</b>
<b>II</b>	21P2MAEDC01	<b>Numerical Analysis</b>

**List of Core Courses:**

1. Linear Algebra
2. Real Analysis
3. Ordinary Differential Equations
4. Classical Dynamics
5. Abstract Algebra
6. Complex Analysis
7. Partial Differential Equations
8. Topology
9. Measure Theory and Integration
10. Integral Equations & Calculus of Variation
11. Fluid Dynamics
12. Functional Analysis
13. Differential Geometry
14. Numerical Analysis

**List of Elective Courses:**

1. Graph Theory
2. Tensor Analysis and Relativity Theory
3. Combinatorics
4. Fuzzy Mathematics
5. Number Theory and Cryptography
6. Difference Equations
7. Nonlinear Differential Equations
8. Control Theory
9. Stochastic Process
10. LaTeX
11. Probability theory
12. Optimization Techniques

**List of Extra Disciplinary Course (EDC)**

1. Operations Research
2. Numerical Analysis

## 5. Examinations:

The examination shall be of **three hours** duration for each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

At the end of fourth semester viva-voce will be conducted on the basis of the Dissertation/ Project report by one internal and one external examiner.

## 6. Question paper pattern:

Question paper pattern for Theory Examination

**Time: Three Hours**

**Maximum marks: 75**

**Part A: (10X1=10)**

**(Two questions from each Unit)**

**Part B: (5X5=25)**

**Answer all questions**

**(One question from each Unit with internal choice)**

**Part C: (5X8=40)**

**Answer all questions**

**(One question from each Unit with internal choice)**

## Evaluation of Continuous Internal Assessment (CIA)

The components for continuous internal assessment (CIA) are

Seminar	- 5 marks
CIA-I	- 5 marks
CIA-II	- 5 marks
Model	- 5 marks
Assignment	- 5 marks
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Total	- 25 marks
	-----

## 7. Dissertation:

### (a) Topic:

The topic of the dissertation shall be assigned to the candidate before the beginning of third semester and a copy of the same should be submitted to the University for approval

### (b) No. of copies project / dissertation:

The students should prepare three copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the

college library and one copy is to be submitted to the university (Registrar) and one copy can be held by the student.

**Format to be followed:**

The formats / certificate for project / dissertation to be submitted by the students is given below:

**Format for the preparation of project work:**

- (a) Title page
- (b) Bonafide Certificate
- (c) Acknowledgement
- (d) Table of contents

**CONTENTS**

<b>Chapter No.</b>	<b>Title</b>	<b>Page No.</b>
1	Introduction	
2	Title of the chapters	
3	Conclusion	
4	References	

**Format of the Title page:**

**TITLE OF THE PROJECT / DISSERTATION**

Project / dissertation Submitted in partial fulfillment of the requirement for the Degree of Master of Science in **MATHEMATICS** to the Periyar University, Salem -635 001.

By

Student's Name :

Register Number :

College :

Year :

**Format of the Certificate:**

**CERTIFICATE**

This is to certify that the dissertation entitled .....submitted in partial fulfillment of the requirement of the degree of Master of Science in **MATHEMATICS** to the Periyar University, Salem is a record of bonafide research work carried out by.....under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma,

fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines

Date:

Place:

Signature of the Guide      Signature of the Head of the Department

This Viva-Voce held on .....

**Signature of Internal Examiner**

**Signature of External Examiner**

**Guidelines for approval of PG guides for guiding students in their research for Submitting project / dissertation:**

A person seeking for recognition as guide should have:

- (a) A Ph.D. degree or M.Phil / M.A. / M.Sc. degree with first class / second class and
- (b) Should have 3 years of teaching / research experience

**8. Passing Minimum**

The candidate shall be declared to have passed the examination if the candidate secures not less than 50% marks (i.e. 38 marks) in the End semester examination in each paper and not less than 50% marks (i.e. 13 marks) in the Continuous Internal Assessment.

There is no passing minimum for the record notebook. However submission of record notebook is a must.

For the Project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should attend viva-voce examination to secure a pass in that paper.

Candidate who does not obtain the required minimum marks for a pass in a paper / Practical Project Report shall be required to appear and pass the same at a subsequent appearance.

## 9. Classification of Successful Candidates

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in **First Class**.

All other successful candidate shall be declared to have passed in the **Second Class**.

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in the **First Class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course only are eligible for **University Ranking**.

## 10. Maximum Duration for the completion of the PG Programme:

The maximum duration for completion of the PG Programme shall not exceed eight semesters.

## 11. Commencement of this Regulation:

These regulations shall take effect from the academic year 2019-2020, that is, for students who are admitted to the first year of the course during the academic year 2019-2020 and thereafter.

## 12. Transitory Provision:

Candidates who were admitted to the PG course of study before 2019-2020 shall be permitted to appear for the examinations under those regulations for a period of three years, that is, up to end inclusive of the examination of April / May 2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

## Program Specific Outcomes (PSOs)

<b>PSO-1</b>	Formulate Complete, Concise and Correct Mathematical Proofs
<b>PSO-2</b>	Analytic skills and Critical thinking.
<b>PSO-3</b>	Aptitude skills that will help to take up research in pure and applied mathematics.
<b>PSO-4</b>	Advanced mathematical topics provide opportunities to research students for communication and discussion.
<b>PSO-5</b>	Nurture problem solving skills, thinking, creativity through assignments, project work.
<b>PSO-6</b>	The relevance and applications of Mathematics in scientific phenomenon.
<b>PSO-7</b>	Communicate mathematics effectively using instructional strategies.

## **CORE COURSE –I : LINEAR ALGEBRA**

**Semester: I**

**Hours / Week : 6**

**Course Code: 21P1MA01**

**Credit : 5**

Objectives:

- To develop a strong foundation in linear algebra
- To provide a basic for advanced studies not only in mathematics but also in other branches like engineering, physics and computers, etc.
- To give particular attention is given to canonical forms of linear transformations, diagonalizations of linear transformations, matrices and determinants.
- To Know the concept of diagonalization process and Primary decomposition theorem.

**UNIT I:**Linear transformationsLinear transformations – Isomorphism of vector spaces – Representations of linear transformations by matrices – Linear functionals.

**UNIT II:**Algebra of polynomials The algebra of polynomials –Polynomial ideals - The prime factorization of a polynomial - Determinant functions.

**UNIT III:**Determinants Permutations and the uniqueness of determinants – Classical adjoint of a (square) matrix – Inverse of an invertible matrix using determinants – Characteristic values – Annihilating polynomials.

**UNIT IV:** Diagonalization Invariant subspaces – Simultaneous triangulations – Simultaneous diagonalization – Direct-sum decompositions – Invariant direct sums – Primary decomposition theorem.

**UNIT V:**The Rational and Jordan forms Cyclic subspaces – Cyclic decompositions theorem (Statement only) – Generalized Cayley – Hamilton theorem - Rational forms – Jordan forms.

**TEXT BOOK:** Kenneth M Hoffman and Ray Kunze, Linear Algebra, 2nd Edition, Prentice-Hall of India Pvt. Ltd, New Delhi, 2013.

**REFERENCE BOOKS:**

1. M. Artin, “Algebra”, Prentice Hall of India Pvt. Ltd., 2005.
2. S.H. Friedberg, A.J. Insel and L.E Spence, “Linear Algebra”, 4th Edition, Pritice-Hall of India Pvt. Ltd., 2009.



3. I.N. Herstein, “Topics in Algebra”, 2nd Edition, Wiley Eastern Ltd, New Delhi, 2013. 4. G. Strang, “Introduction to Linear Algebra”, 2nd Edition, Prentice Hall of India Pvt. Ltd, 2013.

**Course Outcomes:**

<b>CO.No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Computational and Algebraic Skills.	<b>K<sub>5</sub></b>
<b>CO-2</b>	Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra.	<b>K<sub>4</sub></b>
<b>CO-3</b>	Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions.	<b>K<sub>4</sub></b>
<b>CO-4</b>	Communicate and understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism.	<b>K<sub>4</sub></b>
<b>CO-5</b>	Comprehend regions arguments developing the theory underpinning linear algebra.	<b>K<sub>5</sub></b>

**K1:Remember, K2: Understand, K3 :Apply, K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	S	M	M	S	M	S
<b>CO3</b>	M	S	M	S	M	S	M
<b>CO4</b>	S	S	M	S	M	S	S
<b>CO5</b>	S	S	M	M	S	S	M

**S-Strong,**

**M-Medium**

## CORE COURSE II – REAL ANALYSIS

**Semester: I**

**Hours / Week : 6**

**Course Code:21P1MA02**

**Credit : 5**

### **COURSE OBJECTIVE:**

- Define the real numbers, least upper bounds, and the triangle inequality.
- Define functions between sets; equivalent sets; finite, countable and uncountable sets. Recognize convergent, divergent, bounded, Cauchy and monotone sequences.
- Calculate the limit superior, limit inferior, and the limit of a sequence.
- Recognize alternating, convergent, conditionally and absolutely convergent series.
- Prove statements about the differentiability of functions, and related to the integrability of functions

### **UNIT I**

**Basic Topology:** Finite, Countable and Uncountable Sets - Metric Spaces - Compact Sets - Connected Sets. (Chapter 2) – Continuity – Continuous function (Chapter 4: 4.1-4.10)

### **UNIT II**

**RIEMANN – STIELTJES INTEGRAL:** Definition and Existence of the Integral – Properties of The Integral– Integration and Differentiation – Integration of vector valued functions – Rectifiable Curves (Chapter 6)

### **UNIT III**

**SEQUENCE AND SERIES OF FUNCTIONS:** Discussion of Main Problem- Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration - Uniform Convergence and Differentiation.

### **UNIT-IV:**

**SOME SPECIAL FUNCTIONS:** Power series -The Exponential and Logarithmic Functions - The Trigonometric Functions - The Algebraic Completeness of the Complex Field - Fourier series - The Gamma function. (Chapter 8 [8.1 - 8.22])

### **UNIT-V:**

**DIFFERENTIATION:**The Derivative of a real function – Mean value Theorems - The continuity of derivatives – L'Hospital Rule – Derivatives of Higher Order - Taylor's Theorem – Differentiation of Vector valued Functions (Chapters 5)

**TEXT BOOK:**

Walter Rudin, Principles of Mathematical Analysis Third Edition, McGraw Hill, 1976.

**REFERENCE(S)**

1. Tom P. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. Serge Lang, Analysis I & II, Addison-Wesley Publishing Company, Inc. 1969.
3. S.C.Malik&Savitha Arora,, Mathematical Analysis, Published December 1st 2010 by New Age International Pvt Ltd Publishers .

**Course Outcomes:**

CO .No.	Upon completion of this course, students will be able to	Know ledge Level
CO-1	Describe fundamental properties of the real numbers that lead to the formal development of real analysis.	<b>K<sub>5</sub></b>
CO-2	Demonstrate an understanding of limits and how they are used in sequences, series,differentiation and integration	<b>K<sub>7</sub></b>
CO-3	Appreciate how abstract ideas and rigorous methods in mathematical analysis can beapplied to important practical problems	<b>K<sub>4</sub></b>
CO-4	Describe fundamental properties of the real numbers that lead to the formal development of real analysis.	<b>K<sub>5</sub></b>
CO-5	Comprehend regions arguments developing the theory underpinning real analysis.	<b>K<sub>4</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	S	S	S	M	S
CO3	M	S	S	M	M	S	M
CO4	S	S	M	S	S	S	S
CO5	M	S	S	S	M	M	M

**S-Strong, M-Medium**

**CORE COURSE III – ORDINARY DIFFERENTIAL EQUATIONS**

**Semester: I** **Hours / Week: 6**  
**Course Code: 21P1MA03** **Credit : 5**

**Objectives:**

- Evaluate first order differential equations including separable, homogeneous, exact, and linear.
- Show existence and uniqueness of solutions.
- Solve second order and higher order linear differential equations.
- Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
- Solve differential equations using variation of parameters
- Solve linear systems of ordinary differential equations

**UNIT I**

**The general solution of the homogeneous equation** – The use of one known solution to find another – The method of variation of parameters – Power Series solutions. A review of power series – Series solutions of first order equations – Second order linear equations; Ordinary points. (Chapter 3: Sections 15, 16, 19 and Chapter 5: Sections 25 to 27)

**UNIT II**

**Regular Singular Points** – Gauss’s hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions. (Chapter 5 : Sections 28 to 31 and Chapter 6: Sections 32 to 35)

**UNIT III**

**Linear Systems of First Order Equations** – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard’s Theorem. (Chapter 7: Sections 37, 38 and Chapter 11: Sections 55, 56)

**UNIT IV**

**Oscillation Theory and Boundary value problems** – Qualitative Properties of Solutions – Sturm Comparison Theorems – Eigenvalues, Eigenfunctions and the Vibrating String. (Chapter 4: Sections 22 to 24)

## UNIT V

### Nonlinear equations: Autonomous Systems; the phase plane and its phenomena–

Types of critical points; Stability – critical points and stability for linear systems – Stability by Liapunov’s direct method – Simple critical points of nonlinear systems.

(Chapter 8: Sections 42 to 44)

#### TEXT BOOK:

G.F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 1984.

#### REFERENCE(S)

1. W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, New York, 1971.
2. E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill Publishing Company, New York, 1955.

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.	K <sub>7</sub>
CO-2	Find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.	K <sub>5</sub>
CO-3	Introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.	K <sub>7</sub>
CO-4	To have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.	K <sub>3</sub>
CO-5	Comprehend regions arguments developing the theory underpinning ODE.	K <sub>5</sub>

**K1:Remember, K2: Understand, K3 :Apply, K4:Analyze, K5:Evaluate, K6:Create**

#### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	S	M	S	M	S
CO3	M	S	S	S	S	S	M
CO4	M	S	M	S	S	S	S
CO5	S	S	M	M	S	S	M

S-Strong, M-Medium

## **CORE COURSE III – CLASSICAL DYNAMICS**

**Semester: I**

**Hours / Week: 6**

**Course Code: 21P1MA04**

**Credit : 5**

### **Objectives:**

To give a details knowledge about the mechanical system of particles, application of Lagrange's equations and Hamilton equation as well as the theory of Hamilton Jacobi theory, canonical transformations.

### **UNIT I**

**MECHANICAL SYSTEMS:** Introduction – Generalized coordinates – Constraints – Virtual work – Energy and Momentum. (Chapter 1 : Sections 1.1 to 1.5)

### **UNIT II**

**LAGRANGE'S EQUATIONS:** Derivation of Lagrange's equations – Examples – Integrals of motion. (Chapter 2 : Sections 2.1 to 2.3)

### **UNIT III**

**HAMILTON'S EQUATIONS:** Hamilton's Principle –Hamilton's Equation – Other variation principle. (Chapter 4 : Sections 4.1 to 4.3)

### **UNIT IV**

**HAMILTON-JACOBI THEORY:** Hamilton Principle function – Hamilton-Jacobi Equation –Separability.(Chapter 5 : Sections 5.1 to 5.3)

### **UNIT V**

**CANONICAL TRANSFORMATION:** Differential forms and generating functions – Special Transformations - Lagrange and Poisson brackets.

(Chapter 6 : Sections 6.1, 6.2 and 6.3)

### **TEXT BOOK:**

D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

### **REFERENCE(S)**

1. H. Goldstein, Classical Mechanics, (2nd Edition) Narosa Publishing House, New Delhi.
2. N.C.Rane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.
3. J.L.Synge and B.A.Griffth, Principles of Mechanics (3rd Edition) McGraw Hill Book Co., New York, 1970.

**Course Outcomes:**

<b>CO No.</b>	<b>Upon completion of this course,students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Understand force vectors and represent them in one, two and three dimensions	<b>K<sub>4</sub></b>
<b>CO-2</b>	Determine the resultants of forces and moments in two and three dimensions	<b>K<sub>1</sub></b>
<b>CO-3</b>	Describe the concept of dry friction and analyze the equilibrium of rigid bodies subjected to this force.	<b>K<sub>3</sub></b>
<b>CO-4</b>	Understand force vectors and dot product	<b>K<sub>4</sub></b>
<b>CO-5</b>	Comprehend regions arguments developing the theory underpinning ODE	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	S	M	S	S	M	S
<b>CO3</b>	M	S	M	S	S	S	S
<b>CO4</b>	S	S	M	S	S	S	S
<b>CO5</b>	S	S	M	S	S	S	S

S-Strong, M-Medium

## **ELECTIVE – I**

**(To choose any 1 out of the given 3)**

### **PAPER I**

#### **GRAPH THEORY**

**Semester: I**

**Hours / Week : 6**

**Course Code:21P1MAE01**

**Credits : 5**

#### **Objectives**

- The purpose of this course is to make student to understand Graph Theory
- Graph Theory its various model and applications which are widely used in different areas such as study of molecules, construction of bonds in chemistry, study of atoms, biology, operation research, sociology, engineering, economics and war science to find optimal way to perform.

#### **UNIT I**

**CONNECTIVITY, EULER TOURS AND HAMILTON CYCLES:** Connectivity – Blocks – Euler tours – Hamilton Cycles.

(Chapter 3 (Section 3.1 – 3.2) Chapter 4 (Section 4.1 – 4.2))

#### **UNIT II**

**MATCHINGS, EDGE COLOURINGS:** Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic Number – Vizing's Theorem.

(Chapter 5 (Section 5.1 – 5.2) Chapter 6 (Section 6.1 – 6.2))

#### **UNIT III**

**INDEPENDENT SETS AND CLIQUES, VERTEX COLOURINGS:** Independent sets – Ramsey's Theorem – Chromatic Number – Brooks' Theorem – Chromatic Polynomials. (Chapter 7 (Section 7.1 – 7.2) Chapter 8 (Section 8.1 – 8.2, 8.4))

#### **UNIT IV**

**PLANAR GRAPHS:** Plane and planar Graphs – Dual graphs – Euler's Formula – The Five-Colour Theorem and the Four-Colour Conjecture.

(Chapter 9 (Section 9.1 – 9.3, 9.6))



## UNIT V

**DIRECTED GRAPHS:** Directed Graphs - Directed paths – Directed cycles – Directed Hamilton – Making a Road system One – way.

(Chapter 10 (Section 10.1 – 10.3, 10.6))

### TEXT BOOK:

J.A .Bondy and U.S.R. Murthy, Graph Theory and Applications, Macmillan, London, 2176.

### REFERENCE(S):

1. J.Clark and D.A.Holton , A First look at Graph Theory, Allied Publishers, New Delhi, 1995.
2. R. Gould. Graph Theory, Benjamin/Cummings, Menlo Park, 1989.
3. A.Gibbons, Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.

### Course Outcomes:

CO No.	Upon completion of this course,students will be able to	Knowledge Level
CO-1	Understand the ideas of permutations.	K <sub>7</sub>
CO-2	Combinations and apply combinatorial ideas to practical problems	K <sub>3</sub>
CO-3	Use mathematical definitions to identify and construct examples and to distinguish examples from planar graphs.	K <sub>3</sub>
CO-4	Understand the ideas of permutations cycle graph	K <sub>4</sub>
CO-5	Comprehend regions arguments developing the theory underpinning ODE	K <sub>5</sub>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	M	M	S	M	M	S
CO3	M	S	M	M	S	M	S
CO4	S	S	M	S	S	S	M
CO5	M	S	M	M	M	S	M

S-Strong, M-Medium

## 2. TENSOR ANALYSIS AND RELATIVITY THEORY

**Semester: I**

**Hours / Week : 6**

**Course Code: 21P1MAE02**

**Credit : 5**

### Objectives

- To introduce vector algebra and vector calculus
- To know the special relativity and relativistic kinematics, dynamics and accelerated systems.

### UNIT I

**TENSOR ALGEBRA:** Systems of Different orders – Summation Convention – Kronecker Symbols - Transformation of coordinates in  $S_n$  – Invariants – Covariant and Contravariant vectors – Tensors of Second Order – Mixed Tensors – Zero Tensor – Tensor Field – Algebra of Tensors – Equality of Tensors – Symmetric and Skew-symmetric tensors – Outer multiplication, Contraction and Inner Multiplication – Quotient Law of Tensors – Reciprocal Tensor of Tensor – Relative Tensor – Cross Product of Vectors. (Chapter I : 1.1 - 1.3, 1.7 and 1.8 and Chapter II : 2.1 - 2.21 )

### UNIT II

**TENSOR CALCULUS:** Riemannian Space – Christoffel Symbols and their properties. (Chapter III: 3.1 and 3.2)

### UNIT III

**TENSOR CALCULUS (CONTD):** Covariant Differentiation of Tensors – Riemann – Christoffel Curvature Tensor – Intrinsic Differentiation. (Chapter III: 3.3 – 3.5)

### UNIT IV

**SPECIAL THEORY OF RELATIVITY:** Galilean Transformation – Maxwell's equations – The ether Theory – The Principle of Relativity Relativistic Kinematics : Lorentz Transformation equations – Events and simultaneity – Example – Einstein Train – Time dilation – Longitudinal Contraction – Invariant Interval – Proper time and Proper distance – World line – Example – Twin paradox – Addition of velocities – Relativistic Doppler effect. (Chapter 7 : Sections 7.1 and 7.2 )

### UNIT V

**RELATIVISTIC DYNAMICS:** Momentum – Energy – Momentum – Energy four vector – Force – Conservation of Energy – Mass and energy – Example – inelastic collision – Principle of equivalence – Lagrangian and Hamiltonian formulations. Accelerated Systems : Rocket with constant acceleration – Example – Rocket with constant thrust.(Chapter 7 : Sections 7.3 and 7.4 )

**TEXT BOOK(S)**

1. U.C. De, Absos Ali Shaikh and JoydeepSengupta, Tensor Calculus, Narosa Publishing House, New Delhi, 2004. (UNITs I, II and III)

2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

(UNITs IV and V)

**REFERENCE(S)**

1. J.L.Synge and A.Schild, Tensor Calculus, Toronto, 1949.

2. A.S.Eddington. The Mathematical Theory of Relativity, CambridgeUniversity Press, 1930.

3. P.G.Bergman, An Introduction to Theory of Relativity, New York, 1942.

**COURSE OUTCOMES:**

<b>CO No.</b>	<b>Upon completion of this course,students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	The students shall be familiar with the fundamental principles of the general theory of relativity.	<b>K<sub>6</sub></b>
<b>CO-2</b>	Explain the fundamental concepts of the theories of special and general relativity and their role in the study of compact stars and modern cosmology.	<b>K<sub>3</sub></b>
<b>CO-3</b>	Demonstrate accurate and efficient use of tensor calculus in solving problems in special and general relativity.	<b>K<sub>4</sub></b>
<b>CO-4</b>	Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts in the theories of relativity.	<b>K<sub>3</sub></b>
<b>CO-5</b>	Solve problems in relativistic dynamics and Galilean Transformation.	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	M	M	S	M	M	S
<b>CO3</b>	M	S	M	M	S	M	S
<b>CO4</b>	S	S	M	S	S	S	M
<b>CO5</b>	M	S	M	M	M	S	M

S-Strong, M-Medium

### 3. COMBINATORICS

**Semester: I**

**Hours / Week : 6**

**Course Code: 21P1MAE03**

**Credit : 5**

**Objectives:**

- To introduce combinatorial techniques for solving enumeration problems.

#### **UNIT I**

Permutations and combinations – Distributions of distinct objects – Distributions of non distinct objects – Stirlings formula.

#### **UNIT II**

Generating functions. – Generating function for combinations enumerators for permutations – Distributions of distinct objects into non-distinct cells – Partitions of integers – The Ferrers graphs elementary relations.

#### **UNIT III**

Recurrence relation – Linear recurrence relations with constant coefficients solutions by the technique of generating functions – A special class of nonlinear difference equations recurrence relations with two indices.

#### **UNIT IV**

The principle of inclusion and exclusion – General formula – Permutations with restriction on relative positions derangements – The rook polynomials permutations with forbidden positions.

#### **UNIT V**

Polya's theory of counting – Equivalence classes under a permutation group Burnside theorem – Equivalence classes of functions – Weights and inventories of functions – Polya's fundamental theorem – Generation of Polya's theorem.

#### **TEXT BOOK:**

C.L. Liu - Introduction of Combinatorial Mathematics, McGraw Hill, Chapters 1 to 5.

#### **REFERENCE(S)**

1. Marshall Hall. Jr., Combinatorial Theory.
2. H.J. Rayser, Combinatorial Mathematics, Carus, Mathematical Monograph.

**COURSE OUTCOMES:**

<b>CO No.</b>	<b>Upon completion of this course,students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	After completion of the course, the student will be able to: Explain the basic concepts of combinatory.	<b>K<sub>7</sub></b>
<b>CO-2</b>	Apply the basic concepts of mathematical logic	<b>K<sub>3</sub></b>
<b>CO-3</b>	Describe and solve real time problems using concepts of polya theory.	<b>K<sub>3</sub></b>
<b>CO-4</b>	Students will understand the ideas of permutations and combinations.	<b>K<sub>4</sub></b>
<b>CO-5</b>	Students will understand the addition and multiplication principles for counting.	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	S	S	M	S	M
<b>CO2</b>	M	M	S	S	M	M	S
<b>CO3</b>	M	S	S	M	S	M	S
<b>CO4</b>	S	S	S	S	S	S	M
<b>CO5</b>	M	S	S	M	M	S	M

S-Strong, M-Medium

## CORE COURSE V – ABSTRACT ALGEBRA

Semester: II

Hours / Week : 6

Course Code: 21P2MA05

Credit : 5

### Course objectives:

- Learn the elementary concepts and basic ideas involved in homomorphism and isomorphism.
- Develop the ability to form and evaluate group theory and its actions.
- Understand the fundamental concepts of abstract algebra which include Sylow theorems
- Relate this concept to the direct products and abelian groups.

### UNIT-I:

Introduction to groups: Dihedral groups - Symmetric groups - Matrix groups - Homomorphisms and Isomorphisms - Group actions. Subgroups: Definition and Examples - Centralizers and Normalizer, Stabilizers and Kernels.

Chapter 1: (Sections 1.2, 1.3, 1.4, 1.6, 1.7), Chapter 2: (Sections 2.1, 2.2).

### UNIT-II:

Cyclic groups and Cyclic subgroups of a group: Quotient Groups and Homomorphisms: Definitions and Examples - More on cosets and Lagrange's Theorem - The isomorphism theorems - Transpositions and the Alternating group.

Chapter 2: (Sections 2.3), Chapter 3: (Sections 3.1, 3.2, 3.3, 3.5)

### UNIT-III:

Group Actions: Group actions and permutation representations - Groups acting on themselves by left multiplication - Cayley's theorem - Groups acting on themselves by conjugation - The class equation - Automorphisms.

Chapter 4: (Sections 4.1, 4.2, 4.3, 4.4)

### UNIT-IV:

The Sylow Theorems - The simplicity of  $A_n$ . Further topics in group theory:  $p$ -groups, Nilpotent groups and Solvable groups. Chapter 4: (Sections 4.5, 4.6), Chapter 6: (Sections 6.1, 6.2).

## UNIT-V:

Direct and semi-direct products and abelian groups: Direct Products - The fundamental theorem of finitely generated abelian groups- Table of groups of small order - semi directproducts.

Chapter 5: (Sections 5.1, 5.2, 5.3, 5.5)

### TEXT BOOK:

“Abstract Algebra” (Third Edition) by **David S. Dummit** and **Richard M. Foote**, Wiley Student Edition (1999),

### REFERENCE BOOKS:

1. “Topics in Algebra” by **I.N. Herstein**, John Wiley & Sons (Second Edition), New Delhi, 1975.
2. “Lectures in Abstract Algebra” Vol. I by **N. Jacobson, D. Van Nostrand Co.**, New York, 1976.

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowle dge Level
CO-1	To find the number of Sylowsubgroups	<b>K<sub>5</sub></b>
CO-2	To find the number of non isomorphic abelian groups.	<b>K<sub>6</sub></b>
CO-3	To find the splitting field, Galois group of the given polynomial.	<b>K<sub>6</sub></b>
CO-4	To check whether the given polynomial is solvable by radical	<b>K<sub>6</sub></b>
CO-5	Comprehend regions arguments developing the theory underpinning abstract algebra	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	M	S	M	M	S
CO3	M	M	M	S	S	S	S
CO4	S	S	M	S	S	M	M
CO5	M	M	M	S	S	S	S

S-Strong, M-Medium

## CORE COURSE VI – COMPLEX ANALYSIS

Semester: II

Hours / Week : 6

Course Code: 21P2MA06

Credit : 5

### Objectives:

- This course aims to provide an extended study to the subject of complex analysis which is one of the basic pillars of modern mathematics.
- The focus of the course will be the study of analytic functions, properties of power series, mappings,
- Students will be equipped with the understanding Cauchy's theorem
- Students will be equipped with the understanding

### UNIT I

#### FUNDAMENTAL THEOREMS IN COMPLEX INTEGRATION:

Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk; Cauchy's Integral Formula: The Index of a Point with Respect to a Closed Curve – The Integral Formula – Higher Derivatives.

(Chapter 4: 1.1 – 1.5, 2.1 – 2.3)

### UNIT II

#### LOCAL PROPERTIES OF ANALYTIC FUNCTIONS:

Removable Singularities – Taylor's Theorem – Integral representation of the  $n$ th term – Zeros and Poles – Algebraic order of  $f(z)$  – Essential Singularity – The Local Mapping – The Open Mapping Theorem – The Maximum Principle.(Chapter 4: 3.1, 3.2, 3.3,3.4)

### UNIT III

**THE GENERAL FORM OF CAUCHY'S THEOREM:** Chains and Cycles – Simple Connectivity – Homology – The General Statement of Cauchy's Theorem – Proof of Cauchy's Theorem – Locally Exact Differentials; The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals.

(Chapter 4: 4.1 – 4.6, 5.1 – 5.3)

### UNIT IV

#### HARMONIC FUNCTIONS:

Definition and Basic Properties – The Mean-value Property – Poisson's Formula – Schwarz's Theorem – The Reflection Principle; Power series expansions – Weierstrass's Theorem – The Taylor Series – The Laurent Series.

(Chapter 4: 6.1 – 6.5 and Chapter 5: 1.1 – 1.3)

### UNIT V

#### SERIES AND PRODUCT DEVELOPMENTS:

Partial fractions-Infinite products-Canonical products-The Gamma function-Stirling's formula-Entire functions-Jensen's formula-Hadamard's Theorem.

(Chapter 5:2.1-2.5 and Chapter 5:3.1-3.2)



**TEXT BOOK:**

Lars V. Ahlfors, Complex Analysis, Third Ed. McGraw-Hill Book Company, Tokyo, 1979.

**REFERENCE(S)**

[1] Serge Lang, Complex Analysis, Addison Wesley, 1977.

[2] S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, New Delhi, 1997.

[3] Karunakaran, Complex Analysis, September 1, 2005 by Narosa Publishing House

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Easily describe domains and compute limits in the complex plane.	K <sub>6</sub>
CO-2	Verify Cauchy's Integral Formula	K <sub>6</sub>
CO-3	Calculate Zeros and Poles, – Essential Singularity	K <sub>7</sub>
CO-4	Calculate Taylor or Laurent series for functions.	K <sub>4</sub>
CO-5	Comprehend regions arguments developing the theory underpinning ODE	K <sub>5</sub>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	MS	M	S	M	S
CO3	S	M	M	S	S	M	S
CO4	S	S	S	S	S	S	M
CO5	S	S	M	M	S	S	S

S-Strong, M-Medium

## CORE COURSE VII – PARTIAL DIFFERENTIAL EQUATIONS

Semester: II

Hours / Week : 5

Course Code: 21P2MA07

Credit : 4

### Objectives

- Introduce students to partial differential equations.
- Introduce students to how to solve linear Partial Differential with different methods.
- To derive heat and wave equations in 2D and 3D.
- Find the solutions of PDEs are determined by conditions at the boundary of the spatial domain and initial conditions at time zero.
- Technique of separation of variables to solve PDEs and analyze the behavior of solutions in terms of eigen function expansions.

### UNIT – I

**First order, Quasi-linear Equations and Method of Characteristics:** Introduction- Classification of first order equations – Construction of a first order equation – Method of characteristics and general solution – Canonical forms of first order linear equations.

(Chapter – 2 Sections : 2.1 – 2.3, 2.5, 2.6)

### UNIT – II

**Mathematical Models:** The Classical equation – The vibrating string – The vibrating membrane - Waves in elastic medium.

**Classification of second order equations:** Second order equations in two independent variables – Canonical forms – Equations with constant coefficients – General solution.

(Chapter - 3 Sections: 3.1 – 3.4)(Chapter - 4 Sections: 4.1 – 4.4)

### UNIT – III

**The Cauchy problem and Wave Equation:** The Cauchy problem – Cauchy – Kowalewsky theorem – Homogeneous wave equation – Initial – Boundary value problems – Equations with non-homogeneous boundary conditions – Vibration of finite string with fixed ends – Non-homogeneous wave equations.

(Chapter - 5 Sections: 5.1 - 5.7)

### UNIT – IV

**Methods of separation of variables:** Separation of variables – The vibrating string problem – Existence and Uniqueness of solution of the vibrating string problem – The Heat conduction problem – Existence and Uniqueness of solution of the Heat Conduction problem – The Laplace and Beam Equations.

(Chapter - 7 Sections: 7.1 – 7.7)

### UNIT – V

**Boundary value problems and Applications:** Boundary value problems – Maximum and minimum Principles - Uniqueness and Continuity Theorems – Dirichlet problems for a circle – Dirichlet problems for a Circular Annulus – Neumann problem for circle – Dirichlet Problem for a rectangle – The Neumann problem for a rectangle.

(Chapter - 9 Sections: 9.1 – 9.7, 9.9)

**TEXT BOOK:**

1. TynMyint, U. andLokenathDebnath. 2007. **Partial Differential Equation for Scientists and Engineers.** Birkhauser publishers, Boston.

**REFERENCE BOOKS:**

1. Sneddon, *I.N.*1957. **Elements of Partial Differential Equations.** Tata McGraw Hill Company, New Delhi.
2. SankarRao, *K.* 2008. **Introduction to Partial Differential Equations.**[Second Edition]. Prentice Hall of India, New Delhi.
3. Raisinghania, *M.D.* 2016. **Advanced Differential Equations.** S.Chand and Company Ltd., New Delhi.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	classify partial differential equations and transform into canonical form	<b>K<sub>2</sub></b>
CO-2	solve linear partial differential equations of both first and second order	<b>K<sub>7</sub></b>
CO-3	Apply partial derivative equation techniques to predict the behaviour of certain phenomena.	<b>K<sub>4</sub></b>
CO-4	apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.	<b>K<sub>3</sub></b>
CO-5	identify real phenomena as models of partial derivative equations	<b>K<sub>7</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	M	M	S	M
CO2	M	S	M	S	S	M	S
CO3	M	S	M	S	S	M	S
CO4	M	M	M	M	S	S	S
CO5	S	S	M	S	S	S	M

S-Strong, M-Medium

## ELECTIVE – II :STATISTICAL METHODS

Semester: II

Hours / Week : 5

Course Code: 21P2MAE04

Credit : 4

### Objectives

- Remember and compare the Measures of Central tendency and the Measures of Dispersion.
- Determine and analysis Correlation Coefficient and the lines of regression.
- Recall the discrete distribution.
- Recall the continuous distribution.
- Relate the hypothesis for large samples.

### UNIT I: MEASURES OF CENTRAL TENDENCY, DISPERSION SKEWNESS AND KURTOSIS:

Measures of Central Tendency – Mean – Median – Mode – Measures of Dispersion – Range – Quartile deviation – Mean deviation – Standard deviation – Skewness – Kurtosis.

(No derivation, simple problems only).

### UNIT II: CORRELATION AND REGRESSION:

Correlation – Karl Pearson's Co-efficient of correlation –Rank correlation (Correlation of Bivariate frequency distribution to be excluded) – Regression.

(No derivation, simple problems only).

### UNIT III: BINOMIAL AND POISSON DISTRIBUTIONS:

Discrete distribution – Binomial distribution – Mean, Variance and Moments of the Binomial distribution only- Poisson distribution – Mean, Variance and Moments of Poisson distribution only(No derivation, simple problems only).

### UNIT IV: NORMAL DISTRIBUTION:

Continuous distribution – Normal distribution – Mean & variance; Moments, Properties of Normal distribution.

(No derivation , simple problems only).

### UNIT V: TESTING OF HYPOTHESIS FOR LARGE SAMPLES-TEST FOR MEANS:

Test for difference between proportions-Test for difference between standard deviations & ANOVA table.

(No derivation, simple problems only).

**TEXT BOOKS:**

1. Pillai R.S.N and Bagavathi V. (2008), STATISTICS, S.Chand& Co limited, New Delhi. (Units I &II)
2. Vital P.R (2002), MATHEMATICAL STATISTICS, Margham Publications, Chennai (Units – III, IV & V)

**REFERENCE BOOKS:**

1. Dr.S.Arumugam and A.Thangapandi Issac (2004), STATISTICS , New Gamma publishing house
2. Gupta .S.P (2006) ,STATISTICAL METHODS, Sultan Chand & Sons, New Delhi.
3. Navaneetham P.A. (2005), BUSINESS MATHEMATICS AND STATISTICS, Jai Publishersp
4. Sharma J.K, (2006) BUSINESS STATISTICS, Dorling Kindersley, (India) PvtLtd, Licensees of Pearson Education in South Asia.
5. Vital P.R. (2004), BUSINESS STATISTICS, 2<sup>nd</sup> edition, Margham publications, Chennai.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO - 1	Compute the measures of central tendency and measures of dispersion for different types of data's, by using standard formulae.	<b>K<sub>5</sub></b>
CO - 2	Knowledge about correlation coefficients and regression.	<b>K<sub>4</sub></b>
CO - 3	Understand the Binomial and Poisson distributions.	<b>K<sub>6</sub></b>
CO - 4	Understand the normal distribution.	<b>K<sub>3</sub></b>
CO - 5	Analyse the testing of hypothesis for large samples.	<b>K<sub>5</sub></b>

**K1:Remember, K2: Understand, K3 :Apply, K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	M	S	S	M	S
CO3	M	M	M	S	M	S	S
CO4	S	S	M	S	S	S	S
CO5	S	S	M	S	S	M	M

S-Strong, M-Medium

## 2. NUMBER THEORY AND CRYPTOGRAPHY

**Semester: II**

**Hours / Week : 5**

**Course Code: 21P2MAE05**

**Credit : 4**

### **Objectives**

- This course aims to give elementary ideas from number theory which will have applications in cryptology.

### **UNIT I**

**ELEMENTARY NUMBER THEORY:** Time Estimates for doing arithmetic – Divisibility and Euclidean algorithm – Congruences – Applications to factoring. (Chapter-I)

### **UNIT II**

**CRYPTOGRAPHY:** Some simple crypto systems – Enciphering matrices. (Chapter-III)

### **UNIT III**

**FINITE FIELDS AND QUADRATIC RESIDUES:** Finite fields – Quadratic residues and Reciprocity. (Chapter-II)

### **UNIT IV**

**PUBLIC KEY CRYPTOGRAPHY:** The idea of public key cryptography – RSA – Discrete log – Knapsack. (Chapter-IV : Sections 4.1 to 4.4)

### **UNIT V**

**PRIMALITY AND FACTORING:** Pseudoprimes – The rho method – Fermat factorization and factor bases – The Continued fraction method – The quadratic sieve method. (Chapter-V)

### **TEXT BOOK:**

Neal Koblitz, A Course in Number Theory and Cryptography, Springer-Verlag, New York, 2002, Second Edition.

**REFERENCE(S)**

1. Niven and Zuckermann, An Introduction to Theory of Numbers (Edn. 3), Wiley Eastern Ltd., New Delhi, 1976.
2. David M.Burton, Elementary Number Theory, Wm C.Brown Publishers, Dubuque, Iowa, 1989.

**COURSE OUTCOMES :**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO - 1	Find quotients and remainders from integer division	<b>K<sub>5</sub></b>
CO - 2	Apply Euclid's algorithm and backwards substitution	<b>K<sub>4</sub></b>
CO - 3	Understand the definitions of congruences, residue classes and least residues	<b>K<sub>6</sub></b>
CO - 4	Add and subtract integers, modulo n, multiply integers and calculate powers, modulo n	<b>K<sub>3</sub></b>
CO - 5	Determine multiplicative inverses, modulo n and use to solve linear congruences.	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**  
**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M	S	M	S	S	M	S
<b>CO2</b>	M	M	M	S	M	S	S
<b>CO3</b>	S	S	M	S	S	S	S
<b>CO4</b>	M	M	S	S	M	M	S
<b>CO5</b>	S	S	M	S	S	M	M

S-Strong, M-Medium

### 3. DIFFERENCE EQUATIONS

Semester: II

Hours / Week : 5

Course Code: 21P2MAE06

Credit : 4

#### Objectives

- To introduce the process of discretization, discrete version of Differential Equations, Discrete oscillation and
- To Introduce the asymptotic behavior of solutions of certain class of difference equations for linear cases only.
- To verify the Solution of difference equations using z-transforms is stressed.

#### UNIT I

**LINEAR DIFFERENCE EQUATIONS OF HIGHER ORDER:** Difference Calculus – General Theory of Linear Difference Equations – Linear Homogeneous Equations with Constant coefficients – Linear non-homogeneous equations – Method of Undetermined coefficients, the method of variation of constants – Limiting behavior of solutions.(Chapter 2: Sections 2.1 to 2.5)

#### UNIT II

**SYSTEM OF DIFFERENCE EQUATIONS:** Autonomous System – The Basic Theory – The Jordan form – Linear periodic system. (Chapter 3: Section 3.1 to 3.4 )

#### UNIT III

**THE Z-TRANSFORM METHOD:** Definition, Example and properties of Z-transform – The Inverse Z-transform and solution of Difference Equations: Power series method, partial fraction method, the inverse integral method – Volterra Difference Equation of convolution types – Volterra systems(simple problems only). (Chapter 5: Sections 5.1 to 5.3, 5.5 )

#### UNIT IV

**ASYMPTOTIC BEHAVIOUR OF DIFFERENCE EQUATION:** Tools and Approximations – Poincare's Theorem – Second order difference equations – Asymptotic diagonal systems – Higher order Difference Equations. (Chapter 8 : Sections 8.1 to 8.5)



## UNIT V

**OSCILLATION THEORY:** Three-term difference Equation – Non-linear Difference Equations – Self-Adjoint second order equations.

(Chapter 7 : Sections 7.1 to 7.3)

### TEXT BOOK:

Saber N. Elaydi, An Introduction to Difference Equations, Springer Verlag, New York, 1996.

### REFERENCE(S)

1. R.P.Agarwal, Difference Equations and Inequalities, Marcel Dekker, 1999.
2. V. Lakshmi kantham and Trigiante, Theory of Difference Equations, Academic Press, New York, 1988.
3. Peterson, A Difference Equations, An Introduction with Applications, Academic Press, New York, 1991.

### COURSE OUTCOMES :

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO - 1	Students will be able to: Distinguish between linear, nonlinear, partial and ordinary difference equations.	<b>K<sub>4</sub></b>
CO - 2	State the basic existence theorem for 1st order ODE's and use the theorem to determine a solution interval.	<b>K<sub>6</sub></b>
CO - 3	Recognize and solve a variable separable difference equation.	<b>K<sub>5</sub></b>
CO - 4	Recognize and solve a homogeneous difference equation.	<b>K<sub>3</sub></b>
CO - 5	Recognize and solve the problems of Z-transforms.	<b>K<sub>5</sub></b>

**K1:Remember, K2: Understand, K3 :Apply, K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	M	M	S	S	S	M	S
<b>CO2</b>	M	M	M	S	M	S	S
<b>CO3</b>	M	S	S	S	S	S	S
<b>CO4</b>	S	M	M	S	M	M	S
<b>CO5</b>	M	S	S	S	S	M	M

S-Strong, M-Medium

## EDC - I-OPERATIONS RESEARCH

Semester: II

Hours / Week : 5

Course Code:21P2MAED01

Credit : 4

### Objectives:

- To know the origin and development of Operations Research.
- To introduce the field of operations research which has many applications in management techniques.
- To develop the skills of formulation of LPP and different techniques to solve it.
- To know the application of Transportation and Assignment problems.

### Unit I

Linear Programming Problem – Definitions – Mathematical Formulation – Characteristic of a LPP – Matrix form of LPP – Graphical Method – Definitions of bounded, unbounded and optimal solutions – procedure of solving LPP by graphical method – Problems. Simplex technique – Definitions of Basic, nonbasic variables – Basic solutions – Slack variables and optimal solution, simplex procedure of solving LPP – Problems.

### Unit II

Introduction – Big – M method – Definitions of Big – M method, surplus variables and artificial variables – Procedure of solving an LPP by Big – M method.

### Unit III

Introduction – Balanced and unbalanced T.P, Feasible solution – Basic feasible solution – Optimum solution – Degeneracy in a T.P. – Mathematical formulation – North– West Corner rule – Vogel’s approximation method (unit penalty method) – Method of Matrix minima (Least cost Method) – Problems – Algorithm of Optimality test (Modi Method) – Problems.

### Unit IV

Assignment problem – Definition – Mathematical formulation of the Assignment problem – Test for optimality by using Hungarian method – Unbalanced Assignment problem – Degeneracy in Assignment problem – Maximization case in Assignment problem – Restrictions on Assignment problem.

### Unit V

Introduction – Definition of network, event, activity, optimistic time, pessimistic time, the most likely time, critical path, total float and free float – Difference between slack and float – Phases of critical path in a PERT network – Difference between CPM and PERT – Problems.

**Text Books :**

1.P.K.Gupta, Man Mohan and KantiSwarup, Operations Research, Ninth Edition, Sultan Chand and Sons, New Delhi, 2001.

**Reference Books :**

1. S.Kalavathy, Operations Research, Second Edition,Vikas Publishing House, New Delhi,2002.
2. P.K.Gupta and D.S.Hira, Operations Research, Second Edition,S.Chand& Co, NewDelhi, 2004.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Use the linear programming problems.	<b>K<sub>1</sub></b>
CO-2	Understand about the procedure of solving an LPP.	<b>K<sub>2</sub></b>
CO-3	Understand about the balanced and unbalanced transportation problems.	<b>K<sub>2</sub></b>
CO-4	Know methods of solving assignment Problems.	<b>K<sub>2</sub></b>
CO-4	Know methods of solving unbalance assignment Problems.	<b>K<sub>5</sub></b>
CO-5	Comprehend regions arguments developing the theory underpinning LPP.	<b>K<sub>5</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M	M	M	M	M	S	M
CO2	M	S	M	S	S	M	S
CO3	M	S	M	S	S	M	S
CO4	S	M	M	M	S	S	S
CO5	S	S	M	S	S	S	S

S-Strong, M-Medium

## EDC - II–NUMERICAL METHODS

**Semester: II**

**Hours / Week : 5**

**Course Code:21P2MAED02**

**Credit : 4**

### **Objectives:**

- To develop skills in solving problems using numerical techniques.
- This course covers the techniques of Numerical Differentiation and Numerical Integration. It also deals with solution of difference equations, Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order.

### **Unit I**

Method of successive approximation – The method of false position –Newton Raphson Method – Generalized Newton’s Method – Muller’s Method.

### **Unit II**

Finite Differences – Forward Differences – Backward Differences – Newton’s formulae for Interpolation – Central Difference Interpolation formulae – Gauss’s central difference formulae –Bessel’s formulae – Everett’s formulae.

### **Unit III**

Numerical Differentiation – NumericalIntegration– Trapezoidal rule – Simpson’s 1/3 rule – Simpson’s 3/8 rule – Boole’s andWeddle’s rule.

### **Unit IV**

Solution of Linear systems – Direct Methods – Matrix Inversion method – Gaussian elimination method – Modification of the Gauss method to compute the inverse – Solution of Linear systems – Iterative methods – Jacobian’s method – Gauss – Seidal Method.

### **Unit V**

Solution of Taylor’s series – Picard’s method of successive approximations – Euler’s method – Runge – Kutta methods – Second order and third order.

### **Text Books :**

1. S.S.Sastry, Introductory Methods of numerical analysis, Prentice Hall of India Pvt Ltd, NewDelhi,2000.

**Reference Books :**

1. E.Balagurusamy, Numerical Methods, Tata Mc Graw Hill Publishing Company Ltd, NewDelhi, 2002.
2. T.K.Manickavasagam and Narayanan, Engineering Numerical Methods, S.Viswanathan&Co, Chennai, 1998.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowle dge Level
CO-1	Know the method of successive approximation.	<b>K<sub>2</sub></b>
CO-2	Understand about finite differences.	<b>K<sub>1</sub></b>
CO-3	Use the numerical differentiation.	<b>K<sub>3</sub></b>
CO-4	Determine solution of linear systems.	<b>K<sub>1</sub></b>
CO-5	Know methods of solving Matrix Problems.	<b>k<sub>1</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M	M	S	S	M	S	M
<b>CO2</b>	M	S	M	S	S	M	S
<b>CO3</b>	M	M	M	S	S	S	S
<b>CO4</b>	S	S	M	S	S	S	S
<b>CO5</b>	S	S	M	S	S	S	S

S-Strong, M-Medium

## COURSE VIII – TOPOLOGY

**Semester: III** **Hours / Week : 6**

**Course Code:21P3MA08** **Credit : 5**

### **Objective:**

- The purpose of the course is to learn the concept of topological spaces.
- The purpose of the course is to learn the concept of continuous functions, connectedness, compactness, countability and separation axioms.
- This course aims to acquaint the students with various topics of topology.

### **UNIT I**

**TOPOLOGICAL SPACES:** Topological spaces – Basis for a topology – The order topology – The product topology on  $X \times Y$  – The subspace topology – Closed sets and limit points. (Chapter 2: Sections 12 to 17)

### **UNIT II**

**CONTINUOUS FUNCTIONS:** Continuous functions – The product topology – The metric topology. (Chapter 2 : Sections 18 to 21 )

### **UNIT III**

**CONNECTEDNESS:** Connected spaces – Connected subspaces of the Real line – Components and local connectedness. (Chapter 3 : Sections 23 to 25)

### **UNIT IV**

**COMPACTNESS:** Compact spaces – Compact subspaces of the Real line – Limit Point Compactness – Local Compactness (Chapter 3 : Sections 26 to 29)

### **UNIT V**

**COUNTABILITY AND SEPARATION AXIOMS:** The Countability Axioms – The separation Axioms – Normal spaces – The Urysohn Lemma – The Urysohn metrization Theorem. (Chapter 4 : Sections 30 to 34).

### **TEXT BOOK:**

James R. Munkres, Topology (2nd Edition), Pearson Education Pvt. Ltd, New Delhi-2002, (Third Indian Reprint).

## REFERENCE(S)

1. J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1975.
2. George F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co, 1963.
3. J.L. Kelly, General Topology, Van Nostrand, Reinhold Co, New York.

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Construct the product topology on product spaces	K <sub>1</sub>
CO-2	Use the open ball on metric spaces, construct the metric topology and define open-closed sets of the space.	K <sub>2</sub>
CO-3	We also explored and studied Connected subspaces of the Real line	K <sub>3</sub>
CO-4	Compactness is the generalization to topological spaces of the property of closed and bounded subsets of the real line	K <sub>2</sub>
CO-5	Every normal space with countable base is metrizable. Actually, every regular Hausdorff space with countable base is metrizable.	K <sub>4</sub>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	S	M	S	S	M	S
CO3	M	S	M	S	S	S	S
CO4	S	S	M	S	S	S	S
CO5	S	S	M	S	S	S	S

S-Strong, M-Medium



## **CORE COURSE IX- MEASURE AND INTEGRATION**

**Semester: III** **Hours / Week : 6**

**Course Code:21P3MA09** **Credit : 5**

### **Objective:**

- It was designed for Post Graduate students to understand the measures and integration.
- The integral has the advantage that one can give specific formulas for integrand .It gives thorough treatment of integration and differentiation on  $\mathbb{R}$  together with fundamentals of abstract measure and integration

### **UNIT I**

**LEBESGUE MEASURE:** Outer measure – Definition & properties – Lebesgue measure measurable sets – Properties - Non-measurable set - Measurable functions. (Chapter 3 Sec. 1-6)

### **UNIT II**

**LEBESGUE INTEGRAL:**Lebesgue Integral of simple function – Bounded measurable function of a nonnegative function – Fatou’s lemma – Monotone convergence theorem – General Lebesgue integral – Lebesgue convergence theorem – Convergence in measure. (Chapter 4 Sec.1-5)

### **UNIT III**

**DIFFERENTIATION AND INTEGRATION:** Differentiation of monotone functions – Vitali’s lemma – Integral of derivative – Functions of bounded variation –Differentiation of an integral – Absolute continuity – Convex functions – Jensen’s inequality.(Chapter 5 Sec. 1-5)

### **UNIT IV**

**GENERAL MEASURE AND INTEGRATION:** Measure spaces – Measurable functions – Integration – Signed measure – Hahn decomposition theorem – Jordan decomposition theorem – Radon-Nikodymtheorem – Lebsgue decomposition theorem. (Chapter 11 Sec. 1-6)

## UNIT V

**MEASURE AND OUTER MEASURE:** Outer measure and Measurability – Extension theorem – Product measures – Fubini’s theorem – Tonelli’s theorem. Chapter 12 Sec. 1, 2 and 4)

### TEXT BOOK:

H.L. Roydon and P.M. Fitzpatrick, Real Analysis, Prentice Hall of India, Learning Pvt. Ltd., New Delhi, (2001).

### REFERENCE(S)

1. De Barra.G, Measure and Integration, Wiley Eastern Limited, 1991 edition.
- 2 .M. C. Munroe, Measure and Integration, Addison, Wesley Publishing Company, Second Edition (1971).

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Use the Lebesgue outer measure to draw conclusions	K <sub>9</sub>
CO-2	Understand about the function, non negative function and convergence theorems.	K <sub>9</sub>
CO-3	Understand about the Differentiation and Integration.	K <sub>7</sub>
CO-4	Use the Measure spaces, Measurable functions and Integration.	K <sub>7</sub>
CO-5	The term “Outer Measure” is used to extension theorem, Fubini’s and Tonelli’s theorem.	K <sub>9</sub>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M	M	S	M	S	M
CO2	M	M	M	S	S	M	S
CO3	M	S	M	S	S	S	S
CO4	S	M	M	S	S	S	S
CO5	S	S	M	S	S	S	S

S-Strong, M-Medium

**CORE COURSE X – INTEGRAL EQUATIONS & CALCULUS OF  
VARIATIONS**

**Semester: III** **Hours / Week : 6**

**Course Code: 21P3MA10** **Credit : 5**

**Objectives:**

- Calculus of variations and integral equations play an important role in both pure and applied mathematics.
- The objective is to provide an introduction to the central ideas of variational problems and integral equations.
- To guide students through derivations of appropriate integral equations governing the behavior of several standard physical problems.

**UNIT I**

**LINER INTEGRAL EQUATIONS** – Definition, Regularity conditions – Special kind of kernels – Eigen values and eigen functions – Convolution Integral – The inner and scalar product of two functions – notation – Integral equations – Examples – Fred Holm alternative – examples – An approximate method. (Chapter 1:1.1 to 1.6 and 2:2.1 to 2.4 of [1])

**UNIT II**

**METHOD OF SUCCESSIVE APPROXIMATION:** Iterative scheme – Examples – Voltra Integral equation – Examples – Some results about the resolvent kernel. (Chapter 3:3.1 to 3.5 of [1]).

**UNIT III**

**APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS** – Initial value problems – Boundary value problems – Singular integral equations – Abel integral equation.

(Chapter 5:5.1 to 5.3 and Chapter 8 :8.1, 8.2 of [1])

## UNIT IV

**CALCULUS OF VARIATION AND APPLICATION** – Maxima and Minima – The simplest case-Illustrative Examples. (Chapter 2 :Sec:2.1 to 2.3 of [2])

## UNIT V

**NATURAL BOUNDARY CONDITIONS AND TRANSITION CONDITIONS** – The Variational notation – The more general case with illustrative equations – Constraints and Lagrange’s multipliers – Variables end points – Sturm – (Liouville Problems).

(Chapter 2: 2.4 to 2.9 of [2]).

### TEXT BOOK(S)

[1] Ram.P.Kanwal-Linear Integral Equations Theory and Practise, Academic Press 1971.

[2] F.B.Hildebrand, Methods’ of Applied Mathematics II ed. PHI, ND 1972.

### REFERENCE(S)

1. S.J.Mikhlin, Linear Integral Equations (translated from Russian), Hindustan Book Agency, 1960.

2. I.N.Snedden, Mixed Boundary value Problems in Potential Theory, North Holland, 1966.

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Explain the concepts of variation and its properties.	<b>K<sub>1</sub></b>
CO-2	Construct the variational problems with fixed and moving boundaries.	<b>K<sub>4</sub></b>
CO-3	Examine the different methods to solve variational problems	<b>K<sub>4</sub></b>
CO-4	Classify Fredholm , Volterra and singular type integral equations	<b>K<sub>5</sub></b>
CO-5	Solve integral equations using Fredholm theorem, Fredholm Alternative theorem and Method of Successive Approximations	<b>K<sub>3</sub></b>

**K1: Remember,K2: Understand,K3: Apply,K4: Analyze,K5:Evaluate,K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	S	M	S	S	M	S
<b>CO3</b>	M	S	M	S	S	S	S
<b>CO4</b>	S	S	M	S	S	S	S
<b>CO5</b>	S	S	M	S	S	S	S

S-Strong, M-Medium

## CORE COURSE XIV-FLUID DYNAMICS

**Semester: III**

**Hours / Week : 6**

**Course Code:21P3MA11**

**Credit : 5**

### Objectives

- This course aims to discuss kinematics of fluids in motion, Equations of motion of a fluid, three dimensional flows, two dimensional flows and viscous flows.
- To give the students a feel of the applications of Complex Analysis in the analysis of the flow of fluids.

### UNIT I

**KINEMATICS OF FLUIDS IN MOTION:** Real fluids and Ideal fluids – Velocity of a fluid at a point, Stream lines , path lines , steady and unsteady flows- Velocity potential – The vorticity vector – Local and particle rates of changes – Equations of continuity – Worked examples – Acceleration of a fluid – Conditions at a rigid boundary.

(Chapter 2. Sections 2.1 to 2.10)

### UNIT II

**EQUATIONS OF MOTION OF A FLUID:** Pressure at a point in a fluid at rest – Pressure at a point in a moving fluid – Conditions at a boundary of two in viscid immiscible fluids – Euler's equation of motion – Discussion of the case of steady motion under conservative body forces. (Chapter 3. Sections 3.1 to 3.7)

### UNIT III

**SOME THREE DIMENSIONAL FLOWS:** Introduction – Sources, sinks and doublets – Images in a rigid infinite plane – Axis symmetric flows – Stokes stream function. (Chapter 4 Sections 4.1, 4.2, 4.3, 4.5)

### UNIT IV

**SOME TWO DIMENSIONAL FLOWS:** Meaning of two dimensional flow – Use of Cylindrical polar coordinate – The stream function – The complex potential for two dimensional, irrotational incompressible flow – Complex velocity potentials for standard two dimensional flows– Some worked examples – Two dimensional Image systems – The Milne Thompson circle Theorem. (Chapter 5. Sections 5.1 to 5.8)

## UNIT V

**VISCOUS FLOWS:** Stress components in a real fluid – Relations between Cartesian components of stress – Translational motion of fluid elements – The rate of strain quadric and principal stresses – Some further properties of the rate of strain quadric – Stress analysis in fluid motion – Relation between stress and rate of strain – The coefficient of viscosity and Laminar flow – The Navier – Stokes equations of motion of a Viscous fluid. (Chapter 8. Sections 8.1 to 8.9)

### TEXT BOOK:

F. Chorlton, Text Book of Fluid Dynamics, CBS Publications. Delhi, 1985.

### REFERENCE(S)

1. R.W.Fox and A.T.McDonald, Introduction to Fluid Mechanics, Wiley, 1985.
2. E.Krause, Fluid Mechanics with Problems and Solutions, Springer, 2005.

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Emonstrate kinematics of fluids in motion, Equations of motion of a fluid, three dimensional flows, two dimensional flows and viscous flows.	K <sub>1</sub>
CO-2	Give the students a feel of the applications of Complex Analysis in the analysis of the flow of fluids.	K <sub>3</sub>
CO-3	Construct some two and three dimensional flows.	K <sub>2</sub>
CO-4	Describe viscous flows.	K <sub>2</sub>
CO-5	Comprehend regions arguments developing the theory underpinning fluid dynamics .	K <sub>5</sub>

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	S	M	S	M	S	M
CO2	M	S	S	S	S	M	S
CO3	M	S	M	M	M	S	M
CO4	S	S	S	S	S	S	S

S-Strong, M-Medium

**(To choose any one out of the given 3)**

**PAPER-III- OPTIMIZATION TECHNIQUES**

**Semester: III**

**Hours / Week : 6**

**Course Code:21P3MAE07**

**Credit : 4**

**Objectives**

This course introduces advanced topics in Linear and non-linear Programming.

- This course introduces advanced topics in Linear and non-linear Programming.

**Unit-I**

Integer Programming Problem-Methods of Integer programming-Cutting plane Algorithm-Gomory fractional algorithm-Mixed Algorithm- Simple problems (Sec. 6.10.3 to 6.10.6)

**Unit-II**

Decision Theory- Decision Making Environment – Decision making under certainty-Decision making under uncertainty- Decision making under Risk.(Sec- 9.1 to 9.5)

**Unit-III**

Game theory – Game models- Definition- Rules of Game theory-Saddle point- Dominance Property- mixed strategy two-person zero sum game (9.10 to 9.18)

**Unit-IV**

Inventory model necessity for maintaining Inventory – Inventory cost – Inventory costs- inventory control problems-classification of inventory- inventory models with deterministic demand : Demand Rate uniform, Replenishment rate infinite-Demand Rate Non-uniform, Replenishment rate infinite- Demand Rate uniform, Replenishment rate or production finite- Demand Rate uniform, Replenishment rate infinite Shortages allowed- Statements only (simple problems)-inventory models with probabilistic demand- Statements only (simple problems) (Sec. 12.1 to 12.5.4 &12.6)



## Unit-V

Introduction- Formulation-local and global optimum- concave and convex function- types on non-linear programming problem- constrained extremal problems- simple problem (Sec. 16.1 to 16.7)

### TEXT BOOK:

**Prem Kumar Gupta and D.S. Hira**, Operations Research: An Introduction, S. Chand and Co. Ltd, New Delhi.

### REFERENCE(S)

1. Mokther S. Bazaraa and C.M. Shetty, Non Linear Programming, Theory and Algorithms, Willy, New York.
2. Hamdy A. Taha, Operations Research (7<sup>th</sup> Edition), McGraw Hill Publications, New Delhi.
3. S.S. Rao, Optimization Theory and Applications, Wiley Eastern Limited, New Delhi.

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Know methods of solving Integer Programming problems and Multistage programming.	K <sub>1</sub>
CO-2	Know methods of using Operations Research techniques in decision making.	K <sub>3</sub>
CO-3	Be able to understand non-linear programming algorithms.	K <sub>3</sub>
CO-4	Know methods of using Operations Research techniques in decision making and application	K <sub>5</sub>
CO-5	Understanding problem	K <sub>2</sub>

### Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	S	S	S	S	M	M
CO2	S	M	S	S	M	M	S
CO3	M	S	M	S	M	S	M
CO4	M	S	S	M	S	S	M
CO5	S	S	M	S	S	M	M

S-Strong, M-Medium

## 2. NON LINEAR DIFFERENTIAL EQUATIONS

**Semester: III** **Hours / Week : 6**  
**Course Code: 21P3MAE08** **Credit : 5**

### Objectives:

- The objective of this course is to equip the students with knowledge of some advanced concepts related to non linear differential equations and to understand the concepts related to the solution of non linear differential equations.
- The aim of the course is to study non linear differential equations and to know that what is the relationship between the partial differential and ordinary differential equations and how to solve
- To introduce the process of discretization, discrete version of Differential Equations, Discrete oscillation and
- To Introduce the asymptotic behavior of solutions of certain class of difference equations for linear cases only.

### UNIT I

**FIRST ORDER SYSTEMS IN TWO VARIABLES AND LINEARIZATION:** The general phase plane – Some population models – Linear approximation at equilibrium points – Linear systems in matrix form.

### UNIT II

**AVERAGING METHODS:** An energy balance method for limit cycles – Amplitude and frequency estimates – slowly varying amplitudes – nearly periodic solutions – periodic solutions: harmonic balance – Equivalent linear equation by harmonic balance – Accuracy of a period estimate.

### UNIT III

**PERTURBATION METHODS:** Outline of the direct method – Forced Oscillations far from resonance – Forced Oscillations near resonance with Weak excitation – Amplitude equation for undamped pendulum –

Amplitude Perturbation for the pendulum equation – Lindstedt’s Method – Forced oscillation of a self – Excited equation – The Perturbation Method and Fourier series.

#### **UNIT IV**

**LINEAR SYSTEMS:** Time Varying Systems – Constant coefficient System – Periodic Coefficients – Floquet Theory – Wronskian.

#### **UNIT V**

**STABILITY:** Poincare stability – solutions, paths and norms – Liapunov stability Stability of linear systems – Comparison theorem for the zero solutions of nearly – linear systems.

#### **TEXT BOOK:**

D.W.Jordan&P.Smith, Nonlinear Ordinary Differential Equations, Clarendon Press, Oxford, 1977.

#### **REFERENCE(S)**

1. G.F.Simmons, Differential Equations, Tata McGraw Hill, NewDelhi, 1979.
2. D.A.Sanchez, Ordinary Differential Equations and Stability Theory, Freeman (1968).
3. J.K.Aggarwal, Notes on Nonlinear Systems, Van Nostrand, 1972.

#### **Course Outcomes:**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	At the end of the course, Students will be able to solve the differential equations by using various methods.	<b>K<sub>1</sub></b>
<b>CO-2</b>	To have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients	<b>K<sub>3</sub></b>
<b>CO-3</b>	Comprehend regions arguments developing the theory underpinning ODE.	<b>K<sub>5</sub></b>
<b>CO-4</b>	Recognize and solve a variable separable difference equation.	<b>K<sub>5</sub></b>
<b>CO-5</b>	Recognize and solve a homogeneous difference equation.	<b>K<sub>2</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

### Mapping of COs with PSOs

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	S	S	M	S	M	S
<b>CO3</b>	M	S	S	S	S	S	M
<b>CO4</b>	M	S	M	S	S	S	S
<b>CO5</b>	S	S	M	M	S	S	M

S-Strong, M-Medium

## **CONTROL THEORY**

**Semester: III** **Hours / Week : 6**  
**Course Code: 21P3MAE09** **Credit: 5**

### **Objective:**

- This course shall introduce the fundamental of modelling and control of linear time invariant system, primarily from the classical view point of Laplace transforms.
- This course will be useful for student from major streams of engineering to build foundations of time frequency analysis of systems as well as the feedback control of such systems
- To study observability, controllability, stability and optimal control of linear systems.

### **UNIT I**

Observability: Linear Systems – Observability Grammian – Constant coefficient systems – Reconstruction kernel – Nonlinear Systems.

### **UNIT II**

Controllability: Linear systems – Controllability Grammian – Adjoint systems – Constant coefficient systems – steering function – Nonlinear systems.

### **UNIT III**

Stability: stability – Uniform Stability – Asymptotic Stability of Linear Systems - Linear time.varying systems – Perturbed linear systems – Nonlinear systems.

### **UNIT IV**

Stabilizability: Stabilization via linear feedback control – Bass method – Controllable subspace – Stabilization with restricted feedback.

### **UNIT V**

Optimal control: Linear time varying systems with quadratic performance criteria – Matrix Riccatic equation – Linear time invariant systems – Nonlinear Systems

### **Text Book:**

Elements of Control Theory by K.Bala chandran and J.P.Dauer, Narosa, New Delhi, 1999.

**Books for Reference:**

1. Mathematics of Finite Dimensional Control Systems by D.L.Russell, Marcel Dekker, New York,1979.
2. Controllability of Dynamical Systems by J.Klamka, Kluwer Academic Publisher, Dordrecht,1991.

**Course Outcomes:**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Students will be able to express the basic elements and structures of feedback control systems	<b>K<sub>1</sub></b>
<b>CO-2</b>	To correlate the pole-zero configurations of transfer functions and their time -domain response to known test inputs	<b>K<sub>3</sub></b>
<b>CO-3</b>	To apply routh -Hurwitz criterion, Root Locus, Bode Plot and nyquist plot to determine the domain of stability of linear time -invariant systems	<b>K<sub>5</sub></b>
<b>CO-4</b>	To determine the steady -state response, errors of stable control systems and design compensators to achieve the desired performance	<b>K<sub>5</sub></b>
<b>CO-5</b>	Control theory has helped renew the modern technological and industrial landscape.	<b>K<sub>2</sub></b>

**K1:Remember,K2: Understand,K3 :Apply,K4:Analyze, K5:Evaluate, K6:Create**

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	M	M	S	M	S	M
<b>CO2</b>	M	S	S	M	S	M	S
<b>CO3</b>	S	M	S	S	S	M	S
<b>CO4</b>	S	S	M	S	S	M	S
<b>CO5</b>	S	M	M	M	S	S	S

S-Strong, M-Medium

## CORE COURSE XII - FUNCTIONAL ANALYSIS

**Semester: IV**

**Hours/week: 6**

**Course Code: 21P4MA12**

**Credit: 5**

### Objectives

- To study the three structure theorems of Functional Analysis viz., Hahn-Banach theorem, open mapping theorem and uniform boundedness principle.
- To introduce Hilbert spaces and operator theory leading to the spectral theory of operators on a Hilbert space.

### UNIT I

**BANACH SPACES:** The definition and some examples – Continuous linear transformations – The Hahn-Banach theorem. (Chapters9:Sec: 46 to 48)

### UNIT II

**BANACH SPACES:** The natural imbedding of  $N$  in  $N^{**}$  – The open mapping theorem – The conjugate of an operator. –Hilbert spaces definition and some simple properties.  
(Chapters9:Sec: 49 to 51)

### UNIT III

**HILBERT SPACES:** Hilbert spaces definition and some simple properties – Orthogonal complements – Orthonormal sets – The conjugate space  $H^*$  – The adjoint of an operator.  
(Chapter 10: Sec: 52 to 56)

### UNIT IV

**OPERATIONS ON HILBERT SPACES:**Self-adjoint operators– Normal and unitary operators – Projections. (Chapter 10: Sec: 57 to 59)

### UNIT V

**BANACH ALGEBRAS:**The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radical and semi-simplicity.  
(Chapter 12:Sec:64 to 69)

**TEXT BOOK:**

G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill International Ed, 1963.

**REFERENCE(S)**

1. Walter Rudin, Functional Analysis, TMH Edition, 1974.
2. B.V. Limaye, Functional Analysis, Wiley Eastern Limited, Bombay, Second Print, 1985.
3. M. Thamban Nair, Functional Analysis, A First Course, Prentice Hall of India (2002).

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Acquire knowledge about the topological properties on a metric space including convergence and completeness and the higher dimensional functional spaces	<b>K<sub>1</sub></b>
CO-2	Understand Banach spaces with illustrations and their properties	<b>K<sub>2</sub></b>
CO-3	Derive the concept of continuity and boundedness on Banach spaces and infer projection theorem on Banach spaces	<b>K<sub>2</sub></b>
CO-4	Acquire knowledge about various Hilbert spaces and categorise operators and functionals defined on them.	<b>K<sub>1</sub></b>
CO-5	Understand spectral theoretical indices and spectral theorem.	<b>K<sub>2</sub></b>

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	S	S	S	S	M	M
CO2	S	S	M	S	M	M	S
CO3	M	S	M	S	M	S	M
CO4	M	S	M	M	S	S	M
CO5	S	S	M	S	S	M	M

S-Strong, M-Medium



## **CORE COURSE XIII- DIFFERENTIAL GEOMETRY**

<b>Semester: IV</b>	<b>Hours / Week</b>	<b>: 6</b>
<b>Course Code: 21P4MA13</b>	<b>Credit</b>	<b>: 5</b>

### **Objectives**

- This course introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surface and the differential geometry of surfaces are explored
- To enlighten the students with many applications of this subject.

### **UNIT I**

**SPACE CURVES:** Definition of a space curve – Arc length – Tangent – Normal and binormal – Curvature and torsion – Contact between curves and surfaces – Tangent surface – Involutives and evolutes – Intrinsic equations – Fundamental Existence Theorem for space curves – Helics. (Chapter I : Sections 1 to 9 )

### **UNIT II**

**INTRINSIC PROPERTIES OF A SURFACE:** Definition of a surface – Curves on a surface – Surface of revolution – Helicoids – Metric – Direction coefficients – Families of curves – Isometric correspondence – Intrinsic properties. (Chapter II: Sections 1 to 9 )

### **UNIT III**

**GEODESICS:** Geodesics – Canonical geodesic equations – Normal property of geodesics – Existence Theorems – Geodesic parallels – Geodesics curvature – Gauss – Bonnet Theorem – Gaussian curvature – Surface of constant curvature.  
(Chapter II: Sections 10 to 18)

#### **UNIT IV**

**NON INTRINSIC PROPERTIES OF A SURFACE:** The second fundamental form – Principal curvature – Lines of curvature – Developable – Developable associated with space curves and with curves on surface – Minimal surfaces – Ruled surfaces.

(Chapter III: Sections 1 to 8)

#### **UNIT V**

**DIFFERENTIAL GEOMETRY OF SURFACES:** Fundamental Equations of Surface Theory – Fundamental Existence Theorem for surfaces – Compact surfaces whose points are umbilics – Hilbert's lemma – Compact surface of constant curvature – Complete surfaces. (Chapter III : Sections 9 and 10 & Chapter IV : Only Section 1 to 5)

#### **TEXT BOOK:**

T.J.Willmore, An Introduction to Differential Geometry, Oxford University Press, (17th Impression), New Delhi, 2002. (Indian Print)

#### **REFERENCE(S)**

1. Struik, D.T. Lectures on Classical Differential Geometry, Addison - Wesley, Mass, 1950.
2. Kobayashi. S. and Nomizu. K, Foundations of Differential Geometry, Interscience Publishers, 1963.
3. Wilhelm Klingenberg, A course in Differential Geometry, Graduate Texts in Mathematics, Springer-Verlag, 1978.

**Course Outcomes:**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	The Serret-Frenet frame for space curves and the notion of torsion of a space.	<b>K<sub>2</sub></b>
<b>CO-2</b>	Gauss Bonnet theorem and its implications for a geodesic triangle on a surface.	<b>K<sub>5</sub></b>
<b>CO-3</b>	Lines of Curvature and Rodrigue's formula.	<b>K<sub>3</sub></b>
<b>CO-4</b>	The course introduces the fundamentals of differential geometry primarily by focussing on the theory of curves and surfaces in three space.	<b>K<sub>2</sub></b>
<b>CO-5</b>	The theory of curves studies global properties of curves such as the four vertex theorem.	<b>K<sub>6</sub></b>

**Mapping of COs with PSOs**

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	M	S	S	S	S	M	M
<b>CO2</b>	S	S	S	S	M	S	S
<b>CO3</b>	M	S	M	S	M	S	M
<b>CO4</b>	M	S	M	M	S	S	M

S-Strong, M-Medium

## **CORE COURSE XI – NUMERICAL ANALYSIS**

<b>Semester: IV</b>	<b>Hours / Week</b>	<b>: 6</b>
<b>Course Code:21P4MA14</b>	<b>Credit</b>	<b>: 5</b>

### **Objectives:**

- Numerical Analysis is a methodology developed to find solutions to those mathematical problems which do not have exact analytical solutions.
- Numerical Methods finds applications in all field of engineering, physical sciences and life sciences.
- The objective is to use these techniques to find solutions numerically both reliably and to a specified accuracy.

### **UNIT I**

#### **NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS:**

Powers series solution – Pointwise method – Solution by Taylor’s series – Taylor’s series method for simultaneous first order differential equations – Taylor’s series method for Higher order Differential equations – Predictor – Corrector methods – Milne’s method – Adam-Bashforth method.

(Chapter 11 : Sections 11.1 to 11.6 and Sections 11.18 to 11.20)

### **UNIT II**

**PICARD AND EULER METHODS:** Picard’s method of successive approximations – Picard’s method for simultaneous first order differential equations – Picard’s method for simultaneous second order differential equations – Euler’s method – Improved Euler’s method – Modified Euler’s method. (Chapter 11 : Sections 11.7 to 11.12)

### **UNIT III**

**RUNGE – KUTTA METHOD:** Runge’s method – Runge-Kutta methods – Higher order Runge-Kutta methods – Runge-Kutta methods for simultaneous first order differential equations – Runge-Kutta methods for simultaneous Second order differential equations.

(Chapter 11: Sections 11.13 to 11.17)

#### **UNIT IV**

#### **NUMERICAL SOLUTIONS TO PARTIAL DIFFERENTIAL**

**EQUATIONS:** Introduction difference quotients – Geometrical representation of partial differential equations – Classification of partial differential equations – Elliptic equation – Solution to Laplace's equation by Liebmann's iteration process.

(Chapter 12: Sections 12.1 to 12.6)

#### **UNIT V**

#### **NUMERICAL SOLUTIONS TO PARTIAL DIFFERENTIAL**

**EQUATIONS (CONTD):** Poisson equation – its solution – Parabolic equations – Bender – Schmidt method – Crank – Nicholson method – Hyperbolic equation – Solution to partial differential equation by Relaxation method. (Chapter 12 : Sections 12.7 to 12.10)

#### **TEXT BOOK:**

V.N.Vedamurthy and Ch. S.N.Iyengar; Numerical Methods, Vikas Publishing House Pvt. Ltd., 1998.

#### **REFERENCE(S)**

1. E. Balagurusamy, Numerical Methods, Tata McGraw Hill Publishing Company Ltd, 2002
2. Sastry .S.S. Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt Ltd, 2000
3. Elementary Numerical Analysis- Samuel D. Conte / Carl de Boor, Tata McGraw-Hill, Third edition, 2009.

**COURSE OUTCOMES:**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Numerically solve a scalar nonlinear equation. Understand basics of finite precision arithmetic, conditioning of problems and stability of numerical algorithms.	<b>K<sub>6</sub></b>
<b>CO-2</b>	Use condition number and norms to assess accuracy of solutions to linear equations and least squares problems	<b>K<sub>3</sub></b>
<b>CO-3</b>	Numerically approximate functions with polynomials	<b>K<sub>6</sub></b>
<b>CO-4</b>	Understand and apply appropriate techniques for numerical differentiation and integration.	<b>K<sub>7</sub></b>
<b>CO-5</b>	Use condition number and norms to assess Application	<b>K<sub>2</sub></b>

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	S	S	S	S	M	M
<b>CO2</b>	S	S	M	S	M	M	S
<b>CO3</b>	M	S	M	S	M	S	M
<b>CO4</b>	M	S	M	M	S	S	M
<b>CO5</b>	S	S	M	S	S	M	M

S-Strong, M-Medium

## **ELECTIVE – MATHEMATICAL MODELLING**

<b>Semester: IV</b>	<b>Hours / Week</b>	<b>: 6</b>
<b>Course Code:21P4MAE10</b>	<b>Credit</b>	<b>: 4</b>

### **Objectives**

- To study the different mathematical models in ODE and Difference equations.
- To study graph theoretical models.
- Mathematical Modeling courses provide rigorous instruction in fundamental mathematical concepts and skills presented in the context of real-world applications.
- The modeling skills provide analytical methods for approaching problems students encounter in their future endeavors

### **UNIT I**

Mathematical Modelling through Ordinary Differential Equations of First order : Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamics problems – Geometrical problems

### **UNIT II**

Mathematical Modelling through Systems of Ordinary Differential Equations of First Order : Population Dynamics – Epidemics – Compartment Models – Economics – Medicine, Arms Race, Battles and International Trade – Dynamics.

### **UNIT III**

Mathematical Modelling through Ordinary Differential Equations of Second Order: Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models.

#### **UNIT IV**

Mathematical Modelling through Difference Equations : Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory.

#### **UNIT V**

Mathematical Modelling through Graphs : Solutions that can be Modelled through Graphs – Mathematical Modelling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.

#### **TEXT BOOK**

J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.

#### **REFERENCES**

J. N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East – West Press Pvt Limited, New Delhi, 19

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Apply mathematical concepts, including Calculus, linear Algebra and differential Equations to analyse specific problems and identify the appropriate mathematics to realise a solution.	<b>K<sub>6</sub></b>
<b>CO-2</b>	Use computer programming and statistical analysis skills to efficiently model systems	<b>K<sub>3</sub></b>
<b>CO-3</b>	Recognise the connections between mathematics and other disciplines, and how mathematical ideas are embedded in other contexts.	<b>K<sub>6</sub></b>
<b>CO-4</b>	Represent real -world systems from science and technology in a mathematical framework.	<b>K<sub>7</sub></b>
<b>CO-5</b>	Employ appropriate methods to analyse, solve and evaluate the performance of mathematical models	<b>K<sub>5</sub></b>



### Mapping of COs with PSOs

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	M	S	M	S	S	M	M
<b>CO2</b>	S	M	S	S	M	S	S
<b>CO3</b>	M	S	M	S	M	M	M
<b>CO4</b>	M	M	M	M	S	S	M
<b>CO5</b>	S	S	M	S	S	M	M

S-Strong, M-Medium

## 2. PROBABILITY THEORY

**Semester: IV** **Hours / Week : 6**

**Course Code: 21P4MAE11** **Credit : 4**

### Objectives:

- The overall purpose of the course is that the student should be well acquainted with basic concepts in probability theory, models and solution methods applied to real problems.
- The chances or the odds that an event will occur based on the analysis of concrete measures rather than hunches or guesswork
- Each measure is a recorded observation, a hard fact, or part of a long history of collected data
- It can be estimated from proportions, based on empirical data

### UNIT I

**RANDOM EVENTS AND RANDOM VARIABLES:** Random events – Probability axioms – Combinatorial formulae – Conditional probability – Bayes Theorem – Independent events – Random Variables – Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables.

(Chapter 1: Sections 1.1 to 1.7 Chapter 2 : Sections 2.1 to 2.9)

### UNIT II

**PARAMETERS OF THE DISTRIBUTION:** Expectation – Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.

(Chapter 3 : Sections 3.1 to 3.8 )

### UNIT III

**CHARACTERISTIC FUNCTIONS:** Properties of characteristic functions – Characteristic functions and moments – Semi-invariants – Characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions.

(Chapter 4 : Sections 4.1 to 4.7)

#### **UNIT IV**

**SOME PROBABILITY DISTRIBUTIONS:** One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – Normal gamma – Beta – Cauchy and Laplace (continuous) distributions.  
(Chapter 5 : Section 5.1 to 5.10 (Omit Section 5.11))

#### **UNIT V**

**LIMIT THEOREMS:** Stochastic convergence – Bernoulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems – De Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem – Lyapunov Theorem – Borel-Cantelli Lemma – Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.  
(Chapter 6 : Sections 6.1 to 6.4, 6.6 to 6.9 , 6.11 and 6.12)  
(Omit Sections 6.5, 6.10, 6.13 to 6.15)

#### **TEXT BOOK:**

M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.

#### **REFERENCE(S)**

1. R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972.
2. K.L.Chung, A course in Probability, Academic Press, New York, 1974.
3. R.Durrett, Probability: Theory and Examples, (2nd Edition) Duxbury Press, New York, 1996.

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO-1</b>	Apply mathematical concepts, in probability theory specific problems	<b>K<sub>1</sub></b>
<b>CO-2</b>	Use condition distribution in probability theory specific problems	<b>K<sub>3</sub></b>
<b>CO-3</b>	Some inequalities apply in probability	<b>K<sub>4</sub></b>
<b>CO-4</b>	Camper with continuous distribution discrete distribution	<b>K<sub>5</sub></b>
<b>CO-4</b>	Use condition distribution in probability theory specific problems in Gamma distribution	<b>K<sub>5</sub></b>

#### Mapping of COs with PSOs

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	M	S	M	S	S	M	M
<b>CO2</b>	S	M	S	S	M	S	S
<b>CO3</b>	M	S	M	S	M	M	M
<b>CO4</b>	M	M	M	M	S	S	M

S-Strong, M-Medium

### 3. STOCHASTIC PROCESSES

**Semester: IV**

**Hours / Week : 6**

**Course Code: 21P4MAE12**

**Credit : 4**

#### **Objectives**

- To understand the stochastic models for many real life probabilistic situations.
- To learn the well known models like Birth-death and queuing to reorient their knowledge of stochastic analysis.
- The Stochastic Processes are probabilistic models for random quantities evolving in time or space
- To provide a good understanding of the key concepts of stochastic processes in various settings

#### **UNIT I**

**STOCHASTIC PROCESSES:** Some notions – Specification of Stochastic processes – Stationary processes – Markov Chains – Definitions and examples – Higher Transition probabilities – Generalization of Independent Bernoulli trails – Sequence of chain – Dependent trains. (Ch. II : Sec 2.1 to 2.3, Ch III : Sec 3.1 to 3.3)

#### **UNIT II**

**MARKOV CHAINS:** Classification of states and chains – Determination of Higher transition probabilities – Stability of a Markov system – Reducible chains – Markov chains with continuous state space. (Ch III Sec 3.4 to 3.6, 3.8, 3.9 and 3.11)

#### **UNIT III**

**MARKOV PROCESSES WITH DISCRETE STATE SPACE:** Poisson processes and their extensions – Poisson process and related distribution – Generalization of Poisson process- Birth and Death process – Markov processes with discrete state space (continuous time Markov Chains). (Ch IV : Sec 4.1 to 4.5)

#### UNIT IV

**RENEWAL PROCESSES AND THEORY:** Renewal process – Renewal processes in continuous time – Renewal equation – stopping time – Wald’s equation – Renewal theorems. (Ch VI : Sec 6.1 to 6.5)

#### UNIT V

**STOCHASTIC PROCESSES IN QUEUING** –Queuing system – General concepts – The queuing model M/M/1 – Steady state Behaviour – Transient behaviour of M/M/1 Model – Non-Markovian models – The model GI/M/1.

(Ch X : Sec 10.1 to 10.3, 10.7 and 10.8 (omit sec 10.2.3 & 10.2.3.1))

#### TEXT BOOK:

J. Medhi, Stochastic Processes, Howard M. Taylor – Second edition

#### REFERENCE(S)

1. Samuel Korlin, Howard M. Taylor, A first course in stochastic processes, II Edn.
2. Narayan Bhat , Elements of Applied Stochastic Processes.
3. Srinivasan and Metha, Stochastic Processes.

#### COURSE OUTCOMES:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	The student has basic knowledge about stochastic processes in the time domain	K <sub>6</sub>
CO-2	The student has acquired more detailed knowledge about Markov processes with a discrete state space, including Markov chains, poisson processes and birth and death processes	K <sub>3</sub>
CO-3	The student also knows about queueing systems and Brownian motion, in addition to mastering the fundamental principles of simulation of stochastic processes	K <sub>6</sub>
CO-4	The construction of Markov chain Monte Carlo (MCMC) algorithms	K <sub>7</sub>
CO-5	The student is able to formulate simple stochastic process models in the time domain and provide qualitative and quantitative analyses of such models.	K <sub>2</sub>

### Mapping of COs with PSOs

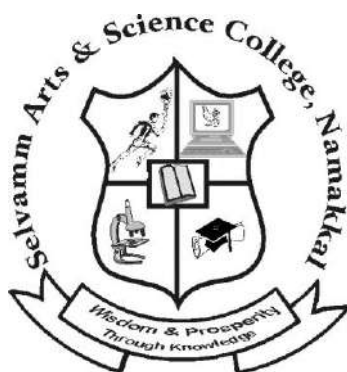
	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>
<b>CO1</b>	S	S	S	S	S	M	M
<b>CO2</b>	S	S	M	S	M	M	S
<b>CO3</b>	M	S	M	S	M	S	M
<b>CO4</b>	M	S	M	M	S	S	M
<b>CO5</b>	S	S	M	S	S	M	M

S-Strong, M-Medium

# **SELVAMM ARTS & SCIENCE COLLEGE (AUTONOMOUS)**

Nationally Accredited by NAAC  
UGC Recognized 2(f) and 12(B) Institution  
Affiliated to Periyar University, Salem

## **NAMAKKAL**



## **SYLLABUS**

**CHOICE BASED CREDIT SYSTEM**

**SEMESTER PATTERN**

## **M.Sc. Microbiology**

**(2021-2023)**



**M. Sc. MICROBIOLOGY**  
**CHOICE BASED CREDIT SYSTEM**

**REGULATIONS**  
**(w.e.f. 2021-2023)**

**1. CONDITIONS FOR ADMISSION**

**ELIGIBILITY CONDITIONS FOR ADMISSION**

Candidate who has passed the B.Sc. degree in any Life Sciences [ Microbiology / Applied microbiology/ Industrial Microbiology/ Botany/ Plant Sciences and Plant Biotechnology/ Zoology/ Animal Science/ Applied Animal Science and Animal Biotechnology/ Biochemistry/ Bioinformatics/ Biology/ Life Sciences/ Home Science/ Food Science & Nutrition/ BSMS/BAMS/BUMS/Chemistry with Botany / Zoology as Allied Subjects of this University or an Examination of any other University accepted by the Syndicate as equivalent thereto shall be eligible for admission to M.Sc. Degree Course in Microbiology.

Candidate shall be admitted to the examination only if he/she has taken the qualifying degree in Science/ Medical subjects as mentioned after having completed the prescribed courses consisting of twelve years of study and has passed the qualifying examination.

**ELIGIBILITY FOR THE AWARD OF DEGREE**

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the University for a period of not less than two academic years, passed the examination of all the four semesters prescribed earning 100 credits and fulfilled such conditions as have been prescribed therefore.

**Duration of the Course**

The programme for the degree of **Master of Science in Microbiology** shall consist of **two Academic years** divided into four semesters. Each semester consist of 90 working days.

**Passing Minimum:**

There shall be four semester examinations: first semester examinations at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.

The candidate shall be declared to have passed the examination if the candidate secures not less than 50% marks in the Board examination in each paper / practical. However submission of a record notebook is a must. For the project work and viva-voce a candidate should secure 50% of the marks for pass.

**Examinations:****Theory Evaluation of Internal Assessment**

Snap test	(5x1)	: 05Marks
Seminar		: 05 Marks
CIA-I		: 05 Marks
CIA-II		: 05 Marks
Model Exam		: 05 Marks
		-----
Total		25 Marks
		-----

The Passing minimum shall be 50% out of 25 marks (12.5 marks)

**Practical:****Evaluation of Internal Assessment**

Test 1	: 15 Marks
Test 2	: 15 Marks
Record	: 10 Marks
	-----
Total	40 Marks
	-----

The passing minimum shall be 50% out of 40 marks (20 Marks)

## **Evaluation of External Examinations**

Time: 6 Hours

Max Marks: 60

### Distribution of Marks

Viva-Voce	: 10 Marks
Record	: 05 Marks
Estimation / Mixture / Expt.	: 35/20/45 Marks
Preparation / Calorimetric	: 10/15 Marks

### Dissertation

Evaluation (External)	: 100 Marks
Viva-voce (joint)	: 20 Marks

## **Regulations of Project Work**

- Students should do their five months [Dec to Apr] Project work in Company / Industries.
- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the 1<sup>st</sup> Week of January in their Project semester.
- Each internal guide shall have maximum of eight Students.
- Periodically the project should be reviewed minimum three times by the advisory committee.
- The Students should prepare three copies of the dissertation and submit the same to the college on 30<sup>th</sup> April for the evaluation by examiners. After evaluation one copy is to be retained in the College Library and one copy is to be submitted to the University (Registrar) and the student can hold one copy.
- A Sample format of the dissertation is enclosed in Annexure-II.
- Format of the Title page and certificate are enclosed in Annexure- III.
- The Students should use OHP / Power Point Presentation during their Project Viva voce Examinations.

## **Vision**

To impart a high quality of education & training in the field of microbiology to enable successful career for the post graduate students in the field of research, education & industrial applications.

## **Mission**

Independent thought, collegiality, exchange of ideas and high ethical standards, development of innovative instructional techniques and increased job opportunities.

## **Program Outcomes**

<b>PO.No</b>	<b>Upon completion of M.Sc Degree programme , the graduates will be able to</b>
PO 1	<b>Application:</b> Apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
PO 2	<b>Analysis:</b> Perform analysis to assess, interpret, and create innovative ideas through practical experiment.
PO 3	<b>Solution Finding:</b> Facilitate to enter multidisciplinary path to solve day-to-day problems.
PO 4	<b>Progression in Career:</b> Prepare students for prominent career in industry, banks offices and for further academic study.
PO 5	<b>Research Capability:</b> Able to do the experiments with proper procedure, appropriately record and Analyze the results.
PO 6	<b>Expressing their talents:</b> Improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.
PO 7	<b>Individual sustainability:</b> Carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
PO 8	<b>Competency:</b> Attain competency in job market / entrepreneurship.

**SELVAMM ARTS AND SCIENCE COLLEGE (AUTONOMOUS), NAMAKKAL**

**COURSE STRUCTURE UNDER CBCS**

**DEPARTMENT OF MICROBIOLOGY**

(For the students admitted in the Year 2021-22 Batch onwards)

Sem	Course	Course Code	Title of the Course	Hrs	Credit	Internal Mark	External Mark	Total Marks
<b>I</b>	Core Course – I	21P1MB01	General Microbiology	6	5	25	75	100
	Core Course – II	21P1MB02	Immunology & Immuno technology	6	5	25	75	100
	Core Course – III	21P1MB03	Pharmaceutical Chemistry	6	5	25	75	100
	Elective – I	21P1MBE01	Biofertilizer Technology	6	4	25	75	100
	Core practical-I	21P1MBP01	General Microbiology, Immunology , Pharmaceutical Chemistry	6	3	40	60	100
<b>Total</b>				<b>30</b>	<b>22</b>			<b>500</b>
<b>II</b>	Core Course – IV	21P2MB04	Medical Bacteriology and Virology	5	5	25	75	100
	Core Course – V	21P2MB05	Medical Mycology and Parasitology	5	5	25	75	100
	Core Course – VI	21P2MB06	Microbial Genetics and Molecular Biology	5	5	25	75	100
	EDC	21P2xxyy	Extra Disciplinary Course	5	4	25	75	100
	Core practical-II	21P2MBP02	Medical Microbiology	4	3	40	60	100
	Core practical-III	21P2MBP03	Microbial Genetics and Molecular Biology	4	3	40	60	100
	Common	21P2HR01	Human Rights	2	2	25	75	100
	21P2MBI01	Internship	2 Wks	1	40	60	100	
<b>Total</b>				<b>30</b>	<b>28</b>			<b>800</b>
<b>III</b>	Core Course – VII	21P3MB07	Genetic engineering and advances in biotechnology	5	5	25	75	100
	Core Course – VIII	21P3MB08	Soil, Agricultural and Environmental Microbiology	5	5	25	75	100
	Core Course – IX	21P3MB09	Industrial and Pharmaceutical Microbiology	5	5	25	75	100
	Elective – II	21P3MBE02	Human anatomy and Physiology	5	4	25	75	100
	Core practical-IV	21P3MBP04	Genetic Engineering and Industrial Microbiology	4	3	40	60	100
Core practical-V	21P3MBP05	Soil Agricultural and Environmental	4	3	40	60	100	

			Microbiology					
	Common	21P3SSS01	Soft Skills	2	1	25	75	100
<b>Total</b>				<b>30</b>	<b>26</b>			<b>700</b>
<b>IV</b>	Core Course – X	21P4MB10	Research Methodology, Biostatistics and Bioinformatics	6	5	25	75	100
	Core Course – XI	21P4MB11	Food, Dairy and Aquatic Microbiology	6	5	25	75	100
	Core practical-VI	21P4MBP06	Food, Dairy and Aquatic Microbiology	4	3	40	60	100
	Elective – III	21P4MBE03	Nanotechnology And Intellectual Property Rights	5	5	25	75	100
	Common	21P4MBPR01	Project	9	5	40	60	100
	Common	21P4Ex01	Extension activities (II & III Sem)	(40) **	1	-	-	-
<b>Total</b>				<b>30</b>	<b>24</b>			<b>500</b>
<b>Grand Total</b>				<b>120</b>	<b>100</b>			<b>2400</b>

**xyyy – Corresponding department, Corresponding Subject**

**\*\* - Outside the Class Hours**

**M. Sc. Microbiology**  
**Choice Based Credit System**  
**(2021-2022 onwards)**

**List of core courses**

<b>Paper code</b>	<b>Subjects</b>
21P1MB01	General Microbiology
21P1MB02	Immunology & Immuno technology
21P1MB03	Pharmaceutical Chemistry
21P2MB04	Medical Bacteriology and Virology
21P3MB05	Medical Mycology and Parasitology
21P3MB06	Microbial genetics and Molecular biology
21P3MB07	Genetic engineering and advances in biotechnology
21P3MB08	Soil, Agricultural & Environmental Microbiology
21P3MB09	Industrial and Pharmaceutical Microbiology
21P4MB10	Research Methodology, Biostatistics and Bioinformatics
21P4MB11	Food, Dairy & Aquatic Microbiology
21P4MBPR01	Project

**List of Elective Courses**

<b>Paper code</b>	<b>Subjects</b>
21P2MBE01	Biofertilizer Technology
21P3MBE02	Human Anatomy and Physiology
21P4MBE03	Nanotechnology and Intellectual property Rights

**List of Extra Disciplinary Courses (EDC)**

1. General hygienic and sanitary practices
2. Medical laboratory techniques

### Programme Specific Outcomes

PSO-1	Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to life science.
PSO-2	Acquire knowledge and understanding of organism biology and genetics, evolution, molecular biology and basic biological chemistry. Instill the intellectual skills to analyze and solve biology-related problems, formulate and test hypothesis using experimental design.
PSO-3	Global level research opportunities to pursue Ph.D Programme targeted approach of CSIR – NET examination.
PSO-4	Explore the scientific literature effectively and use computational tools. Communicate ideas and principles effectively through oral presentations, computer based tools and written reports.
PSO-5	Specific placements in R & D and synthetic division of polymer industries & Allied Division.
PSO-6	Graduates will acquire practical skills- plan & execute experimental techniques independently as well as to analyze & interpret data.
PSO-7	Graduates will effectively know the concept of metabolism, such as anabolic and catabolic activities in organisms.
PSO-8	A general course emphasizing distribution, morphology and physiology of microorganisms in addition to skills in aseptic procedures, isolation and identification.
PSO-9	Analyze and apply latest laboratory technologies to solve problems in the areas of infection sites & critical thinking.
PSO-10	Will get knowledge in designing a synthetic route for developing organic compounds, drugs, natural products & also will be well versed in green concepts of organic synthesis.



**SEMESTER – I**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P1MB01</b>
<b>Marks</b>	<b>100</b>

## **CORE I-GENERAL MICROBIOLOGY**

### **Course Objectives:**

#### **General microbiology deals with**

- The early developments of microbiology,
- Basic concepts of what microorganism is & its characteristics,
- Importance of the various cellular organization,
- Taxonomic groups and their economic importance.
- Various types of microscopes
- Staining techniques for identification of microbes,
- The effect of various antimicrobial agents on microbial inhibition.

**UNIT I Classification and Microbial Diversity** – Classification of Microorganisms – Haeckel's three kingdom concepts – Whittaker's five kingdom concepts – Classification and Salient features of bacteria according to the Bergey's manual of determinative bacteriology. Conventional and molecular methods of studying Microbial diversity – Phylogenomics.

**UNIT II Microscopy** – Simple – Compound, Dark field, Phase contrast, Fluorescent and Electron microscopes – SEM, TEM, freeze fraction, confocal microscopy and their applications – Stains and staining reactions – Simple, Differential and Special staining techniques - Capsular staining (negative), Spore.

**UNIT III Extremophiles** – Role of Extremophiles in Modern Microbial Technology. Thermophiles – Hyperthermophilies and halophiles - Dead Sea – halotolerance – Applications of halophiles and their extremozymes. Barophiles – High pressure habitats, life under pressure, barophils.

**UNIT IV Bacterial physiology** - Growth – factors – nutritional requirements for bacterial growth. Bacterial metabolism – Respiration – Fermentation – Photosynthesis - Characteristics and types of Photosynthetic Prokaryotes. CO<sub>2</sub> fixation Oxygenic and Anoxygenic.

**UNIT V Antimicrobial chemotherapy and Sterilization**– Antibiotics – classification – mode of action –drug resistance – Sensitivity tests – ESBL Resistance– Sterilization and disinfection – Principles and methods. Sterility control for dry heat and moist heat. Disinfection and chemical agents – Mode of action.

## **TEXTBOOKS**

1. Prescott M (2019). Microbiology. 11<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.

## **REFERENCES**

1. Pelczar JR, Chan ECS & Kreig NR (2020). Microbiology. 7<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.
2. Powar CB & Dagainawala HF (2019). General Microbiology – Volume I & II. 8<sup>th</sup> Edition, Himalaya Publishing House, Mumbai.
3. Dubey RC Maheswari DK & (2015). A Text Book of Microbiology, Kindle Edition, Published by S.Chand & Company Limited, New Delhi.
4. Kushner, D.J (2007) Microbial Life in Extreme Environments, Academic Press.
5. Tortora, G.J., Funke, B.R. and Case, C.L. (2016) Microbiology: An Introduction, 11<sup>th</sup> Edition, Pearson Education, India.
6. Alcamo E. Fundamentals of Microbiology. 6<sup>th</sup> Ed., Jones and Bartlett Publishers, New Delhi. 2001.
7. Baveja, C.P. and Baveja, V. (2017) APC Text Book of Microbiology. 4<sup>th</sup> Edition, Arya Publications, New Delhi.

### Web Site Addresses:

1. <http://www.sheffcol.ac.uk/links/Science/Biology/Microbiology>
2. <http://www.cat.cc.md.us/courses/bio141/Labmanal/index.html>
3. <http://www.microbiologyonline.org.uk/links.html>
4. <http://www.bact.wisc.edi/Microtextbook/index.php>
5. <http://www.bris.ac.uk/vetpath/cpl/tut.html>
6. <http://www.bmb.leeds.ac.uk/mbiology/ug/ugteach/elect/elect.html>

### Course Outcome

Co.No	Upon Completion of this course, Students will be able to	Knowledge Level
CO1:	Know about the Classification and Microbial Diversity	K2
CO2:	Demonstrate theory and practical skills in Microscopy and their handling techniques and staining procedures.	K2 & K3
CO3:	Know about the Extremophiles in Modern Microbial Technology	K2
CO4:	Understand the Structural Similarities and differences among Various Physiological groups of Bacteria/Archaea	K2 & K4
CO5:	Learn Culture media and their applications and also understand various physical and chemical means of Sterilization	K2 & K3

### Mapping

PSO										
CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	M	M	S	M	M	M	M	S	S	M
CO2	S	M	S	M	S	S	S	S	M	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	M	S	S	M	S	S	S	S	S	M

M – Medium

S - Strong

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P1MB02</b>
<b>Marks</b>	<b>100</b>

## **CORE II- IMMUNOLOGY AND IMMUNOTECHNOLOGY**

### **Course Objectives:**

- To study in detail the components of the immune system.
- To learn the immunological basis of antigen and types.
- To distinguish and characterize various immune cells, to understand the mechanism of antibody diversity,
- To understand the antigen antibody reaction.
- To understand the role of cytokines in immunity, to understand the significance of the major histocompatibility.

**Unit-I Introduction:** History of Immunology, types of immunity- Innate and acquired, passive and Active. Primary Lymphoid organ - bone marrow and thymus, Secondary lymphoid organ- spleen and lymph nodes. Humoral and cell mediated immunity. Induction of immune response- Cytokines, lymphokines and chemokines.

**Unit-II Antigenicity:** Factors governing antigenicity. Antigen types, haptens, epitopes, adjuvants, carriers, bacterial, viral and tumour antigens, autoantigens, bloodgroup antigens, T dependent, T independent antigens.

**Unit-III Antibodies and Complement system:** Immunoglobulin – Types, Kinetics of antibody production - primary and secondary antibody response. The complement systems: Mode of activation, classical, alternate and lectin pathway

**Unit-IV Antigen antibody reactions-**precipitation, agglutination, immunofluorescence, haem agglutination, RIA, ELISA. Immuno diagnosis Used to detect Corona and SARS. Role of Biomarkers in diagnosis of COVID-19. Mechanism of Vaccination, Importance and immunological response. Hypersensitivity reactions - types, Antibody mediated (Type- I, Type II, Type III) and Cell mediated (Type- IV).

**Unit-V Immunology in Relation to Tumour:** Tumor antigens – immune response to tumors and functional classification. Immunodiagnosis of tumors – detection of tumor markers- alphafoetal proteins, carcino embryonic antigen. Role of microorganisms in tumor. Immunotherapy of malignancy. Monoclonal antibody-production and their applications. **Major Histo compatibility Complex:** Structure, function of MHC and HLA system. Transplantation-organ transplantations in humans, tissue typing methods, Graft disease (GVHD). Autoimmune diseases – Rheumatoid arthritis and Systemic lupus erythematosus.

### TEXTBOOKS

1. Owen, J., Punt, J and Strandford, S. “Kuby Immunology”, 7th Ed., W. H. Freeman Publication, New York, USA, 2012.
2. Kuby J., 2019. Immunology (8<sup>th</sup> edition) – WH Freeman and Company, New York

### REFERENCES

1. Ivan M. Roit (2012). Essential Immunology (13<sup>th</sup> Edition)–Blackwell Scientific Publications, Oxford.
2. Roitt, I., Brostoff, J. and David, M. “Immunology”, 6th Ed., Mosby publishers Ltd., New York, USA, 2001.
3. Tizard, R.I. “Immunology”, 4 th Ed., Saunders college publishing, Chennai Microprint Pvt.Ltd.,Chennai, 2004.

### Web Site Addresses:

1. <http://www-immuno.path.cam.ac.uk/-immuno/part1.html>
2. <http://www.Iclark.edu/-reiness/immuno/lectures.html>
3. <http://www.hhmi.org/biointeractive/immunology/lectures.html>
4. <http://www.immuneweb.xxmc.edu.cn/immunology/immunology.html>

## Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge Level
<b>CO1:</b>	Understand to demonstrate a capacity of problem solving about immune response.	K2
<b>CO2:</b>	Demonstrate the process of antigenecity.	K3
<b>CO3:</b>	Understand the basic mechanism antioibes and lectin pathway.	K1
<b>CO4:</b>	Understand the mechanism of clonal selection, diversity and various serological diagnostic techniques based on antigen – antibody interaction.	K2
<b>CO5:</b>	Analyze the immune response to tumor cells function and organ transplantation.	K4

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	S	S	S	M	S	S	M
<b>CO2</b>	S	S	S	M	S	M	S	M	M	M
<b>CO3</b>	S	S	S	M	M	S	S	M	M	M
<b>CO4</b>	S	M	M	M	M	S	S	M	M	M
<b>CO5</b>	S	M	M	M	M	S	S	M	S	S

**M – Medium**

**S - Strong**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P1MB03</b>
<b>Marks</b>	<b>100</b>

### **CORE III - PHARMACEUTICAL CHEMISTRY**

#### **Course Objectives:**

- To know about fundamentals of chemistry
- To expose the students to the concepts of production of therapeutics
- To learn techniques used in pharmaceutics
- To study about mechanism of action of drugs
- To learn about techniques in microbiology laboratories

**UNIT I Basic Chemistry concepts-** Standard periodic table of the chemical elements - Atomic structure: Atom - Ion - Electron - Proton - Neutron -Atomic orbital - Molecular orbital - Chemical element - Valence - Atomic nucleus - Isotope. Bonding : Chemical bond - Ionic bond - Covalent bond - Metallic bond - Hydrogen bond - Intermolecular force - Dipole - Electron pair - Unpaired electron.

**UNIT II Chemical structure and uses** –Antibiotics - Penicillin, Chloramphenicol, Tetracyclin. General properties and drug action of Sulphonamides – Sulphadiazine, Sulphapyridine. Narcotic analgesics – morphine, heroine and codeine. Synthetic analgesics – pethidine and methadone. Antipyretic analgesics – methyl salicylate, aspirin and paracetamol. Anaesthetics, Tranquilizers, Antineoplastics and Sedatives.

**UNIT III Pharmacokinetics and Pharmacodynamics** - Routes of drug administration- volume of distribution- biotransformation- phase I and phase II reactions- bioavailability- excretion of drugs and their metabolites as defined by Henderson Hasselbalch equation.

**UNIT IV Mechanism of action of drugs** - Drug physical and chemical actions – drug interactions - therapeutic applications of beneficial interactions. Adverse drug reactions, Drug allergies. Principles of toxicity, Evaluation and determination of LD 50, ED 50 and TD 50. Water activity. Drug safety.

**UNIT V** Growth promotion test(GPT), Disinfectant efficacy study for different types of Disinfectants, Container Closure Integrity test(CCIT), Preservative efficacy study (PET), Qualitative and quantitative methods of environmental monitoring samples, Gowning qualifications, Isolation and identification of isolates - VITEK - Biochemical method, Trend analysis, Results and Discussions reporting (OOS & OOT), Out of specifications and Out of trend. Bacterial endotoxin test (BET), Bioburden analysis, and Water analysis in pharmaceuticals, Biological indicators, Raw material samplings and sterility checking for finished products.

### **Text Books**

1. Cooper JR, Bloom FE, Roth RH (Eds.). The biochemical basis of neuropharmacology (8<sup>th</sup>edn.). Oxford University Press, Chennai, 2003.
2. Prescott M (2019). Microbiology. 11<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.
3. Pelczar JR, Chan ECS & Kreig NR (2020). Microbiology. 7<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi.

### **Reference Books**

1. Highlights of Marine Natural Products Chemistry (1972-1999). D. J. Faulkner, Natural Products Report, 2000, 17, 1-6
2. Marine Pharmacology. D. J. Faulkner, Antonie van Leeuwenhoek, 2000, 77, 135-145
3. Purohit, S.S., 2003. Pharmaceutical microbiology. 596.pp

### **Websites**

[http://www.chemlin.net/chemistry/pharmaceutical\\_chemistry.htm](http://www.chemlin.net/chemistry/pharmaceutical_chemistry.htm)

<http://www.internetchemie.info/chemistry/pharmaceutical-chemistry.htm>

<http://web.chem.ucla.edu/~harding/orglinks.html>

[http://en.wikipedia.org/wiki/H3\\_Pharmaceutical\\_Chemistry](http://en.wikipedia.org/wiki/H3_Pharmaceutical_Chemistry)

[http://ibchem.com/IB/ibfiles/options/opt\\_B/opb.htm](http://ibchem.com/IB/ibfiles/options/opt_B/opb.htm)



## Course Outcome

Co.No	Upon completion of this course, students will be able to	Knowledge Level
<b>CO1:</b>	Demonstrate the importance of chemistry	K2
<b>CO2:</b>	Understand the importance of ionization of drugs with respect to the solubility and asses the efficacy of drugs.	K2
<b>CO3:</b>	Develop an understanding of the physical-chemical properties and Metabolism of drugs.	K2
<b>CO4:</b>	Summarizing the principles and applications of drug action	K2
<b>CO5:</b>	Understand the importance of testing analysis of micro organisms	K2

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	M	S	S	M	S	S	S
<b>CO2</b>	S	S	S	M	S	S	M	M	S	S
<b>CO3</b>	S	S	M	M	S	S	M	M	S	S
<b>CO4</b>	S	M	M	M	S	S	S	M	M	S
<b>CO5</b>	S	M	S	S	M	S	S	S	M	S

**M – Medium**

**S - Strong**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>4</b>
<b>Code</b>	<b>21P1MBE01</b>
<b>Marks</b>	<b>100</b>

**SEMESTER – I**

## **Elective I: BIOFERTILIZER TECHNOLOGY**

### **Course Objectives**

- To make the students to understand the applying of bio fertilizers.
- To learn organic composting matter of microorganisms.
- They bio fertilizer as potential of microorganisms.
- To used inoculation technology of agricultural production.
- To make the students entrepreneurs of bio control agents.

**UNIT-I** Introduction to biofertilizers - Structure and characteristic features of the following biofertilizer organisms: Bacteria: *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*. Cyanobacteria: *Anabaena*, *Nostoc*. Fungi: *Glomus*, *Gigaspora*, *Sclerocystis*, *Amanita*.

**UNIT-II** Biofertilization processes - Decomposition of organic matter and soil fertility and vermicomposting. Mechanism of phosphate solubilization and phosphate mobilization. Nitrogen fixation - Free living and symbiotic nitrogen fixation. Biotechnological application in nitrogen fixation. Isolation and Purification of phosphate solubilizers. Mass multiplication and field applications of phosphate solubilizer (*Pseudomonas striata*).

**UNIT-III** Nitrogenous Biofertilizers I: Bacteria – Isolation, purification, Mass multiplication and application of *Azospirillum* and *Azotobacter*. Isolation and purification of *Rhizobium*, mass multiplication and inoculum production of *Rhizobium*, Methods of application of *Rhizobium* inoculants.

**UNIT-IV** Isolation and purification of Cyanobacteria. Mass multiplication of Cyanobacterial bioinoculants - Trough or Tank method, Pit method, Field method; Methods of application of cyanobacterial inoculum. *Azolla* - mass cultivation and application in rice fields.

**UNIT-V Mycorrhizae - Ecto and endomycorrhizae and their importance in agriculture. Isolation of AM fungi - Wet sieving method and sucrose gradient method. Mass production of AM inoculants and field applications. Biocontrol Agents – Biopesticides.**

**TEXTBOOKS**

1. Modi H. A., (2012), Microbial Inoculants and Biofertilizer Technology, 1<sup>st</sup> Edition, Jaipur Publications.
2. Subba Rao NS (2004). Soil Microbiology. 4th Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

**REFERENCE**

1. Paul E.A. (Ed.) (2015) Soil Microbiology, Ecology and Biochemistry, 4th Edn, Academic Press.
2. Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15th Edn. (Global Edn.) Pearson Education.
3. NIIR Board, (2012). The complete Technology Book on Biofertilizer and Organic Farming, 2<sup>nd</sup> Revised Edition, NIIR Project Consultancy Services.
4. Sylvia D.M., Fuhrmann, J.J., Hartel P.J. and Zuberer D.A. (2005) Principles and Applications of Soil Microbiology, 2nd Edn. Pearson, Prentice Hall.

**Course Outcome**

<b>Co.No</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
<b>CO1:</b>	Develop a knowledge on different microbial flora of soil, nitrogen fixing capacity and their use as biofertilizer	K2
<b>CO2:</b>	Understand various biogeochemical of bio fertilization processes – Decomposition of organic matter and soil fertility and vermicomposting.	K2 & K3
<b>CO3:</b>	Isolation and purification of various plant microbes interactions especially <i>Rhizobium</i> , inoculum production of <i>Rhizobium</i> and their production techniques	K2 & K3
<b>CO4</b>	To application of the mass cultivation and harvesting methods and production of Azolla -and application in rice fields.	K2 & K3
<b>CO5</b>	Understand student the ecto and endo mycorrhizae and their importance in agriculture field	K2

## Mapping

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	S	S	S	M	S	S	S	S	S	S
<b>CO2</b>	S	S	S	M	M	M	S	S	S	S
<b>CO3</b>	S	S	S	M	S	S	S	S	S	S
<b>CO4</b>	M	M	M	S	S	M	M	M	M	M
<b>CO5</b>	M	M	S	M	S	M	M	M	M	M

**M – Medium**

**S - Strong**

<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P2MB04</b>
<b>Marks</b>	<b>100</b>

## **CORE IV – MEDICAL BACTERIOLOGY AND VIROLOGY**

### **Course Objectives:**

- The study of microorganisms of medical importance and are capable of causing diseases in human beings.
- The Medical diagnostic laboratory, microbiologists are often medical technologists.
- The specification of virus & its structure, characteristics & cultivation of viruses, Reproduction types observed.
- The mechanism of Pathogenesis, laboratory diagnosis and treatment of bacterial and viral infections.
- Understand the classification of viruses along with their role in cancers in humans.

**UNIT I** General approaches to clinical specimens –collection and transport of clinical specimens for microbiological examination - Mechanism of bacterial pathogenesis – Indigenous normal microbial flora of human – Process and Transmission of Infectious diseases, Diagnosis and Treatment.

**UNIT II Gram positive bacteria** – The epidemiology, pathogenesis, diagnosis and treatment of infections caused by pathogenic species of bacteria belonging to the genus – *Staphylococci*, *Streptococci*, *Enterococci*, *Corynebacterium*, *Treponemapallidum*, *Mycobacterium* and *Clostridium*.

**UNIT III Gram Negative bacteria** - The epidemiology, pathogenesis, symptoms, diagnosis and treatment of infections caused by medically important pathogenic species of bacteria belonging to the genus – *Escherichia*, *Klebsiella*, *Proteus*, *Salmonella*, *Shigella*, *Vibrio*, *Pseudomonas*, *Neisseria* and Zoonotic infections – Anthrax, Brucellosis.

**UNIT IV General Properties of viruses** – Structure, replication, reaction to physical and chemical agents. Serodiagnosis of viral infections – Cultivation and detection of viruses –

Structure and properties of prions and viroids – Anti-viral agents (Drugs, Interferons & Vaccines).

**UNIT V** Classification and nomenclature of Animal and Human Viruses. Epidemiology, life cycle, pathogenicity, diagnosis, prevention and treatment of DNA Viruses- Pox viruses, Herpes viruses, Adeno viruses, Hepatitis viruses ; RNA Viruses- *Corona viridae*, *SARS*, Rhabdo, Rota, HIV- oncogenic viruses.

### **TEXTBOOKS**

1. Ananthanarayan R & CK JayaramPaniker (2020). Text Book of Microbiology. 11<sup>th</sup> Edition, Orient Longman Private Limited.
2. Chakraborty P (2013). A Text book of Microbiology. 3<sup>rd</sup> Edition, Published by New Central Book Agency (P) Ltd., Kolkata.

### **REFERENCES**

1. Jawetz E & JL Melnic (2001). Medical Microbiology. 22<sup>nd</sup> Edition, Tata McGraw Hill, New Delhi.
2. Monica Cheesbrough (2003). District Laboratory Practice in Tropical Countries. Part 1 & Low-Price Edition, CambridgeUniversity Press.
3. David Greenwood & CB Richard (2002). Medical Microbiology. 22<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi.

### **Web Site Addresses:**

1. [http:// www.virology.net/garryfavwebaids.html](http://www.virology.net/garryfavwebaids.html)
2. [http:// www.virology.net/garryfavwebaids.html#genaid](http://www.virology.net/garryfavwebaids.html#genaid)
3. [http:// www.bcm.edu/pedi/infect/dvl/links.htm](http://www.bcm.edu/pedi/infect/dvl/links.htm)
4. <http://users.ox.ac.uk/~genemed/virology.htm>
5. [http:// www.bact.wisc.edu/bact330](http://www.bact.wisc.edu/bact330)
6. [http:// www-micro.msb.le.ac.uk](http://www-micro.msb.le.ac.uk)
7. [http:// www.cellsalive.com/ecoli.htm](http://www.cellsalive.com/ecoli.htm)
8. [http:// www.bact.wise.edu/microtextbook/](http://www.bact.wise.edu/microtextbook/)
9. [http:// www. Pitt.edu/-super1/lecture/lec4771/](http://www.Pitt.edu/-super1/lecture/lec4771/)

10. [http:// www.textbook of bacteriology.net/](http://www.textbookofbacteriology.net/)

### Course Outcome

Co.No	Upon completion of this course, students will be able to	Knowledge Level
<b>CO1:</b>	Practise the Methods of Collection, Transport and Processing of Clinical Specimens.	K1
<b>CO2:</b>	Recall the Morphological, Biochemical, Cultural properties of Medically important Bacteria and Virus.	K3
<b>CO3:</b>	Demonstrate the diagnosis of bacterial and viral infections and prevention methods.	K2
<b>CO4:</b>	Understand the architecture of viruses, their classification and the methods used in their study.	K2
<b>CO5:</b>	Comprehend the role of viruses in oncogenesis, and ways of preventing/ treating viral infections.	K2

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	M	S	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S	S	S	S	S	S
<b>CO3</b>	S	S	S	M	S	S	S	S	S	S
<b>CO4</b>	S	S	S	M	S	S	S	S	S	S
<b>CO5</b>	S	S	S	M	S	S	S	S	S	S

**M – Medium**

**S - Strong**

Hrs	5
Cred.	5
Code	21P2MB05
Marks	100

## CORE V – MEDICAL MYCOLOGY AND PARASITOLOGY

### Course Objectives:

- The study of fungi of medical importance and are capable of causing diseases in human beings.
- The medical diagnostic laboratory, microbiologists are often medical technologists.
- To understand the basic techniques of fungal culture.
- To know Parasites classification and parasite diagnosis
- To learn Individual parasite study

**UNIT I** Morphology and classification of medically important fungi–Isolation and Identification of fungi from clinical specimens. - Antifungal agents- Antifungal antibiotics and synthetic antifungal agents – Mycotoxins.

**UNIT II**-Morphology, classification, culture characters, pathogenicity, laboratory diagnosis, control and treatment of following organisms. **Superficial mycosis** – Pityriasis versicolor, Tinea nigra. **Cutaneous mycosis** – Dermatophytosis; **Subcutaneous mycosis** – Sporotrichosis, Mycetoma. Chromoblastomycosis.

**UNIT III**- Morphology, classification, culture characters, pathogenicity, laboratory diagnosis, control and treatment of following organisms. **Systemic mycosis** – Histoplasmosis. **Opportunistic mycosis** – Mucor mycosis Candidiasis, Cryptococcosis – Aspergillosis.

**UNIT IV**-**Introduction and classification of parasites** – Laboratory techniques in Parasitology. **Intestinal amoebae** – *Entamoeba histolytica*, – **Free living amoebae** – *Naegleria fowleri*. **Intestinal and genital flagellates** - *Giardia*, *Trichomonas*. - **Blood and tissue flagellates** – *Leishmania donovani*, *Trypanosoma cruzi*. **Heamosporina**–Malarial Parasites. **Coccidian**-*Toxoplasma*, *Cryptosporidium*.



**UNIT V Infection of helminthes** – *Taeniasolium*, *T. saginata* , *Echinococcus granulosus*, *Fasciola hepatica*, *Paragonimus westermani* and Schistosomes. *Ascaris lumbricoides*, *Ancylostoma duodenmale*, *Trichuris*, *Enterobious* and *Wuchereria bancrofti*. Brief intoduction of Medical Entamology.

### **TEXT BOOKS**

1. Parija S.C. (2013) Text book of Medical Parasitology. 4<sup>th</sup> Edition
2. Chakraborty P (2013). A Text book of Microbiology. 3<sup>rd</sup> Edition, Published by New Central Book Agency (P) Ltd., Kolkata.

### **REFERNCES**

1. Saravanan P (2006). Virology. 1<sup>st</sup> Edition, MJP Publishers, A unit of Tamilnadu Book House, Chennai
2. Ananthanarayan R & JayaramPaniker (2005). Text Book of Microbiology. 7<sup>th</sup> Edition, Orient Longman Private Limited.
3. D. R. Arora (2014) Medical Mycology, CBS Publishers & Distributors; 1st edition.
4. Greenwood, D., Slack, R.B. and Peutherer, J.F. (2002) Medical Microbiology, 16<sup>th</sup>
5. Jawetz E & JL Melnic (2001). Medical Microbiology, 22<sup>nd</sup> Edition, Tata Mcgraw-Hill, New Delhi.
6. Karyakarte RP & AS Damle (2005). Medical Parasitology. Revised Edition. Published by Books And Allied (P) Ltd., Kolkata
7. Jayaram Paniker CK (2004). Text book of Medical Parasitology. 5<sup>th</sup> Edition, JAYPEE Brothers, Medical Publishers (P) Ltd., New Delhi
8. Ichpujani RL& Rajesh Bahatia (2003) . Medical Parasitology. 3<sup>rd</sup> Edition, Reprinted, JAYPEE Brothers, Medical Publishers (P) Ltd. New Delhi

### **Web Site Addresses:**

1. <http://dmoz.org/Science/Biology/Microbiology/>
2. <http://microbiology.mtsinai.on.ca/manual/default.asp>
3. <http://cal.vet.upenn.edu/parasite/links.html>
4. <http://www.suite101.com/links.cfm/microbiology>
5. <http://www.biosci.ohio-state.edu/-zoology/parasite/home.html>

### Course Outcome

Co.No	Upon Completion of this Course, Students will be able to	Knowledge Level
<b>CO1:</b>	Explain viruses, fungi and parasites including their classification, morphology, and laboratory diagnosis and prevention measures	K2
<b>CO2:</b>	Conceptual basis for understanding pathogenic fungi and parasite along with the mechanisms by which they cause disease in the human body.	K2
<b>CO3:</b>	Develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of fungal and parasitic diseases.	K3 & K6
<b>CO4:</b>	Demonstrate practical skills in Fundamental Microbiological techniques for fungi and parasitic infection.	K2
<b>CO5:</b>	Describe the life cycle, morphology, symptomatology and pathology of the tapeworms of man.	K2

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	M	S	M	S	S	M	M
<b>CO2</b>	S	S	S	M	S	M	S	S	M	M
<b>CO3</b>	S	S	S	S	S	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S	S	S	S	S	S
<b>CO5</b>	S	S	S	M	S	M	S	S	M	M

**M – Medium**

**S - Strong**

<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P2MB06</b>
<b>Marks</b>	<b>100</b>

## **CORE VI– MICROBIAL GENETICS AND MOLECULAR BIOLOGY**

### **Course Objectives:**

- Gain knowledge on the structure and characters of Genetic materials.
- Understand replication of DNA.
- To expose the mechanism and function mutation.
- Learn transcription and translation process in prokaryotes.
- Understand the methods of genetic exchange.

**UNIT I DNA the genetic material** – Evidences for DNA as the genetic material – Importance of bacteria and viruses in genetics. Genetic code. The duplex DNA- Double helix and multiple conformations, Denaturation and Renaturation. RNA – Structure and as genetic material. Gene transfer mechanisms- Transformation, Conjugation and Transduction. Introduction about Cellular Molecules, Compounds, Structure and Nucleic acid interaction.

**UNIT II DNA Replication** – Geometry of DNA replication – Meselson – Stahl experiment – Enzymology of DNA replication – Bidirectional and Rolling circle replication. DNA repair mechanisms.

**UNIT III Mutagenesis** – Types of mutations – Molecular basis of mutation – Base substitutions, additions and deletions – Spontaneous mutations – Induced mutations – Mutation rates. Host spots - Site specific mutagenesis. Reverse mutations and suppressor mutations – Detection and isolation of mutants, Mutant selection – Carcinogenicity testing – AMES test.

**UNIT IV Molecular aspects of Gene expression** – Organisation of bacterial genes – promoter – coding sequences – terminator, Transcription and Translation processes – Post transcriptional modifications of RNA. Gene regulation in bacteria – lac and trp operons.

**UNIT V Plasmids** – Properties and types of plasmids – Detection – Purification – Transfer and replication – episomes – cosmids. Transposable elements – Detection of transposition in bacteria – types of bacterial transposons – excision of transposons. *E. Coliphage Mu-Mu* DNA transposons and evolution – use of transposons in mapping and cloning of genes. Vectors and its Derivatives: Hybrid Vectors- BAC and YAC.

### **TEXTBOOKS**

1. David Frifielder (2002). Microbial Genetics. 9<sup>th</sup> Reprint, Narosa Publishing House, New Delhi.
2. David Frifielder (2005). Molecular Biology. 2<sup>nd</sup> Edition. Narosa Publishers, New Delhi.

### **REFERENCES**

1. Robert H Tamarin (2004). Principles of Genetics. 7<sup>th</sup> Edition. Tata McGraw-Hill Publishing House, New Delhi.
2. Eldon John Gardner, Michael J Simmons & D Peter Snustad (2005). Principles of Genetics. 8<sup>th</sup> Edition, John Wiley & Sons (Asia) Pvt Ltd.,
3. Verma PS & Agarwal VK (2006). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. Multicolour Illustrative Edition, Published by S.Chand & Company Ltd., New Delhi.
4. Waston JD, Baker TA, Bell SP, Alexander Gann, Michael Levine and Richard Losick (2004). Molecular Biology of the Gene. 5<sup>th</sup> Edition, Published by Pearson Education Pvt. Ltd., Delhi.
5. Benjamin Lewin (2004). Genes VIII. Pearson Prentice Hall, USA.
6. Brown TA (2003). Essential of Molecular Biology. Freeman Publishing House.
7. Peter J Russel (2002). Genetics. Benjamin Cummings.

### **Web Site Addresses:**

1. [www.en.wikipedia.org/wiki/Microbial\\_genetics](http://www.en.wikipedia.org/wiki/Microbial_genetics)
2. [www.microbiologyprocedure.com/genetics/microbial-genetics/microbial-genetics.htm](http://www.microbiologyprocedure.com/genetics/microbial-genetics/microbial-genetics.htm)
3. [www.bestwebbuys.com/Microbiology-N\\_10038066-books.html](http://www.bestwebbuys.com/Microbiology-N_10038066-books.html)
4. [www.en.wikipedia.org/wiki/Molecular\\_biology](http://www.en.wikipedia.org/wiki/Molecular_biology)
5. [www.web-books.com/MoBio/](http://www.web-books.com/MoBio/)

## Course Outcome

Co.No	Upon completion of this course, Students will be able to	Knowledge Level
<b>CO1:</b>	Know about basics structure of DNA and RNA and Organization of genes in prokaryotes & Eukaryotes.	K2
<b>CO2:</b>	Gain knowledge about replication in Prokaryotes & Eukaryotes and role of enzymes in replication.	K4
<b>CO3:</b>	Explain the processes behind mutations and other genetic changes and Know about the Mutation, their types and repair mechanism	K1 & K2
<b>CO4:</b>	Understand concept of genes and Recall the Process of DNA Replication, Transcription, Translation	K2 & K3
<b>CO5:</b>	Understand the Genetics exchanges in microbes	K2

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	S	S	S	S	M	S	S
<b>CO2</b>	S	S	S	M	S	S	S	S	S	S
<b>CO3</b>	S	M	M	M	M	M	S	S	M	M
<b>CO4</b>	S	S	S	M	S	S	M	M	S	S
<b>CO5</b>	S	M	M	M	M	M	S	S	S	M

**M – Medium**

**S - Strong**

**SEMESTER – I**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>3</b>
<b>Code</b>	<b>21P1MBP01</b>
<b>Marks</b>	<b>100</b>

**PRACTICAL-I**  
**(GENERAL MICROBIOLOGY, IMMUNOLOGY AND PHARMACEUTICAL**  
**CHEMISTRY)**

**Practical Exam.Hours: 6 hours/day**

**Course Objectives:**

- Basic Techniques to handle the Microorganisms.
- Handling of Instruments and Laboratory safety Measures
- Methods of Immunological Techniques.
- To expose the students to common laboratory assays agglutination reactions, Flocculation and precipitation reaction.
- Students can evaluate microbial content testing and sterility testing of Pharmaceutical Products

**General Microbiology**

1. Staining – Simple, Gram’s, Acid – fast, Spore, Capsule.
2. Motility determination – Hanging drop method.
3. Pure culture techniques: Streak plate, pour plate, spread plate.
4. Enumeration of bacteria from soil & Water sample.
5. Growth curve – Turbidity Method

**Immunology**

6. ABO Blood grouping – Rh typing and cross matching.
7. Agglutination tests.
  - a. WIDAL – slide and tube test
  - b. RA test
  - c. ASO test
  - d.  $\square$ -HCG test
  - e. CRP test
8. Precipitation reaction

- i). Ouchterlony's Double Immunodiffusion test (ODD)
  - ii). Counter immunoelectrophoresis (CIE)
9. Rapid plasma reagin test

### **Pharmaceutical Chemistry**

10. Evaluation of disinfectants – Filter paper disc assay
11. Phenol co – efficient test
12. Sterility testing of pharmaceutical products (Membrane filter assay – Fluid thioglycollate medium) (Demo)
13. Antibiotic sensitivity test – Kirby – Bauer methods.

### **TEXT BOOKS**

1. Sundaraj T, Mrs.Aswathy Sundararaj. (2005) Microbiology Laboratory Manual, First edition, Chennai.
2. Dubey, R.C. and Maheshwari, O.K. (2014) Practical Microbiology. S, Chand and Co.Ltd., Revised edition. New Delhi.

### **REFERENCES**

1. Cappuccino, J. and Sherman, N. (2019) *Microbiology: A Laboratory Manual*, 12<sup>th</sup> Edn. Pearson Education Publication, New Delhi.
2. Celis, V.E. Cell Biology Vol I to III
3. Aneja, K.R (2003) Experiments in Microbiology, Plant Pathology and Biotechnology (4th edition), New age international, New Delhi.
4. Alfred E. Brown (2010) Benson's Microbiological Applications: Laboratory
5. Manual in General Microbiology, 11th Edition, McGraw-Hill Companies.
6. Kocher, G.S. (2013) Practical Manual Series Vol III: Practical Teaching in
7. Microbiology HB, NPH Publishers and Distributors.

## Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge Level
<b>CO1:</b>	Demonstrate practical skills in microscopy and their handling techniques and staining procedures. Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and also Understand the structural similarities and differences among Various physiological groups of bacteria. Master aseptic techniques and be able to perform routine culture handling tasks safely and effectively	K2 & K3
<b>CO2:</b>	Determination of blood Group, Capable of identifying sensitivity of antigen & antibody by double Immunodiffusion: Ouchterlony's Method, performing Immuno electrophoresis.	K1
<b>CO3:</b>	Evaluate microbial content testing and sterility testing. Understand various disinfection and sterilization techniques; evaluate the sterility testing, microbial assays.	K2 & K5
<b>CO4:</b>	Demonstrate practical skills in various immunological methods and improve their knowledge in diagnostics methods	K2
<b>CO5:</b>	Evaluate the different types of pharmaceutical products.	K2

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	M	S	M	M	S	S	S	S	S	M
<b>CO2</b>	M	S	M	M	S	S	M	M	S	M
<b>CO3</b>	S	S	M	M	S	S	M	M	S	M
<b>CO4</b>	S	S	S	S	S	S	M	M	S	M
<b>CO5</b>	S	M	M	M	S	S	S	S	M	M

**M – Medium**

**S – Strong**



**SEMESTER – II**

<b>Hrs</b>	<b>4</b>
<b>Cred.</b>	<b>3</b>
<b>Code</b>	<b>21P2MBP02</b>
<b>Marks</b>	<b>100</b>

**PRACTICAL-II**  
**(MEDICAL MICROBIOLOGY)**  
**Practical Exam. Hours: 6 hours/day**

**Course Objectives:**

- Able to identify common infectious agents and can evaluate methods used to identify them.
- To develop diagnostic skills in microbiology including the practical application and interpretation of laboratory test.
- To understand the various clinical microbiological techniques.

1. Collection and transport of clinical specimens and Culture techniques from sputum, pus, urine, faeces and blood

2. Identification of pathogenic bacteria from clinical specimens.

*Staphylococcus*spp

*Salmonella*spp

*Streptococcus*spp

*Shigella*spp

*Bacillus*spp

*Vibrio*spp

*Escherichia*spp

*Pseudomonas*spp

*Klebsiella*spp

*Proteus*spp

3. Viral cultivation methods - Egg inoculation techniques (All routes)

4. Diagnosis of HIV/HBV virus ELISA Method (Demo)

5. Direct microscopy – KOH and Lactophenol cotton blue preparations for skin scrapings for fungi

6. Cultivation of fungi.

7. Isolation and identification of fungal pathogens from clinical specimens.

*Dermatophytes*

*Aspergillus*spp

*Candida* spp.

*Fusarium* spp.

8. Examination of cysts/ Ova in faeces – Direct Method
9. Simple floatation
10. Concentration methods
11. Formal ether Method
12. Zincsulphate Methods
13. Saturated saline – technique.

### **TEXT BOOKS**

1. Dubey, R.C. and Maheshwari, D.K. (2010) *Practical Microbiology*, 2<sup>nd</sup> Edn. S. Chand & Co. Ltd., New Delhi.
2. Cowan and Steel (2004) *Manual for Identification of Medical Bacteria*, 4<sup>th</sup>Edn. Cambridge University Press, London.
3. Cappuccino, J. and Sherman, N. (2019) *Microbiology: A Laboratory Manual*, 12<sup>th</sup> Edn. Pearson Education Publication, New Delhi.

### **REFERENCES**

1. Murray, P.R., Baron, E.J., Jorgensen, J.H., Tenover, M.A. and Tenover, R.H. (2007) *Manual of Clinical Microbiology*, 9<sup>th</sup> Edn. Vol 1 & 2, ASM Press, Washington, D.C.
2. Finegold, S.M. (2000) *Diagnostic Microbiology*, 10th Edn. C.V. Mosby Company, St. Louis
3. Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Eds) (2007) *Methods for General and Molecular Bacteriology*. ASM Press, Washington, DC.
4. Finegold, S.M. (2013) *Diagnostic Microbiology*, 10th Edn. C.V. Mosby Company, St. Louis.
5. Stanbury PF, Whittaker A and Hall SJ 2009. 2<sup>nd</sup> Edition. Principles of fermentation technology. 2/e Pergamon Press.

### **Web Site Addresses:**

- [http:// www.bact.wise.edu/bact330](http://www.bact.wise.edu/bact330)  
[http:// www.bact.wise.edu/microtextbook/](http://www.bact.wise.edu/microtextbook/)  
[http:// www.textbook of microbiology.net/](http://www.textbookofmicrobiology.net/)  
[http:// www.microbeworld.org/](http://www.microbeworld.org/)  
[http:// www.protocol-online.com](http://www.protocol-online.com)

[http:// www.microbiologyonline.org.uk/](http://www.microbiologyonline.org.uk/)

[http:// www.microbes.info/](http://www.microbes.info/)

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge Level
CO1:	Recall clinical lab techniques. Diagnostic approaches for microbial pathogens.	K1 & K3
CO2:	Comprehend the various methods for identification of pathogenic microorganisms.	K2
CO3:	Different approaches, techniques and tools used to identify Pathogens	K1
CO4:	Remember the interpretation of laboratory tests in the diagnosis of infectious diseases	K1
CO5:	Learning opportunities in the basic principles of medical microbiology and infectious disease.	K2

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	M	M	S	M	S	S	M	S	S	M
CO2	M	S	S	M	S	S	S	S	S	M
CO3	M	M	S	M	S	S	M	S	S	M
CO4	M	S	S	M	S	S	S	S	S	M
CO5	M	M	S	M	S	S	M	S	S	M

**M – Medium**

**S - Strong**

**SEMESTER – II**

<b>Hrs</b>	<b>4</b>
<b>Cred.</b>	<b>3</b>
<b>Code</b>	<b>21P2MBP03</b>
<b>Marks</b>	<b>100</b>

**PRACTICAL-III**  
**(MICROBIAL GENETICS & MOLECULAR BIOLOGY)**

**Practical Exam.Hours: 6 hours/day**

**Course Objectives:**

- To understand different techniques used to study the microbial genetics and utilizing the microbial phenomenon in different applications.
- To develop diagnostic skills in microbiology including the practical application and interpretation of laboratory test.
- The candidate will gain hands-on knowledge and acquire adequate skill required to separate and observe chromosomal DNA, amino acids, lipids as well as estimate nucleic acids.

1. Isolation of Auxotrophic mutant by replica plate method.
2. Isolation of drug resistant mutants by gradient plate method.
3. Bacterial conjugation
4. Development of competent cells in *E.coli*.
5. Bacterial transformation
6. Isolation of phage from sewage.
7. Isolation of chromosomal DNA from Bacteria.
8. Observation of mitosis from onion root tip.
9. Estimation of DNA (DPA method).
10. Separation of DNA by Agarose gel Electrophoresis.
11. Separation of proteins by polyacrylamide gel Electrophoresis

**TEXT BOOKS**

1. Baron E J and Finegold S M. (2002). Diagnostic Microbiology. Blackwell Scientific Systems.

2. An Introduction to Immunology (2017) by C.V. Rao, Narosa Publishing House, India. 3<sup>rd</sup> Edition.
3. Immunology (2012) by K. R. Joshi, N.O. Osama, Agrobios Ltd, India. 5<sup>th</sup> Edition.
4. Manual of Clinical Laboratory Immunology (2006) 7<sup>th</sup> Edition. Edited by N. R. Rose, R. G. Hamilton and B. Detrick, ASM Press.

## REFERENCES

1. Hand book of Experimental Immunology Vol.I& II (2001) by Weir, D.M. Blackwell Scientific Company.
2. Immunochemistry (Vol. IV) Publication, Chicago
3. Immunology (2006) Janis Kuby 6<sup>th</sup> edition, W H Freeman Company, USA
4. Essential Immunology (2012) Ivan Roitt (Blackwell Science Publishers, UK, 13<sup>th</sup> Edition.
5. A Hand Book of Practical Immunology (2017) GP Talwar, Vikas Publishing House, India.

## Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge Level
CO1:	Handle and independently work on Lab protocols involving molecular Techniques	K3
CO2:	Demonstrate application of the formal practices of observation, experimentation. Develop an ability to solve, analyze and interpret data generated from experiments done in project work or practical courses.	K2, K4 & K6
CO3:	Demonstrate the knowledge of common and advanced laboratory practices in cell and molecular biology	K2
CO4:	Understand the concept of plasmid isolation and characterization	K2
CO5:	Know how to purify bacterial chromosomal DNA and Gain knowledge on methods of DNA & RNA estimation	K2 & K4

### Mapping

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	M	S	S	M	S	S	M	S	S	M
<b>CO2</b>	M	S	S	S	S	S	M	S	S	S
<b>CO3</b>	S	S	S	S	S	S	M	S	S	S
<b>CO4</b>	S	S	S	S	S	S	M	S	S	S
<b>CO5</b>	S	S	S	S	S	S	M	S	S	S

**M – Medium**

**S – Strong**

**SEMESTER – III**

<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P3MB07</b>
<b>Marks</b>	<b>100</b>

## **CORE VII- GENETIC ENGINEERING AND ADVANCES IN BIOTECHNOLOGY**

### **Objectives:**

- To impart thorough knowledge of the basic tools in genetic engineering
- To expose the students to the concepts of genetic recombination, sequencing and gene amplification.
- To explain the applications of biotechnological tools
- To study the applications of engineering in plants, animals and environmental aspects.
- To understand the principles, instrumentation and applications of bio analytical techniques.

### **UNIT I**

Introduction to Genetic Engineering – Definitions, Historical perspectives. Enzymes in rDNA technology - Restriction enzymes – types – nomenclature – Properties of type II restriction endonucleases. DNA ligase. DNA modifying enzymes – alkaline phosphatase, poly nucleotide kinase and terminal transferase.

### **UNIT II**

Cloning Vectors – Bacterial Plasmid vectors- pBR322 & pUC vectors, Bacteriophages,  $\lambda$ , M13. Hybrid vectors – Cosmids. Yeast vectors- YEP, YIP, YRP, YCP & YAC. Shuttle vector and Expression vector.

### **UNIT III**

Gene cloning strategies- insertion of DNA molecule into a vector; the use of reverse-transcriptase, cDNA library construction. Gene transfer methods–transformation, electroporation, particle bombardment and microinjection. Screening and selection of clones.

#### **UNIT IV**

Agrobacterium mediated transformation: Crown gall disease, Ti plasmids, T-DNA transfer, Ti plasmid derivatives- co-integrate vectors and binary vectors. Gene transfer to plants- development of pesticide, insecticide and stress resistant plants. Biomarkers.

#### **UNIT V**

Techniques in Biotechnology–Blotting techniques – Southern, Northern and Western blotting. PCR amplification and its application. RFLP and RAPD analysis and its applications. DNA sequencing methods – dideoxy, chemical and Next Generation Sequencing (NGS). DNA Finger printing, DNA Microarray. Chromosomal walking, chromosome jumping, site directed mutagenesis, Protein engineering.

#### **TEXT BOOKS**

1. Brown, T.A. 2016. Gene Cloning – An Introduction, 7<sup>th</sup> Edition, Chapman and Hall, UK.
2. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
3. Dubey RC (2005). A Text of Biotechnology. Multicolor Illustrative edition, S.Chand and Company Ltd., New Delhi.

#### **REFERENCE**

1. Mitra (2005). Genetic engineering. Published by Macmillan India Ltd., Chennai.
2. Jogdand SN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai.
3. Preeti Joshi (2002). Genetic engineering and its application. First edition, Agrobios (India).
4. Bernad R Glick (2003). Molecular Biotechnology - Principles and Applications of Recombinant DNA. Third edition, ASM Press, Washington, D.C.
5. Ramawat K and Shaily Goyal (2010). Molecular Biology and Biotechnology. First edition, S.Chand and company Ltd., New Delhi.



## Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	Describe how sections of DNA containing a desired gene can be extracted from a donor organism using restriction enzymes	K2
<b>CO2:</b>	Recall How isolated DNA fragments can be placed in plasmids, with reference to the role of ligase.	K1
<b>CO3:</b>	Able to learn the Cloning strategies	K1
<b>CO4:</b>	Have the basic knowledge of Gene transfer	K1
<b>CO5:</b>	Handle and independently work on lab protocols involving molecular techniques	K3

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	M	M	S	M	M	M	M	M
<b>CO2</b>	S	S	M	M	S	M	M	M	M	M
<b>CO3</b>	S	S	M	M	S	M	M	M	S	S
<b>CO4</b>	S	S	M	M	S	M	M	M	M	M
<b>CO5</b>	S	S	M	M	S	M	M	M	S	S

**M – Medium**

**S - Strong**

<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P3MB08</b>
<b>Marks</b>	<b>100</b>

## **CORE VIII - SOIL, AGRICULTURAL AND ENVIRONMENTAL MICROBIOLOGY**

### **Objectives:**

- The students study about various soil properties of earth layers microbes and nature, its roles and its utilization for the creation of sustainable environment.
- Transforming student caring nature as an eco-friendly society and introducing in the relationship between soil microorganisms of nature, its roles of utilization for creation environment.
- To symptoms and controls of fundamental and applied knowledge about the various plant pathogens.
- To expose through knowledge of the basic waste treatment is biodegradations an environmental factors.
- Enumeration the distribution and source of air borne diseases is control ecofriendly.

### **UNIT I**

Introduction to Soil microbiology - Properties of soil (Structure, texture, formation). Distribution of microorganisms in soil, Autochthonous, Allochthonous and Zymogenous microbes, quantitative estimation of microorganisms in soil, role of microorganisms in soil fertility; influence of soil and environmental factors on micro flora, moisture, pH, temperature, organic matter, agronomic practices.

### **UNIT II**

Interaction between soil microbes – Neutralism, Commensalism, Symbiosis, Synergism, Amensalism, Parasitism, Predation and Competition. Inter relationships between soil microbes and plants, Rhizosphere concept, R:S ratio, rhizoplane; spermosphere; phyllosphere, Mycorrhizae-types, Rumen flora, Insects microbial interactions.

### **UNIT III**

Symptoms, Characters of pathogens and control measures. Bacterial diseases – Citrus canker, Blight of paddy, Fungal Disease- Red rot of sugarcane, Black stem rust of wheat, Tikka leaf spot, Wilt of cotton, Viral Disease – TMV, Vein clearing disease of Bhendi.

#### **UNIT IV**

Environmental Microbiology: Microbiology of air - composition of air, number and types of organisms in air. Distribution and sources of air borne organisms. Enumeration of bacteria in air - Air sampling devices. Air sanitation. Air borne diseases and their control. Microbiology of water-Indicator organisms. Assessment of water quality. Water sanitation. Water borne diseases. ISI and BIS Regulations for packaged drinking water. Microorganisms inhabiting extreme environments – Hydrothermal vents.

#### **UNIT V**

Waste treatment - Types of wastes - Characterization of solid and liquid wastes. Effluent treatment - Primary, secondary (aerobic and anaerobic) and tertiary Methods - Disinfection - Definition of DO, BOD, COD and their limits in treated industrial effluents. Solid waste management - Composting, vermicomposting. Biodegradation–Cellulose, Lignin. Biodeterioration – Wool, Leather. Bioleaching- Copper. Biomagnification, Bioremediation – Degradation of DDT and Cleanup oil spills – *Pseudomonas putida*. Degradation of Xenobiotics.

#### **TEXTBOOKS**

1. Ramanathan, N 2018. Environmental Microbiology. Kalyani Publishers, New Delhi .ISBN 978-93-272-8844-5. 221 pages.
2. SubbaRao, N.S 2007. Soil Microbiology, Oxford and IBH publishing House. India
3. Sylvia D.M., Fuhrmann, J.J., Hartel P.J. and Zuberer D.A. (2005) Principles and Applications of Soil Microbiology, 2nd Edn. Pearson, Prentice Hall.

#### **REFERENCES**

1. Glick B.R. (2015) Beneficial Plant Bacterial Interactions, Springer.
2. Paul E.A. (Ed.) (2015) Soil Microbiology, Ecology and Biochemistry, 4th Edn, Academic Press.
3. Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15th Edn. (Global Edn.) Pearson Education.
4. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.

5. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
6. R.M, Atlas and Richard Bartha (2000). Microbial Ecology, Fourth edition, an imprint of Addison Wesley Longman, Inc, New York.
7. Rangaswamy G and Bagyaraj. 2001. Agricultural Microbiology, Prentice Hall of India Pvt. Ltd, New Delhi.

**Website:**

1. <http://marghampublications.com/index.php/text-books/maths/soil-and-agricultural-microbiology-b-nagamani>
2. <https://www.abebooks.com/Introduction-Soil-Agricultural-Microbiology-GPrabakaran/356572514/bd>

**Course Outcome**

<b>Co.No</b>	<b>Upon completion of this course students will be able to</b>	<b>Knowledge level</b>
<b>CO1:</b>	Learn the occurrence, abundance and distribution of soil microorganism in the environment and their role in the environment factors and quantitative analysis soil microorganisms	K1
<b>CO2:</b>	Analysis of various plant microbes interactions especially rhizosphere, phyllosphere, sermosphere and Interaction between soil microbes in plants and insects microbial interactions.	K2 & K4
<b>CO3:</b>	Evaluate the various methods to determine the symptoms, characters of plant pathogens and control measures.	K2 & K3
<b>CO4</b>	Applying knowledge of air, number and types of organisms in air. Distribution and air sampling their control inhabiting extreme environments.	K1 & K2
<b>CO5</b>	To students understand waste treatment, characterization of solid and liquid wastes and their limits in treated industrial effluents. Solid waste management - Composting, vermicomposting.	K2 & K3

## Mapping

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	M	S	S	M	S	S	S	M	S	S
<b>CO2</b>	M	S	S	M	S	S	M	M	S	S
<b>CO3</b>	M	S	S	M	S	S	S	M	S	S
<b>CO4</b>	S	S	S	S	M	M	M	M	M	M
<b>CO5</b>	S	M	M	S	S	M	M	S	M	M

**M – Medium**

**S - Strong**

Hrs	5
Cred.	5
Code	21P3MB09
Marks	100

## CORE IX – INDUSTRIAL AND PHARMACEUTICAL MICROBIOLOGY

### Course Objectives

- To introduce the role of microbes in industries.
- To impart knowledge on different types of fermentors and fermentation processes.
- To familiarize with the various industrial production process involving microbes.
- To provide the information on the role of various factors influencing the fermentation processes.
- To ensure safety and efficacy of pharmaceutical products.

### Unit I

Industrially important microorganisms - Screening Techniques- Primary and Secondary - Preservation of cultures - Strain improvement-Development of inoculum for various fermentation processes.

### Unit -II

Gaden's Fermentation classification, Design and operation of Fermentor, Basic concepts for selection of a reactor, packed bed reactor, Fluidized bed reactor, Trickle bed reactor, Bubble column reactor, Scale up of Bioreactor.

### Unit -III

Down Stream processing. Recovery of particulate matter, product isolation, distillation, centrifugation, whole broth processing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis.

### UNIT IV

Microbial production of organic acids (Citric acid, Acetic acid, Lactic acid and Itaconic acid), Amino acids (L - Glutamic acid and L - Lysine), Antibiotics (Penicillin, Semi synthetic penicillins, Streptomycin, Tetracyclines and Griseofulvin), enzymes (Amylases, Proteases and Pectinases), vitamins (B12, B2 and C), alcoholic beverages (Ethanol and Wine) Microbial transformations – steroids, sterols, antibiotics and pesticides

## **UNIT V**

Production of vaccines, toxoid, antisera and their standardization. Antiseptics, disinfectants and their standardization. Types of water (DM/Purified water/water for injection) used in pharmaceutical industry. Environmental monitoring. Growth promotion test (Sterility and pyrogen testing).

### **Text Book:**

1. Patel A.H. (2016) Industrial Microbiology, 2nd Edn. Laxmi Publications.
2. Waites M.J. Morgan N.L., Rockey J.S. and Highton G. (2011) Industrial Microbiology. An Introduction, Paperback, WB Publishers.
3. Denyer S.P., Hodges N.A. and Gorman S.P. (2004) Hugo and Russell's Pharmaceutical Microbiology, 7th Edn. Blackwell Publishers.
4. Mehra P.S. (2011) A text book of Pharmaceutical Microbiology, IK International Publishing House.

### **References:**

1. Agrawal AK and Pradeep Parihar (2005). Industrial Microbiology: Fundamentals and applications. 1st Edition, Published by Agrobios (India).
2. Baltz R.H., Demain A.L. and Davies J.E. (2010) Manual of Industrial Microbiology and Biotechnology, ASM Press.
3. Stanbury P.T., Whitaker A. and Hall S. (2016) Principles of Fermentation Technology, Butterworth-Heinemann.
4. Baird R.M., Hodges N.A. and Denyer S.P. (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
5. Saghee M.R., Sandle T. and Tidswell E.C. (2011) Microbiology and Sterility Assurance in Pharmaceuticals and Medical devices, Business Horizons publishers.
6. Hanlon G. and Sandle T. (2015) Industrial Pharmaceutical Microbiology: Standards and Controls, Euromed Communications.

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	Understood the basics of fermentation technology and learnt the concept of screening, optimization and maintenance of cultures.	K2
<b>CO2:</b>	Know about combining living matter, in the form of organisms or enzymes, with nutrients under specific optimal conditions to make a desired product	K1
<b>CO3:</b>	Know about designing processes for higher production yield at economically cheaper rate	K1
<b>CO4:</b>	Gathering the knowledge about different types of aminoacids	K2
<b>CO5:</b>	Understand and preparing the vaccine productions methods	K2&K3

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	M	S	S	M	S	M	M	S	M	S
<b>CO2</b>	M	S	S	M	S	M	M	S	M	S
<b>CO3</b>	M	S	S	M	S	M	M	S	M	S
<b>CO4</b>	M	S	M	S	S	S	M	S	M	M
<b>CO5</b>	S	M	M	S	S	S	S	M	M	S

**M – Medium**

**S - Strong**



<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>4</b>
<b>Code</b>	<b>21P3MBE02</b>
<b>Marks</b>	<b>100</b>

**SEMESTER – III**

**ELECTIVE II-  
HUMAN ANATOMY AND PHYSIOLOGY**

**Course Objectives:**

- Identify different types of cells and describe their functions.
- Identify the three types of muscle and describe the muscular system’s functions.
- Identify the major components of the circulatory system and describe their functions.
- Understand the anatomy and physiology of hormones
- Understand the anatomy and physiology of reproductive organs

**UNIT I**

An Introduction to Human body - Overview of level of organization and characteristics- Digestive system - Components of digestive system (GI tract and accessory organs) and their functions.

**UNIT II**

Muscular system - Muscle tissue - types (Skeletal, smooth and cardiac) – functions and properties. Neuro muscular junction.

**UNIT III**

Respiratory system - Anatomy - External and internal respiration. Cardiovascularsystem - Anatomy of heart, Cardiac cycle and ECG.

**UNIT IV**

Nervous system - CNS and ANS Organization - Neuron - Structure and functions -Neuro transmitters and signal transmission. Anatomy and physiology of endocrineglands - Classification of hormones - General properties and action of pituitary,thyroid, para thyroid, pancreatic hormones and gonads.

## UNIT V

Urinary system - External and Internal anatomy of kidneys - nephron - parts and functions. Mechanism of urine formation. Reproductive system - Anatomy and physiology of male and female reproductive organs.

### TEXT BOOKS:

1. Gerard J. Tortora, Bryan H. Derrickson (2014) Principles of anatomy and physiology, John Wiley and sons Inc; 10th Edition.

### REFERENCES:

1. A.C. Guyton (2010) Text Book of Medical physiology, Saunders; 12th edition.
2. K. Sembulingam and Prema Sembulingam (2012) Essentials of medical physiology - Jaypee brothers Medical publishers (P) Ltd; 6th Edition.
3. D U Silverthorn (2015) Human physiology - An integrated approach, Pearson; 7th edition.

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
CO1:	Use anatomical terminology to identify and describe locations of major organs of each system covered	K1
CO2:	Explain structure and functions of three types of muscular systems	K4
CO3:	Explain structure and functions of Respiratory and cardiovascular systems.	K4
CO4:	Explain properties of nervous system and hormones	K4
CO5:	Explain properties of excretory and reproductive system	K4

## Mapping

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	S	M	S	M	M	M	M	M	M	M
<b>CO2</b>	S	M	S	M	M	M	M	M	M	M
<b>CO3</b>	S	M	S	M	M	M	M	M	M	M
<b>CO4</b>	S	M	S	S	M	M	M	S	S	M
<b>CO5</b>	S	S	M	M	S	S	S	M	M	M

**M – Medium**

**S - Strong**

**SEMESTER – IV**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P4MB10</b>
<b>Marks</b>	<b>100</b>

## **CORE X- RESEARCH METHODOLOGY, BIostatISTICS AND BIOINFORMATICS**

### **Course Objectives:**

- To develop understanding of the basic framework of research process and to develop an understanding of various research designs and techniques.
- To identify various sources of information for literature review and data collection.
- Understand and apply statistical methods for the design of biomedical research and analysis of biomedical research data.
- use and interpret results from specialized computer software for the management and Statistical analysis of research data
- To learn the basics, advanced techniques and applications of Instruments.

### **UNIT I**

Research Methodology - Meaning and importance. Statement, Constraints, Review of literature - Review and synopsis presentation. Types of research, Research tools, Qualities of a good researcher. Research process, Research designs –Experimental and non-experimental. Preparation of research report. Guidelines for preparing an article. Computers in biological research.

### **UNIT II**

Data collection, source of data, types of classification of data, Tabulation of data –Diagrammatic representation of data (line, bar diagram, pie diagram, pictogram and cartogram) - Graphical representation of data. Measures of central tendency – mean, median, mode - Standard deviation. Correlation – coefficient of correlation (KarlPearson method, group bi –variable data). Coefficient of variation. Probability.

### **UNIT III**

ANOVA (one way and two way), Chi square test –Student's T test – testing of hypothesis-null hypothesis- level of significance-standard error. F Test WebResources for Microbiology – Use of Digital Library.

### **UNIT IV**

Bioinformatics - Introduction and skills for a bioinformatician. Biological databases-Database searching, Sequence analysis, Pair alignment, Visualizing proteins structures, Predicting structure and function of protein using sequences, Tools for genomics and proteomics.

### **UNIT V**

Bioinstrumentation - Principles and applications of pH meter, Centrifuge. Electrophoresis-Agarose Gel, Poly acrylamide gel electrophoresis. Chromatography-Thin layer, Column, Gas and high pressure liquid chromatography, spectrophotometry, NMR, Atomic absorption spectrophotometer, Microbial Identification System, Autoanalyser - ELISA Reader.

### **TEXT BOOKS:**

1. Gurumani. N., 2006. Research methodology for biological sciences. 1st edition, MJP Publishers. A unit of Tamil nadu Book House, Chennai.
2. Wayne W. Daniel, 2006. Biostatistics- A foundation for analysis in the Health Sciences. 7TH edition. Wiley India publication.

### **REFERENCES:**

1. Attwood T.K. and D.J. Parry-Smith, 2001. Introduction to Bioinformatics, Pearson Education Asia.
2. Jeffrey A. Witmer Myra L. Samuels, 2002. Prentice Hall Statistics for the Life Sciences (3rd Edition).
3. Rastogi. S. C, N. Mendiratta and P. Rastogi, 2008. Bioinformatics-Methods and Applications Genomics, Proteomics and Drug Discovery 3rd edition.
4. Claverie J-M and C. Notredame, 2003. Bioinformatics for Dummies, Wiley Publishing, Inc.
5. Beth Dawson Robert G. Trapp Beth Dawson Robert Trapp, 2004. Basic and Clinical Biostatistics (LANGE Basic Science), McGraw-Hill.

## Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	Understanding of the underlying principles of quantitative and qualitative research methods.	K2
<b>CO2:</b>	Know Different computational methods used in basic biostatistics	K1
<b>CO3:</b>	Know Various modes of presenting and disseminating research findings	K1
<b>CO4:</b>	Apply the computer knowledge in bioinformatics techniques	K3
<b>CO5:</b>	Understand and remember the different types of Bio instrumentation techniques	K4&K1

## Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	S	S	S	M	M	M	M
<b>CO2</b>	M	M	M	M	M	M	M	M	M	M
<b>CO3</b>	S	S	S	S	S	S	M	M	M	M
<b>CO4</b>	M	S	M	S	S	M	S	M	S	M
<b>CO5</b>	M	S	M	S	S	S	S	M	S	M

**M – Medium**

**S - Strong**

**SEMESTER – IV**

<b>Hrs</b>	<b>6</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P4MB11</b>
<b>Marks</b>	<b>100</b>

## **CORE XI - FOOD, DAIRY AND AQUATIC MICROBIOLOGY**

### **Objectives:**

#### **In food and dairy microbiology**

- To complement the students with the basic knowledge of food microbiology
- Study about food preservation, spoilage and detection of pathogens using advanced techniques.
- To Study about Food borne infections
- To study about importance of microbes in dairy microbiology
- To learn about various kinds of Aquatic ecosystem.

**Unit-I: Food as substrate for microorganisms:** Microorganisms important in food microbiology-Molds, yeasts and Bacteria-General characteristics- classification and importance. General principles methods of food preservation–asepsis, removal of microorganisms, anaerobic conditions, high temperature, low temperature, drying, radiation, smoking, chemical preservatives and food additives. Factors that influence microbial growth in food - Intrinsic factors-extrinsic factors.

**Unit-II: Contamination and spoilage:** Cereals, sugar products, vegetables, fruits, meat and meat products, milk and milk products-Fish and sea food- spoilage of canned foods. Detection of spoilage and characterization.

**Unit-III: Food-borne infection and intoxications:** Bacterial and non bacterial- with examples of infective and toxic types- *Brucella*, *Bacillus*, *Clostridium*, *Salmonella*, *Escherichia*, *Shigella*, *Staphylococcus*, *Vibrio*, *Yersinia*, *Camphylobacter*, Nematodes, Protozoa, algae, fungi and viruses. Molecular and immunological methods for detection of food pathogens.

**Unit-IV: Milk-** Its composition -Quality Control of Milk - SPC, alkaline Phosphatase, MBRT, Litmus Milk, Resazurine. Role of constituents and method of manufacture of cheese (bacterial and mold ripened) butter and ice cream- fermented milk beverages-probiotics-potential benefits-characteristics need for probiotics culture.

**Unit-V: Aquatic Microbiology** - Types of aquatic ecosystems: fresh water – ponds, lakes, streams. Marine habitats–estuaries, mangroves, deep sea. Zonations – upwelling – eutrophication – food chain. Potability of water – microbial assessment of water quality – water purification – brief account of water borne diseases.

### **TEXTBOOKS**

1. Frazier WC and Westhoff DC. (2014) Food Microbiology, Fifth edition, Tata McGraw-Hill Publishing Ltd., New Delhi.
2. Adams MR and Moss MO (2008) Food Microbiology, fourth edition, published by the royal society of chemistry, Cambridge,.

### **REFERENCES**

1. James M Jay (2003). Modern Food Microbiology. 4th Edition, CBS Publishers & Distributors, New Delhi.
2. Doyle M.P. and Buchanan R.L. (Ed.) (2013) Food Microbiology: Fundamentals and Frontiers, 4th Edn. ASM press.
3. Jay J.M., Loessner M.J. and Golden D.A. (2005) Modern Food Microbiology, 7th Edn. Springer Publishers.
4. Robinson R.K. (2002) Dairy Microbiology: Milk and Milk Products, 3rd Edn. Wiley Publishers.
5. Munn CB. Marine Microbiology- Ecology and Applications. Bios Scientific publishers, New York. 2004.



### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	Get sufficient knowledge in relationship between food and microbes, techniques used in food processing.	K2
<b>CO2:</b>	Know advanced theoretical education and practical training in the area of food microbiology.	K2 & K3
<b>CO3:</b>	Comprehend knowledge regarding fermented food products, food spoilage and infection	K2
<b>CO4:</b>	Know the concepts related to popular milk products, milk examination and spoilage.	K1
<b>CO5:</b>	Get Knowledge about aquatic eco system	K2

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	S	S	S	S	S	M	M	M	M
<b>CO2</b>	M	M	M	M	M	M	M	M	M	M
<b>CO3</b>	S	S	S	S	S	S	M	M	M	M
<b>CO4</b>	S	S	S	S	S	S	M	M	M	M
<b>CO5</b>	S	S	S	S	S	S	M	M	M	M

**M – Medium**

**S - Strong**

**SEMESTER – IV**

<b>Hrs</b>	<b>5</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P4MBE03</b>
<b>Marks</b>	<b>100</b>

## **ELECTIVE III - NANOTECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS**

### **Objectives:**

- To impart the knowledge of Nano Science and its application in biology
- To improve the knowledge about recombinant products with help of advanced techniques
- To know the molecular diagnostic methods.
- To learn the advanced level microscopy techniques.
- To know about the Bioethics & Biosafety levels of Specific Microorganisms.

### **UNIT I**

Definition - Nanotechnology - Nanomaterial - Classification of nanostructures - Nanospheres, Nanotubes, Nanorods, Nanowires, Nanosheets, Quantum dots - Effects of the nanometre length scale - Changes to the system structure-Nanocomposites - Graphene - Carbon Nanotubes - Fullerenes - Natural Nanomaterials - Bio-inspired nanomaterials.

### **UNIT II**

X-ray diffraction (XRD). Electron microscopes: Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM); Atomic Force Microscope (AFM) -UV - Visible Spectrophotometer-Fourier Transform InfraRed Spectrometer (FTIR) - Nuclear Magnetic Resonance (NMR).

### **UNIT III**

Synthesis of nanoparticles and microorganisms and Use of Nanoparticles in Animals - Nanoparticles for Imaging and Therapy in Humans - Military applications of Nanotechnology - Nanomaterials for food Applications - Toxicity of Nanoparticles - Future Perspectives.

### **UNIT- IV**

IPR - Definition - Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, IP as a factor in R&D; IPs of

relevance to Microbiology few Case Studies.WTO - Definition - Functions - Forms of IPR Protection.

#### **UNIT-V**

Biosafety – Introduction, Historical background, Introduction to biological safety cabinets, Primary Containment for Biohazards, Biosafety levels, Biosafety levels of Specific Microorganisms. Bioethics-Definition - Animal Ethics – Norms in India – Licensing of animal house – ethical clearance norms for conducting studies on human subjects.

#### **TEXTBOOKS**

1. Winnacker EL (2003). From Genes to clones – Introduction to Gene technology. 1<sup>st</sup> Indian Reprint, Panima Publishing Corporation, New Delhi.
2. WulfCruegar&AnnelieseCruegar (2000). Biotechnology – A Text Book of Industrial Biotechnology. 2<sup>nd</sup>Edition. Panima Publishing Corporation, New Delhi.
3. Richard Brooker and Earl Boysen (2006). Nanotechnology. Wiley Publishing Inc., India. Pp 361.

#### **REFERENCES**

1. Bernad R Glick (2003). Molecular Biotechnology – Principles and Applications of Recombinant DNA. 3<sup>rd</sup> Edition, ASM Press, Washington, DC.
2. Primrose SB, RM Twyman and RW Old (2003). Principles of Gene Manipualtion. 6<sup>th</sup> Edition, Blackwell Scinece Ltd. Rs. 2249/-
3. James D Watson, Michael Gilman, Jan Witkowski, Mark Zoller (2001). Recombinant DNA. 2<sup>nd</sup> Edition, Scientific American Books – Distributed by W.H. Freeman and Company, New York.
4. Brown TA (2001). Gene cloning & DNA Analysis Introduction. 4<sup>th</sup> Edition, Blackwell Science Ltd., London.
5. GeroDecher, Joseph B. Schlenoff, *Multilayer Thin Films*, Wiley-VCH Verlag GmbH & Co. KGaA, 2003.
6. David S. Goodsell, *Bionanotechnology : Lessons from Nature*, Wiley-Liss , 2004.

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	The applications of nanotechnology will influence science of tomorrow and will change many sides of our life.	K3
<b>CO2:</b>	To learn the advanced level microscopy techniques	K2 & K3
<b>CO3:</b>	Know the intellectual property rights and their application.	K1
<b>CO4:</b>	Prepare a professional written memorandum, as well as understanding and drafting the main types of legal contracts used in this area.	K2 & K3
<b>CO5:</b>	know about the Bioethics & Biosafety levels of Specific Microorganisms	K3 & K5

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	M	S	S	S	M	M	M	M	S
<b>CO2</b>	S	S	S	S	S	S	M	M	S	M
<b>CO3</b>	S	M	S	S	S	M	M	M	M	M
<b>CO4</b>	S	S	S	S	S	M	M	M	S	M
<b>CO5</b>	S	S	S	S	S	M	S	S	S	S

**M – Medium**

**S – Strong**

**SEMESTER – III**

<b>Hrs</b>	<b>4</b>
<b>Cred.</b>	<b>3</b>
<b>Code</b>	<b>21P3MBP04</b>
<b>Marks</b>	<b>100</b>

**PRACTICAL – IV- GENETIC ENGINEERING AND INDUSTRIAL MICROBIOLOGY****Objectives:**

- The objectives of this practical course are to provide students with laboratory experimental knowledge of genetic engineering aspect.
  - Also, this course is aimed to teach students with different approaches to perform genetic engineering and their practical applications in biotechnological research as well as in pharmaceutical industries.
  - The course is designed to teach students the utility of set of experimental methods
  - To learn how to handle microbiology experimental problems in industry-oriented manner.
  - To correlate this knowledge with the industrial fermentation process
1. Restriction digestion of Chromosomal DNA
  2. Isolation and quantification of plasmid DNA.
  3. SDS - PAGE.
  4. Protein estimation by Lowry et al method
  5. Separation of biomolecules by paper and thin layer chromatography.
  6. Immobilization of cells and enzymes
  7. Screening of Biopigment producing micro organisms
  8. Microbial production of wine
  9. Minimal inhibitory concentration (MIC) determination of antibiotics – Broth Dilution
  10. Minimal inhibitory concentration (MIC) determination of antibiotics – Filter paper disc assay

**REFERENCE BOOKS:**

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai.

2. Michael, R. G., Sambrook. J., “Molecular Cloning – A Laboratory Manual”, 4th edition, Cold Spring Harbor Laboratory Press, 2012.
3. Aneja KR (2005).Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
4. Dubey RC and Maheswari DK (2004).Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
5. James G Cappuccino and Natalie Sherman (2004). Microbiology: A laboratory manual. Sixth edition, Published by Pearson Education.
6. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi.
7. The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai

#### **Course Outcome**

<b>Co.No</b>	<b>Upon completion of this course students will be able to</b>	<b>Knowledge level</b>
<b>CO1:</b>	Carry out the experiments of molecular biology and interpret the results, designing a strategy to circumvent potential experiments.	K3 & K5
<b>CO2:</b>	Learn basic instruments, DNA isolation, electrophoresis and restriction digestion.	K1
<b>CO3:</b>	Demonstrate a clear understanding of antibiotic susceptibility testing	K2
<b>CO4:</b>	Understand the fermentation processes involved for various products	K2
<b>CO5:</b>	Inculcate the salient features of quality management and regulatory processes	K3

## Mapping

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	S	S	S	M	S	S	M	M	S	M
<b>CO2</b>	S	S	S	M	S	S	M	M	S	M
<b>CO3</b>	S	M	S	M	S	S	M	M	S	M
<b>CO4</b>	S	M	S	M	S	S	M	M	S	M
<b>CO5</b>	S	M	S	M	S	S	M	M	S	M

**M – Medium**

**S – Strong**

SEMESTER – III

Hrs	4
Cred.	3
Code	21P3MBP05
Marks	100

**PRACTICAL-V**  
**SOIL, AGRICULTURAL AND ENVIRONMENTAL**  
**MICROBIOLOGY**

**Practical Exam.Hours: 6 hours/day**

**Objectives:**

- To be able to export knowledge in the isolation and characterization of important agricultural soil microbes.
  - To understand the different plant-pathogen interaction
  - To provide cultivation and harvesting knowledge of Azolla, uses of society.
  - To encourage of skills development in various plant pathogens and increasing agricultural yielding.
  - Enumeration to isolate microorganisms that have a potential as air.
1. Enumeration of microbial population from soil
  2. Isolation of free living nitrogen fixing bacteria from soil – *Azotobacter*
  3. Isolation of symbiotic Nitrogen fixing bacteria from root nodule – *Rhizobium*
  4. Enumeration of microorganisms from phyllosphere
  5. Isolation and Morphological Identification of Cyanobacteria.
  6. Cultivation of Azolla.
  7. Examination of plant diseases
    - a. **Bacterial Disease** - Blight of rice, Citrus canker
    - b. **Fungal Disease** - Blast of rice, Red rot of sugarcane, Tikka leaf spot of ground nut.
  8. Enumeration of microorganism from air - Settle plate technique
  9. Isolation of cellulolytic organisms.

**REFERENCES**

1. Subba Rao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.



2. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.
3. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
4. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
CO1:	Understand the importance of microbes in agriculture	K2
CO2:	Know the methods of isolation, identification of microbes from soil and other sources.	K1
CO3:	Know the methods to identify plant pathogens	K1
CO4	To demonstrated know about the plant disease sample	K3
CO5	To identifications of air samples	K2

### Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	M	S	S	M	S	M	M
CO2	S	M	S	M	S	S	M	S	M	M
CO3	S	M	S	M	S	S	M	S	M	M
CO4	S	M	S	M	M	M	M	S	M	M
CO5	S	M	M	M	M	M	S	M	M	S

**M – Medium**

**S – Strong**

**SEMESTER – IV**

<b>Hrs</b>	<b>4</b>
<b>Cred.</b>	<b>3</b>
<b>Code</b>	<b>21P4MBP06</b>
<b>Marks</b>	<b>100</b>

**PRACTICAL-VI**  
**FOOD, DAIRY AND AQUATIC MICROBIOLOGY**

**Practical Exam. Hours: 6 hours/day**

**Objectives:**

- To provide practical knowledge and skills in production as well as evaluate the microbial quality of the food product.
  - To give students confidence in modern technical capabilities to analyse food for specific microorganisms
  - To encourage development of skills in co-operative learning in small groups to design methods for microbial food analysis as a team and communicate the decisions of the design to peers.
1. Direct microscopic count of organism in milk (Breeds count).
  2. Detection of bacteria in milk by standard plate count.
  3. Reductase test for milk-Methylene Blue / Resazurin.
  4. Litmus milk test.
  5. Microbiological examination of spoiled food – Meat and Meat Products
  6. Effect of food preservatives on survival of food spoilage organism
  7. Examination of microbial load in soft drinks.
  8. Examination of microbial load in ice-creams.
  9. Enumeration of Microbial Population in Packed food.
  10. Bacterial examination of water (qualitative)
  11. Standard plate count (quantitative test)

**REFERENCES**

1. Dubey, R.C and Maheshwari, O.K (2005) Practical Microbiology, S Chand and Co. Ltd., (First edition), New Delhi.

2. James G. Cappuccino and Natalie Sherman (2014) Microbiology: A Laboratory Manual (10th Edition), Pearson.
3. Aneja, K.R (2003) Experiments in Microbiology, Plant Pathology and Biotechnology (4th edition), New age international, New Delhi.
4. Rajan S., R. Selvi Christy (2010), Experimental procedures in Life Sciences, (3rd reprint) Anjanaa Book House, Chennai. 2000) Diagnostic Microbiology, 10th Edn. C.V. Mosby Company, St. Louis.

### Course Outcome

Co.No	Upon completion of this course students will be able to	Knowledge level
<b>CO1:</b>	Identify standard methods for the isolation and identification of microorganisms in food sample.	K1
<b>CO2:</b>	Impressed on the application of rapid microbial techniques for the microbial analysis of food.	K3 & K4
<b>CO3:</b>	Comprehend observations, evaluate the data obtained and report accurately on the findings.	K3 & K4
<b>CO4:</b>	Detect food poisoning causing microbes and perform the tests to determine quality control of dairy product (milk)	K4
<b>CO5:</b>	Analyse the quality of waste water	K4

### Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>CO1</b>	S	M	S	M	M	M	M	S	S	M
<b>CO2</b>	S	M	S	M	M	M	M	S	S	M
<b>CO3</b>	S	M	S	S	S	M	M	M	S	M
<b>CO4</b>	S	M	S	S	S	M	M	M	S	M
<b>CO5</b>	S	M	S	S	S	M	M	M	S	M

**M – Medium**

**S - Strong**

**SEMESTER – IV**

<b>Hrs</b>	<b>9</b>
<b>Cred.</b>	<b>5</b>
<b>Code</b>	<b>21P4MBPR01</b>
<b>Marks</b>	<b>100</b>

## **PROJECT**

### **Objectives:**

- Planning and execution of various research related practicals independently.
- The study of microbes helps us to understand our world and our place within it.
- It gives us insights into the complexity of nature and society, which in turn provide many different health, environmental, social, cultural, industrial and economic benefits.
- It is aimed at studying the diversity and activity of microorganisms in their natural environment, their mutual interactions and their survival and adaptation strategies.
- To acquaint the student with various techniques used in contemporary research in microbiology

1. Identification of research problem in Microbiology.
2. Review of literature associated with project.
3. Listing the various objectives.
4. Planning and conducting experiments related to project work.
5. Collection and analysis of data for preparation of project report.
6. Final preparation of project report to be submitted as dissertation in partial fulfillment of M.Sc. Programme.

### **Course Outcome**

<b>Co.No</b>	<b>Upon completion of this course students will be able to</b>	<b>Knowledge level</b>
<b>CO1:</b>	Apply the tools and techniques of Microbiology in conducting research.	K4
<b>CO2:</b>	Enhanced capacity to analyze observations and results & prepare project report.	K3 & K4
<b>CO3:</b>	To prepare the research report and its oral demonstrations.	K3
<b>CO4:</b>	Undertake research on their area of interest in Microbiology.	K3 & K4
<b>CO5:</b>	This training acquaints students with identification of a research topic, research planning and its execution.	K2 & K3

## Mapping

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>	<b>PSO9</b>	<b>PSO10</b>
<b>CO1</b>	S	S	S	S	S	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S	S	S	S	S	S
<b>CO5</b>	S	S	S	S	S	S	S	S	S	S

**M – Medium**

**S - Strong**

**M.Sc. MICROBIOLOGY**  
**QUESTION PAPER PATTERN**  
**(Theory Paper)**

**Time 3 hours**

**Max.Marks: 75**

**SECTION A (10 X1 = 10 Marks)**

Answer all questions

**SECTION B (5 X 5 = 25 Marks)**

Answer all questions

Either or pattern

**SECTION- C (5 X 8 =40)**

Answer all questions

Either or pattern

# **M.Sc. MICROBIOLOGY**

## **QUESTION PAPER PATTERN FOR PRACTICALS**

### **FIRST SEMESTER**

Practical – I (10 Am to 4 Pm - 6 hours / day)

Practical – II (10 Am to 4 Pm - 6 hours / day)

2 Major questions each carry 25 marks (2 X 25 = 50)

Record 5 Marks

Viva voce 5 Marks

**(Practical I and Practical II should be conducted simultaneously for two consecutive days )**

### **SECOND SEMESTER**

Practical – III (10 Am to 4 Pm - 6 hours / day)

Practical – IV (10 Am to 4Pm -6 hours / day)

2 Major questions each carry 25 marks (2 X 25 = 50)

Record 5 Marks

Viva voce 5 Marks

**(Practical III and Practical IV should be conducted simultaneously for two consecutive days)**

### **THIRD SEMESTER**

Practical – V (10 Am to 4Pm -6 hours / day)

Practical – VI (10 Am to 4Pm -6 hours / day)

2 Major questions each carry 25 marks (2 X 25 = 50)

Record 5 Marks

Viva voce 5 Marks

**(Practical V and Practical VI should be conducted simultaneously for two consecutive days )**

### **FOURTH SEMESTER**

#### **PROJECT**

#### **Internal**

2 Reviews (20 + 20) = 40 Marks

#### **External**

Report Valuation = 40 Marks

Viva =20 Marks

#### **Format to be followed in dissertation**

The formats/certificate for dissertation to be submitted by the students are give below:



Format for the preparation of project work

- (a) Title Page
- (b) Bonafide certificate
- (c) Acknowledgement
- (d) Table of contents

**CONTENTS**

<b>Chapter No.</b>	<b>Title</b>	<b>Page No.</b>
1.	Introduction	
2.	Review of Literature	
3.	Materials and Methods	
4.	Results	
5.	Discussion	
6.	Summary	
7.	References	

**Format of the Title Page**

**TITLE OF THE DISSERTATION**

Dissertation Submitted in partial fulfillment of the  
requirement for the Degree of Master of Science of in

Applied Microbiology  
to the Selvamm Arts and Science College (Autonomous) Affiliated to Periyar University , Salem  
636 011

BY

Student's Name

Register Number

College/University Department

Year

## **Format of the Certificate**

### **CERTIFICATE**

This is certify that the dissertation entitled .....(*title of the dissertation*) .....submitted in partial fulfillment of the requirement of the degree of Master of Science in Applied Microbiology to the Selvamm Arts and Science College (Autonomous), Affiliated to Periyar University, Salem is a record of ..... bonafide research work carried out by ..... (name of the candidate) .....under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Signature of the Head

Signature of the Guide

Examiner 1.

2.

# **Selvamm Arts and Science College**

**(Autonomous)**

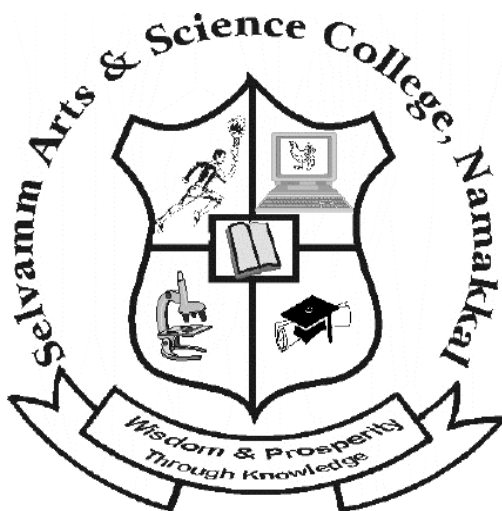
Nationally Accredited by NAAC

UGC Recognized 2(f) and 12(B) Institution

Affiliated to Periyar University, Salem.

Namakkal-637 003

## **MASTER OF SCIENCE PROGRAMME**



**Department of Physics**

### **M.Sc. Physics Syllabus**

Choice Based Credit System (CBCS)

### **REGULATIONS AND SYLLABUS**

Effective from 2021-2022

# REGULATIONS

## 1. Objective of the Course

To develop the Post Graduates in Physics with strong knowledge of theoretical Physics subjects who can be employed in research and development units of industries and academic institutions.

## 2. Condition for Admission

A candidate who has passed B.Sc. Degree Examination in Branch of Physics of this University or some other University accepted by the members of board of studies as equivalent there to shall be permitted to appear and qualify for the M.Sc. Physics Degree Examination of this college after a course of study of two academic years.

## 3. Duration of the Course

The programme for the degree of Master of Science in Physics shall consist of two academic years divided into four semesters. Each semester consist of 90 working days.

#### 4. M.Sc. Physics Course Structure (For Candidates admitted from 2021-2022 onwards)

Sem	Part	Course	Course Code	Title of the Course	Hours / Week	Credits	Internal Marks	External Marks	Total Marks
I	III	Core - I	21P1PH01	Mathematical Physics	5	5	25	75	100
		Core - II	21P1PH02	Classical Mechanics	5	5	25	75	100
		Core - III	21P1PH03	Electronics	5	5	25	75	100
		Elective - I	21P1PHE01	Non Conventional Energy Sources	5	4	25	75	100
			21P1PHE02	Semiconductor Physics					
Core Practical	21P1PHP01	Practical – I : General Physics Experiments	10	4	40	60	100		
<b>Total Hours and Credits</b>					<b>30</b>	<b>23</b>			<b>500</b>
II	III	Core -IV	21P2PH04	Microprocessor and Microcontroller	5	5	25	75	100
		Core - V	21P2PH05	Quantum Mechanics – I	5	5	25	75	100
		Elective - II	21P2PHE03	Nanophysics	5	4	25	75	100
			21P2PHE04	Communication Electronics					
		EDC	21P2xxxxxx	EDC	5	4	25	75	100
		Core Practical	21P2PHP02	Practical – II : Electronics Experiments	8	4	40	60	100
		Human Rights	21P2HR01	Human Rights	2	2	25	75	100
<b>Total Hours and Credits</b>					<b>30</b>	<b>24</b>			<b>600</b>
III	III	Core - VI	21P3PH06	Thermodynamics and Statistical Mechanics	5	5	25	75	100
		Core – VII	21P3PH07	Quantum Mechanics – II	5	5	25	75	100
		Core - VIII	21P3PH08	Electromagnetic Theory	5	5	25	75	100
		Core - IX	21P3PH09	Condensed Matter Physics	5	5	25	75	100
		Elective - III	21P3PHE05	Modern Optics	4	4	25	75	100
			21P3PHE06	Nonlinear Dynamics					
		Core Practical	21P3PHP03	Practical – III : Microprocessor and Microcontroller	4	4	40	60	100
		Soft Skills	21P3SSS01	Soft Skills	2	1	25	75	100
Internship	21P3PHI01	Internship	*	-	-	-	-		
<b>Total Hours and Credits</b>					<b>30</b>	<b>29</b>			<b>700</b>
IV	III	Core - X	21P4PH10	Nuclear and Particle Physics	6	5	25	75	100
		Core - XI	21P4PH11	Molecular Spectroscopy	6	5	25	75	100
		Elective - IV	21P4PHE07	Crystal Growth and Thin Films	6	4	25	75	100
			21P4PHE08	Instrumental Methods of Analyses					
		Project Work	21P4PHPR1	Project and Viva Voce	12	8	--	--	200
<b>Total Hours and Credits</b>					<b>30</b>	<b>22</b>			<b>500</b>
	V	Extension Activity	21P4EX01	Empowering Rural People [ERP] ( II – III Semester)	(40)**	2	-	-	-
<b>Total</b>					<b>120</b>	<b>100</b>			<b>2200</b>

xxxxxx - Corresponding Extra Disciplinary Course by other department

\* 15 Days – 2<sup>nd</sup> Semester Leave

# Commended / Highly Commended will be given, based on report and Viva-voce Examination

\*\* Total hours for extension – 40 hours, 20 hours per semester outside the class hours in II and III semester.

**EDC (Extra Disciplinary Course)** - Students are expected opt EDC offered by other Departments.

**Core Elective Courses:** Choose any one course in each semester

Course Core Elective -	Course Code	Title of the Course
Core Elective - I	21P1PHE01	Non Conventional Energy Sources
	21P1PHE02	Semiconductor Physics
Core Elective - II	21P2PHE03	Nanophysics
	21P2PHE04	Communication Electronics
Core Elective - III	21P3PHE05	Modern Optics
	21P3PHE06	Nonlinear Dynamics
Core Elective - IV	21P4PHE07	Crystal Growth and Thin Films
	21P4PHE08	Instrumental Methods of Analyses

**Extra Disciplinary Courses:** (For Other departments)

S. No.	Extra Disciplinary Courses	Course Code
1.	Medical Physics	21P2PHED1
2.	Renewable Energy Sources	21P2PHED2
3.	Biophysics	21P2PHED3

**5. Evaluation:**

## **Question Paper Pattern**

**Time: 3 Hours**

**Max Marks: 75**

**Section - A**

**(10x 1 = 10)**

(Answer all the questions)

(Two questions from each unit)

**Section - B**

**(5 x 5 = 25)**

(Answer all the questions)

(One set of question from each unit with either or type)

**Section - C**

**(5x 8 = 40)**

(Answer all the questions)

(One set of question from each unit with either or type)



## 6. Passing Minimum:

Theory Maximum = 100 Marks				Passing Minimum			
CIA	=	25	Marks	CIA	(50%)	-	13 Marks
ESE	=	75	Marks	ESE	(50%)	-	38 Marks
<b>CIA= 25 Marks</b>				<b>ESE= 75 Marks</b>			
CIA Test-I	:	05	Marks	Section A	10x2	=	20 Marks
CIA Test-II	:	05	Marks	Section B	5x 5	=	25 Marks
Model Exam	:	05	Marks	Section C	3x10	=	30 Marks
Seminar	:	05	Marks	-	-	-	-
Assignment	:	05	Marks	-	-	-	-
Total	:	25	Marks	Total		=	75 Marks
<b>Practical Maximum = 100 Marks</b>				<b>Passing Minimum</b>			
CIA	=	40	Marks	CIA	(50%)	-	20 Marks
ESE	=	60	Marks	ESE	(50%)	-	30 Marks
<b>CIA = 40 Marks</b>				<b>ESE = 60 Marks</b>			
Observation Note	=	15	Marks	Practical	= 50	Marks	
Attendance	=	05	Marks	Record	= 10	Marks	
Model Exam	=	10	Marks				
Record	=	10	Marks				
Total	=	40	Marks	Total	= 60	Marks	

The Candidate shall be declared to have passed the examination if the candidate secures not less than 38 marks out of 75 marks in the Semester examination in each theory paper. For the practical paper a minimum of 30 marks out of 60 marks in the Semester examination and the record note book taken together is required to pass the examination. There is no passing minimum for record note book however submission of record note book is a must.

### Project:

Dissertation = 150 Marks

Viva – Voce = 50 Marks

**Total = 200 Marks**

## 7. Extension Activities:

- PG Students of Physics should attend Extension Activities in their respective adopted villages during the period of II and III semester of their studies.
- Period of Extension Activities minimum 40 hours.
- The following activities should be undertake:
  1. Tree Plantation,
  2. Conducting different awareness programmes.
  3. Adult Education,
  4. 'Clean Green' programmes, etc...

## 8. Classification of Successful Candidates:

- Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed in First Class with Distinction provide they pass all the examinations prescribed for the course at first appearance.
- Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed in First Class.
- All other successful candidates shall be declared to have passed in Second Class.

## 9. Commencement of this Regulation:

These regulations shall take effect from the academic year 2021 – 2020 onwards. The proposed new syllabus and the contents of the papers were presented before the board. The boards discussed about the proposals and were approved with certain modifications. Here, we listed out the member of our board.

Dr. P. Anbarasan	Subject Expert – Professor of Physics, Periyar University.
Dr. L. Palaniappan	Subject Expert - Professor of Physics, Annamalai University.
Mr. B.H. Ganesh Babu	Industrialist - Executive Engineer, Elmacs Scientific Instruments.
Mr. S. Padmanathan	Chair Person – Dean (Academic) & Head, SASC, Namakkal.

## Internal Members:

Mr. P. Pachamuthu

Mr. P. Kannan

Mr. R. Arulkumar

Mr. B. Karthick

Mrs. N. Radhiya

Assistant Professors, Department of Physics, SASC Namakkal.

## **Programme Specific outcomes:**

**PSO1:** Gain the subject knowledge in depth and applications of Concepts.

**PSO2:** Solve the Mathematical and Physical Problems in the level of Competitive exams.

**PSO3:** Create design and conduct experiments/ demonstration/ Models to analyze and interpret the data.

**PSO4:** Acquire the Knowledge on the Laws, Theorem and equations.

**PSO5:** Gain the technical knowledge on instrumentations, synthesis and characterization of Materials.

**PSO6:** Plot a basic Research foundation and develop the presentation Skill with Proper Communication.

**PSO7:** Employability skills, Leadership quality and Entrepreneurial Skills.

**PSO8:** Higher education towards ethics and social relevant.

Semester	I	<b>Mathematical Physics</b>	Hours	5
Course Code	21P1PH01		Credits	5

### Course Objectives:

- To impart knowledge about orthogonal coordinates, vector spaces and hydrodynamics.
- To understand the linear equations, matrices, determinants, eigen value, eigen vectors.
- To understand Complex variables to physical situations in various branches of Physics.
- To become familiar with the method of Green's function to solve linear differential equations with inhomogeneous term.
- To learn molecular combinations.

### Unit – I: Vectors

Classification of vector fields – Helmholtz Theorem – Orthogonal Curvilinear coordinates – Spherical polar coordinates and Differential operators – Linear vector space – Linear independence of Vector – Schwartz inequality – Schmidt's orthogonalization Method – Applications of vector to hydrodynamics – Equation of Continuity – Equation of Heat flow in solids.

### Unit – II: Matrices and Tensor

Matrix algebra – Special types of matrices – Symmetric and Antisymmetric matrices – Hermitian and Skew-Hermitian matrices – Unitary Matrices – Eigen values and Eigen vectors – Cayley-Hamilton Theorem – Diagonalization of Matrices.

Tensor – n-dimensional space – Superscripts and Subscripts – Contravariant and Covariant vectors – Tensors of Higher ranks – Algebraic operation of tensor – Symmetry and Antisymmetric tensors – Applications of tensor in Dynamics of particle.

### Unit – III: Complex Variables

Analytic function – Cauchy Riemann equations – Line integral of a complex function – Cauchy's integral theorem (Cauchy's proof) – Cauchy's integral formula – Taylor's series, Laurent series (Statement and Proof only) – Singularities of an analytic function – Residues and their evaluation – Cauchy's Residue theorem – Evaluation of definite integrals – Integration round the unit circle.

### Unit – IV: Differential Equations and Green's function

Legendre differential equation – Generating function, Rodrigue's formula, Recurrence formula of Legendre Polynomial – Bessel differential equation - Recurrence formula, Generating function and Orthonormality of Bessel's functions. Solution of Laplace's equation in Cartesian coordinates - Solution of Laplace's equation in Spherical polar coordinates. Green's function – Symmetry property of green function – Green function for Quantum Mechanical scattering problem.

## Unit – V: Group Theory

Concept of Group – Abelian group – Subgroups – Isomorphism and Homomorphism – Cayley’s theorem – Representation of groups – Reducible and Irreducible representation – Orthogonality theorem – Unitary Group – Irreducible representation & Character of SU(2).

### **Books for Study:**

1. Sathyaprakash - Mathematical Physics, S.Chand & Co.2nd edition, 2004.
2. B.D.Gupta - Mathematical Physics, Vikas Publishing House Pvt.Ltd, 2005.

### **Books for Reference:**

1. S.D.Joglekar - Mathematical Physics, Universities Press Pvt.Ltd, 2005.
2. Charlie Harper – Introduction to Mathematical Physics, Prentice Hall of India Pvt.Ltd.
3. A.K.Ghatak, I.G.Goyal and A.J.Chua - Mathematical Physics, Mc-Millan, New Delhi, 1995.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	How to apply the basic methods of mathematical physics in addressing the statics and dynamics of physical systems on examples from classical and quantum physics.	K1
CO-2	Explain The theory of partial differential equations are perhaps most closely associated with mathematical physics.	K2
CO-3	Use complex function techniques, Employ analytical techniques to solve boundary value problems.	K3
CO-4	Make symmetry considerations to solve problem within spectroscopic techniques, solid state physics and particle physics.	K6
CO-5	Analyze application of basic research in group theory	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	S	M	M	M	M	M	M
CO-2	S	S	M	M	M	M	M	M
CO-3	S	S	M	S	S	S	M	M
CO-4	S	S	M	S	S	M	S	S
CO-5	S	S	M	S	M	M	M	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>I</b>	<b>Classical Mechanics</b>	Hours	<b>5</b>
Course code	<b>21P1PH02</b>		Credits	<b>5</b>

## Course Objectives:

- To emphasis the understanding of Classical Mechanics using Lagrangian and Hamiltonian Approach.
- To know what central, conservative and central-conservative forces mathematically understand the conservative theorems of energy, linear momentum and angular Momentum.
- To understand the rigid body motion and oscillatory motions.
- To understand the knowledge of the Hamiltonian formulations of classical mechanics as well as their applications.
- To learn various mathematical techniques of classical mechanics and their Applications to physical systems and introduce relativistic dynamics.

### Unit I : Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and a system of particles – Conservation laws – Constraints – Generalized coordinates – D’Alembert’s principle and Lagrange’s equation –Hamilton’s principle – Lagrange’s equations of motion – Conservation theorems and symmetry properties – Applications to Linear Harmonic Oscillator, Pendulum, Compound pendulum, charged particles in an electromagnetic field and Atwood’s machine.

### Unit II: Motion under Central Force

Conservation of energy and angular momentum – Inverse square law – Kepler’s problem – Virial theorem – Scattering in a central force field – Artificial satellites – Geostationary satellites – Eccentricity of orbit of satellites – Escape velocity.

### Unit III: Rigid Body Dynamics and Oscillatory Motion

Euler’s angles – Moments and products of inertia – Euler’s equations – Symmetrical top – Theory of small oscillations – Normal modes and frequencies – Linear triatomic molecule – Wave equation and motion – Phase velocity – Group velocity - Dispersion.

### Unit IV: Hamilton’s Formulation

Hamilton’s canonical equations of motion – Hamilton’s equations from variation principle – Applications of Hamilton’s equations of motion to linear harmonic oscillator, pendulum, compound pendulum and charged particles in an electromagnetic field - Principle of least action – Canonical transformations – Poission bracket –Hamilton-Jacobi method – Action and angle variables – Kepler’s problem in action angle variables.

## Unit V: Relativistic Mechanics

Reviews of basic ideas of special relativity – Energy momentum four -vector – Minkowski's four-dimensional space – Lorentz transformation as rotation in Minkowski's space – Composition of Lorentz transformation about two orthogonal directions – Thomas precession – Elements of general theory of relativity.

### Books for Study:

1. Satya Prakash, *Mathematical Physics with Classical Mechanics* (S.Chand & Sons)
2. S.L. Gupta, V. Kumar and H.V. Sharma, *Classical Mechanics* (Pragati Prakashan, Meerut,2001).
3. N.C. Rana and P.S. Joag, *Classical Mechanics* (Tata McGraw-Hill, New Delhi, 1991).

### Books for Reference:

1. V.B. Bhatia, *Classical Mechanics* (Narosa, New Delhi, 1997).
2. H. Goldstein, C.P. Poole and J.L. Safko, *Classical Mechanics* (Pearson Education and Dorling Kindersley, New Delhi, 2007).
3. T.L. Chow, *Classical Mechanics* (John-Wiley, New York, 1995).

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the advanced classical techniques like Lagrangian and Hamiltonian equations and their applications.	K1
CO-2	Discuss the satellite motions.	K2
CO-3	Apply the principle of rigid body & oscillatory motions.	K3
CO-4	Discussion the Hamiltonian of motion and principle of least action.	K4
CO-5	Evaluate the classical concepts in relativistic mechanics	K6

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	M	S	M	M	S	S
CO-2	S	S	M	S	S	S	M	S
CO-3	S	M	M	S	S	M	S	M
CO-4	S	M	M	S	M	M	M	M
CO-5	M	S	M	M	M	S	M	S

**S- STRONG**

**M-MEDIUM**

Semester	I	<b>Electronics</b>	Hours	5
Course code	21P1PH03		Credits	5

### Course Objectives:

- To understand the knowledge of Semiconductor devices and Diodes.
- To study the concepts of Operational Amplifiers.
- To understand various techniques of comparator, waveform generators and filters.
- To learn the concepts of digital Logic circuits and data Converters.
- To develop the skill in Transducer.

#### Unit-I: Semiconductor Devices and Special Devices

JFET – Construction and Characteristics - JFET Common Source amplifier – MOSFET - Depletion and Enhancement mode of MOSFET - MOSFET as switches - UJT - UJT Relaxation Oscillator – SCR – Tunnel diode – PIN diode - DIAC and TRIAC - Construction and characteristics.

#### Unit-II: Operational Amplifier

Operational amplifiers – AC and DC Characteristics – V-I and I-V converter – Op Amp circuits using diodes – Half wave and full wave rectifier – Log and Antilog amplifiers – Multiplier and divider – Differentiator and Integrator - Solutions to simultaneous equations.

#### Unit-III: Comparator, Waveform Generators and Active Filters

Comparator - Application of comparator -Schmitt trigger - Astable and Monostable operations - Triangular wave generator - Phase shift oscillator – Wien bridge oscillator - Active filters - First order low pass filter - High pass active filter - Band pass filter - Band reject filter - All pass filter.

#### Unit-IV: D-A and A-D Converters

Digital to Analog Converters - Binary weighted-Resistor DAC – R/2R ladder DAC - Analog to Digital Converters – The counter type A-D converter - Successive Approximation Method ADC - Dual slope ADC – DAC/ADC Specifications – Resolution, Linearity and Accuracy.

#### Unit-V: Transducer

Electrical transducer – Selecting a transducer – Resistive Pressure Transducer – Resistive Position Transducer – Grid type Strain Gauge – Semiconductor Strain Gauge – Resistance thermometer – Thermistor – Linear Variable Differential Transducer – Photo Electric Transducer – Thermocouple.



### **Books for study:**

1. R.S. Sedha, A text Book of Applied Electronics S. Chand & Co., New Delhi.
2. D. Roy Choudhury & Shail B. Jain, Linear Integrated Circuit, New Age International Publishers, New Delhi.
3. H S Kalsi, Electronic Instrumentation –, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

### **Books for Reference:**

1. G.K.Mithal Khanna - Electronic Devices and Circuits Publishers, NewDelhi.
2. Malvino, A.P. & Leech, D and Goutam Saha - Digital Principles and Application (VI ed.): Tata McGraw Hill, 2006.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the V-I characteristics of different semiconductor devices.	K1
CO-2	Learn basic function of operational amplifier, Ideal and practical Characteristics and their mathematical application.	K2
CO-3	Construct basic circuit of active filters, comparators and their applications.	K5
CO-4	Develops an ability to analyse and design different Digital systems.	K6
CO-5	Analyse principle of working of various transducers used to measure Temperature, comparative study of various transducers.	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
COs↓								
CO-1	S	M	S	M	S	M	M	S
CO-2	S	S	S	M	L	S	M	S
CO-3	S	M	S	S	M	M	S	S
CO-4	M	S	S	S	M	S	S	S
CO-5	M	S	M	M	M	M	M	S

**S- STRONG**

**M-MEDIUM**

Semester	I	<b>Practical – I : General Physics Experiments</b>	Hours	<b>10</b>
Course code	<b>21P1PHP01</b>		Credits	<b>4</b>

### Course Objectives:

- To understand the concept of elasticity by using elliptical and hyperbolic experiments.
- To explain the characteristics of various semiconductor devices.
- To apply and analyze the different Arc- Spectra.
- To calculate the counting and operating voltage.
- To Design a V-I characteristics circuit by using solar panel.

#### (Any fifteen experiments only)

1. To determine Young's modulus by Elliptical fringes.
2. To determine Young's modulus by Hyperbolic fringes.
3. To determine the Susceptibility of the given sample by Guoy's method.
4. To determine the Susceptibility of the given liquid by Quincke's method.
5. To determine Stefan's constant using Hot body method.
6. To determine Rydberg's constant for Hydrogen spectrum & Solar spectrum.
7. To find thickness of air gap between Etalon plates by using F.P. Etalon.
8. To determine thickness of thin sheet using Michelson's Interferometer.
9. To study the Arc Spectra of Fe-Hg (or) Cu-Hg (or) Brass-Hg.
10. To study the Molecular spectra of ALO band or CN band.
11. To determine surface temperature of the sun using Lee's disc.
12. To determine the velocity and adiabatic compressibility of the given liquid using Ultrasonic interferometer.
13. To find Band gap energy of
  - i) Thermistor using Post Office Box
  - ii) Semiconductor using Four Probe method.
14. To study the Hall Effect in semiconductor & find Hall coefficient, Current density & Carrier mobility.
15. To study the Characteristics of GM Tube and Verify inverse square law and find absorption coefficient of Aluminum foil by GM Counter.
16. To determine charge of an electron using Milliken's oil drop method.
17. To study the diffraction of light due to propagation of ultrasonic wave in a liquid.
18. To plot the V-I Characteristics of Solar Panel and Photosensitive devices.
19. To measure the resolution of the detector and analyze given sample using Gamma ray Spectrometer.
20. To determine the diameter of a circular aperture and thickness of enamel coating (Straight Edge) Using Laser.

## Books for Study:

1. An Advanced Course in Practical Physics - D. Chattopadhyay, P. C. Rakshit; New Central Book Agency (P) Ltd; Eighth Edition, 2007.
2. A Textbook of Advanced Practical Physics - S. K. Ghosh; New Central; Fourth Edition, 2000.

## Books for Reference

1. Advanced Practical Physics for students - B. L. Worsnop and H. T. Flint; Littlehampton. Book Services Ltd; Ninth Revised Edition, 1951.
2. Physical Methods, Instruments and Measurements - Vol. 1-4, - Yuri M. Tsipenyuk; Russian Academy of Sciences, Russia, 2009.

## Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Define the concept of elasticity	K1
CO-2	Understand different laboratory technique, to determine the band gap energy.	K2
CO-3	Compare the different types of Arc spectra.	K3
CO-4	Analyze the value of understand the physics experiments	K4
CO-5	Calculate the value of charge of an electron	K5

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
COs↓								
CO-1	S	S	S	S	S	M	M	S
CO-2	S	S	S	S	M	S	S	M
CO-3	S	S	M	S	S	M	M	S
CO-4	S	S	M	M	S	M	M	M
CO-5	S	S	S	S	M	M	M	S

**S- STRONG M-MEDIUM**

Semester	<b>II</b>	<b>Microprocessor and Microcontroller</b>	Hours	<b>5</b>
Course code	<b>21P2PH04</b>		Credits	<b>5</b>

### **Course Objectives:**

- To understand the architecture of 8085 Microprocessor and know the machine code, opcode and mnemonics.
- To know the interfacing an external device with the microprocessor.
- To know the applications of 8085 microprocessors.
- To understand the architecture of 8051 Microcontroller.
- To understand microcontroller based program for various applications.

#### **UNIT- I: Architecture and Programming of 8085**

Architecture of 8085 - Control, data and address buses – Registers in 8085 – Addressing modes of 8085 – Pin configuration – Instruction set of 8085 - Data transfer, Arithmetic, Logical, Branching, stack and I/O instructions - Timing and Sequencing - Instruction cycle, Machine cycle - Halt state, Wait state – Timing diagram for opcode fetch, memory read and write cycles.

**Assembly language programming:** Arithmetic operations: Choosing biggest & smallest numbers from a list –Ascending and Descending orders –Square root of 8-bit number.

#### **UNIT- II: Data transfer schemes and interfacing**

Memory interfacing and I/O interfacing – Address space – Address space partitioning – Data transfer schemes – Programmed data transfer – Direct memory access – Serial data transfer – Types of interfacing devices – Programmable peripheral interface 8255 - Interfacing of ADC and DAC – Wave form generation – LED interface – 7 segment Display interface.

#### **UNIT - III: Applications of microprocessors**

Stepper motor – Traffic light controller - Microprocessor based process control – Closed loop control – Open loop control - Example for closed loop control – Crystal growth control - Microprocessor based temperature monitoring systems – limit settings – Operator panel – Block diagram.

#### **UNIT - IV: Architecture of Microcontroller 8051**

Introduction – Comparison between microcontroller and microprocessors – architecture of 8051 – key features of 8051 – Memory organization – Data memory and program memory – Internal RAM organization – Special function registers – control registers – I/O ports – Counters and Timers – Interrupt structure.

#### **UNIT- V: Programming the Microcontroller 8051**

Instructions set of 8051 – Arithmetic, Logical, Data move, Jump and call instructions - Addressing modes – Immediate, Register, Direct and Indirect addressing modes – Assembly language

programming – Simple programs to illustrate arithmetic and logical operations (sum of numbers, biggest and smallest in an array) – Software time delay.

**Books for study:**

1. Ramesh S. Gaonkar - Microprocessor Architecture, Programming and applications with 8085, Wiley Eastern 5<sup>th</sup> edition with new simulation programs.
2. B. Ram - Fundamentals of Microprocessors and Microcontroller, Dhanpat Rai Publications (P) Ltd., New Delhi, 2008.
3. Kenneta J. Ayala - The 8051 Microcontroller, Penram International-India, 2003.

**Books for Reference:**

1. Douglas V.Hall - Microprocessors and Interfaces, Tata Mc Graw Hill Company, 1999.
2. Aditya P.Mathur - Introduction to Microprocessors, Tata Mc Graw Hill Company, II edition, 2002.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded Systems, Pearson Education, Delhi, Seventh Indian Reprint 2004.
4. Kumar, Umashankar- The 8085 Microprocessor-Dorling Kindersley Pvt.Ltd.-2008.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the basic architecture of 8- bit microprocessors and able to write programming skills in assembly language programs.	K2
CO-2	Analyze the I/O interfacing and techniques	K4
CO-3	Apply the knowledge of microprocessor programmes	K3
CO-4	Compare microprocessor and microcontroller.	K6
CO-5	Learn instruction set and Able to write assembly language program for Microcontroller	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Creation**

**Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	S	M	S	S	S
CO-2	S	M	M	M	M	S	S	S
CO-3	S	M	S	M	S	S	S	S
CO-4	S	M	M	M	M	S	S	S
CO-5	S	M	M	M	M	S	S	S

**S- STRONG                      M-MEDIUM**

Semester	<b>II</b>	<b>Quantum Mechanics - I</b>	Hours	<b>5</b>
Course code	<b>21P2PH05</b>		Credits	<b>5</b>

### **Course Objectives:**

- To make students aware about the basic formulations in quantum mechanics.
- To know information about energy eigenvalues and their problems
- To study the Matrix formulation of Quantum Mechanics.
- To know about the concepts of identical particles and spin.
- To understand the knowledge of angular momentum and their properties.

### **UNIT – I: Foundation of Quantum Mechanics**

Wave velocity and Group velocity – Quantum picture of material particle - Equation of motion for matter waves - Schrodinger equations - Physical interpretation of Wave function - Normalized and Orthogonal wave functions - conditions satisfied by wave function - Operators associated with different observables - Expectation values - Probability current density - Ehrenfest's theorem - Uncertainty principle - Heisenberg's gamma ray microscope.

### **UNIT – II: Energy Eigen Value Problems**

Free particle - Potential step - Rectangular potential barrier - Applications of Barrier penetration (alpha decay) - A particle in one dimensional, infinite deep potential well - A Particle in 3 dimensional, infinitely deep potential well - Square well potential (Bound States) - One dimensional linear harmonic oscillator - Three dimensional harmonic oscillator - The Hydrogen atom.

### **UNIT – III: Matrix formulation of Quantum Mechanics**

Hilbert space - Operators of Matrices - Matrix form of wave function – Unitary transformation - Eigen value problem - Schroedinger, Heisenberg and Interaction matrix representation - Dirac 'Bra' and 'Ket' vectors - Coordinate and Momentum operator - Projection operator - Matrix theory of Harmonic oscillator.

### **UNIT – IV: Identical particles and spin**

Physical meaning of identity - Symmetry and Antisymmetric wave functions and their construction – Particle exchange operator - Distinguishability of identical particles - Pauli's exclusion principle - Slater's determinant - Spin angular momentum - Spin matrices for electron - Commutation relations – Density operator and density matrix - Symmetric and Antisymmetric wave functions hydrogen molecule.

### **UNIT – V: Angular momentum and their properties**

Angular momentum operator in position representation - The relation operator and angular momentum - Total angular momentum operators - Commutation relation of total angular momentum

with components - Eigen value of  $J^2$  and  $J_z$  - Eigen value of  $J_+$  and  $J_-$  - Addition of angular momentum - Clebsch Gordan coefficients – Calculation of CG for  $j_1 = \frac{1}{2}$ ,  $j_2 = \frac{1}{2}$  and P-state of electron.

### **Books for Study:**

1. Sathya Prakash - Quantum mechanics, Kedar Nath Ram Nath and Co. Publications, 2011.
2. G. Aruldas - Quantum mechanics, Prentice Hall of India Publications, 2002.

### **Books for Reference:**

1. P.M. Mathews and K.Venkatesan - A Text book of Quantum mechanics, Tata McGraw Hill Publications, 2003.
2. A.K.Ghatak and Lokanathan - Quantum Mechanics (5th edition) Theory and Application Macmillan India Ltd Publication, 2005.
3. Leonard I. Schiff – Quantum Mechanics, McGraw-Hill International Publication.
4. Edwin C. Kemble – Fundamental principles of Quantum mechanics with elementary Applications.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Arrange the physical interpretation of wave functions.	K1
CO-2	Examine the eigen kets of the angular momentum operators and prove Properties of completeness and Orthogonality.	K4
CO-3	Explain identical particles and quantum statistics, and able to perform Calculations on systems of identical particles.	K2
CO-4	Evaluate the concepts of angular momentum and spin.	K6
CO-5	Apply for the phenomena involved in the Matrix formulation of Quantum Mechanics.	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
COs↓								
CO-1	S	S	M	S	M	S	M	M
CO-2	S	S	M	M	M	M	S	M
CO-3	S	S	S	S	S	M	M	S
CO-4	S	S	M	M	M	M	M	M
CO-5	S	S	M	S	M	S	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>II</b>	<b>Practical – II : Electronics Experiments</b>	Hours	<b>8</b>
Course code	<b>21P2PHP02</b>		Credits	<b>4</b>

### Course Objectives:

- To study the different types of Transistors.
- To develop knowledge and core expertise related to applications of Op-Amp.
- To learn the fundamentals and applications of Optoelectronics devices.
- To interpret characteristics of digital systems.
- To learn the concepts of digital Logic circuits and data Converters.

### (Any fifteen experiments only)

1. To study FET characteristics and design FET amplifier.
2. To study UJT characteristics and design saw tooth wave oscillator.
3. To construct and study square wave generator using OP-AMP IC 741.
4. To construct and study square wave generator using timer IC 555.
5. To construct and study monostable multivibrator using the OP-AMP IC 741.
6. To construct and study monostable multivibrator using the timer IC 555.
7. To construct and study Schmitt's trigger using OP-AMP IC 741.
8. To construct and study Schmitt's trigger using timer IC 555.
9. To solve the simultaneous equations – 3<sup>rd</sup> order differential equations using analog computer.
10. To construct and study the binary addition and subtraction using IC 7483.
11. To construct and study the multiplexer and de-multiplexer IC circuits.
12. To construct and study the decoder and encoder IC circuits.
13. To construct and study the counter and shift registers using IC 7476 / 7473.
14. To construct and study the BCD counter.
15. To construct and study the binary weighted R/2R ladder DAC using OP-AMP IC 741.
16. To construct and study of ADC and DAC.
17. To study the characteristics of SCR.
18. To construct and study the half adder and full adder circuits using NAND and NOR gates.
19. To construct and study the half subtractor and full subtractor circuits using NAND and NOR gates.
20. To solve the given Boolean equation by sum of products (SOP) and product of sum (POS) using logic gates.



## Books for Study and Reference:

1. Advanced Practical Physics Volume I – Dr. S.P. Sing, Pragati Prakasan Educational publishers, Seventeenth Edition, 2011.
2. Practical Physics and Electronics – C.C. Ouseph, U.J. Rao, V. Vijayendran S. Viswanathan (Printers & Publishers), Pvt., Ltd., First Edition, 2007.

## Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Describe an active exertive in sing and constructing electronic circuits.	K1
CO-2	Recoganize various components such as resistor, capacitor, IC's, Voltmeter, Ammeter, LED, etc... and its usage in circuit designs.	K2
CO-3	Demonstrate practical competence in principles, construction and VI characteristics of several devices like JFET, UJT.	K3
CO-4	Assemble simple practical circuits using the electronic components.	K6
CO-5	Capable of performing several experiments.	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	S	S	M	S	S	M	M
CO-2	S	M	S	S	S	M	M	S
CO-3	S	S	M	S	M	M	S	M
CO-4	S	M	S	S	S	M	S	S
CO-5	S	M	S	S	S	S	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Thermodynamics And Statistical Mechanics</b>	Hours	<b>5</b>
Course code	<b>21P3PH06</b>		Credits	<b>5</b>

### Course Objectives:

- To study the laws of thermodynamics and Phase transitions
- To understand the concept of kinetic theory
- To learn the basics of classical and quantum statistical mechanics and to understand some of their applications.
- To understand the need for quantum Statistical Mechanics.
- To know the knowledge of applications of quantum statistical mechanics.

#### Unit I: Thermodynamics

Thermo dynamical laws and their consequences – Entropy - Changes in entropy in reversible processes - Principle of increase of entropy - Thermodynamic functions Enthalpy, Helmholtz and Gibbs functions - Phase transitions – Clausius – Clayperon equation - Vander Wall equation of state.

#### Unit II: Kinetic Theory

Boltzmann transport equation and its validity - Boltzmann's H-theorem -Relation between H-function and entropy - Maxwell--Boltzmann distribution -Mean free path – Conservation laws - Transport phenomena – Viscosity of gases - Thermal conductivity - Diffusion process.

#### Unit III: Classical Statistical Mechanics

Review of probability theory - Macro and micro states – Phase space – Statistical ensembles - Density function - Liouville's theorem - Maxwell—Boltzmann distribution law - Micro canonical ensemble – Ideal gas – Entropy – Partition function – Equipartition theorem - Canonical and grand canonical ensembles.

#### Unit IV: Quantum Statistical Mechanics

Basic concepts - Ideal quantum gas – Bose-Einstein statistics - Photon statistics – Fermi -Dirac statistics - Sackur-Tetrode equation – Equation of state - Bose-Einstein condensation - Comparison of classical and quantum statistics.

#### Unit V: Applications of Quantum Statistical Mechanics

**Ideal Bose System:** Equation of state – Bose-Einstein condensation – Black body radiation – Phonons – Helium II – Landau theory of Liquid helium II.

**Ideal Fermi System:** Equation of State – Free electron gas in metals – Thermionic emission – Heat capacity – Pauli's Para magnetism – Landau Diamagnetism.

### **Books for Study:**

1. S.K. Sinha, *Introduction to Statistical Mechanics* (Narosa, New Delhi, 2007).

### **Books for Reference:**

1. F. Reif, *Fundamentals of Statistical and Thermal Physics* (McGraw Hill, Singapore, 1985).
2. Singhal, Agarwal, Prakash, *Thermodynamics and Statistical Physics* (Prakashan, Meerut, 2003).
3. K. Huang, *Statistical Mechanics* (Wiley Eastern Limited, New Delhi, 1963).
4. Gupta, Kumar, *Statistical Mechanics* Pragathi prahashan.
5. Grudeep raj, *Thermodynamics*, Aarthi publications.
6. R.K. Shrivastava, *Statistical Mechanics*, Aarthi publications.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the four postulates, including definitions of state variables and the entropy	K2
CO-2	Learn how to derive Maxwell relations among derivatives of thermodynamic variables	K4
CO-3	Understand statistical mechanics of systems in other generalized canonical Formulation.	K2
CO-4	The statistical mechanical description of Fermi - and Bose - statistics for Electron, photon- gases.	K5
CO-5	Explain of applications of statistical mechanics and thermodynamics in other Disciplines	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	M	M	S	M	M
CO-2	S	S	M	S	M	S	M	M
CO-3	S	M	M	S	S	M	M	M
CO-4	S	S	M	M	S	S	M	M
CO-5	S	M	S	S	S	M	M	M

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Quantum Mechanics - II</b>	Hours	<b>5</b>
Course code	<b>21P3PH07</b>		Credits	<b>5</b>

### Course Objectives:

- To understand Advance level - Quantum Mechanics.
- To acquire knowledge on approximation methods employed in solving quantum mechanical problems.
- To throw light on relativistic mechanics and quantum theory of radiation.
- To learn the ideas of scattering theory.
- To have a glimpse of perturbation theory and its applications.

#### UNIT – I: Time independent perturbation theory

Stationary perturbation theory – Non-degenerate case – First order Perturbation – Normal helium Atom – Zeeman effect - Degenerate case - Stark effect in hydrogen atom – Variation method - Ground state of Helium atom - WKB method - Connection formulas for penetration of a barrier.

#### UNIT - II: Time Dependent Perturbation Theory

Time dependent perturbation theory – Probability of final state – Perturbation Constant in time – Fermi golden rule – Harmonic perturbation – Adiabatic approximation – Sudden approximation – Application of time dependent perturbation theory to semi classical theory of radiation.

#### UNIT- III: Scattering Theory

Scattering cross-sections – Scattering amplitude – General formulation of scattering theory – Green's function - Born approximation and its condition for validity – Scattering by square well potential in Born approximation – Partial wave analysis – Phase shifts – Scattering length and effective range for low energy scattering.

#### UNIT - IV: Relativistic Quantum Mechanics

Klein-Gordan equation for a free particle – Charge and current densities – Dirac relativistic equation – Dirac free particle solutions – Probability and Current density – Magnetic moment of electron – Spin orbit energy – Covariant formulation of Dirac equation.

#### UNIT - V: Element of field quantization.

Concepts of classical mechanics – Classical Field equation – Lagrangian form – Hamiltonian form – Quantization of the field – Quantization Schrodinger equation – N-Representation – System of Bosons - Creation, Annihilation operators - System of Fermions.

#### Books for Study:

1. Sathya Prakash, Quantum mechanics, Kedar Nath Ram Nath and Co.Publications, 2011.
2. G. Aruldhas - Quantum mechanics, Prentice Hall of India Publications, 2002.

### **Books for Reference:**

1. P.M. Mathews and K.Venkatesan, A Text book of Quantum mechanics, Tata McGraw Hill Publications, 2003.
2. Leonard I. Schiff – Quantum Mechanics, McGraw-Hill International Publication
3. A.K.Ghatak and Lokanathan, Quantum Mechanics (5th edition)-Theory and applications, Macmillan India Ltd Publication, 2005.
4. Franz Schwabl – Quantum mechanics, Narosa Publications.
5. Gupta, Kumar, Sharma, Quantum Mechanics, Galgotia Publications,
6. S. Devanarayanan, Quantum Mechanics, Aarthi Publications.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Develop a knowledge and understanding of time dependent perturbation theory	K6
CO-2	Express the knowledge of scattering theory and partial wave Analysis.	K2
CO-3	Analyze the Klein-Gordon equation for free-particle solutions	K4
CO-4	Formulate the Lagrangian and Hamiltonian form of classical field Equations as well as analyze the system of bosons and fermions	K6
CO-5	Acquire knowledge from field theory in solving quantum mechanical problems.	K2

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	S	S	M	M	S
CO-2	S	M	S	S	S	M	M	S
CO-3	S	S	S	M	S	S	M	S
CO-4	S	S	S	M	M	S	M	S
CO-5	S	S	M	M	S	S	M	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Electromagnetic Theory</b>	Hours	<b>5</b>
Course code	<b>21P3PH08</b>		Credits	<b>5</b>

### **Course Objectives:**

- To understand the basics of electrostatics, magnetostatics and electromagnetics.
- To acquire knowledge of wave propagation in different median and flow of power.
- To analyze problems involving loss media with planar Boundaries.
- To understand of Maxwell's equations and EM problems.
- To know the modes of propagation of guided waves and propagation through wave guides.

#### **UNIT-I: Electrostatics**

Gauss Law – Poisson & Laplace equations - Solution of Laplace equation in spherical polar coordinate - Conducting sphere - Multipole expansion - Electrostatic energy – Dielectrics - Polarization and Displacement vectors - Boundary conditions -Dielectric sphere in a uniform field - Molecular polarisability and electric susceptibility - Electrostatic energy in dielectric medium - Clausius-Mossotti equation.

#### **UNIT-II: Magnetostatics**

Lorentz force law - Biot- Savart's law - Divergence and Curl of Magnetic Induction- Ampere's Circuital Law – Applications - Magnetic vector potential – Multipole expansion of a vector potential – Boundary conditions on B and H – Magnetic flux – Intensity of Magnetization – Magnetic susceptibility - Uniformly magnetized sphere.

#### **UNIT-III: Electromagnetics**

Faraday's law of induction - Maxwell's equation - Maxwell's displacement current - Vector and Scalar potential – Maxwell equations in terms of electromagnetic Potential - Gauge transformation - Lorentz gauge - Coulomb gauge - Conservation laws for a system of charges - Poynting vector.

#### **UNIT-IV: Wave Propagation**

Plane electromagnetic waves in free space – Isotropic and anisotropic non conducting media – Conducting media – Boundary conditions at the surface of discontinuity – Reflection and Refraction of electromagnetic waves at a plane interface between dielectrics – Polarization – Polarization by reflection and total internal reflection.

#### **UNIT-V: Wave Guides and Simple Radiating Systems**

Wave guides – Propagation of waves in a rectangular wave guide – TE and TM modes – The coaxial transmission lines – Retarded potentials – Radiation and fields due to an oscillating dipole – Radiation from a small current element – Fields and Radiation from a linear half wave antenna – Antenna arrays.

### **Books for Study:**

1. Chopra & Agarwal- Electromagnetic Theory – K.Nath & Co. Publishers
2. J.D.Jackson - Classical Electrodynamics- III Edition -John Wiley, 2000.
3. Paul Corson and Dale R.Corson - E Electromagnetic waves and fields- III Edition – CBS Publishers and Distributers, New Delhi, 2000.

### **Books for Reference:**

1. David J. Griffiths, Introduction to Electrodynamics, Prentice-Hall of India, New Delhi,2000.
2. E.C. Jordan and K.G. Balmin, Electromagnetic waves and radiating system, Second Edition, Prentice Hall of India, 1995.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Have an understanding of Maxwell's equations and be able to manipulate and apply them to EM problems.	K3
CO-2	Formulate and analyze problems involving loss media with planar Boundaries using uniform plane waves.	K6
CO-3	Solve such problems in simple geometries using separation of variables	K6
CO-4	Understand the expressions for the energy both for the electrostatic and Magneto static fields.	K2
CO-5	Illustrate techniques for antenna parameter measurements and understand the various applications of antennas	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	M	S	S	M	M	S
CO-2	S	M	S	S	S	M	M	S
CO-3	S	S	M	S	S	M	M	S
CO-4	S	M	M	S	S	M	M	S
CO-5	S	M	S	M	S	M	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Condensed Matter Physics</b>	Hours	<b>5</b>
Course code	<b>21P3PH09</b>		Credits	<b>5</b>

### Course Objectives:

- To study Crystallography ,Lattice Vibration and Phonons
- To impart the knowledge of free electron theory and Transport properties
- To acquire the knowledge band theory of solids and semiconductor.
- To explain superconductivity in detail.
- To understand defects in crystal.

### UNIT-I: Crystallography, Lattice Vibration and Phonons

Basics of crystal systems – Bravais lattices – External symmetry of crystal – Internal symmetry of crystal – Reciprocal lattice – Geometrical structure factor - Lattice vibrations – Elastic vibrations of continuous media – Group and Phase velocity – Phonons – Momentum of phonons – Phonon model.

### UNIT - II: Thermal property, Free electron theory and Transport properties.

Classical Calculation of specific heat – Einstein’s theory of specific heat – Debye’s model of specific heat – Thermal Expansion - Lattice thermal Conductivity of Solid - Free Electron Gas - Drude theory – Sommerfeld model - Free electron gas in 3D – Boltzmann transport equation – Sommerfeld’s theory of electrical conduction - Wiedemann – Franz law - Hall effect

### UNIT- III: Band Theory of solids & Semiconductor

Bloch’s theorem – Kronig Penny model – Construction of Brillouin zones - concept of Fermi surface – Importance of Fermi surface – De Hass Van Alphen effect. Classifying Materials as Semiconductors – Band gap – Band Structure of Silicon – Effective Mass – Intrinsic carrier concentration – Fermi level – Energy band diagram and Fermi level.

### UNIT- IV: Superconductivity

Meissner effect – Type I & Type II Superconductors – Josephson tunneling – Josephson effect – Thermodynamics of the superconducting transition – Electrodynamics of super conductor - London equations and penetration depth – BCS theory – Cooper pair - Ginsberg – Landau theory – SQUIDS.

### Unit – V: Defects in crystal

Classification of imperfections - Crystallography imperfections – Point defect – The Schottky defect – Frenkel defect – Vacancies and Diffusion through solids – Line defects – Shear strength of the crystal – Edge dislocation – Screw dislocation – Burgers vector – Dislocation motion – Plane defects – Dislocations and crystal growth.

### Books for Study:

1. Gupta, Kumar - Solid State Physics, K. Nath & Co., Meerut, 2004.
2. C.Kittel-Introduction to Solid state Physics, John Wiley and Sons, New Delhi, 2004.
3. Singhal-Solid state Physics Kedarnath Ramnath & Co., 2005.



### **Books for Reference:**

1. Gupta & Saxeena-Solid state Physics, Pragati Praashan, Meerut, 9th edition,2004.
2. J. S. Blakemore, Solid State Physics, Second edition Cambridge University press, Cambridge, London, 1974.
3. A. J. Dekker, Solid State Physics, Mac Millen, Madras, 2004.
4. M. M. Woolfson, An Introduction to X-ray Crystallography, Vikas publishing Ltd., 1978.
5. Gupta ,Kumar, Sharma- Solid State Physics, Galgotia Publications.
6. S.L.Gupta, V.Kumar - Solid State Physics, Galgotia Publications.
7. S.O.Pillai- Solid State Physics, Aarthi Publications.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Differentiate between different Lattice types and explain the concepts of Reciprocal lattice and crystal diffraction.	K4
CO-2	Predict electrical and thermal properties of solids and explain their origin.	K2
CO-3	Understand the Band theory and classifying semiconductor.	K2
CO-4	Explain superconductivity, its properties, important parameters related to possible applications.	K3
CO-5	Explain different types of defects in crystals.	K3

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Creation**

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	S	S	S	M	M
CO-2	S	M	M	S	S	M	M	S
CO-3	S	S	M	S	M	S	M	S
CO-4	S	M	M	S	S	M	M	S
CO-5	S	M	S	M	M	M	S	M

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Practical – III Microprocessor and Microcontroller Experiments</b>	Hours	<b>6</b>
Course code	<b>21P3PHP03</b>		Credits	<b>4</b>

### Course Objectives:

- To expose students to the operation of typical microprocessor (8085) trainer kit.
- To know the interfacing an external device with the microprocessor.
- To know the applications of 8085 microprocessors.
- To develop the quality of assessing and analyzing the obtained data.
- To understand microcontroller based program for various applications.

#### (Any Fifteen experiments only)

1. Clock programs using 8085 microprocessor
2. Addition, Subtraction, Multiplication and Division – 16 bit numbers.
3. Sum of a series of 8 – bit numbers solving expressions.
4. Finding the largest / smallest number in a data array.
5. Arranging a series of numbers in Descending /Ascending order.
6. Square, Square root and factorial of a number.
7. Code conversions and temperature conversion.
8. Interfacing of ADC 0809.
9. Interfacing of an 8 – bit DAC and wave form generation  
[Square, Rectangular, Saw tooth, Triangular and Sine waves].
10. Interfacing of ADC – DAC and Comparator.
11. Interfacing of seven segment display – Display of Alphanumeric character
12. Stepper motor interfacing.
13. Traffic light controller.
14. Hex – Key board interface.
15. Microcontroller arithmetic operation using 8051
16. Microcontroller array operations using 8051
17. Code-conversion using 8051 Microcontroller.
18. Temperature controller using 8051.

## Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller	K3
CO-2	Work with standard microprocessor real time interfaces including digital-to-analog converters, analog-to-digital converters and seven segment display	K4
CO-3	Designing of microprocessors/microcontrollers-based systems.	K6
CO-4	Develop the quality of assessing and analyzing the obtained data.	K3
CO-5	Understand the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor.	K6

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	S	S	S	M	M
CO-2	S	S	M	S	S	S	M	S
CO-3	S	M	M	M	M	S	S	S
CO-4	S	M	S	S	M	S	S	S
CO-5	S	M	S	S	S	M	S	M

**S- STRONG**

**M-MEDIUM**

Semester	<b>IV</b>	<b>Nuclear and Particle Physics</b>	Hours	<b>5</b>
Course Code	<b>21P4PH10</b>		Credits	<b>5</b>

### Course Objectives:

- To understand the basic structure and properties of the nucleus.
- To know the various theories and mechanisms of radioactive decay.
- To acquire knowledge about nuclear fission and fusion processes.
- To learn various reactions of nucleus.
- To understand the basic idea of elementary particles.

#### UNIT – I:

**Nuclear Forces:** Deuteron – Ground state and Excited state of the Deuteron - Neutron proton scattering at low energies – Scattering length – Determination of the phase Shift - Spin dependence of nuclear force - Charge independence of nuclear force – Proton-Proton scattering at low energies – Exchange forces – meson theory of exchange forces.

#### UNIT – II:

**Radioactive decays:** Neutrino hypothesis – Fermi’s theory of beta decay - Selection rules – Non conservation of parity in beta decay – Gamma decay – Internal conversion – Nuclear isomerism.

**Nuclear detectors:** Basic principle of particle detectors – Proportional counters – Geiger Muller counters – Semiconductor Counters – Scintillation counter.

#### UNIT – III:

**Nuclear Fission:** Types of fission – Mass and Energy distribution of nuclear fragments – Nuclear chain reactions – Four factor formula – Bohr wheeler’s theory of nuclear fission.

**Nuclear fusion:** – Thermonuclear reactions – Controlled thermonuclear reactions – Pinch effect – Fusion Reactor.

#### UNIT – IV:

**Nuclear Reactions:** Types of nuclear reaction – Conservation laws – Nuclear scattering kinematics - Energetic of reactions – Q equation – Level width in nuclear reaction – Nuclear reaction cross section – Partial wave analysis – Breit-wigner one level formula – Direct reactions – Nuclear shock waves.

#### UNIT – V:

**Elementary Particles:** Classifications of elementary particles – Four type of interactions and– Isospin quantum numbers – Strangeness and Hypercharge – Invariance principles and symmetries – Invariance under charge – Parity (CP), Time (T) and CPT -CPT violation in neutral K meson decay – Quark model SU(3) symmetry – Gellmann – Nishijama formula .

#### **Books for Study:**

1. D.C. Tayal - Nuclear Physics, 2000.
2. R.R. Roy and B.P. Nigam - Nuclear Physics. New Age International, New

Delhi, 2005.

3. W.S.C Williams, Nuclear and Particles Physics, Clarendon Press, 1981.

### **Books for Reference:**

1. S.N. Ghoshal, Nuclear Physics, S.Chand and Company Ltd, 2003.
2. Satya Prakash, Nuclear Physics and Particle Physics, Sultan Chand and sons, First edition, 2005.
3. Pandya and Yadav – Nuclear and Particle Physics world, Cambridge University Press.
4. Hans- Nuclear Physics, Aarhi Publications.
5. Devanathan- Nuclear Physics, Narosa Publications.
6. Sharma- Nuclear Physics, Galgotia Publications.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the nuclear forces and scattering theories.	K2
CO-2	Calculate alpha, beta and gamma decay. Know about particle detectors and accelerators	K3
CO-3	Know the concepts of fission, fusion and chain reactions.	K2
CO-4	Learn nuclear reactions, nuclear scattering kinematics and Q-value of Nuclear reactions.	K3
CO-5	Classify elementary particles according to their quantum numbers and draw simple reaction diagrams.	K2

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	S	M	S	S	S	M	S
CO-2	S	S	M	M	M	M	M	S
CO-3	S	M	M	S	S	M	M	S
CO-4	S	M	M	S	S	M	M	S
CO-5	S	S	M	M	M	S	S	M

**S- STRONG**

**M-MEDIUM**

Semester	<b>IV</b>	<b>Molecular Spectroscopy</b>	Hours	<b>5</b>
Course Code	<b>21P4PH11</b>		Credits	<b>5</b>

### Course Objectives:

- To understand the fundamental aspects of major areas of spectroscopy, likes as Infra-red, Raman, NMR, etc.
- To know the spectroscopic techniques to use in finding the molecular structure, bond angles, bond length, etc.
- To learn concepts of Vibrational & IR Spectroscopy.
- To understand the fundamentals of NMR and ESR Spectroscopy.
- To study Quadrupole transitions of molecules.

#### UNIT – I: Rotational & Microwave Spectroscopy

Characterization of electromagnetic Radiation- Quantization of energy – Regions of Spectrum – The rotation of molecules – Diatomic molecules – Polyatomic molecules – Techniques and Instrumentation.

#### UNIT – II: Vibrational & IR Spectroscopy

The vibrating energy of diatomic molecules – Polyatomic molecules – Calculation of normal modes for Raman and IR activity to  $C_{2v}$  and  $C_{3v}$  point groups – Internal and symmetry coordinates- Principle and theory of Infrared Spectroscopy – Selection rules-IR Spectrometer – Instrumentation – Sample handling Techniques – FTIR – Applications.

#### UNIT – III: Raman Spectroscopy

FT Raman spectroscopy – Degree of depolarization – Structure determination using IR and Raman spectroscopy – Resonance Raman spectroscopy – Coherent anti- Stokes Raman spectroscopy – Inverse Raman surface Enhanced Raman spectroscopy – Principles, Techniques and Applications.

#### UNIT – IV: NMR and ESR Spectroscopy

Basic principles of interaction of spin and applied magnetic field – Concept of NMR spectroscopy –NMR spectrometer – Advantage of FT-NMR – Chemical shift – simple application to structural determination.

Origin of electron spin resonance –ESR spectrometer – Hyper fine structure study – Triplet states study of ESR –applications of ESR.

#### UNIT – V: NQR and Mossbauer spectroscopy

Principles of NQR – Energy levels of quadrupole transitions for half integral spins – NQR spectrometer – Applications of NQR.

Principle of Mossbauer effect – Mossbauer spectrometer – Isomer shift – quadrupole interaction – Magnetic hyperfine interactions – Applications.

### **Books for Study:**

1. C.N.Banwell –Fundamentals of Molecular spectroscopy, Tata McGraw Hill, 2005.
2. D.N.Sathyanarayana – Vibrational Spectroscopy and Application, New Age Internations Publication, 2004.
3. G.Aruldas – Molecular Structure and Spectroscopy, Prentice Hall of India Pvt. Ltd. – New Delhi, 2001.

### **Books for Reference:**

1. B.P.Straughan and Walker, Spectroscopy, Vol.1, 2 Chapman and Hall, 1996.
2. T.P.Das and E.L.Hehn., NMR spectroscopy, Academic press, 1958.
3. Norman B.Colthup, Lawrence H.Daly & Stephen E. Wiberly, Introduction to IR and Raman Spectroscopy, Academic press.

### **Course Outcomes:**

CO. No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the vibrational normal modes.	K2
CO-2	Known the basic physical chemistry law those govern molecular spectroscopy.	K2
CO-3	Understand the basic information on molecular methods.	K1
CO-4	Select molecular spectroscopy methods suitable for solving given scientific problem.	K5
CO-5	Understand the phenomenon of the interaction of light with matter in terms of the relationship with the molecular structure.	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** – Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	M	S	S	M	M	S
CO-2	S	M	S	S	M	S	M	S
CO-3	S	S	M	M	S	M	S	S
CO-4	S	M	M	S	S	M	M	S
CO-5	S	S	S	M	M	S	S	S

**S- STRONG**

**M-MEDIUM**

## Elective Courses

Semester	I	<b>Non Conventional Energy Sources</b>	Hours	<b>5</b>
Course Code	<b>21P1PHE01</b>		Credits	<b>4</b>

### Course Objectives:

- To create awareness among students about the growing energy needs.
- To study the wind energy methods of proper utilization.
- To understand the various types of energy from biomass and biogas sources.
- To know geothermal energy and its applications.
- To learn about oceans energies in india.

### Unit – I: Energy sources and solar radiation

Energy sources and their availability – Renewable energy sources - Prospects and Advantages.

**Solar Radiation:** Solar constant – Solar radiation at the Earth’s surface – Solar radiation Geometry – Solar radiation measurements – Solar radiation data – Estimation of average solar radiation – Solar radiation of tilted surfaces.

### Unit – II: Wind Energy

Basic principles of wind energy conversion wind data and energy estimation – Basic components of wind energy conversion systems (WECS) - Types of wind machines – Generating systems – Schemes for electric generation – Generator control – Load control – Applications of wind energy.

### Unit – III: Energy from Biomass and Biogas

**Biomass:** Biomass conversion Technologies – Wet and Dry process – Photosynthesis.

**Biogas generation:** Introduction – Basic process and energetic – Advantages of anaerobic digestion – Factors affecting bio digestion or generation of gas.

**Classification of Biogas plants:** Continuous and batch type – Dome and Drum types - Advantage and Disadvantage - Bio gas plants – KVIC - Biogas from wastes - Fuel properties of biogas - Utilization of biogas.

### Unit – IV: Geothermal Energy

Nature of geothermal field – Geothermal Sources – geothermal energy conversion – Impulse/ reaction machines – Positive displacement machines – Impulse machines – Advantage and disadvantage of geothermal energy – Application of geothermal energy



## Unit – V: Energy from the Oceans

**OTEC:-** Methods of ocean thermal electric power generation – Open cycle OTEC System – Closed cycle OTEC system – Site selection – Energy Utilization – Prospects of ocean thermal energy conversion in India

**Tides:-** Basic Principal of tidal power – Components of tidal power plants – Operation methods of utilization of tidal energy.

### **Books for study:**

1. G.D.Rai, Non-Conventional Energy Sources, Khauna Publications, New Delhi, 2005.
2. M.P.Agarwal, Solar Energy, S.Chand & Co.,

### **Books for Reference:**

1. S.P.Sukhatme - Solar Energy, TMH, 1998.
2. Kreith and Kreider - Principles of Solar Engineering, McGraw Hill Publication.
3. A.B.Meinel and A.P.Meinel - Applied Solar Energy.

## Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	List out the renewable energy sources and solar radiations.	K1
CO-2	Understand the principles of wind energy.	K2
CO-3	illustrate the concept of biomass energy and their classification	K3
CO-4	Analyze the knowledge about principle and operation of geothermal energy	K4
CO-5	Select the energy from the oceans. Understand the Tidal energy, OTEC energy.	K5

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
COs↓								
CO-1	S	M	M	S	M	S	M	M
CO-2	S	M	S	S	S	S	S	S
CO-3	S	S	M	S	S	M	S	S
CO-4	S	M	M	M	S	S	S	S
CO-5	S	M	S	S	S	S	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>I</b>	<b>Semiconductor Physics</b>	Hours	<b>5</b>
Course Code	<b>21P1PHE02</b>		Credits	<b>4</b>

### Course Objectives:

- To understand the equilibrium distribution and Fermi levels of semiconductor.
- To know the concepts of current density and impurities distributions.
- To give knowledge about semiconductor contact with metal.
- To learn working of MOSFET and energy band diagram of MOS.
- To Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their Applications

#### Unit - I:

Equilibrium distribution of electrons and holes in intrinsic semiconductors –  $n_0$  and  $p_0$  equations - Intrinsic Fermi level position - Dopant energy levels – Equilibrium distribution of electrons and holes in extrinsic semiconductors - Degenerated/Non - degenerated semiconductors.

#### Unit - II:

Drift current density – Mobility Effect – Conductivity – Diffusion Current Density – Total Current Density – Graded Impurity Distribution and induced electric field– Einstein relation - Hall Effect – Carrier Generation and Recombination – Continuity Equations – Time dependent diffusion equation.

#### Unit - III:

Metal-Semiconductor contact: Schottky barrier formation - Its characteristics and junction properties - Non-ideal effects on the barrier height - Current voltage relationship - Ideal non-rectifying barriers - Specific contact resistance - Basics Hetero-junction and 2DEG formation.

#### Unit - IV:

MOS structure and its energy band diagram - Depletion layer thickness - Work function differences - Flat band voltage - Charge distribution – Capacitance - Voltage characteristics and frequency effects – Fixed oxide and interface charge effects – MOSFET structure and principle of operation – MOSFET current-voltage characteristics relationship- Substrate bias effects.

#### Unit - V:

Tunnel diodes - Impact diodes and its static and dynamic characteristics – Transferred Electron devices (TED): negative differential resistance – TED device operation; Quantum effect devices (QED): Resonance tunnel diode – Unipolar resonant tunneling transistor - Visible and Infrared LEDs (Device structure and Working principle) – Semiconductor lasers (device structure, laser operation, optical confinement) – Basics of quantum well lasers – Photoconductor and Photodiode (device structure and working principle) – PN junction solar cells.

### Books for Study:

1. Donald A. Neamen Semiconductor Physics and Devices the McGraw-Hill companies.
2. S. M. Sze Semiconductor devices Physics and Technology, Wiley Student edition.

### **Books for Reference:**

1. Dieter. K. Schroder, Semiconductor Material and Device characterization, John Wiley & Sons Inc., New York, 1990.

### **Course Outcomes:**

<b>CO No.</b>	<b>Upon completion of this course, students will be able to</b>	<b>Knowledge Level</b>
CO-1	Outline knowledge about the physics of semiconductor materials.	K1
CO-2	Describe crystalline structures of semiconductors.	K2
CO-3	Integrating the band structures of semiconductors	K3
CO-4	analyze the physical characteristics such as electronic structure and optical and transport properties.	K6
CO-5	Discuss the fundamental knowledge and expose to the field of semiconductor theory and devices and their Applications	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

<b>PSO→</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	<b>PSO7</b>	<b>PSO8</b>
<b>COs↓</b>								
CO-1	S	S	M	S	S	S	M	M
CO-2	S	M	S	S	S	S	M	S
CO-3	S	S	M	M	M	S	S	M
CO-4	S	M	M	S	S	S	M	S
CO-5	S	S	M	S	M	S	S	S

**S- STRONG**

**M-MEDIUM**

Semester	II	NANOSCIENCE	Hours	4
Course Code	21P2PHE03		Credits	4

### Course Objectives

- To understand the nanomaterial.
- To know the concepts of Semiconductors and Ceramics Nanocrystals.
- To apply the magnetic behavior of nanoparticles.
- To learn the catalytic aspects of Nanocrystals.
- To know the applications of nanotechnology.

### UNIT – I: Introduction to NanoScience

Historical perspective on nanomaterial – Nano and energetic - Classification of Nanomaterials – Nanoparticles - Quantum well, Quantum Wire and Quantum dots — Method of Top down, Bottom Up approach - Nano Particle Fabrication Methods

### UNIT – II: Synthesis of Nanoparticles and magnetism of Nanoparticles

**Synthesis:** Synthesis of metal nanoparticles and structures - Synthesis of semiconductors Nanoparticles - Synthesis of Nano composites –Nanobiomaterials - Cadmium Telluride Nanocrystals – Cadmium Sulfide Nanocrystals.

**Magnetism in Nanoparticles:** Magnetism in particles or reduced size and dimensions – Variations of magnetic moment with size – Magnetism in clusters of nano magnetic solids – Magnetic behavior of small particles

### UNIT – III: Fabrication of Nanomaterials

Preparation of nanomaterials —Electrochemical deposition - Chemical vapour deposition – sol gel methods – Forming of nanostructured surfaces using sol- gel process – Electro deposition – Ball milling method – Plasma arcing - Atomic layer deposition – Lithography.

### UNIT – IV: Characterization of nanomaterials

Principle, experimental set up and procedure of Scanning electron microscopy (SEM) – Transmission electron microscopy (TEM) – Atomic force microscopy - Scanning tunneling microscope (STM) – Scanning probe microscopy (SPM) – Fourier Transform infrared spectroscopy (FTIR) – X – Ray diffraction (XRD) – Calculation of particles size and lattices parameters.

### UNIT – V: Application of Nanotechnology

Structural and Mechanical materials - Colorants and Pigments – Carbon Nano tubes – Applications – Electronics and Magnetic applications –Nanobiotechnology – Nano biosensors - DNA – Chips, DNA array devices, Drug delivery systems – Nanomaterials in textiles

### Books for Study:

1. Nanotechnology – Basic Science and Emerging Technologies – by Mick Wilson, Kamali Kannangara Geoff Smith, Michelle Simmons, Burkhard Raguse.

2. J.de Jongh, Physics and Chemistry of Metal Cluster Compounds, Kluwer Academic Publishers, Dordrecht, 1994.

3. A Text Book of Nano Science & Technology – by T.Pradeep.

**Books for Reference:**

1. V.Henrich, P.A.Cox, metal Oxides, PCambridge University Press, New York, 1994.

2. P.K. Sharma – Origin and Development of Nanotechnology, 1st Edition 2008, Vista International Publishing House, New Delhi.

3. NanoMaterials – Synthesis, Properties & Applications.A.S.Edelstein& RC Cammarata

4. NanoScience and Nano Technology – Shubrasingh M.S. Ramachandra Raw (Fundamentals of Frontiers)

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Classify the knowledge of general principles of physics, chemistry, and biology role on the nanometer scale.	K4
CO-2	Understand the knowledge of at least one specialization area within the field of nanoscience and nanotechnology.	K2
CO-3	Proficiency in translating this knowledge into useful technological applications	K5
CO-4	Predict finite size effects induced changes on material properties.	K6
CO-5	Learnt the application of nanotechnology	K1

**Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	S	M	S	M	S	M	M
CO-2	S	M	S	M	M	M	M	S
CO-3	S	S	M	M	S	S	S	M
CO-4	S	M	M	M	S	M	S	S
CO-5	S	M	S	S	S	S	M	M

**S- STRONG M-MEDIUM**

Semester	<b>II</b>	<b>Communication Electronics</b>	Hours	<b>5</b>
Course code	<b>21P2PHE04</b>		Credits	<b>4</b>

### **Course Objectives:**

- To study the different types of communication systems.
- To give an exposure to various types of computer communications.
- To understand the concepts and techniques involved in communication by optical fiber
- To learn the concept of Radar and Navigation.
- To acquire the knowledge of Satellite and mobile communication.

### **UNIT – I: Modulation Systems & Digital data Carrier systems**

**Modulation Systems:** Sampling theorem – Low Pass and Band Pass signals - Pulse Amplitude Modulation - Pulse Frequency Modulation - Pulse Time Modulation - Pulse Position Modulation - Pulse Width Modulation.

**Digital data Carrier systems:** Amplitude shift keying - Frequency shift keying – Phase shift Keying - Pulse Code Modulation - Multiplex transmission - Frequency and Time Division Multiplexing.

### **UNIT – II: Computer Communication System**

Types of networks - Design features of computer communication networks – ISDN – LAN - Time Division Multiple Access (TDMA) - Frequency division multiple Access (FDMA) – ALOHA - Slotted ALOHA - Carrier sense multiple Access - CDMA - WCDMA.

### **UNIT – III: Fiber Optic Communication system**

Fiber optics - Different types of fiber - Step index and graded index fibers – Fiber Losses - Optical sources and detectors (qualitative only) - Power launching and coupling -Sources to power launching – Fiber joints - Splicing techniques - General optical communication systems.

### **UNIT – IV: Radar and Navigation**

Basic radar System – Pulsed radar System – Moving target indicator – CW Doppler effect – Frequency modulated radar – Radio navigational aids – Radio direction finding – Long range navigation – Distance measuring equipments – Instruments landing System – Ground controlled approach System.

### **UNIT –V: Satellite and Mobile Communication**

Satellite Communication System – Satellite orbits – Basic Components – Constructional features – Commonly used frequency – Multiple access – Satellite Communication in India.

Cellular mobile Communication System – The Concept of Cell – Basic Cellular mobile radio system – The Cell Phone.

### ***Books for study***

1. Herbert Taub and Donald L. Shilling – Principles of Communication Systems, Tata McGraw - Hill Publishing Company Ltd, New Delhi, 1991.
2. Anokh Singh & A.K. Chhabra - Principle of Communication Engineering, S. Chand & Co. New Delhi.

### ***Books for Reference***

1. Sanjeev Gupta - Electronic Communication Systems, Khanna publications, New Delhi, 1995.
2. Govind P. Agrawal - Fiber-Optic Communication Systems, Third edition, John Wiley & sons, 2004.
3. Simon Haykin- Communication System, Third edition John Wiley & Sons, 1994.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the basic aspects of signals and systems analysis.	K2
CO-2	Show clear understanding of the basic concepts of data communications including the key aspects of networking.	K1
CO-3	Distinguish between the various modes of operation of Optical fibers.	K4
CO-4	Describe Target detection and tracking using radar systems.	K6
CO-5	Know Compare competitive satellite services and satellite access techniques.	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** – Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	M	S	M	M	M
CO-2	S	M	S	M	S	M	S	M
CO-3	S	S	S	M	M	S	M	M
CO-4	S	M	M	M	S	S	M	S
CO-5	S	S	M	M	S	M	S	S

**S- STRONG**

**M-MEDIUM**

Semester	III	<b>Modern Optics</b>	Hours	4
Course Code	21P3PHE05		Credits	4

### Course Objectives:

- To learn the knowledge of Interference and Coherence.
- To provide a broad overview of the various optical instruments and laser.
- To know about the nonlinear optical phenomena.
- To understand the magneto and electro optics.
- To describe the requirements needed for making a hologram.

### Unit-I: Interference and Coherence

**Multiple beam interferometry:** Multiple reflections from a plane parallel film - Fabry-Perot Etalon - Fabry-Perot interferometer - Resolving power of a scanning Fabry-Perot interferometer and Fabry-Perot Etalon - Interference Filters.

**Coherence:** The line width - Spatial Coherence - Michelson Stellar interferometer – Optical Beats.

### Unit-II: Lasers

Basic principles - Spontaneous and Stimulated emissions - Components of a laser - Optical amplification - Resonator and Lasing Action - Types of Lasers - Solid State Laser - Nd-YAG Laser - Gas Lasers – He-Ne Laser - CO<sub>2</sub> Laser - Semiconductor Laser - Liquid Laser - Dye Laser – Chemical Lasers – HF Laser –Applications of Laser.

### Unit-III: Holography

Principles of holography – Recording and Reconstruction of image – OFF-Axis holography – Holograms – Important properties of holograms – Classifications of hologram – Thin hologram – Transmission hologram – Rainbow hologram – 360<sup>0</sup> holograms – Applications of hologram.

### Unit-IV: Non-Linear Optics

Basic Principles - Harmonic Generation - Second Harmonic Generation - Phase Matching - Third Harmonic Generation - Optical Mixing - Parametric Amplification - Self-Focusing of Light .

### Unit-V: Magneto and Electro Optics

**Magneto - Optical Effects:** Zeeman Effect - Faraday Effect - Voigt Effect - Cotton-Mouton Effect - Kerr Magneto-Optic Effect.

**Electro - Optical Effects:** Stark Effect - Electric double refraction - Kerr Electro-Optic Effect - Pockels Electro - Optic Effect.



### **Books for Study:**

1. Optics by Ajoy Ghatak, 3rd Edition, Tata McGraw - Hill Publishing Co., New Delhi 2005.
2. Lasers and Non-Linear Optics by B.B. Laud, Wiley Eastern Ltd., New Delhi, 1985.

### **Books for Reference:**

1. A text book of Optics - N. Subramanian and Brijlal, Revised by M.N. Avadhanula S.Chand & Co. PVT. Ltd. New Delhi, 2008.
2. Optics – Eugene Hecht Fourth Edition, Pearson Education, New Delhi, 2007.
3. Fundamentals of Optics- M.G. Raj , Anmol Publications Pvt. Ltd., New Delhi, 1996.
4. F.A. Jenkins, H.E. White, Fundamentals Of Optics (4th Edition), McGraw- Hill Book Company, 1981.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Known the working principle of optical instruments.	K1
CO-2	Acquire Absorption and spontaneous and stimulated emission in two level systems.	K2
CO-3	Learn about the principles of nonlinear optics and origin of optical Non linearity.	K4
CO-4	Compare the principles of electro-optics & magneto optics for various Optical Effects.	K5
CO-5	Gain knowledge about the fundamentals of holography.	K2

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	M	S	S	M	M	S
CO-2	S	M	S	M	M	S	S	S
CO-3	S	M	M	S	S	S	M	S
CO-4	S	M	S	S	S	S	M	S
CO-5	S	M	M	S	S	M	M	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>III</b>	<b>Nonlinear Dynamics</b>	<b>Hours</b>	<b>4</b>
Course Code	<b>21P3PHE06</b>		<b>Credits</b>	<b>4</b>

### **Course Objectives:**

- To provide an advanced level learning of Nonlinear Dynamics, Chaos and applications.
- To cover basic nonlinear differential equations, one and two dimensional flows, stability, phase plane, limit cycles, bifurcations, chaos, fractals.
- To know about integrable dynamical systems and solitons will also be covered.
- To understand series of numerical experiments in Python on understanding the fixed points, limit cycles, chaos, calculation of Lyapunov exponents, power spectrum, synchronization and controlling of chaos.
- To learn the concepts of Integrable Systems in different system.

#### **Unit-I: Dynamical Systems**

Linear and nonlinear differential equations - Autonomous and nonautonomous systems - Phase trajectories, phase-space, flows and limit sets – Classification of equilibrium points in planar systems – Invariant manifolds - stable, unstable and center manifolds - Periodic orbits, limit cycles, Poincaré maps and Floquet theory - Poincaré-Bendixson theorem .

#### **Unit-II: Bifurcations and Chaos**

Bifurcation theory – Local and global bifurcations - Three dimensional autonomous systems and chaos, Lyapunov exponents – Torus – quasi-periodic attractor – Poincaré map – Period doubling cascades – Feigenbaum number – characterization – Homoclinic orbits, heteroclinic orbits – Strange attractor and strange non-chaotic attractor.

#### **Unit-III: Discrete Dynamics Systems, Synchronization and Controlling of Chaos**

Linear and nonlinear discrete dynamics systems – complex iterated maps – Logistic map – Linear stability – Period doubling phenomena and chaos – Lyapunov exponents – Chaos synchronization – Synchronization manifold and stability properties – Controlling of Chaos – applications.

#### **Unit-IV: Fractals, Cellular automata and Pattern formation**

Dimension of regular and chaotic attractors – Fractals – Koch curve – Cantor set – Sierpinski set – Julia and Mandelbrot sets – Cellular automata – Self organized criticality – Stochastic resonance – pattern formation – Time series analysis.

#### **Unit-V: Integrable Systems**

Finite dimensional integrable systems - Linear and nonlinear dispersive systems – Cnoidal and solitary waves - The Scott Russel phenomenon and derivation of Korteweg-de Vries (KdV) equation – Fermi – Pasta – Ulam (FPU) numerical problem – FPU recurrence phenomenon – Numerical experiments of Zabusky and Kruskal.

## Books for Study:

1. M. Lakshmanan and S. Rajasekar, Nonlinear Dynamics: Integrability Chaos and Patterns (Springer-Verlag, Berlin, 2003)

## Books for Reference:

1. S. H. Strogatz, Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering, II Edition (CRC Press, 2014)
2. A. Fuchs, Nonlinear Dynamics in Complex Systems: Theory and Applications for the Life-, Neuro- and Natural Sciences (Springer, 2013)
3. C. Misbah, Complex Dynamics and Morphogenesis: An Introduction to Nonlinear Science (Springer, 2017)
4. M. Lakshmanan and K. Murali, Chaos in Nonlinear Oscillators, (World Scientific, Singapore, 1996)

## Course Outcome:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Discussion on the linear and nonlinear resonances and resonance in driven and damped nonlinear oscillator.	K2
CO-2	Explain the linear stability analysis and the Illustration of basic bifurcations with suitable examples.	K3
CO-3	Definition of chaos in dynamical systems and discussion on the various characterizing tools such as power spectrum, Lyapunov exponents etc.	K1
CO-4	Discriminate a detailed account of the stability of fixed points and the period doubling route to chaos in logistic map.	K4
CO-5	Carry out Painlevé singularity analysis of a given second order ordinary differential equations.	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	M	S	S	M	M	S
CO-2	S	M	M	S	S	S	M	M
CO-3	S	M	S	S	S	M	M	M
CO-4	S	S	S	M	M	S	M	S
CO-5	S	M	S	S	S	S	M	M

**S- STRONG**

**M-MEDIUM**

Semester	<b>IV</b>	<b>Crystal Growth and Thin Films</b>	Hours	<b>5</b>
Course Code	<b>21P4PHE07</b>		Credits	<b>4</b>

### Course Objectives:

- To provide the basic knowledge of the crystal growth and thin film techniques.
- To understand the theories of crystal growth.
- To study the thin film deposition techniques.
- To study the characterization of growing crystal and thin film.
- To learn Optoelectronic devices and Application of ferromagnetic thin films.

### Unit – I: Nature and Crystal Growth Theory

Crystalline state – Chemical bonding - Nature of bonding - Covalent, Ionic, Metallic, Hydrogen and Vanderwaals bonds - Phase equilibrium – Components of system – Single component system - Binary compounds with congruent melting – Solid solutions – Solid-Liquid equilibrium - Liquid-Vapour equilibrium.

### Unit – II: Crystal Growth Techniques

**Solution growth technique:** Low temperature solution growth: Solution –Solubility – Seed preparation and mounting – Slow cooling and slow evaporation methods.

**Gel growth technique:** Principle –Various types –Structure of gel – Experimental procedure – Advantage of gel method.

**Melt growth technique:** Bridgmann technique- Czochralski technique – Experimental arrangement – Growth process.

**Vapour Deposition:** Fundamentals of Physical Vapour Deposition – Chemical Vapour Deposition (CVD).

### Unit – III: Preparation of Thin-film

Classifications of vacuum ranges – Kinetic aspects of gases in a vacuum chamber – Production of vacuum – Thin film – Epitaxy – Types of Epitaxy.

**Different Growth Techniques:** Liquid Phase Epitaxy – Vapour Phase Epitaxy – Molecular Beam Epitaxy – Metal Organic Vapour Phase Epitaxy – RF & DC Sputtering – Pulsed Laser Deposition.

**Thickness Measurement:** Microbalance technique – Photometry – Ellipsometry.

### Unit – IV: Thin film Deposition Techniques

Thin films – Vacuum technology deposition techniques –Physical methods –Resistive heating, Electron beam gun and Laser gun evaporation –Chemical methods –Spray pyrolysis –Preparation of transport conducting oxides – Spin coating.

### Unit – V: Characterization and Applications

**Characterization of grown crystals:** X-ray Laue and Powder diffraction - SEM - TGA and DTA to analyses thermal properties.

**Optoelectronic devices:** LED - Solar cell – Micro Electromechanical Systems (MEMS) – Thin film capacitor.

**Application of ferromagnetic thin films:** Data storage, Giant Magneto Resistance (GMR) – Fabrication and Characterization of thin film Transistor.

**Book for study:**

1. P. Santhana Ragavan, P.Ramasamy, Crystal Growth and Processes, KRU Publications, Kumbakonam, 2000.
2. A. Goswami, Thin Film Fundamentals, New Age International (P) Ltd. Publishers, New Delhi, 1996.

**Book for Reference:**

1. K.L. Chopra, Thin Film Phenomena, McGraw- Hill book company, New York, 1969.
2. P.Ramasamy, ISTE Summer school Lecture Notes, Crystal Growth Centre, Anna University, Chennai, 1991.
3. Boyan Mutaftschiev, Fundamentals and Crystal Growth. Springer-Verlag New York, 2001.

**Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the importance of the crystalline order in solids.	K2
CO-2	Criticize the crystal growth mechanisms and techniques.	K5
CO-3	Design, preparation and growth techniques of thin films.	K6
CO-4	Classify the Various thin films deposition techniques.	K5
CO-5	Explain the characterization and techniques for crystal and thin films.	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

**Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	S	S	M	M	S
CO-2	S	M	S	S	S	S	S	S
CO-3	S	M	S	M	M	S	S	M
CO-4	S	M	M	S	S	S	M	M
CO-5	S	M	M	S	S	M	M	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>IV</b>	<b>Instrumental Methods of Analyses</b>	Hours	<b>5</b>
Course Code	<b>21P4PHE08</b>		Credits	<b>4</b>

### **Course Objectives:**

- To acquire the knowledge of Errors and Analysis of Experimental Data.
- To provide the basic principle, working and instrumentation of various analytical tools.
- To study the electronic, electrical, optical, thermal properties of materials.
- To learn the concepts of X-ray analysis of samples.
- To provide the knowledge on the types of Electrical Methods.

### **Unit-I: Errors and Analysis of Experimental Data**

Types of errors – Mean, variance and standard deviation, standard deviation of standard deviation – sampling techniques – Chi square test. Experimental Stress Analysis: Stress analysis by strain gauging- high temperature strain gauge techniques – photoelasticity and holography.

### **Unit-II: Thermal Analysis**

Introduction – Thermo gravimetric analysis – Instrumentation of weight loss and decomposition products – Differential scanning calorimetric – instrumentation – Specific heat capacity measurements – Determination of thermo chemical parameters – Differential thermal analysis – Basic principles – Melting point determination and analysis.

### **Unit-III: X-ray Analysis**

Single Crystal and powder diffraction – Diffractometer – Interpretation of diffraction patterns – Indexing – Unknown and phase identification – Double and four crystal Diffractometer for epitaxial characterization – Lattice mismatch – Tetragonal distortion – Thin film characterization – X-ray fluorescence spectroscopy – uses.

### **Unit-IV: Optical Methods and Electron Microscopy**

Photoluminescence – Light-matter interaction – Fundamental transitions – Excitons – Instrumentation – electroluminescence – instrumentation – Photo reflectance electronic transitions – Behavior of electronic transitions as a function of electric field. Principles of TEM, EDAX, AFM – Instrumentation – sample preparation – analysis of materials – study of dislocations – ion implantation – uses.

### **Unit-V: Electrical Methods**

Hall Effect – carrier density – resistivity – two probe and four probe methods – scattering mechanism – CV characteristics – Schottky barrier capacitance – impurity concentration – electrochemical CV profiling – limitations.

## Books for Study:

1. Instrumental Methods of Analysis - Willard.M, Steve.D, CBS Publishers, New Delhi, 1986.

## Books for Reference:

1. Electron Microscopy and Microanalysis of Crystalline materials - Stradling, R.A, Applied Science Publishers, London, 1979.
2. Electron microscopy and Microanalysis of Crystalline Materials - Belk.J.A, Applied Science Publishers, London, 1979.
3. Modern Metallographic Techniques and their Applications - Philips V.A, Wiley Interscience, 1971.

## Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Explain the types of errors in experimental methods of analysis.	K4
CO-2	Understand the principle and working of thermal methods of analysis such as thermo gravimetric analysis and differential scanning calorimetric analysis and apply for material analysis.	K2
CO-3	Apply x-ray diffraction method for analysing crystalline materials.	K3
CO-4	Utilize luminescence methods and electron microscopy methods for material analysis and their application	K2
CO-5	Apply various analytical methods for electrical property measurement.	K4

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

## Mapping with Programmes Specific Outcomes:

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	S	M	S	S	S	M	S
CO-2	S	M	M	S	S	M	M	M
CO-3	S	M	S	M	M	S	M	S
CO-4	S	M	M	S	S	M	M	S
CO-5	S	M	S	M	M	S	M	S

**S- STRONG**

**M-MEDIUM**

## EDC - Extra Disciplinary Courses

Semester	<b>II</b>	<b>Medical Physics</b>	Hours	<b>5</b>
Course code	<b>21P2PHED1</b>		Credits	<b>4</b>

### Course Objectives

- To understand the basic knowledge of electrodes and biosensors.
- To know the various transducers and their working principles.
- To acquire the knowledge of blood pressure and its measurements
- To provide a basic idea about X-Rays and the hazards of radiation on human health.
- To learn the basic concept of Radioactivity and Endoscope

#### UNIT – I: Electrodes

Bioelectric signal - Electrode – Types of Electrodes – Micro Electrode, Surface Electrode and Needle Electrode - Biosensors. Osmosis – Diffusion and Viscosity in Human Physiology.

#### UNIT – II: Transducer

Transducers- Classification of transducers – Piezoelectric Transducer- Thermistors – Photoelectric type resistive transducer - Strain gauge Transducers – metallic wire transducer - LVDT

#### UNIT – III: Blood pressure measurements

Blood pressure measurements - Types of measurements – Direct and indirect measurements - Measurement of heart sound - Basic principles of ECG - The Stethoscope – Ultrasonic – display – Instrumentation – Application of ultrasound - MRI Scanner – Principle and working.

#### UNIT – IV: X- Ray Instrumentation

Basics of X-ray – X-ray tube, machine - Differences between Radiography and Fluoroscopy – Image Intensifiers - Application of X-ray - Basic principles of computer tomography - Application of CT.

#### UNIT – V: Radioactivity and Endoscope

Radioactivity – Theory of Radio Isotopes, Gamma rays and its Medical applications – Basic principle of Laser – Instrumentation – Basic principle of Endoscopes-types of Endoscope – Endoscopic laser coagulator.

#### ***Books for Study:***

1. R.S.Khandpur, Hand book of Biomedical Instrumentation, TMG, New Delhi, 2005.
2. Dr.M.Arumugham, Biomedical Instrumentation, Anuradha Agencies, Publishers, 2002.



### **Books for Reference:**

1. Leslie Cromwell, Fred J.Weibell and Erich A.Pfeiffer, Biomedical instrumentation and measurements.
2. A text book of bio physics R.N.Roy, Books and Allied (P) Ltd., 2001.
3. Prof.S.K.Venkatraman - Bio medical electronics & Instrumentation Galgotia Pub.Pvt. Ltd, 2002.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Observed types of electrodes and its uses.	K1
CO-2	Known various form of energy conversion by using transducers.	K2
CO-3	Analyze technique involved in blood pressure measurements as well as instrumentation applications'	K4
CO-4	Discuss the knowledge of X –ray tube and computer tomography.	K5
CO-5	Utilize the various medicinal field applications.	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	M	S	M	S	S
CO-2	S	S	M	S	S	S	S	S
CO-3	S	S	S	S	S	M	S	S
CO-4	S	M	M	M	S	M	S	S
CO-5	S	M	M	M	S	M	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>II</b>	<b>Renewable Energy Sources</b>	Hours	<b>5</b>
Course Code	<b>21P2PHED2</b>		Credits	<b>4</b>

### Course Objectives:

- To create awareness among students about the growing energy sources.
- To study the conventional sources of energy in various cells
- To know the applications of solar energy in current needs.
- To study the wind energy methods of proper utilization.
- To understand the various types of energy from biomass and biogas sources.

#### Unit – I: Energy sources and solar radiation

Energy sources and their availability – Renewable energy sources - Prospects and Advantages.

**Solar Radiation:** Solar constant – Solar radiation at the Earth’s surface – Solar radiation Geometry – Solar radiation measurements – Solar radiation data – Estimation of average solar radiation – Solar radiation of tilted surfaces.

#### Unit – II: Solar cells

Solar cells for direct conversion of solar energy to electric powers – Solar cell parameter – Solar cell electrical characteristics – Efficiency – Single crystal silicon solar cells – Polycrystalline silicon solar cells – Cadmium Sulphide solar cells.

#### Unit – III: Applications of solar energy

Solar water heating – Solar heating and cooling of building – Agricultural and Industrial process heat – Solar Distillation – Solar production of hydrogen – Solar Furnace – Solar Cooking – Solar green house.

#### Unit – IV: Wind Energy

Basic principles of wind energy conversion wind data and energy estimation – Basic components of wind energy conversion systems (WECS) - Types of wind machines – Generating systems – Schemes for electric generation – Generator control – Load control – Applications of wind energy.

#### Unit – V: Energy from Biomass and Biogas

**Biomass:** Biomass conversion Technologies – Wet and Dry process – Photosynthesis.

**Biogas generation:** Introduction – Basic process and energetic – Advantages of anaerobic digestion – Factors affecting bio digestion or generation of gas.

**Classification of Biogas plants:** Continuous and batch type – Dome and Drum types - Advantage and Disadvantage - Bio gas plants – KVIC - Biogas from wastes - Fuel properties of biogas - Utilization of biogas.

### **Books for study:**

1. G.D.Rai, Non-Conventional Energy Sources, Khauna Publications, New Delhi, 2005.
2. M.P.Agarwal, Solar Energy, S.Chand & Co.,

### **Books for Reference:**

1. S.P.Sukhatme - Solar Energy, TMH, 1998.
2. Kreith and Kreider - Principles of Solar Engineering, McGraw Hill Publication.
3. A.B.Meinel and A.P.Meinel - Applied Solar Energy.

### **Course Outcomes:**

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the renewable energy sources and solar radiations.	K2
CO-2	Gain the knowledge about principle and operation of solar cells.	K4
CO-3	Learn the different technologies of converting the solar energy and learn the different applications.	K1
CO-4	Translate the wind energy to electrical energy	K3
CO-5	Explain the concept of biomass energy and their classification.	K5

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### **Mapping with Programmes Specific Outcomes:**

PSO→ COs↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO-1	S	M	S	M	M	S	M	M
CO-2	S	M	M	S	S	S	S	S
CO-3	S	S	M	S	S	M	S	S
CO-4	S	M	M	M	S	S	S	S
CO-5	S	M	S	S	S	S	S	S

**S- STRONG**

**M-MEDIUM**

Semester	<b>II</b>	<b>Biophysics</b>	Hours	<b>5</b>
Course code	<b>21P2PHED3</b>		Credits	<b>4</b>

### **Course Objectives:**

- To acquire the basic knowledge of bonding and thermodynamics.
- To understand the knowledge of photobiology,
- To learn the membrane conductivity and radiation biology.
- To acquire the knowledge of instrumentation of biological studies.
- To know the basic idea of medical biophysics.

#### **Unit-I: Chemical bonds and Thermodynamics**

Atom – Molecule – Chemical bonds – Molecular interactions – Primary Chemical bond – Covalent bond – Ionic Bond – Secondary bond – Hydrogen bond – Vander walls bond. Thermodynamics – First and Second law of thermodynamics.

#### **Unit-II: Photobiology**

Nature of light – Wave and Particle nature of light – Radiation - Solar, UV and IR radiation – Absorption of light – Photo synthesis – De-Excitation – Singlet and triplet states – Spin property of electron – Fluorescence – Phosphoresence.

#### **Unit-III: Membrane conductivity and Radiation biology**

Diffusion – Biological Significance – Active transport – Mechanism and Significance – Osmosis – Electric Conductivity – Isotopes – Radioactivity – Alpha, Beta and Gamma radiation – Radioactive decay – Half life time – Detection of Radioactivity – GM counter – Biological use.

#### **Unit-IV: Instrumentation**

Microscopy – Compound Microscope – Phase Contrast Microscope – Electron Microscope – SEM – TEM – Hydrogen ion concentration – Colorimeter – pH meter – Chromatography – Types Chromatography – Paper , TLC, Column, GLC & HPLC– UV-Vis., IR, Raman, NMR and ESR Instrumentation.

#### **Unit-V: Medical Biophysics**

Electrocardiography (ECG) – Electromyography (EMG) – Electroencephelograph (EEG) – Phonocardiography (PCG) – Computer Tomography (CT) – X-Ray tube – X-Ray Machine – MRI Scanner.

### Book for Study:

1. Biophysics – Dr. S. Thiravia Raj, Saras Publication, Kanyakumari.
2. Biophysics Principles and Techniques – M A Subramanian, MJP Publishers, Chennai.
3. Biomedical Instrumentation – Dr. M. Arumugam, Anuradha Agencies, 2002.

### Book for Reference:

1. Biophysics – Vasantha Pattabbi and N. Gauthm, Narosa Publishing House, New Delhi.
2. Hand Book of Biomedical Instrumentation – R. S. Khandpur, TMG, New Delhi,

### Course Outcomes:

CO No.	Upon completion of this course, students will be able to	Knowledge Level
CO-1	Understand the different types bonding and thermodynamics.	K1
CO-2	Known the knowledge of Photobiology, Membrane Conductivity and radiation Biology.	K2
CO-3	Analyze Biological significance involved in Radiation.	K4
CO-4	Gain the knowledge of bio physics instrumentation	K5
CO-5	Demonstrate the Medical instrumentation	K3

**K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** - Creation

### Mapping with Programmes Specific Outcomes:

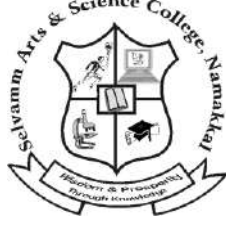
PSO→	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
COs↓								
CO-1	M	S	M	S	M	M	M	S
CO-2	S	M	M	S	S	S	S	M
CO-3	S	M	M	M	M	M	M	S
CO-4	S	M	S	S	S	S	S	S
CO-5	S	S	M	S	S	M	M	S

**S- STRONG**

**M-MEDIUM**

# செல்வம் கலை மற்றும் அறிவியல் கல்லூரி (தன்னாட்சி)

தேசியத் தரமதிப்பிட்டு சான்றிதழ் பெற்றது  
பல்கலைக்கழக மானியக்குழுவால் 2(f) மற்றும் 12(B) அங்கீகாரம் பெற்றது  
நாமக்கல் - 3



தமிழ்த்துறை

முதுகலைத் தமிழ்ப் பாடத்திட்டம்

தெரிவுசார் பாடமுறை (CBCS)

முழுநேரப் பாடத்திட்டம் மாணவர் சேர்க்கை 2021 – 2022

## முதுகலைத் தமிழ்

### தகுதி

முதுகலைத் தமிழ் இலக்கியத்தில் சேர்வதற்கு இளங்கலையில் B.A. தமிழ் / B.Lit. தமிழ் இலக்கியம் முடித்திருத்தல் சிறப்பு அல்லது இளநிலை ஏதாவது ஒரு பட்டத்தில் நான்கு பருவத்திலும் பொதுத்தமிழ் பயின்று 50 விழுக்காடு மதிப்பெண் பெற்றிருத்தல் வேண்டும். இளங்கலைப் பட்டப்படிப்பு முழுநேரம் அல்லது பகுதி நேரமாக முடித்திருந்தாலும் சேரலாம்.

### படிப்புக் காலம்

முதுகலைத் தமிழ் இலக்கிய படிப்புக் காலம் இரண்டாண்டுகள் ஆகும். ஒவ்வொரு ஆண்டுக்கும் இரண்டு பருவங்கள் உண்டு.

### தேர்வு

முதுகலைத் தமிழ் இலக்கியத்தில் ஒவ்வொரு ஆண்டுக்கும் இரண்டு பருவங்கள் உண்டு. ஒவ்வொரு பருவத்திற்கும் உள்ள ஒவ்வொரு தாளுக்கும் 25 மதிப்பெண்கள் அக மதிப்பீடாகவும் 75 மதிப்பெண்களுக்குத் தேர்வு எழுத வேண்டும்.

### தேர்வு முறைகள்

முதுகலைத் தமிழ் இலக்கியத்தில் எதிர்காலத்தில் பயன்பெறும் முறையில் தெரிவுசார் பாடமுறை (CBCS) பின்பற்றப்படுகிறது. மாணவர்களின் விருப்பத்திற்காகத் தெரிவுசார் பாடங்களாகத் சைவசித்தாந்தம், படைப்பிலக்கியம், அகராதியியல், ஊடகவியல், போன்ற பாடங்கள் கொடுக்கப்பட்டுள்ளன.

### வினாத்தாள் அமைப்பு

காலம் : 3 மணி நேரம்

மொத்த மதிப்பெண்கள் : 75

### பகுதி - அ

10X1=10

அனைத்து வினாக்களுக்கும் விடையளித்தல் வேண்டும் ஒவ்வொரு அலகிலும் இரு வினாக்கள் வீதம் 10 ஒரு மதிப்பெண் வினாக்கள் அமைதல் வேண்டும்.

### பகுதி - ஆ

5X5=25

அனைத்து வினாக்களுக்கும் விடையளிக்க வேண்டும். ஒவ்வொரு அலகிலும் ஒரு சிறு வினா கட்டாயமாகக் கேட்கப்பட வேண்டும். (இது அல்லது அது என்ற முறையில் அமைதல் வேண்டும்.

பகுதி - இ

5X8=40

அனைத்து வினாக்களுக்கும் விடையளிக்க வேண்டும். ஒவ்வொரு அலகிலும் ஒரு பெரு வினா கட்டாயமாகக் கேட்கப்பட வேண்டும். (இது அல்லது அது என்ற முறையில் அமைதல் வேண்டும்.

**குறிப்பு**

பகுதி 'அ'வில் 1 முதல் 10 வரையிலும்

பகுதி 'ஆ'வில் 11 முதல் 15 வரையிலும்

பகுதி 'இ'யில் 16 முதல் 20 வரையிலும்

வினா எண்கள் அமைய வேண்டும்.

**குறைந்தபட்ச தேர்ச்சி மதிப்பெண்**

**அகமதிப்பீட்டு மதிப்பெண் - 25 மதிப்பெண்கள்**

தேர்வு - 15

ஒப்படைப்பு - 05

கருத்தரங்கம்(வகுப்பெடுத்தல்) - 05

தன்னாட்சி பருவத்தேர்வு - 75 மதிப்பெண்கள்

மொத்த மதிப்பெண் - 100 மதிப்பெண்கள்

**குறைந்தபட்ச தேர்ச்சி மதிப்பெண்கள்**

அகமதிப்பீட்டுத் தேர்வு - (25% of 25 மதிப்பெண்கள்) 12 மதிப்பெண்கள்

தன்னாட்சி பருவத்தேர்வு - (75% of 75 மதிப்பெண்கள்) 38 மதிப்பெண்கள்

மொத்தம் - 50 மதிப்பெண்கள்



## திட்டக்கட்டுரை - மதிப்பெண்கள்

மொத்தம் - 100 மதிப்பெண்கள்

### திட்டக்கட்டுரை நோக்கம்

மாணவர்களின் திட்டமிடல், அறிவுசார் பணி, தொகுத்தும், பகுத்தும், திறனாய்ந்து எழுதுதல் ஆகிய திறன்களை வளர்த்தல்.

இலக்கணம், இலக்கியம், கவிதைகள், ஒப்பீடு, பண்பாட்டு மானிடவியல் - நாட்டுப்புறவியல் - இதழியல் - ஊடகங்கள் பற்றிய பொருள்களில் ஏதேனும் ஒரு தலைப்பை தேர்ந்தெடுத்து 50 - 70 பக்கங்களுக்குள் திட்டக்கட்டுரை எழுதுதல் வேண்டும்.

### விரிவாக்கச் செயல்பாடு

முதுகலைத் தமிழ் இலக்கிய மாணவர்கள் பொது மக்களின் நலன்களின் மீது அக்கறைக் கொண்டு இரண்டு வருடப் படிப்புக் காலத்தில் சமூக சேவை செய்ய வேண்டும். இதற்காக அறுபது மணிநேரம் மாணவர்கள் பொதுமக்களுக்காக உழைக்க வேண்டும். இதற்கான மதிப்பெண் 100. மாணவர்களின் செயல்பாட்டைப் பொறுத்து மதிப்பெண்கள் வழங்கப்படும். இச்செயல்பாடு மூலம் மாணவர்களின் மனநிலை விரிவுபடுத்துவதோடு பொது மக்களின் வாழ்வாதாரம் வளம் பெறும்.

## Program Specific Outcomes (PSOs)

PSO1	தமிழ் மொழியின் இலக்கண வகைகளையும் அதன் வரலாற்று அடிப்படையில் ஆசிரியர் கருத்தக்களையும் வெளிப்படுத்தி மொழிகளை கையாளும் விதத்தினை அகராதியியல் நோக்கி ஆராய்வதாகும்.
PSO2	பழங்கால தமிழர்களின் வாழ்வியல் முறைகளை கற்று உணர்ந்து உரைநடை இலக்கியமான காப்பிய வகைகளை அறிந்து கொண்டும் சிற்றிலக்கிய பண்புகளையும் அற நெறி சிந்தனைகளையும் இன்றைய வாழ்வியல் கருத்தோடு ஒப்பிட்டு திறன் அறிதல் மூலமாக பகுத்து ஆராய்ந்து கொள்ளுதல்.
PSO3	பக்தி இலக்கியங்கள் தொடர்பான சித்தாந்தக் கருத்துக்களை அறியச் செய்வதோடு பிறநாட்டு அறிஞர்களின் கருத்துக்களையும் பிற சமய சார்ந்த சிந்தனைகளை கற்று உணர்ந்து மனித வாழ்வின் உண்மை தன்மையினை அறிந்து கொண்டனர்.
PSO4	பெரியார் போன்ற தத்துவ ஞானிகளின் கருத்துக்களை தற்கால மாணவர்கள் உணர்ந்து கொள்ளும் வகையில் வாழ்வியல் தொடர்பான உண்மைகளை தெளிவு படுத்திக் கொண்டனர். இலக்கியங்களை அடிப்படையாக கொண்டு நூல்களின் மதிப்பீடுகளை திறனாய்வு செய்து தனது ஆய்வு அறிவினை வளர்த்து கொள்கின்றனர். கலைகளில் ஒன்றான நுண்கலைகளை கற்று உணரும் வகையிலும், நாட்டுப்புறவியல் போன்ற நுட்பமான கலைத்திறனை வளர்த்துக் கொண்டனர்.
PSO5	தற்கால எழுத்தாளர்களின் கருத்துக்களை உள்வாங்கி அதனை தன் உணர்வுகளுக்கு ஏற்றவாறு கவிதை, சிறுகதை, நாவல், நாடகம், போன்ற துறைகளில் மாணவர்கள் தன் படைப்பாற்றல் திறனை மேம்படுத்திக் கொண்டனர். ஊடகம், அறிவியல் வளர்ச்சி, கலைச்சொல் உருவாக்கம் போன்ற பல்வேறு துறைகளில் ஊக்கப்படுத்துவதோடு உயர்கல்வி பயிலவும் போட்டித்தேர்வுகளில் பங்குபெறும் விதமாக அமைந்துள்ளது.

Sem	Core /Elective	Course Code	Course Title	Hrs/ week	Credit	Exam Hrs	Marks		Total
							CIA	ESE	
I	Core-I	21P1TA01	தொல்காப்பியம் எழுத்து	6	5	3	25	75	100
	Core-II	21P1TA02	இக்கால இலக்கியம்	6	5	3	25	75	100
	Core-III	21P1TA03	தமிழ் இலக்கண வரலாறு	6	5	3	25	75	100
	Core-IV	21P1TA04	சிறுநிலக்கியங்கள்	6	5	3	25	75	100
	Core - Elective-I	21P1TAE01	சைவ சித்தாந்தம்	6	4	3	25	75	100
		21P1TAE05	தமிழ்நெறி வழிபாட்டியல்						
<b>மொத்தம்</b>				<b>30</b>	<b>24</b>				<b>500</b>

Sem	Core /Elective	Course Code	Course Title	Hrs/ week	Credit	Exam Hrs	Marks		Total
							CIA	ESE	
II	Core-V	21P2TA05	தொல்காப்பியம் சொல்லதிகாரம்	6	4	3	25	75	100
	Core-VI	21P2TA06	காப்பியங்கள்	6	4	3	25	75	100
	Core-VII	21P2TA07	சமய இலக்கியங்கள்	4	4	3	25	75	100
	Core-VIII	21P2TA08	அற இலக்கியங்கள்	4	4	3	25	75	100
	Core Elective-II	21P2TAE02	படைப்பிலக்கியம்	4	4	3	25	75	100
		21P2TAE06	நாட்டுப்புறவியல் கோட்பாடுகள்						
	Comman	21P2HR01	மனித உரிமைகள்	2	2	3	25	75	100
		21P2xxxxxx	பயன்பாட்டுத் தமிழ்	4	4	3	25	75	100
<b>மொத்தம்</b>				<b>30</b>	<b>26</b>				<b>700</b>

xxxxxx - corresponding department course code

Sem	Core /Elective	Course Code	Course Title	Hrs/ week	Credit	Exam Hrs	Marks		Total
							CIA	ESE	
III	Core-IX	21P3TA09	தொல்காப்பியம் பொருளதிகாரம்	6	5	3	25	75	100
	Core-X	21P3TA10	அக இலக்கியங்கள்	6	5	3	25	75	100
	Core-XI	21P3TA11	இலக்கியத் திறனாய்வியல்	6	5	3	25	75	100
	Core-XII	21P3TA12	ஆராய்ச்சி நெறிமுறைகள்	6	5	3	25	75	100
	Core - Elective- III	21P3TAE03	அகராதியியல்	6	4	3	25	75	100
		21P3TAE07	படைப்பிலக்கியம்						
			21P3TAI03	INTERSHIP*	*	#			
<b>மொத்தம்</b>				<b>30</b>	<b>24</b>				<b>500</b>

Sem	Core /Elective	Course Code	Course Title	Hrs/ week	Credit	Exam Hrs	Marks		Total	
							CIA	ESE		
IV	Core-XIII	21P4TA13	புற இலக்கியங்கள்	5	5	3	25	75	100	
	Core-XIV	21P4TA14	ஒப்பிலக்கியம்	5	4	3	25	75	100	
	Core-XV	21P4TA15	பெரியாரியல்	5	4	3	25	75	100	
	Core-XVI	21P4TA16	தமிழர் நுண்கலைகள்	5	4	3	25	75	100	
	Core Elective-IV	21P4TAE04	ஊடகவியல் /	5	4	3	25	75	100	
		21P4TAE08	வாழ்வியல் பண்பாட்டுக்கல்வி							
			21P4SSA01	Soft Skills	2	1	3	25	75	100
			21P4TAPR01	ஆய்வேடு	3	3		25	75	100
			21P4EX01	விரிவாக்கச் செயல்பாடு	(40)**	1	--	--	--	--
	<b>மொத்தம்</b>				<b>30</b>	<b>26</b>				<b>700</b>

\* 15 DAYS - I YEAR VACATION LEAVE (OR) II SEMESTER LEAVE – REPORT WILL SUBMIT IN III SEMESTER

# - COMMANDED / HIGHLY COMMANDED/ WILL BE, BASED ON REPORT & VIVA VOICE EXAMINATION

\*\* Out Side the class Hours

TOTAL HRS. – 120

CREDIT - 100

TOTAL HOURSE - 2400

முதல் பருவம்  
தாள் - 1

தொல்காப்பியம் எழுத்ததிகாரம்

Programme : MA.,

Semester : I

Core Paper : I (தொல்காப்பியம் எழுத்ததிகாரம்)

Course Code : 21P1TA01

No.of hrs : 6

No.of Credits: 5

நோக்கம் : எழுத்துக்களின் வகைகளை அறிதல்.

நோக்கம் : எழுத்துக்கள் பிறக்கும் முறையை அறிதல்.

நோக்கம் : எழுத்துக்கள் புணரும் வகையை அறிதல்.

நோக்கம் : உயிர், மெய்யெழுத்துக்கள் மயங்கும் முறைகளை அறிதல்.

நோக்கம் : எண்ணுப்பெயரின் வகைகளை அறிதல்.

அலகு - 1

நூன் மரபு, மொழி மரபு, பிறப்பியல்

அலகு - 2

புணரியல், தொகை மரபு, உருபியல்.

அலகு - 3

உயிர் மயங்கியல்.

அலகு - 4

புள்ளி மயங்கியல்.

அலகு - 5

குற்றியலுகரப் புணரியல்.

பாடநூல்

1. சா.பாலசுந்தரம்

- தொல்காப்பியம் எழுத்ததிகாரம்,  
ஆராய்ச்சிக் காண்டிகையுரை தொகுதி - 1,  
பெரியார் பல்கலைக்கழகம் ,  
சேலம் - 11.

பார்வை நூல்கள்

1. வே. வேங்கடராசலு ரெட்டியார்

- தொல்காப்பிய எழுத்ததிகார ஆராய்ச்சி  
சென்னைப் பல்கலைக்கழகம்

2. சா. இன்னாசி,

- எழுத்தியல்,  
தமிழரசன் பதிப்பகம், பாளையங்கோட்டை.

3. செ.வை.சண்முகம்,

- எழுத்திலக்கணக் கோட்பாடுகள்,  
அனைத்திந்திய தமிழ் மொழியியல் கழகம்,  
அண்ணாமலை நகர், சிதம்பரம்.

பயன் : குறில், நெடில் ஒற்று இவற்றின் பாகுபாட்டை அறிந்துகொண்டனர்

பயன் : எழுத்துக்கள் பிறக்கும் முறையை அறிந்துகொண்டனர்.

பயன் : எழுத்துக்கள் எவ்வாறெல்லாம் புணருகின்றன என்பதை தெரிந்துகொண்டனர்.

பயன் : எழுத்துக்கள் எவ்வாறெல்லாம் மயக்கம் பெறுகின்றன என்பதை அறிந்துகொண்டனர்.

பயன் : எண்கள் புணரும் முறையை அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	தமிழ் மொழியில் உள்ள எழுத்துக்களின் வகைகளை கற்பதோடு மொழிகளை கையாளும் விதத்தை கற்றல்.	K2
CO-2	தமிழ் மொழியில் உள்ள எழுத்துக்களின் வகைகளையும் பிறமொழியைத் திறம்படக் கையாளும் முறையையும் கற்றல்.	K5
CO-3	மரபிலக்கத்தை புரிந்து கொண்டு தற்கால இலக்கணத்தை உருவாக்கலாம்.	K6
CO-4	தமிழ் எழுத்துக்கள் உச்சரிக்கும் முறைகளை கற்று மேடைப் பேச்சாற்றலை வளர்த்துக் கொள்ளலாம்.	K3
CO-5	தமிழில் பிழையின்றி எழுதும் கலையை வளர்த்துக் கொண்டனர்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	M	M	S
CO-2	S	M	M	M	S
CO-3	S	S	M	S	S
CO-4	S	M	M	S	S
CO-5	S	M	M	S	S

**S – Strong**

**M – Medium**

**தாள் - 2**  
**இக்கால இலக்கியம்**

**Programme : MA.,**

**Semester : I**

**Core Paper : II (இக்கால இலக்கியம்)**

**Course Code : 21P1TA02**

**No.of .Hrs : 6**

**No.of .Credits: 5**

**நோக்கம் :** மரபுக்கவிதையின் முறைகளைப் பண்டைய கவிஞர்கள் மூலம் அறியச்செய்தல்.

**நோக்கம் :** புதுக்கவிதையின் மூலமாக தற்காலக் கவிஞர்கள் சமுதாயத்தில் ஏற்படும் மாற்றங்களை உணர்த்துதல்.

**நோக்கம் :** மனித சமுதாயத்தை வழிநடத்துவதில் நாடகத்தின் முக்கியத்துவத்தைப் பண்டைய நாடகம் வழி உணர்தல்.

**நோக்கம் :** பல்வேறு காலகட்டத்தில் எழுந்த சிறுகதை ஆசிரியர்களின் கதைகளை மையமாகக்கொண்டு சமுதாய மாற்றத்தை வெளிப்படுத்துதல்.

**நோக்கம் :** சிறுகதையின் வளர்ச்சி நிலையான புதினத்தின் கட்டமைப்புகளை மாணவர்களுக்கு உணர்த்துதல்.

**அலகு - 1**

மரபுக்கவிதை

1. பாரதியார் - பாஞ்சாலி சபதம் (முழுவதும்)
2. பாரதிதாசன் - குடும்ப விளக்கு (முழுவதும்)

**அலகு - 2**

புதுக்கவிதை

1. சிற்பி - கண்ணாடிச் சிறகள்ள ஒரு பறவை
2. மு.மேத்தா - கண்ணீர்ப் பூக்கள் (முழுவதும்)

**அலகு - 3**

நாடகம்

1. இன்குலாப் - குறிஞ்சிப்பாட்டு
2. இரா.கோதண்டபாணி - சேதுக்கரையிலே

**அலகு - 4**

சிறுகதை

1. ஜெயகாந்தன் - இறந்த காலங்கள்
2. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிபிள்ளையும்
3. கு.ப.ரா - விடியுமா?

4. கு. அழகிரிசாமி - காற்று
5. இந்திரா பார்த்தசாரதி- நாசகார கும்பல்
6. சுந்தர ராமசாமி - பல்லக்குத் தூக்கிகள்
7. கி. ராஜநாராயணன் - கதவு
8. கு. சின்னப்பாரதி - கௌரவம்

#### அலகு - 5

##### புதினம்

1. மு.மேத்தா - சோழநிலா
2. சி.சு. செல்லப்பா - வாடிவாசல்

##### பாடநூல்கள்

1. பாரதியார் - பாஞ்சாலி சபதம், காலச்சுவடு பதிப்பகம், சென்னை.
2. பாரதிதாசன் - குடும்ப விளக்கு, மணிவாசகர் பதிப்பகம், சென்னை.
3. சிற்பி - கண்ணாடிச் சிறகுகள் ஒரு பறவை, கவிதா பதிப்பகம், சென்னை.
4. மு.மேத்தா - கண்ணீர்ப் பூக்கள், கவிதா பதிப்பகம், சென்னை.
5. இன்குலாப் - குறிஞ்சிப்பாட்டு, காலச்சுவடு பதிப்பகம், சென்னை.
6. சி.சு.செல்லப்பா - வாடிவாசல் காலச்சுவடு பதிப்பகம், சென்னை.
7. மு.மேத்தா - சோழநிலா கவிதா பதிப்பகம், சென்னை.
8. ஜெயகாந்தன் - இறந்த காலங்கள் கவிதா பதிப்பகம், சென்னை.
9. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிபிள்ளையும் உதயம் பதிப்பகம், சென்னை.
10. கு.ப.ரா - விடியுமா? காலச்சுவடு பதிப்பகம், சென்னை.
11. இந்திரா பார்த்தசாரதி - நாசகார கும்பல் கவிதா பதிப்பகம், சென்னை.
12. கு. அழகிரிசாமி - காற்று காலச்சுவடு பதிப்பகம், சென்னை.
13. சுந்தர ராமசாமி - பல்லக்குத் தூக்கிகள் காலச்சுவடு பதிப்பகம், சென்னை.



14. கி. ராஜநாராயணன் - கதவு அன்னம்  
அகரம் பதிப்பகம், தஞ்சாவூர்.
15. கு. சின்னப்பாரதி - கௌரவம்  
பாவை பதிப்பகம், சென்னை.

#### பார்வை நூல்கள்

1. க. பூர்ணசந்திரன், - கவிதையியல்,  
உலகத்தமிழாராய்ச்சி நிறுவனம், சென்னை.
2. கி.வா. ஜகந்நாதன் - கவிபாடலாம்,  
அல்லயன்ஸ் கம்பெனி இராமகிருஷ்ணா மடம்  
சாலை, மயிலாப்பூர், சென்னை.
3. வல்லிக்கண்ணன் - புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்,  
அன்னம் வெளியீடு,  
சிவகங்கை.
4. பாலா - புதுக்கவிதை ஒரு புதுப்பார்வை,  
அகரம் வெளியீடு, சும்பகோணம்.
5. கா. சிவத்தம்பி - தமிழில் சிறுகதையின் தோற்றமும் வளர்ச்சியும்,  
தமிழ்ப்புத்த காலயம், சென்னை.
6. தா. வே. வீராசாமி, - தமிழ் நாவல் இயல்,  
தமிழ்ப் புத்தகாலயம், சென்னை.
7. மா.இராமலிங்கம், - இருபதாம் நூற்றாண்டு தமிழ் இலக்கியம்  
தமிழ்ப்புத்தகாலயம், சென்னை.
8. நா.வானமாமலை - புதுக்கவிதை முற்போக்கும் பிற்போக்கும்,  
மக்கள் வெளியீடு, சென்னை.

**பயன்** : மரபுக்கவிதையின் அமைப்பு முறைகளை முற்கால கவிஞர்களின் வழி கற்று  
உணர்ந்தனர்.

**பயன்** : புதுக்கவிதையின் வழி சமுதாய நிலைகளை அறிந்துகொண்டனர்.

**பயன்** : மனித உணர்வின் வெளிப்பாடானது நாடகம் என்பதை அறிந்துகொண்டனர்.

**பயன்** : காலந்தோறும் சிறுகதை ஆசிரியர்களின் எழுத்து முறைகளை அறிந்துகொண்டனர்.

**பயன்** : புதினத்தின் வரைமுறைகளையும் கருத்துச் செறிவையும் அறிந்துகொண்டனர்

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	மரபுக்கவிதை கற்பதன் மூலம் மாணவர்களின் கவிதை இலக்கண முறை அமைவதை கற்றுக் கொண்டனர்.	K2
CO-2	புதுக்கவிதையை வாசிப்பதன் மூலம் மாணவர்களின் கற்பனை ஆற்றல் விரிவடைவதுடன் புதியப் படைப்புகளுக்கு வழி வகை செய்கிறது.	K6
CO-3	நாடக இலக்கியத்தைக் கற்பதன் மூலம் கதாபாத்திரங்களின் முக்கியத்துவத்தை அறிந்து கற்பனை வளம் பெருகும்.	K5
CO-4	சிறுகதைகள் பற்றி அறிந்துக்கொள்ளுவதன் மூலம் மாணவர்களிடையே சிறுகதை எழுதும் ஆர்வம் வெளிப்படுகிறது.	K3
CO-5	தற்கால படைப்பாளர்களை நேரில் சந்தித்து அவர்களின் படைப்பு அனுபவங்களை அறிந்து கொள்வதன் மூலம் தங்களின் படைப்பாற்றலை மேம்படுத்திக் கொள்ள இயலும்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	M	M	S
CO-2	S	M	M	M	S
CO-3	M	S	M	S	S
CO-4	M	M	M	M	S
CO-5	M	M	M	S	S

**S – Strong M – Medium**

**தாள் - 3**  
**தமிழ் இலக்கண வரலாறு**

**Programme : MA.,**  
**Semester : I**  
**Core Paper : III (தமிழ் இலக்கண வரலாறு)**

**Course Code : 21P1TA03**  
**No.of hrs : 6**  
**No.of Credits: 5**

**நோக்கம் :** இலக்கணநூல்களின் தோற்றம் வளர்ச்சி, முதல் இலக்கண உரையாசிரியர்கள் குறித்து அறிந்துகொள்ளுதல்

**நோக்கம் :** அகம், புறம் இலக்கண வரலாற்று முறைகளை அறியச் செய்தல்.

**நோக்கம் :** சமயம் சார்ந்த இலக்கண வரலாற்று நூல்களை அறியச் செய்தல்.

**நோக்கம் :** 12 ஆம் நூற்றாண்டில் எழுந்த இலக்கண ஆசிரியர்களை மையமாகக் கொண்டு நூல் வரலாற்றை அறியச் செய்தல்.

**நோக்கம் :** தற்கால இலக்கண வரலாறு குறித்து அறியச் செய்தல்.

**அலகு - 1**

**பழந்தமிழ் இலக்கணங்கள்**

இலக்கணம் - வரையறை - சொல் வரலாறு - வேறு சொற்கள் (குறி, நூல், புலன், எழுத்து, இயல்பு, முறை, மரபு) - வட சொல் மரபு - இலக்கண இயல்புகள் - முந்துநூல் மரபு - பனம்பாரனார் பாயிரம் - முந்துநூல் - உரையாசிரியர்கள் தரும் வரையறைகள் - தொல்காப்பியமும் முந்துநூல் மரபு போற்றலும், அகத்தியம் - வரலாறு, அகத்தியம் பற்றிய குறிப்புகள் - பிற்கால அகத்திய நூல்கள்.

தொல்காப்பியம் - தொல்காப்பியர் வரலாறு - தொல்காப்பியப் பழமை- சமயம், காலம் - அதிகார அமைப்பு - ஐந்திலக்கண விரிவாக்க அடித்தளம். இறையனார் அகப்பொருள் - நூல்வகை - பெயர் விளக்கம் - பாயிரம் - நூல் அளவு - பகுதிநூல். பிற்கால முந்துநூல்கள் - அவிநயம் - காக்கைப்பாடினியம் - சங்கயாப்பு - சிறுகாக்கைப் பாடினியம் - நத்தத்தம் (நற்றத்தம்) - பல்காயம் - பன்னிருபடலம் - மயேச்சுரர் யாப்பு - இந்நூல்களின் இயல்புகள்.

**அலகு - 2**

**(7ஆம் நூற்றாண்டு முதல் 12ஆம் நூற்றாண்டு வரையிலான இலக்கணங்கள்)**

புறப்பொருள் வெண்பாமாலை - ஐயனாரிதனார் சமயம், காலம் - நூலமைப்பு .  
திணைகள் - வெட்சி - கரந்தை - வஞ்சி - காஞ்சி - நொச்சி - உழிஞை - தும்பை -  
வாகை - பாடாண் - தமிழரின் போர்முறை - வீரம் - புகழ் - தமிழ் நெறிவிளக்கம் - நூல்  
இயல்பு - நூலமைப்பு - அகப்பொருளின் சிறப்பு - அகப்பொருள் வேறுபாடுகள் -  
யாப்பருங்கலம் - காலம் - அமிர்தசாகரர் - நூலின் வரலாறு - சமயம் காலம், நூல்அமைப்பு,  
யாப்பருங்கலக்காரிகை - அமிர்தசாகரர் - நூல் அமைப்பு - நூலின் சிறப்பு - உறுப்பியல்  
(எழுத்து, அசை, சீர், தளை, அடி, தொடை) - செய்யுளியல் - பா வகை - வெண்பா  
(வெண்பா வகை இனங்கள்) - ஆசிரியப்பா - (ஆசிரியப்பா வகை - இனங்கள் ) - கலிப்பா  
- கலிப்பாவின் உறுப்புகள் (கலிப்பா வகை, இனங்கள்) - வஞ்சிப்பா (வஞ்சிப்பா வகை,  
இனங்கள்) - மருட்பா - (மருட்பா வகை) - யாப்பருங்கலத்துடனான, வேறுபாடுகள் - நூல்  
சிறப்பு.

**அலகு - 3**

வீரசோழியம் - புத்தமிழ்த்திரர் காலம் - சமயம் - நூல் அமைப்பு - நூலின் சிறப்பு -  
தனித்தன்மைகள் - தண்டியலங்காரம் - வரலாறு - காலம் - சமயம் - நூலின் அமைப்பு -  
அணி வகைகள் - தன்மையணி - உவமை - உருவகம் - தீவகம் - பின்வருநிலை -  
முன்னவிலக்கு - வேற்றுமை - ஒட்டு - அதிசயம் - தற்குறிப்பேற்றம் - ஏது - இலேசம் -  
நிரல் நிறை - சுவை - சிலேடை - விசேடம் - புகழ்நிலை - புகழாப்புகழ்ச்சி - சங்கீரணம்  
- பாவிகம் - தண்டி - வீரசோழியம் ஒப்பீடு. காவியதரிசன வழிநூல் - தண்டி தமிழ்  
ஆசிரியரே- காலமும் நூல் அமைப்பும் - இந்திரகாவியம் - இந்திரகாளியம் சமயம் காலம் -  
நூலின் அமைப்பு - நேமிநாதம் - குணவீரபண்டிதர் சமயம் - காலம் - நூல் இயல்பு -  
நூலின் சிறப்பு - வெண்பாப்பாட்டியல்-நூல் அமைப்பு -சிறப்பு.

**அலகு - 4**

**(12ஆம் நூற்றாண்டு இலக்கணங்களும் அதற்குப் பிந்தைய இலக்கணங்களும்)**

நன்னூல் - பவணந்தி முனிவர் - வரலாறு - சமயம் - காலம் - நூல் அமைப்பு  
- எழுத்து - பாயிரம் - எழுத்தியல் - பதவியல் - உயிரீற்றுப் புணரியல் - மெய்யீற்றுப்  
புணரியல் - உருபு புணரியல் - சொல் - பெயரியல், வினையியல், பொதுவியல், இடையியல்,

உரியியல் - அகப்பொருள் விளக்கம் - நாற்கவிராசநம்பி - வரலாறு - சமயம் - காலம் - நூல் இயல்பு - அகப்பொருள் சிறப்பு - களவு - கற்புநிலை - தமிழரின் அகத்திணை இயல்பு - வரைவின் சிறப்பு - களவியற்காரிகை - பெயர்க்காரணம் - நூல் இயல்பு. பன்னிருப்பாட்டியல் - ஆசிரியர்கள் - பாடுபொருள் - நவநீதப் பாட்டியல் முதலான நூல்கள் - நூல்களின் அமைப்பு - வரலாறு - சிறப்புக்கூறுகள் - தனித்தன்மைகள்.

## அலகு - 5

மாறனலங்காரம் - திருக்குருகைப் பெருமாள் கவிராயர் வரலாறு, நூல் இயல்பு. மாறனகப் பொருள் - மாறனகப் பொருள் பாப்பாவின் ஆசிரியர் - நூல் இயல்பும் பொருளும். சிதம்பரச் செய்யுட் கோவை - குமரகுருபரர் வரலாறு - நூற்செய்தி. பிரயோகவிவேகம் - சுப்ரமணிய தீட்சிதர் காலம் - நூல் இயல்பு. இலக்கணவிளக்கம் - வைத்தியநாத தேசிகர் வரலாறு - நூல் இயல்பு. இலக்கண விளக்கச் சூறாவளி சிவஞான முனிவர் - இலக்கணவிளக்கம் கண்டனம். இலக்கணக் கொத்து - சுவாமிநாததேசிகர் வரலாறு காலம் - நூல் இயல்பு தொன்னூல் விளக்கம் - வீரமாமுனிவர் வரலாறு - நூலியல்பு - வேறுபாடுகள். முத்துவீரியம் - முத்துவீர உபாத்தியாயர் சமயம் காலம் - நூல் இயல்பு. சுவாமிநாதம் - சுவாமிகவிராயர் வரலாறு - நூல் இயல்பு.

### பாடநூல்

1. சோம.இளவரசு, - இலக்கண வரலாறு  
மெய்யப்பன் பதிப்பகம், சிதம்பரம்.

### பார்வை நூல்கள்

1. இரா. இளங்குமரன், - இலக்கண வரலாறு,  
மணிவாசகர் பதிப்பகம், சென்னை.
2. மு.அருணாசலம், - இளம்பூரணர் சொர்ணாம்மாள்  
நினைவுச்சொற்பொழிவுகள்,  
அண்ணாமலைப் பல்கலைக்கழகம்,  
அண்ணாமலைநகர், சிதம்பரம்

**பயன் :** மொழியை வளப்படுத்தும் இலக்கணத் தோற்றத்தையும் ஆசிரியர் வரலாற்றையும் அறிந்து கொண்டனர்.

**பயன் :** மனித வாழ்வினை வளப்படுத்தும் இலக்கணத் தோற்றத்தை அறியச் செய்தல்.

**பயன் :** இலக்கியத்தின் வளர்ச்சிக்கு சமயத்தின் இன்றியமையாமையை அறிந்துகொண்டனர்.

**பயன் :** 12 ஆம் நூற்றாண்டிற்கு பிந்தைய இலக்கண ஆசிரியர்களை அறிந்துகொண்டனர்.

**பயன் :** இலக்கண வரலாற்றோடு உரையாசிரியர்களின் காலநிலையையும் அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	பழந்தமிழ் இலக்கணங்களை கற்பதன் மூலம் சங்ககால மரபுகளின் மாண்புகளை அறிந்து கொள்ளுதல்.	K1
CO-2	புறம் சார்ந்த போர் இலக்கண நெறிமுறைகளை கற்பதின் மூலம் மாணாக்கர்களின் தமிழரின் வீரங்களை அறிந்து செயல்படுகின்றனர்.	K4
CO-3	மரபிலக்கணத்தை புரிந்து கொண்டு புதிய படைப்புகளை உருவாக்குகின்றனர்.	K6
CO-4	தமிழரின் அகத்திணை மரபினை கற்று அக ஒழுக்கநெறிமுறைகளைப் பின்பற்றுகின்றனர்.	K3
CO-5	இலக்கண நூல்களின் தன்மைகளை பாட்டியல் கோவை ஆகியவற்றின் மூலமாக அறிந்து தெளிவு பெறுதல்.	K2

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	M	M	S
CO-2	S	S	M	M	M
CO-3	S	M	M	M	S
CO-4	M	S	S	M	M
CO-5	S	M	M	M	S

**S – Strong M – Medium**

**தாள் - 4**  
**சிற்றிலக்கியங்கள்**

**Programme : MA.,**  
**Semester : I**  
**Core Paper : IV சிற்றிலக்கியங்கள்**

**Course Code : 21P1TA04**  
**No.of .Hrs : 6**  
**No.of Credits : 5**

**நோக்கம் :** 96 வகை சிற்றிலக்கியங்களில் தூது இலக்கியத்தை மையமாகக் கொண்டு அமைத்தல்.

**நோக்கம் :** உலா இலக்கிய நயத்தை அறியச் செய்தல்.

**நோக்கம் :** பரணி இலக்கியத்தின் உவமை நயங்களை அறியச் செய்தல்.

**நோக்கம் :** பிள்ளைத்தமிழ் இலக்கியத்தை அறியச் செய்தல்.

**நோக்கம் :** பள்ளு இலக்கிய வகைகளை அறியச் செய்தல்.

**அலகு - 1**

**தமிழ் விடு தூது (முழுவதும்)**

சீர்கொண்ட கூடல் சிவராச தானி..... (முதல் பாடல் வரி)

தூறவாதே சேர்ந்து சுகாநந்தம் நல்க

மறவாதே தூது சொல்லிவா (கடைசி பாடல் வரி) 268 கண்ணிகள்

**அலகு - 2**

**குலோத்துங்கன் சோழன் உலா (முழுவதும்)**

தேர்மேவு பாய்புரவி பாசடைச்

செங்கமலம் .... (முதல் பாடல் வரி)

பெருகுடையா நீரேழும் பாரேழும் பேனும்

ஒருகுடையான் போந்த னுலா (கடைசி பாடல் வரி)

**அலகு - 3**

**கலிங்கத்துப்பரணி (காடு பாடியது, களம் பாடியது, போர் பாடியது)**

**காடு பாடியது - 75 முதல் 96 வரை (22 பாடல்கள்)**

களம் போர் விளைந்த கலிங்கத்துக் (முதல் பாடல் வரி)

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----- அணிகொண்ட குரங்கினங்கள்

அலைகடலுக் கப்பாலை

மணவொன்று காணமால் வரையெடுத்து

மயங்கினவே.

(கடைசி பாடல் வரி)

களம் பாடியது - 472 முதல் 596 வரை (125 பாடல்கள்)

தேவாசுர ராமாயண மாபாரத முளவென்

(முதல் பாடல் வரி)

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வேத நன்னெறி பரக்க வேஅ பயன்

வேன்ற வெங்கலிக ரக்கவே

பூதலம் புகழ் பரக்க வேபுவி நிலைக்க

வேபுயல் சுரக்கவே.

(கடைசி பாடல் வரி)

போர் பாடியது - 404 முதல் 471 வரை (67 பாடல்கள்)

எடுமெடு மெடுவென் வெடுத்ததோர்

(முதல் பாடல் வரி)

இகலொளி கடலொளி யிகக்கவே

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சூடினான் வண்டையர்க்கோன் தொண்டைமானே

(கடைசி பாடல் வரி)

அலகு - 4

மீனாட்சியம்மை பிள்ளைத் தமிழ்

காப்பு பருவம், செங்கீரை பருவம் - 102 பாடல்கள்

காப்பு பருவம் - மணிகொண்ட நெடுநேமி வலயஞ் சுமந்தாற்று (முதல் பாடல் வரி)

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இருவர் எண்மர் பதினொருவர் பன்னிருவர்

எனும் விண்ணவர்கள் முப்பத்து மூவரே

(கடைசி பாடல் வரி)

செங்கீரை பருவம் - நீராட்டி ஆட்டு பொன்சுண்ணம் நிமிந்தள்ளி

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தேளிதமிழ் மதுரையில் வளருமாந் இளமயில்  
செங்கோ செங்கீரை



அலகு - 5

குற்றாலக் குறவஞ்சி

கடவுள் வணக்கம் - இறைவனின் - வசந்த வல்லியின் காதல் -  
குறவஞ்சி நாடகம் - சிங்கன் சிங்கி நீங்கலாக

முக்கூடற் பள்ளு (6 முதல் 52 பாடல்கள்)

1. குடிமை ! பெருமை !

காவலர் தேவரைமுன்.....முதல்

கருநெடும் புயலழகர்.... கூவாய் குயிலே .... வரை (6 - 31 பாடல்கள்)

2. வளமை ! செழுமை !

காரிப் பிரான் புதல்வர்.....முதல்

சிற்றா நென்பது ... சித்திரம் பாடும் பள்ளீரே (32 - 52 பாடல்கள்)

பாட நூல்கள்

1. டாக்டர் உ.வே. சாமிநாதையர், - மதுரைச் சொக்கநாதர் - தமிழ் விடு தூது, கேசரி அச்சகம், சென்னை.
2. டி.வி சதாசிவ பண்டிதர் - குலோத்துங்கன் சோழன் உலா, ஜீபிட்டர் அச்சகம், சென்னை.
3. செயங்கொண்டார் - கலிங்கத்துப்பரணி கழக வெளியீடு சென்னை.
4. ஞா.மாணிக்கவாசகன் - மீனாட்சியம்மை பிள்ளைத் தமிழ் உமா பதிப்பகம் சென்னை.
5. திரிகூடராசப்பக் கவிராயர் - திருக்குற்றாலக் குறவஞ்சி, கழக வெளியீடு, சென்னை.
6. முக்கூடற் பள்ளு - மறுபதிப்பு சென்னை -2004

பார்வை நூல்கள்

1. சோம. இளவரசு - பரணி இலக்கியம், மணிவாசகர் பதிப்பகம், சென்னை.
2. ச.வே. சுப்பிரமணியன் - திராவிடமொழி இலக்கியங்கள் அறிமுகம், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை.
3. ந.வீ.ஜெயராமன், - பள்ளு இலக்கியம் மாணிக்கவாசகர் பதிப்பகம், சென்னை.

**பயன் :** முதல் தூது நூலின் இலக்கிய நயத்தை அறிந்துகொண்டனர்.

**பயன் :** குலோத்துங்கச் சோழன் உலா வரலாற்றை இலக்கிய வழி அறிந்துகொண்டனர்.

**பயன் :** காளிதேவியின் வரலாற்றோடு போர்க்கள நிகழ்வுகளையும் அறிந்து கொண்டனர்.

**பயன் :** மீனாட்சியை குழந்தையாகப் பாவித்துப் பாடிய பாடலின் வழி பிள்ளைத்தமிழ் இலக்கியத்தை அறிந்துகொண்டனர்.

**பயன் :** சிவனை மையமாகக் கொண்டு இயற்றிய பாடல்கள் வாயிலாக பள்ளி இலக்கியத்தை அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	சிற்றிலக்கியங்களில் உள்ள தூது வகைகளை அறிந்து அதற்கான இலக்கண மரபுகளின் மாண்புகளை கற்று உணர்கின்றனர்.	K3
CO-2	இலக்கிய வகைமை வளர்ச்சி நிலைகளை அறிந்து கொள்ளுதல்.	K1
CO-3	போருக்கான இலக்கண நெறிமுறைகளை கற்பதின் மூலம் மாணாக்கர்களின் போரினுடைய தன்மைகளை புரிந்து கொண்டனர்.	K2
CO-4	பிள்ளைத்தமிழ் கற்பதன் மூலம் பருவ வகைகளின் குணநலங்களை தெரிந்து அதை கையாளுகின்றனர்.	K5
CO-5	புதிய சிற்றிலக்கியங்களைப் படைக்கப் பயிற்சி பெறுதல்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	M	M	M
CO-2	M	S	M	M	S
CO-3	S	S	M	M	M
CO-4	M	S	M	M	S
CO-5	M	S	M	M	S

**S – Strong M –Medium**

## ELECTIVE PAPER - I - A

### சைவ சித்தாந்தம்

**Programme** : MA.,  
**Semester** : I  
**Elective Paper** : I - A சைவ சித்தாந்தம்

**Course Code** :21P1TAE01  
**No.of hrs** : 6  
**No.of Credits**: 4

- **நோக்கம்** : சைவத்தொன்மையை பல்வேறு இலக்கியம் வழி அறிதல்.
- **நோக்கம்** : நாயன்மார்கள் மூலமாக சைவத்தின் வழிபடும் முறையை அறிதல்.
- **நோக்கம்** : சித்தாந்த நூல்களின் மெய்கண்ட சாஸ்திர முறையை அறிதல்.
- **நோக்கம்** : வீர சைவ வளர்ச்சியினை அறிதல்.
- **நோக்கம்** : சைவ அடியார்களின் வரலாற்றை அறிதல்.
- **அலகு - 1**
  - சைவத்தின் தொன்மை - சிந்துவெளி - ஹரப்பா மொகஞ்சதாரோ, புதைபொருட் சின்னங்களில் லிங்கம் - தொல்காப்பியம், சங்க இலக்கியங்களில் சைவம் பற்றிய குறிப்புகள், திருமுருகாற்றுப்படை, பரிபாடல், செவ்வேள் பாடல்கள் - பிற சங்க நூல்களில் சைவக்கடவுள் குறிப்புகள், சிலப்பதிகாரம், மணிமேகலை, திருக்குறள் நூல்களில் சைவ சமயக் கருத்துக்கள்.
- **அலகு - 2**
  - பன்னிரு திருமுறைகள் - திருமுறைகளின் சிறப்பு - மூவர் தேவாரம் - திருஞானசம்பந்தர் - திருநாவுக்கரசர் - சுந்தரர் - மாணிக்கவாசகரின் திருவாசகம் - திருவாசகத்தில் இறை உணர்வு - ஒன்பதாம் திருமுறை ( திருவிசைப்பா, திருப்பல்லாண்டு ) - பத்தாம் திருமுறை திருமந்திரம் - சைவ சமயச் சிறப்புகள் - பதினோராம் திருமுறை (12 பேர் பாடிய 40 நூல்கள்) - சைவத்தின் சிறப்பு - சிவ வழிபாடு - 12 ஆம் திருமுறை பெரிய புராணம் - அறிமுகம் - சைவ சமய கோட்பாடுகள் - சைவத்திருத்தலங்கள் - தல புராணங்கள் அடியார்களின் வழிபாடு - பாடியோர் வரலாறு - சைவ சமய வளர்ச்சி - வாழ்வியல் நூல் - பெரியபுராணம்.
- **அலகு - 3**
  - சித்தாந்த நூல்கள் - சித்தாத்தம் - பொருள் - விளக்கம் - பசு, பதி, பாசம் - பொருள் உணர்த்தல் - சித்தாந்தம் பற்றிய கருத்துக்கள் - மெய்கண்ட சாத்திரங்கள் பற்றிய அறிமுகம் - வகைப்படுத்துதல், மெய்கண்டாரின் சிவஞான போதம் (12 நூற்பாக்கள்) -

இறைவனை உணர்தல் - மன ஒருமைப்பாடு, மும்மலம் நீக்குதல் (ஆணவம், கன்மம், மாயை) - சைவத்தின் சிறப்பு - திருமந்திரம் வெளிப்படுத்தும் சைவ வழிபாடு, உடம்பும் உயிரும் - இறைமையின் நிலைப்புத்தன்மை, சிவஞான சித்தியாரில் உள்ள சைவ உணர்வு, உமாபதி சிவாச்சாரியாரின் (8 நூல்கள்) உண்மை நெறி - திருவருட்பயன், வினா வெண்பா - கொடிக்கவி - அகப்புறச் சமயங்கள் - விளக்கங்கள் - பாடியோர் - சித்தாந்தக் கருத்துக்கள் - மெய்கண்ட சாத்திரம் பற்றிய அறிமுகம் - இவற்றை வகைப்படுத்தியுள்ள நெறி.

• அலகு - 4

• சைவ சமயம் - சைவ சமய வகைப்பாடு - வீரசைவம் - வீர சைவத்தின் சிறப்பு - காசுமீர சைவம் - காசுமீர சைவச்சிறப்பு - ஆறுவகைச் சமயங்கள் குறித்த விளக்கங்கள் - இறைவனின் தன்மையைக் கூறுதல் - வழிபாட்டு முறை - இறை உணர்வு - ஆறுவகைச் சமயங்களின் தேவை - இவை வலுவழிந்ததற்கான காரணங்கள் - பாடல்பெற்ற தலங்கள் - பொதுமைக்கூறுகள் - தனிச்சிறப்புகள் - சைவத்திருமடங்கள் - அவற்றின் தமிழ்ப் பணிகள் - இறைப்பணி முதலானவை

• அலகு - 5

• பிற்காலச் சைவ சித்தாந்தப் புலவர்கள் - தாயுமானவர் - பரம்பொருளின் உயர்வு - பற்றற்ற நிலை - இறைவனே அனைத்தும் எனல் - சிவஞான முனிவர் - சிவஞானபோதம் உணர்த்தும் இறைமையுணர்வு - உலகப் பற்று நீக்குதல் - சைவத்தின் சிறப்பு - கச்சியப்ப முனிவர் கந்தபுராணச் சிறப்பு சைவ சமயக் கருத்து - குமரகுருபரர் - இறைவனைப் புகழ்ந்து பாடுதல் - இறையருள் பெறுதல் - முப்பொருள் உணர்த்துதல் (பசு, பதி, பாசம்) - அருணகிரிநாதர் - இறைவனின் பெருமை - நிலையாமையைக் கூறுதல் - சைவ சமயத்தின் மேன்மை - இறைவனை அடையும் வழி - முப்பொருள் உணர்வு - மறைமலையடிகள் - சிவஞான போதம் - பைந்தமிழ்க் கொள்கை - தமிழரின் மதம் - திரு.வி.க - சைவத்திறவு பொதுமை உணர்வு - சைவப் படைப்புகள்.

• பார்வை நூல்கள்

- |                          |   |  |
|--------------------------|---|--|
| 1. இரா.மயில்வாகனம்       | - | சைவசித்தாந்தம் கைநூல்  |
|                          |   | • ஆறாவது உலகத்தமிழ்மாநாடு தஞ்சாவூர்.                               |
| 2. மா. இராசமாணிக்கனார்   | - | சைவ சமயம்<br>செல்வி பதிப்பகம்,<br>காரைக்குடி.                      |
| 3. திரு.கு. வைத்தியநாதன் | - | பன்னிரு திருமுறை வரலாறு<br>மெய்ஞ்ஞான வள்ளல்<br>ஆறுவகைச் சமயங்கள் - |

கழகவெளியீடு

**பயன் :** சைவத்தின் பழமையை அகப்புறச் சான்றுகளோடு அறிந்துகொண்டனர்.

**பயன் :** சைவ அடியார்களின் வரலாற்றோடு இறைச் சிறப்பினையும் அறிந்துகொண்டனர்.

**பயன் :** அகப்புறசமயங்கள் சைவக் கருத்துக்கள் கூறும் நூல்களை அறிந்துகொண்டனர்.

**பயன் :** வீரசைவத்தின் தோல்வியையும் அறுவகை சமயத்தின் இன்றியமையாமையும் அறிந்து கொண்டனர்.

**பயன் :** முப்பொருள் கொள்கைகளை அடிப்படையாகக் கொண்ட சைவ சமய உண்மைகளை அறிந்து கொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	பக்கி இயக்கத்தின் தோற்றம் சமயங்களின் வளர்ச்சி நிலையினை கற்று உணர்கின்றனர்.	K2
CO-2	அடியார்களின் வாழ்க்கையையும், அற்புதங்களையும் அறிந்து கொண்டனர்.	K1
CO-3	தமிழரின் சமய நெறி தத்துவங்களை அறிந்து கொண்டு பயனடைகின்றனர்.	K3
CO-4	அனைத்து சமயங்களின் கொள்கைகளை அறிந்து கொள்வதன் மூலம் சமயங்கள் வலியுறுத்தும் அன்பு நெறியே இறைநெறி என்பதை மாணவர்கள் உணர்ந்து உழவாரப் பணிகளை செய்கின்றனர்.	K5
CO-5	இறைநெறி தத்துவங்களாக அறிஞர்கள் கூறும் கருத்தக்களை கற்று வாழ்வில் உயர்கின்றனர்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

**Course outcomes mapping with programme specific outcomes**

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	M	S	M	M
CO-2	M	S	S	S	M
CO-3	M	M	S	S	M
CO-4	M	M	S	S	M
CO-5	M	M	S	S	M

**S – Strong M –Medium**

## ELECTIVE PAPER – 1 - B

### தமிழ்நெறி வழிபாட்டியல்

Programme : MA.,

Semester : I

Elective Paper : I.B தமிழ்நெறி வழிபாட்டியல்

Course Code : 21P1TAE05

No.of hrs : 6

No.of Credits: 4

நோக்கம் : பழந்தமிழர்களின் வழிபாட்டு முறைகளையும் கோயில் அமைப்புகளையும் அறிதல்.

நோக்கம் : சுபநிகழ்வுகளின் சடங்கு முறைகளை அறிதல்.

நோக்கம் : வாழ்விற்குப் பின் நிகழும் சடங்கு முறைகளை உணர்த்துதல்.

நோக்கம் : செய்முறை மூலமாக சடங்கு முறைகளை அறிந்து கொள்ளுதல்.

நோக்கம் : வேள்விகளின் பயன்களை அறியச் செய்தல்.

#### அலகு – 1

தமிழரின் தமிழ் வழிபாடு – தமிழ் வழிபாட்டின் தேவை – தோற்றமும் வளர்ச்சியும் - முன்னோடிகள், மந்திரம் - விளக்கம் - வழிபாடு விளக்கம் - திருக்கோயில் அமைப்பு முறைகள் - திருநெறிய தமிழ் வழிபாடு – அன்புநெறி – அறநெறி வழிபாடுகள்.

#### அலகு – 2

வாழ்வியல் நிகழ்வுகள் - புதுமனைப்புகுதல் - திருமண நிகழ்வுகள் - காதணி விழா – பூப்பு நன்னீராட்டு – மகப்பேறு – மணிவிழா – பவளவிழா – முத்து விழா நிகழ்வுகள் - நீத்தார் நினைவு நிகழ்வுகள்.

#### அலகு - 3

அருளியல் நிகழ்வுகள் - மூத்தப்பிள்ளையார் - அம்மையப்பர் - நித்தேவர் - வேள்வி வழிபாடுகள் - திருக்குட நீராட்டு – நூறாயிரம் பரவுதல் - ஆண்டுச் சிறப்பு நிகழ்வுகள் - சிறப்பு வேள்வி வழிபாடுகள்.

#### அலகு – 4

செயல்முறை நிகழ்வுகள் - வேள்விமேடை - வேள்விக் குண்டம் - வேள்விச் சாலை  
அமைத்தல் - தருப்பைப் பூட்டுதல் - திருக்குடங்கள் அமைத்தல்

### அலகு - 5

சிறப்பு வேள்விகள் நடத்துதல் - வாழ்வியலோடு ஒட்டியவை - அதற்கேற்ப  
பலவகைகள் - வேள்விகளின் வகைகள் - அவற்றின் விளக்கங்களை அறிந்து கொள்ளுதல்

### பாட நூல்கள்

1. மணிவாசகர் - வாழ்வியல் நிகழ்வுத் தொகுப்பு  
அருட்பணி மன்ற வெளியீடு.
2. சத்தியவேல் முருகனார் - செந்தமிழ் வேள்வி  
சந்தியா பதிப்பகம்  
அசோக் நகர் சென்னை.
3. கைலாசபதி.க - பண்டையத் தமிழர் வாழ்வும் வழிபாடும்  
காலச்சுவடு, சென்னை.
4. தவத்திரு மருதாசல அடிகள் - திருநெறிய தமிழகராதி திருக்குட நன்னீராட்டு  
பேரூராதீன வெளியீடு.
5. தவத்திரு மருதாசல அடிகள் - திருமுறை நெறியில் வாழ்வியல் வழிபாட்டு  
பேரூராதீன வெளியீடு.

**பயன் :** ஆகம விதிப்படி அமைந்த கோயில் அமைப்பு, இறைவழிப்பாட்டை  
உணர்ந்துகொண்டனர்.

**பயன் :** தமிழர் வாழ்வோடு ஒன்றிய வழிபாட்டுமுறைகளைத் தெரிந்துகொண்டனர்.

**பயன் :** மனிதன் இறைவனோடு ஒன்றுபடும் வழிபாட்டுமுறைகளை அறிந்துகொண்டனர்.

**பயன் :** மாணவர்கள் கள நிகழ்வுகள் மூலம் வேள்விகுண்டம் அமைத்தலை  
அறிந்துகொண்டனர்.

**பயன் :** வேள்விகளோடு பக்தி நிலையையும் அறிவியல் முறைகளையும் அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	பக்கி இயக்கத்தின் தோற்றம் சமயங்களின் வளர்ச்சி நிலையினை அறிந்து ளுள்ளதல்.	K1
CO-2	விழாக்களின் நிகழ் முறைகளை தெரிந்து கொண்டு தமிழரின் கலாச்சாரத்தை கடைப்பிடிக்கின்றனர்.	K3
CO-3	தலங்களில் நடைபெறக்கூடிய புனித நிகழ்வுகளை உணர்ந்து அவற்றை பின் பற்றுகின்றனர்.	K4
CO-4	இறைவனுக்காக செய்யப்படும் வேள்விகளின் அமைப்பு முறைகளை கற்று கொண்டு நடைமுறைப்படுத்துகின்றனர்.	K5
CO-5	வேள்வியின் வகைகளையும் அதன் பயன்களையும் உணர்ந்து கொண்டனர்.	K2

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	M	S	M	M
CO-2	M	M	S	M	M
CO-3	M	M	S	M	M
CO-4	M	M	S	M	M
CO-5	M	M	S	M	M

**S – Strong M –Medium**



**இரண்டாம் பருவம்**  
**தாள் - 5**  
**தொல்காப்பியம் - (சொல்லதிகாரம்)**

**Programme : MA.,**

**Course Code : 21P2TA05**

**Semester : II**

**No.of Hrs : 6**

**Core Paper : V தொல்காப்பியம் - (சொல்லதிகாரம்) No.of Credits: 4**

**நோக்கம் :** திணை, பால்பகுப்பு, மூவிடம் இவற்றை அறிதல்.

**நோக்கம் :** சொற்கள் பேசும் முறைகளைத் தெளிவாக அறிதல்.

**நோக்கம் :** சொற்கள் பொருள் தரும் முறைகளையும் முக்காலத்தையும் அறிதல்.

**நோக்கம் :** சொல்லில் இடைச்சொற்களை அறிதல்.

**நோக்கம் :** அறியப்படாதச் சொற்களின் பொருள் அறிதல்.

**அலகு - 1**

கிளவியாக்கம், வேற்றுமையியல்

**அலகு - 2**

வேற்றுமை மயங்கியல், விளிமரபு

**அலகு - 3**

பெயரியல், வினையியல்

**அலகு - 4**

இடையியல், உரியியல்

**அலகு - 5**

எச்சவியல்

**பாடநூல்கள்**

1. சா.பாலசுந்தரம் - தொல்காப்பியம் பொருளதிகாரம்  
ஆராய்ச்சிக் காண்டிகையுரை, தொகுதி-3  
பெரியார் பல்கலைக்கழகம்,  
சேலம் - 11.

**பார்வை நூல்கள்**

1. சேனாவரையர் உரை - தொல்காப்பியம் - சொல்  
கழக வெளியீடு.  
2. ச.திருஞானசம்பந்தம் - தொல்காப்பியம் - சொல்  
கதிர் பதிப்பகம்,  
தெற்கு திருவையாறு - 04

**பயன் :** மனிதனுக்கும் விலங்குகளுக்கும் உள்ள திணைப் பால்களை அறிந்துகொண்டனர்

**பயன் :** தொடர்கள் கையாளும் முறைகளை கற்றுப் பயனடைந்தனர்.

**பயன் :** சொற்களை முறைப்படுத்தி பொருள் பிரிவுகளையும் முக்காலத்தையும் அறிந்துகொண்டனர்.

**பயன் :** இடைச்சொற்களின் பொருள்களையும் அவற்றின் வகைப்பாட்டையும் அறிந்துகொண்டனர்.

**பயன் :** அசைநிலைகளின் பொருள்களைக் கற்றுப் பயனடைந்தனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	தமிழ் மொழியின் சொல்லமைப்பினையும் வாக்கியமைப்பினையும் அறிந்து கொண்டு மொழிகளை கையாளும் விதத்தை கற்றல்.	K3
CO-2	தமிழ் இலக்கணத்தின் தொடரமைப்பை அறிந்து கொள்வதன் மூலம் மற்ற மொழியை எளிதில் கற்கலாம்.	K2
CO-3	மரபிலக்கத்தை புரிந்து கொண்டு தற்கால இலக்கணத்தை உருவாக்கலாம்.	K6
CO-4	தமிழில் உள்ள சொற்களின் வகைகளை அடையாளம் காண பழகுவதல்.	K1
CO-5	தமிழில் பிழையின்றி எழுதும் கலையை அறிந்து செயல்படுகிறான்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	S	M	S	M
CO-2	S	S	S	M	M
CO-3	S	M	M	M	S
CO-4	S	M	M	M	S
CO-5	S	M	M	S	S

**S – Strong M –Medium**

**தாள் - 6**  
**காப்பியங்கள்**

**Programme : MA.,**  
**Semester : II**  
**Core Paper : VI காப்பியங்கள்**

**Course Code : 21P2TA06**  
**No.of hrs : 6**  
**No.of Credits: 4**

**நோக்கம் :** பழங்கால மதுரையின் சிறப்புகளையும் கண்ணகியின் வீரத்தன்மையையும் விளக்குதல்

**நோக்கம் :** சீவகனின் தனித்திறன் மூலமாக சுரமஞ்சரியை மணக்கும் முறையைக் கூறுதல்.

**நோக்கம் :** கம்பராமாயணம் தோன்றக் காரணமாக இருந்த கைகேயி, மந்தரையின் சூழ்ச்சிகளை உணர்த்துதல்.

**நோக்கம் :** சைவ நாயன்மார்களின் வரலாறுகளை உணர்த்துதல்.

**நோக்கம் :** பிற சமய இலக்கியங்களான கிறிஸ்தவ, இஸ்லாமிய இலக்கியங்களை அறியச் செய்தல்.

**அலகு - 1**

**சிலப்பதிகாரம் - மதுரைக்காண்டம்**

காடுகாண் காதை,வேட்டுவ வரி, புறஞ்சேரி இறுத்த காதை, ஊர்காண் காதை, அடைக்கலக்காதை, கொலைக்கலக் காதை, ஆய்ச்சியர் குரவை, துன்ப, மாலை, ஊர்கூழ் வரி, வழக்குரைக் காதை, வஞ்சின மாலை, அழல்படு காதை, கட்டுரைக்காதை

**அலகு - 2**

**மணிமேகலை - 1 முதல் 3 காதைகள்**

விழாவறைக் காதை

ஊரலர் உரைத்த காதை

மலர்வனம் புக்க காதை

இரமானுஜர் காவியம் - காட்டுவழிப் பாதை

**அலகு - 3**

**கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம்**

கைகேயி சூழ்வினைப் படலம்

**அலகு - 4**

**பெரியபுராணம்**

1. கண்ணப்பநாயனார் புராணம்

மேவலர் புரங்கள் செற்ற  
விடையவர் வேத வாய்மைக்  
(முதல் பாடல் வரி)

பொங்கிய புகலின் மிக்கார் திருத்  
தொண்டு புகலல் உற்றேன்  
(இறுதி பாடல் வரி)

2. இளையான்குடி மாறநாயனார் புராணம்  
அம் பொன் நீடிய அம்பலத்தினில்  
ஆடுவார் அடி சூடுவார்  
(முதல் பாடல் வரி)

இப்பரிசு இவர்க்குத் தக்க  
வகையினால் இன்பம் நல்கி  
(இறுதி பாடல் வரி)

அலகு - 5

இயேசு காவியம் - பாடுகளின் பாதை (4-ம் பாகம்)  
சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம்  
குயினிழல் பரப்பச் செவ்விக்  
கொழுந்தடை நறவஞ் சிந்தும் (முதல் பாடல் வரி)

குடிமனை யிடத்திற் புக்கார் ஹப்பீற  
சூலூ மன்றே (இறுதி பாடல் வரி)

பாடநூல்கள்

1. சு.செல்லப்பன் - சிலப்பதிகாரம்  
முனைவர் சிலம்பொலி பாரதி பதிப்பகம்,  
126- 108 உஸ்மான் சாலை,  
தியாகராய நகர், சென்னை.
2. உ.வே.சாமிநாத ஐயர் - மணிமேகலை  
பாவை பப்ளிகேசன்,  
சென்னை.
3. சிற்பி - இரமானுஜர் காவியம்  
கோலம் வெளியீடு  
வெங்கடேசா காலனி  
பொள்ளாச்சி
4. எம். நாராயணவேலுப்பிள்ளை - கம்பராமாயணம்  
(உரையாசிரியர்) திருமகள் நிலையம்,  
55, வெங்கட் நாராயணா சாலை,  
சென்னை.

5. வ.த. இராம சுப்பிரமணியம் (உரையாசிரியர்) - பெரியபுராணம் திருமகள் நிலையம், 55, வெங்கட் நாராயணா சாலை, சென்னை.
6. கவிஞர் கண்ணதாசன் - இயேசு காவியம் கண்ணதாசன் பதிப்பகம்.
7. செய்குதம்பிப் பாவலர் - சீறாப்புராணம் யுனிவர்சல் பப்ளிஷர்ஸ்.

#### பார்வை நூல்கள்

1. வ.சுப. மாணிக்கம் - காப்பியப் பார்வை, மணிவாசகர் பதிப்பகம்.
2. சொ. சிங்காரவேலன், - காப்பியப் பார்வைகள், ஞானவேல் பதிப்பகம், மயிலாடுதுறை.
3. கோ. இலட்சுமணசாமி, - சிலப்பதிகாரம் மணிமேகலை காப்பியமரபு, அண்ணாமலைப் பல்கலைக்கழகம், அண்ணாமலை நகர்- 02 சிதம்பரம்.
4. எஸ். வையாபுரிப்பிள்ளை - தமிழர் பண்பாடு கம்பன் காவியம் வையாபுரிப்பிள்ளை நினைவு மன்றம், நாலாவது குறுக்குத்தெரு, இராஜா அண்ணாமலைபுரம், சென்னை.
5. எஸ். வையாபுரிப்பிள்ளை - தமிழ் இலக்கிய சரிதத்தில் காவிய காலம் திராவிட மொழிகளில் ஆராய்ச்சி வையாபுரிப்பிள்ளை நினைவு மன்றம் நாலாவது குறுக்குத்தெரு, இராஜா அண்ணாமலைபுரம், சென்னை.
6. துரை. சீனிச்சாமி - தமிழ்க் காப்பியக் கொள்கை(தொகுதி-1&2) தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்.
7. ஓய். டென்னிசன் - மணிமேகலை காப்பியக் கதையும் பிற இயைபுக் கதைகளும் - ஓர் ஒப்பாய்வு மெரில் பதிப்பகம், திருச்சிராப்பள்ளி.

**பயன் :** முதல் வரலாற்றுக் காப்பியமான சிலப்பதிகாரத்தின் பெருமையை உணர்த்தும் செய்திகளை அறிந்து கொள்ளுதல்.

**பயன் :** ஐம்பெரும் காப்பியத்தில் பௌத்த சமயத்தைத் தழுவிய கதைப்போக்குகளை அறிந்து கொள்ளுதல்.

**பயன் :** சமுதாய மாற்றத்திற்கு அறிவுக்கூர்மையும் சிறப்பான கதைப்போக்குகளும் இன்றியமையாதது என்பதை உணர்ந்தனர்.

**பயன் :** ஆதிகடவுளான சிவனின் சிறப்புகளை நாயன்மார்கள் மற்றும் வரலாறுகளின் வழி அறிந்து கொண்டனர்.

**பயன் :** தமிழ் வளர்ச்சிக்குப் பிற சமய இலக்கியங்கள் எவ்வாறு உதவின என்பதை அறிந்தனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	சிலம்பு கூறும் வாழ்வியல் தத்துவங்களை கற்று பின்பற்றுகின்றனர்.	K3
CO-2	மணிமேகலை காப்பிய மரபோடு பிற்கால காப்பியங்கள் ஒன்றுபடுதலையும் வேறுபடுதலையும் இனங்காணுதல்.	K4
CO-3	தமிழர் வாழ்வில் நிலைபெற்ற தொன்மங்களை கற்று அறிதல்.	K1
CO-4	இறை தத்துவத்தை புராணங்கள் வழி உணர்ந்து கொண்டனர்.	K2
CO-5	வாழ்வியல் துன்பங்களை உணர்ந்து பிற உயிர்களுக்கு தீங்கு எண்ணாமை குறித்த விழிப்புணர்வை ஏற்படுத்துதல்.	K5

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	S	S	S	M
CO-2	M	S	M	M	M
CO-3	M	S	S	M	M
CO-4	M	S	S	S	M
CO-5	M	S	S	M	M

S – Strong M –Medium

சமய இலக்கியங்கள்

Programme : MA.,  
Semester : II  
Core Paper : VII (சமய இலக்கியங்கள்)

Course Code : 21P2TA07  
No.of hrs : 4  
No.of Credits: 4

நோக்கம் : மூவர் தேவாரத்தை அறிந்துகொள்ளுதல்.  
நோக்கம் : ஆழ்வார்களின் பக்தித்திறத்தை அறியசெய்தல்.  
நோக்கம் : மூவர் தேவாரத்தை அறிந்துகொள்ளுதல்.  
நோக்கம் : சித்தர்களின் வரலாறுகளை உணர்த்தல்.  
நோக்கம் : அன்பு, இறைநெறிகளை உணர்த்தல்.  
அலகு - 1

தேவாரம் - திருஞானசம்பந்தர் - 97,98 ஆம் பதிகங்கள்

திருக்கோளிலி 97 ஆம் பதிகம் (1 முதல் 11 பாடல்கள் )  
நாளாய கோகாமே நஞ்சணியுங் கண்டனுக்கே (முதல் பாடல் வரி)  
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நம்பனைநல் அடியார்கள் நாமுடைமா.. வரை (கடைசி பாடல் வரி)

திருவாய்மூர் 98 ஆம் பதிகம் (1 முதல் 11 பாடல்கள்)  
தளிரிள வளரென உமைபாத் .... (முதல் பாடல் வரி)  
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திங்களொ டருவரைப் பொழிற்கோவைத் .. (கடைசி பாடல் வரி)

நாவுக்கரசர் - 32, 33 ஆம் பதிகங்கள்  
திருவாணைக்கா 32 ஆம் பதிகம் (1 முதல் 10 பாடல்கள்)  
கோணைக் காவிக் குளிர்ந்த மனத்தாராய் (முதல் பாடல் வரி)  
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ஓத மாகடல் சூழ் இலங் கைக்கிறை (கடைசி பாடல் வரி)

திருப்பைங்ளீலி 33 ஆம் பதிகம் (1 முதல் 10 பாடல்கள்)  
உடையர் கோவண மொன்றுங் குறைவிலர் (முதல் பாடல் வரி)  
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தருக்கிச் சென்று தடவரை பற்றலும்..... (கடைசி பாடல் வரி)  
சுந்தரர் - 1, 2 ஆம் பதிகங்கள்

கோயில் 1 ஆம் பதிகம் (1முதல்10 பாடல்கள்)  
மடித்தாடும் அடிமைக்கண் அன்றியே (முதல் பாடல் வரி)

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பாரூரும் அரவல்குல் உமைநங்கை யவள் பங்கன் பைங்கன் ஏற்றன்

திருக்கழிப்பாவை 2 ஆம் பதிகம் (1முதல்10 பாடல்கள்)  
செடியேன் தீவினையில் தடுமாறக் கண்டாலும் (முதல் பாடல் வரி)  
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பழிசே ரின்புகழான் பரமன் பரமேட்டி (கடைசி பாடல் வரி)

அலகு - 2

ஆழ்வார்கள் பாடல்கள் (11 – 30 பாடல்கள்)

- ஆண்டாள் - திருப்பாவை முழுவதும்  
பெரியாழ்வார் - அம்புலி, செங்கீரைப் பருவம்.

அலகு - 3

- திருவாசகம் - திருச்சதகம் 1 முதல் 50 பாடல்கள்  
திருமந்திரம் - யாக்கை, செல்வம், இளமை நிலையாமை

அலகு - 4

சித்தர்கள்

1. இடைக்காட்டுச் சித்தர் - 1 முதல் 20 பாடல்கள்  
2. சிவவாக்கியர் - 1 முதல் 20 பாடல்கள்  
3. பட்டினத்தார் - கச்சிக்கலம்பகம் 1 முதல் 20 பாடல்கள்

அலகு - 5

கிறித்தவ இசுலாமிய சமய இலக்கியங்கள்

1. தேம்பாவணி - ஐயம் நீங்கு படலம்  
2. இரட்சணிய யாத்திரிகம் - உயிர் நீத்த படலம்  
3. குணங்குடி மஸ்தான் சாகிபு - பராபரக்கண்ணி கொள்ளுதல்

பாடநூல்கள்

1. வெள்ளைவாரணனார் - பன்னிருதிருமுறைகள் வரலாறு அண்ணாமலை பல்கலைக்கழகம் அண்ணாமலை நகர் -02 சிதம்பரம்.  
2. தே. ந. ச. தேவராஜன் - வைணமும் ஆழ்வார்களும் ஸ்ரீ செண்பகா பதிப்பகம் சென்னை.  
3. ப.அருணாச்சலம் - பக்தி இலக்கியம் பாரி புத்தக நிலையம் சென்னை.  
4. க. நாராயணன் - சித்தர் தத்துவம் மாரி பதிப்பகம், புதுச்சேரி  
5. மரியா அந்தோணி (உ.ஆ) - தேம்பாவணி வீரமாமுனிவர் ஆய்வுக் கழகம் சென்னை.

பார்வை நூல்கள்

1. மு. இராகவையங்கார் - ஆழ்வார்களின் காலநிலை, மணிவாசகர் பதிப்பகம், சிதம்பரம்.  
2. கார்த்திகேசு சிவத்தம்பி - தமிழ் இலக்கியத்தில் மதமும் மானுடமும், மக்கள் வெளியீடு, சென்னை.  
3. ஆ. வேலுப்பிள்ளை - தமிழ்ச் சமய வரலாறு, தமிழ்ப்புத்தகாலயம், சென்னை.  
4. ஞா. தேவநேயப்பாவாணர் - தமிழர் மதம் தமிழ்மான் பதிப்பகம், சென்னை.  
5. சோ. கந்தசாமி - தமிழ் தத்துவம்



6. சோ. கந்தசாமி

-

மணிவாசகர் பதிப்பகம், சென்னை.  
திருமுறை இலக்கியம்  
உலகத் தமிழாராய்ச்சி நிலையம்.  
சென்னை.

**பயன் :** சைவஅடியார்களின் பக்தித்திறத்தை அறிந்துகொள்ளுதல்

**பயன் :** ஆழ்வார்களின் பக்தித்திறத்தை அறிந்துகொண்டனர்

**பயன் :** சைவஅடியார்களின் பக்தித்திறத்தை அறிந்துகொண்டனர்.

**பயன் :** சித்தர்களின் வரலாறுகளை அறிந்துகொண்டனர்.

**பயன் :** கிறித்தவ இசுலாமிய பக்தித்திறத்தை அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	பக்கி இயக்கத்தின் தோற்றம் சமயங்களின் வளர்ச்சி நிலையினை கற்று உணர்கின்றனர்.	K2
CO-2	ஆழ்வார்கள் வாழ்க்கையையும், அற்புதங்களையும் அறிந்து கொள்வதன் மூலம் சமூகத்தில் வாழ்வியல் மதிப்புகள் மேம்படுகிறது.	K4
CO-3	தமிழரின் சமய நெறி தத்துவங்களை அறிந்து கொண்டு பயனடைகின்றனர்.	K5
CO-4	சித்தர் கொள்கைகளை கற்று உடல் நலத்தை பேணி காக்கின்றனர்.	K3
CO-5	இறைநெறி தத்துவங்களாக அறிஞர்கள் கூறும் கருத்துக்களை கற்று புதிய வாழ்வியல் கருத்துக்களை உருவாக்குகின்றனர்.	K6

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	M	S	M	M
CO-2	M	S	S	M	M
CO-3	M	S	S	S	M
CO-4	M	M	S	S	M
CO-5	M	S	S	S	M

**S – Strong M –Medium**

**தாள் - 8**  
**அற இலக்கியங்கள்**

**Programme : MA.,**  
**Semester : II**  
**Core Paper : VIII (அற இலக்கியங்கள்)**

**Course Code : 21P2TA08**  
**No.of.Hrs : 4**  
**No.of Credits : 4**

**நோக்கம் :** முப்பால் பெருமையை அறியச்செய்தல்.

**நோக்கம் :** நாலடியார் உணர்த்தும் அறநெறிக் கருத்துக்களைக் கற்றுக்கொடுத்தல்

**நோக்கம் :** அறம் அறிவு சார்ந்த கருத்துக்களைக் கற்றுக்கொடுத்தல்

**நோக்கம் :** நாட்டுமருத்துவத்தின் மகத்துவத்தைக் கற்றுத்தருதல்.

**நோக்கம் :** வாழ்நாளில் மனிதன் செய்வன, செய்யக்கூடாதவைகளைக் கற்றுக்கொடுத்தல்.

**அலகு - 1**

**திருக்குறள்**

அறத்துப்பால் - வாழ்க்கைத் துணைநலம் மக்கட்பேறு, அன்புடைமை, பொருட்பால் - இறை மாட்சி, கல்வி, கல்லாமை, கேள்வி, அறிவுடைமை இன்பத்துப்பால் - தகையணங்குறுத்தல், குறிப்பறிதல், புணர்ச்சித்தல், நலம் புனைந்துரைத்தல், காதல் சிறப்புரைத்தல்.

**அலகு - 2**

**நாலடியார்**

சுற்றந்தழால், நட்பாராய்தல், நட்பில் பிழை பொறுத்தல், கூடாநட்பு (40 பாடல்கள்) முதுமொழிக்காஞ்சி - சிறந்த பத்து, அறிவுப்பத்து, பழியாப்பத்து நல்கூர்ந்த பத்து, தண்டாப் பத்து.

**அலகு - 3**

**இன்னா நாற்பது**

(முதல் 15 பாடல்கள்)

பந்தம் இல்லாத மனையின் வனப்பு

(முதல் பாடல்)

இன்னா-----

இல்லாதார் நல்ல விழைவு இன்னா

(இறுதி பாடல்)

ஆங்கு இன்னா,

புல்லாருள் நாணுப் படல்

**ஆசாரக்கோவை**

(முதல் 20 பாடல்கள்.)

நன்றி யறிதல்  
பொறையுடைமை  
இன்சொல்லோடு  
இன்னாத எவ்வுயிர்க்கும்----- (முதல் பாடல்)

நன்குஇரீஇ யாண்டும்  
பிறிதியாதும் நோக்கான்  
உரையான் தொழுதுகொண்டு  
உண்க உகாஅமை நன்கு (இறுதி பாடல்)

#### அலகு - 4

##### நான்மணிக்கடிகை - முதல் 20 பாடல்கள்

மதிமன்னும் மாயவன் வான்முகம் ஒக்கும் (முதல் பாடல்)  
கதிர்சேர்ந்த ஞாயிறு சக்கரம் ஒக்கும்-

மனைக்காக்கம் மாண்ட மகளிர் ஒருவன்  
வினைக்காக்கம் செவ்வியன் ஆதல் (இறுதி பாடல்)

##### சிறுபஞ்சமூலம் - முதல் 20 பாடல்கள்

முழுதுணர்ந்து மூன்றொழித்து மூவாதான் பாதம் (முதல் பாடல்)  
பழுதின்றி ஆற்றப் பணிந்து

தேவரே கற்றவர் கல்லாதார் தேருங்கால்  
பூதரே முன்பொருள் செய்யாதார் (இறுதி பாடல்)

##### திரிகடுகம் - முதல் 10 பாடல்கள்

அருந்ததிக் கற்பினர் தோளும் திருந்திய (முதல் பாடல்)  
தொல்குடியின் மாண்டார் தொடர்ச்சியும்

கணக்காயர் இல்லாத ஊரும் பிணக்கறுக்கும் (இறுதி பாடல்)  
முத்தோரை இல்லாத அவைக்களனும்

#### அலகு - 5

##### ஔவையார் நல்வழி முதல் 10 பாடல்கள்

புண்ணியம் ஆம் பாவம் போம் போன நாள் (முதல் பாடல்)  
மண்ணில் பிறந்தார்க்கு வைத்த பொருள்

ஆண்டாண்டு தோறும் அழுது புரண்டாலும் (இறுதி பாடல்)

மாண்டார் வருவரோ?

**குமரகுருபரர் - நீதிநெறி விளக்கம் முதல் 10 பாடல்கள்**

அறம் பொருளின்பமும் வீடும் பயக்கும் (முதல் பாடல்)  
புறங்கடை நல்லிசைபு நாட்டும்

இன்சொல்லன் றாழ்நடைய னாயினுமென் (இறுதி பாடல்)  
றில்லானேல்

**அதிவீரராம பாண்டியர் - வெற்றி வேற்கை முழுவதும்.**

எழுத்து அறிவித்தவன் இறைவன் ஆகும் (முதல் பாடல்)

இவை காண் உலகிற்கு இயலாம் ஆறே (இறுதி பாடல்)

#### பாடநூல்கள்

1. தொகுப்பு - பதினெண் கீழ்க்கணக்கு நூல்கள், கழக வெளியீடு, சென்னை.
2. செல்லதுரை, முரளிதரன் (பதிப்பாசிரியர்) - நீதி நூல்கள் ஏழு அஸ்டலட்சுமி பதிப்பகம் 41, கண்டி வீதி, கொழும்பு.

#### பார்வை நூல்கள்

1. அ .வேலுப்பிள்ளை, - தமிழ் இலக்கியத்தில் காலமும் கருத்தும் (அறநெறிக்காலம் மட்டும்) பாரி புத்தகப்பண்ணை, சென்னை.
2. எஸ். ராமகிருஷ்ணன் - திருக்குறள் ஒரு சமுதாயப்பார்வை, மீனாட்சி புத்தக நிலையம், மதுரை.

**பயன் :** திருக்குறள் உணர்த்தும் வாழ்வியல் தன்மையைக் கற்றுத் தெளிந்தனர்.

**பயன் :** நாலடியார் உணர்த்தும் சினம் தவிர்க்கும் முறையைக் கற்றுத் தெளிந்தனர்.

**பயன் :** அறம் அறிவு சார்ந்த கருத்துக்களை உணர்ந்து கொண்டனர்.

**பயன் :** நாட்டு மருத்துவத்தின் பயனை உணர்ந்து கொண்டனர்.

**பயன் :** மாணவர்கள் நடத்தை விதிகளைக் கற்றுணர்ந்தனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	மனித குலத்தின் பொது ஒழுக்கத்தை கற்பதன் மூலம் மாணவ சமுதாயத்தினுடைய வாழ்வாதாரம் மேம்படுகிறது.	K5
CO-2	அற சார்ந்த நூல்கள் தோன்றுவதற்கான சூழலை உருவாக்கிறது.	K6
CO-3	சமூக ஒழுக்கத்திற்கு தேவையானவற்றை கற்பதன் மூலம் தனிமனித ஒழுக்கம் மேன்மையடைகிறது.	K4
CO-4	தமிழர்களின் நோயற்ற வாழ்விற்கான வழிமுறைகளை கற்று பின்பற்றுகின்றனர்.	K3
CO-5	அறக்கோட்பாடுகளை கற்று உணர்ந்தனர்.	K2

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

#### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	S	S	S	M
CO-2	M	S	S	S	M
CO-3	M	S	S	S	M
CO-4	M	S	S	S	M
CO-5	M	S	S	S	M

**S – Strong M –Medium**

## ELECTIVE PAPER – II - A படைப்பிலக்கியம்

**Programme** : MA.,

**Course Code** :21P2TAE02

**Semester** : II

**No.of Hrs** : 4

**Elective Paper** : II - A (படைப்பிலக்கியம்)

**No.of Credits**: 4

**நோக்கம்** : மாணவர்களின் படைப்பாற்றலை வளர்த்தல்.

**நோக்கம்** : சமூகச் சிக்கல்கள் குறித்து மாணவர்களின் படைப்பாற்றலை வளர்த்தல்.

**நோக்கம்** : இதிகாசம் பற்றிய கருத்துச் செறிவை வளர்த்தல்.

**நோக்கம்** : மாணவர்களுக்குக் கடிதம் எழுதும் முறையை உணர்த்துதல்.

**நோக்கம்** : இதழ்கள், திரைப்படங்கள், மின் ஊடகங்கள் - மதிப்பீடுகள் மற்றும் களப்பணியைக் கையாளும் விதத்தை எடுத்துரைத்தல்.

### அலகு – 1

மரபுக்கவிதை - மரபுக்கவிதை விளக்கம் - பொருள் - இலக்கண விதி - இருபதாம் நூற்றாண்டில் மரபுக்கவிதை - மரபுக்கவிஞர்கள் - பாரதியார் - பாரதிதாசன் - கவிமணி தேசிய விநாயகம் பிள்ளை - நாமக்கல் கவிஞர் - புலவர்குழந்தை - சுரதா - வாணிதாசன் - கண்ணதாசன் - மரபுக்கவிதைகளைப் படைத்தல் - புதுக்கவிதை வரையறை - புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் - காலம் - மணிக்கொடிக்காலம் - எழுத்துக்காலம் - வானம்பாடிக்காலம் - புதுக்கவிதை படைப்பாளர்கள் - நா. பிச்சமூர்த்தி - மு.மேத்தா - முடியரசன் - புதுக்கவிதை வடிவங்கள் - ஹைக்கூ கவிதை - வரையறை - இலக்கணம் - அமைப்பு முறை - ஹைக்கூ கவிதையின் பண்புகள் - கொடுக்கப்படும் தலைப்புக்களில் கவிதை படைத்தல் - புதுக்கவிதை எழுதுதல் - அடி வரையறை - அடி அமைப்பு - ஒரு சொல் அடிகள் - ஓரெழுத்து அடிகள் - புள்ளிட்ட அடிகள் - சொற்சுருக்கம் - ஒலி நயம் - சொல்லாட்சி - தொடை நயம் - எதுகை - மோனை - இயைபு - யாப்புச் சாயலும் நாட்டுபுறச் சாயலும் - வசன நடையும் உரையாடல் பங்கும்.

### அலகு - 2

சிறுகதை - விளக்கம் - இலக்கணம் - மேலை நாட்டு அறிஞர்கள் விளக்கம் - இந்திய அறிஞர்கள் விளக்கம் - தமிழ் சிறுகதை உத்திகள் - நடை - நோக்கு நிலை - பாத்திரப்படைப்பு - சிறுகதைப்படைப்பாளர்கள் - புதுமைப்பித்தன் - கு.பா. ரா. - கல்கி - ஜெயகாந்தன் - அகிலன் - கு.அழகிரிசாமி - சிறுகதையின் வடிவங்கள் - சமூகம் - சமூகத்தின் அங்கங்கள் - சமூகச் சிக்கல்கள் - தனிமனித சிக்கல் - குடும்ப சிக்கல் - சமூக

விழிப்புணர்வுகள் - ஏற்றத்தாழ்வுகள் - பெண்ணியம் - சமூக நடைமுறைகள் - ஒரு குறிப்பிட்ட பொருளை மையமாகக் கொண்டு சிறுகதை எழுதுதல் - சிறுகதையின் தொடக்கம் - முடிவு - தலைப்பு - சிறுகதையின் வகைகள் - கருக்கதை - பாத்திரக்கதை - நிகழ்ச்சிக் கதை - உணர்ச்சிக்கதை- சமூகச் சிக்கல்கள் , சமூக விழிப்புணர்வுகள் முதலான குறிப்பிட்ட பொருளை மையமாகக் கொண்டு, சிறுகதை எழுதுதல், ஒருபக்கக் கதை, குறுங்கதை படைத்தல்.

### அலகு - 3

நாடகம் - நாடகத்தின் பொருள் - விளக்கம் - நாடகத்தின் தோற்றம் - வளர்ச்சி - இலக்கிய நாடகம் - நாடகம் பற்றிய குறிப்புகள் - நாடகச்சபை தோற்றம் - சங்கரதாஸ் சுவாமிகள் - பம்பல் சம்பந்தனார் - பரிதிமாற் கலைஞர் - நாடக அமைப்பு - பாத்திரங்கள் - கட்டமைப்பு - நாடகத்தின் தொடக்கம் - முடிவு - வசனம் - காட்சியமைப்புக் குறிப்புகள் - நாடகத் தலைப்புகள் - நாடக உத்திகள் - நாடகத்தின் வகைகள் - ஓரங்க நாடகம் - வரலாற்று நாடகம் - புராண இதிகாச நாடகம் - நகைச்சுவை நாடகம் - துப்பறியும் நாடகம் - தமிழ் காப்பியக் கூறுகளை அடிப்படையாகக் கொண்டு நாடகம் படைத்தல்.

### அலகு - 4

கட்டுரை - கட்டுரையின் பொருள் - கட்டுரையின் வடிவம் - எழுதும் முறைகள் - கட்டுரையின் முக்கிய அம்சங்கள் - முக்கிய பிரிவுகள் - கட்டுரை எழுதும் போது கவனிக்க வேண்டியவை - தவிர்க்க வேண்டியவை - புள்ளி வழங்கும் திட்டம் - பொருள் அமைவும் அளவும் - கருத்து வெளிப்படும் மொழிச் செம்மை - எழுத்து நுட்பங்கள் - தலையங்கம் - கட்டுரை வகைகள் - இலக்கியக் கட்டுரை, வரலாற்றுக்கட்டுரை, சமூக விழிப்புணர்வுக் கட்டுரை, வருணனைக் கட்டுரை - விளக்கக் கட்டுரை - சிந்தனைக்கட்டுரை - கற்பனைக் கட்டுரை - தருக்கக் கட்டுரை - ஆராய்ச்சிக் கட்டுரை - அங்கதக்கட்டுரை - புகழ்ச்சிக் கட்டுரை - நோக்கக் கட்டுரை - விமர்சனக் கட்டுரை - தேசியத் தலைவர்களின் வாழ்க்கை வரலாற்றுக் கட்டுரை - சாதனையாளர்கள் கட்டுரை - தலையங்கக் கட்டுரை, பயணக் கட்டுரை, ஆன்மீகக் கட்டுரை படைத்தல்.

### அலகு: 5

- நூல் மதிப்பீடு செய்தல், வரையறை - மதிப்பீட்டு முறைகள் - மதிப்பீட்டின் தேவை - பயன் - மதிப்பீட்டாளர்களின் தகுதிகள் - இலக்கியங்கள், ஆய்வு நூல்கள் - பயண நூல்கள் - இதழ்கள் - திரைப்படங்கள் - மின் ஊடகங்கள்- மதிப்பீடு செய்தல் - மதிப்பீடு

செய்வதற்கான நோக்கம் - மதிப்பீடுதலின் கோட்பாடுகள் - களப்பணி - களப்பணி செய்யும் முறைகள் - களப்பணியாளரின் தகுதிகள் - செய்தி சேகரித்தல்- வெளியீடுதல் - நேர்காணல் - நேர்காணலின் பயன் - நேர்காணலின் வகைகள் - தற்செயல் நேர்காணல் - ஆளுமை விளக்க நேர்காணல் - செய்தி நேர்காணல் - செய்திக் கூட்டம் - செய்திச் சுருக்கம் - காலைச்சிற்றுண்டிக் கூட்டம் - தொலைபேசி நேர்காணல் - அடைகாத்தல் நேர்காணல் - பட்டம் பறக்கவிடும் நேர்காணல் - நேர்முக வர்ணனைகளை ஆராய்தல்.

#### பார்வை நூல்கள்

1. திருஞானசம்பந்தம் - யாப்பருங்கலக்காரிகை  
கதிர் பதிப்பகம்,  
திருவையாறு
2. க.பூரணச்சந்திரன் - கவிதை இயல்  
உலகத் தமிழாராய்ச்சி நிறுவனம்  
சென்னை.
3. அ.கி. பரந்தாமனார் - கவிஞராக  
பாரி நிலையம் சென்னை.
4. அ.கி. பரந்தாமனார் - நல்ல தமிழில் எழுத வேண்டுமா?  
அல்லி நிலையம்  
முத்து முதலி தெரு,  
வேப்பேரி, சென்னை.

**பயன் :** மரபுக்கவிதை புதுக்கவிதை, ஹைக்கூ கவிதை எழுதும் திறனை வளர்த்துக்கொண்டனர்.

**பயன் :** சிறுகதை எழுதும் திறனை வளர்த்துக்கொண்டனர்.

**பயன் :** நாடகம் எழுதும் திறனை வளர்த்துக்கொண்டனர்.

**பயன் :** மாணவர்கள் கடிதம் எழுதும் முறையைக் கற்றுக்கொண்டனர்

**பயன் :** இதழ்கள், திரைப்படங்கள், மின் ஊடகங்கள், மதிப்பீடுகள், களப்பணி நேர்காணல் வழி அறிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	கவிதையின் சாராம்சத்தை அறிந்து கொள்ளுதல்.	K1
CO-2	சிறுகதைகள் பற்றி அறிந்துக்கொள்ளுவதன் மூலம் மாணவர்களின் படைப்பாற்றல் வெளிப்படுகிறது.	K6



<b>CO-3</b>	நாடகத்தைக் கற்பதன் மூலம் கதாபாத்திரங்களின் முக்கியத்துவத்தை அறிந்து கற்பனை வளம் பெருகும்.	K3
<b>CO-4</b>	கட்டுரைகளின் வகைகளையும் அதன் முக்கியத்துவத்தையும் கற்று கொள்கின்றனர்.	K2
<b>CO-5</b>	தற்கால படைப்பாளர்களை நேரில் சந்தித்து அவர்களின் படைப்பு அனுபவங்களை அறிந்து கொள்வதன் மூலம் தங்களின் படைப்பாற்றலை மேம்படுத்திக் கொள்ள இயலும்.	K5

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### **Course outcomes mapping with programme specific outcomes**

<b>COs/PSOs</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO-1</b>	S	M	M	S	S
<b>CO-2</b>	S	M	M	S	S
<b>CO-3</b>	S	M	M	S	S
<b>CO-4</b>	S	M	M	S	S
<b>CO-5</b>	M	S	S	S	S

**S – Strong M –Medium**

## ELECTIVE PAPER – II - B

### நாட்டுப்புறவியல் கோட்பாடுகள்

Programme : MA.,

Course Code : 21P2TAE06

Semester : II

No.of hrs : 4

Elective Paper : II - B நாட்டுப்புறவியல் கோட்பாடுகள்

No.of Credits: 4

**நோக்கம் :** நாட்டுப்புறச் சடங்குகள் நம்பிக்கைகள் குறித்த விழிப்புணர்வை ஏற்படுத்தல்.

**நோக்கம் :** நாட்டுப்புறக்கதைகள் - நாட்டுப்புறப் பாடல்கள் குறித்த விழிப்புணர்வை ஏற்படுத்தல்.

**நோக்கம் :** நாட்டுப்புறக் கதைகள், விடுகதைகள், பழமொழிகளை அறியச்செய்தல்.

**நோக்கம் :** நாட்டுப்புறக் கோட்பாடுகள் - தோற்றம் - வளர்ச்சி நிலைகளை எடுத்துரைத்தல்

**நோக்கம் :** தமிழியல் ஆய்வுக்கு நாட்டுப்புறவியலின் பங்களிப்புக் குறித்த விளக்கமளித்தல்.

#### அலகு - 1

நாட்டுப்புறவியல் என்ற சொல்லின் விளக்கம் - Folk, lore என்ற சொற்களின் விளக்கம் - தமிழ்ச் சூழலில் இச்சொல் பயன்படுத்தப்பெறும் முறைகள் - நாட்டுப்புறவியலின் வகைகள் - நாட்டுப்புற இலக்கியம் - நாட்டுப்புற பழக்கங்கள் - நாட்டுப்புறக் கலைகள் - நாட்டுப்புற அறிவியல் மற்றும் தொழில்நுட்பம் - நாட்டுப்புற ஆய்வின் வளர்ச்சி - நாட்டுப்புறவியலும் வரலாறும்.

#### அலகு - 2

வாய்மொழி இலக்கியம் - நாட்டுப்புறக்கதைகள் - கதைகளின் நோக்கம் - கதைகளின் பொருண்மை - கதைகளின் தன்மை - வகைகள் - நீதிக் கதைகள் - தந்திரக் கதைகள் - ஏளனக் கதைகள் - நகைச்சுவை கதைகள் - நம்பிக்கைக் கதைகள் - கற்பனைக் கதைகள் - வஞ்சகக் கதைகள் - இதிகாச புராணக்கதைகள் - பேய்க் கதைகள் - சமுதாயக் கதைகள் - விலங்குக் கதைகள் - மந்திரக்கதைகள் - நாட்டுப்புறப் பாடல்கள் (தாலாட்டு, சிறுவர் விளையாட்டுப் பாடல்கள், ஒப்பாரிப் பாடல்கள்) - கதைப்பாடல்கள் (வரலாறு, சமூகக் கதைப்பாடல்கள்) - கதைப்பாடல்கள் தோற்றமும் வளர்ச்சியும் - கதைப்பாடல் மரபு தன்மை - கதைப்பாடல் அமைப்புகள் - கதைப்பாடல் வகைகள் - கதைப்பாடல் காட்டும் நம்பிக்கைகள் பழக்கவழக்கங்கள்.

#### அலகு - 3

பழமொழியும் தமிழ் இலக்கியங்களும் - தமிழ் பழமொழித் தொகுப்பு - தமிழ் பழமொழி - வகைபாடுகள் - தமிழ் பழமொழி அமைப்பு - தமிழ் பழமொழி சூழல் - தமிழ் பழமொழி பயன்பாடு - தமிழ் கருப்பொருட்கள் - இயற்கை - மனிதன் - விலங்குகளும், பறவைகளும் - மரம் செடி கொடிகள் - குடும்பம் - வேளாண்மை - கல்வி பெருளாதாரம் - தவம், தெய்வம் கிழமைகள் - வளிநிலைகள் - நம்பிக்கைகள் - பழக்க வழக்கங்கள் -

பல்பொருள் - பிறமொழி விடுகதை பெயர்கள் - சூழல்கள் - கருப்பொருள் - வகைகள் - இயற்கை - விலங்கு பறவை - தாவரங்கள் - உடல் உறுப்புகள் - உணவுகள் - பண்ட பாத்திரங்கள் - அணிகலன்கள் - வாகனங்கள் - தத்துவம் அறிவியல் புராண இதிகாசம் - விளையாட்டுகள் - களாய்வு - திட்டங்கள் - களப்பணி - ஊர்களைத் தேர்ந்து எடுத்தல் - தகவலாளி தேர்ந்து எடுத்தல் - சேகரிப்பிற்கான காலமும் சூழலும் - வினா நிரல் - வினாப்பட்டியல் - உற்றுநோக்கல் - பேட்டி முறை - சேகரிப்பு சுழல்வகைப்படுத்தல் - நாட்டுப்புறக்கலைகளின் வகைப்பாடுகள் - விளையாட்டுகள் - சிறுவர் விளையாட்டு - சிறுமியர் விளையாட்டுகள் - மகளிர் விளையாட்டு - ஆடவர் விளையாட்டு.

#### அலகு - 4

நாட்டுப்புறவியல் சூழலியல் கோட்பாடு - நாட்டுப்புறவியல் வரலாற்று கோட்பாடு - மீட்டுருவாக்கக் கோட்பாடு - லெட்சிய கோட்பாடு -செயல்திறன் கோட்பாடு - உளவியல் ஆய்வியல் கோட்பாடு - அமைப்பியல் கோட்பாடு - வாய்மொழி வாய்பாட்டுக் கோட்பாடு - களப்பு பண்புக் கோட்பாடு - மக்கள் பண்பாட்டுக் கோட்பாடு - அரை உலகக் கோட்பாடு சூழ்நிலைக் கோட்பாடு - விளக்கம் - வளர்ச்சி நிலைகள் - அமைப்பியல் கோட்பாடு - உளவியல் கோட்பாடு - இனவரைவியல் கோட்பாடு - வாய் மொழி வாய்பாட்டுக் கோட்பாடு.

#### அலகு - 5

இயற்கை வழிபாடு - ஆவியுலக வழிபாடு - குலக்குறி வழிபாடு - புனித போலிப் பொருள் வழிபாடு - முன்னோர் வழிபாடு - சிறுதெய்வ வழிபாடு - பெருந்தெய்வ வழிபாடு - சிறுதெய்வ, பெருந்தெய்வ ஒப்புமை - நாட்டுப்புறத்தெய்வ வகைப்பாடு - கோயில் அமைப்பு - உருவ அமைப்பு - வழிபாட்டு முறைகள் - நாட்டுப்புறத் திருவிழாக்கள் - தமிழ் வருடப்பிறப்பு - சித்ரா பெளர்ணமி - வைகாசி விசாகம் - ஆடி பதினெட்டாம் பெருக்கு - வரலட்சுமி விரதம் - பிட்டுத்திருவிழா - விநாயகர் சதுர்த்தி - நவராத்திரி - சரஸ்வதி பூஜை - தீபாவளி - கந்தசஷ்டி - கார்த்திகை தீபம் - ஆருத்ரா தரிசனம் - வைகுண்ட ஏகாதசி - தைப்பூசம் - பொங்கல் விழா - மாசிமகம் - மகா சிவராத்திரி - பங்குனி உத்திரம் - தேர்த்திருவிழா - கம்பம் திருவிழா - மொந்தையன் திருவிழா - மாரணி பொங்கல் - மயானக் கொள்ளை - காத்தவராயனைக் கழுகு ஏற்றும் திருவிழா.

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**பயன் :** நாட்டுப்புறச் சடங்குகள் நம்பிக்கைகள் பற்றி தெரிந்துகொண்டனர்.

**பயன் :** நாட்டுப்புறக்கதைகள் - நாட்டுப்புறப் பாடல்கள் பற்றி அறிந்துகொண்டனர்.

**பயன் :** நாட்டுப்புறக் கதைகள், விடுகதைகள், பழமொழிகளைக் கேட்டுப் பயனடைந்தனர்.

**பயன் :** நாட்டுப்புறக் கோட்பாடுகள் - தோற்றம் - வளர்ச்சி நிலைகளை தெரிந்துகொண்டனர்.

**பயன் :** தமிழியல் ஆய்வுக்கு நாட்டுப்புறவியலின் பங்களிப்புகளை அறிந்து பயனடைந்தனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	நாட்டுப்புற வாய்மொழி இலக்கிய மரபுகளை அறிந்து கொள்ளுதல்.	K1
CO-2	பாமர மக்களின் கதை சொல்லும் மரபுகளை அறிந்து கதை எழுதும் திறனை வளர்த்துக் கொண்டனர்.	K6
CO-3	புதிர், உவகதை பேசும் திறனை கற்று நடைமுறையில் கையாளுகின்றனர்.	K5
CO-4	நாட்டுப்புற மக்களின் வாழ்வில் வெளிப்படும் கலைக்கூறுகள், அறிவியல் கூறுகளையும் அதன் முக்கியத்துவத்தையும் கற்று கொள்கின்றனர்.	K2
CO-5	வழிபாட்டு முறைகளையும், தமிழர்களின் பண்பாட்டுக் கூறுகளையும் அறிந்து கொள்வதன் மூலம் தங்களின் இறை நம்பிக்கையை மேம்படுத்திக் கொள்ள இயலும்.	K4

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	M	S	M
CO-2	S	M	S	M	S
CO-3	M	S	M	S	S
CO-4	M	S	M	S	S
CO-5	S	M	M	S	M

**S – Strong M –Medium**

## NON MAJOR ELECTIVE COURSE

### HR - மனித உரிமைகள்

**Programme : MA.,**

**Semester : II**

**Part - IV - HR Paper - I மனித உரிமைகள்**

**Course Code : 21P2HR01**

**No.of Hrs : 2**

**No.of Credits : 2**

**நோக்கம் :** மனித உரிமைகள், வாழ்வுரிமை மற்றும் அரசியல் உரிமைகள் குறித்து எடுத்துரைத்தல்.

**நோக்கம் :** மனித உரிமைகள், அரசியல் சாசன உரிமைகள் குறித்து எடுத்துரைத்தல்.

**நோக்கம் :** வலுக்கட்டாயம் மற்றும் கொத்தடிமை உழைப்பினைத் தடை செய்தல் குறித்து எடுத்துரைத்தல்

**நோக்கம் :** ஐ.நா சபை மற்றும் மனித உரிமை மீறல்கள் குறித்து எடுத்துரைத்தல்.

**நோக்கம் :** மனித உரிமைகள், வாழ்வுரிமை மற்றும் அரசியல் உரிமைகள் குறித்து எடுத்துரைத்தல்.

#### அலகு - 1

மனித உரிமைகள் வரலாறு - மனித உரிமை இயல்புகள் வகைகள் - கலாச்சாரக் - கோட்பாடுகள் - மனித உரிமைகள் பற்றிய அனைத்துலக மாநாட்டின் பிரகடனம், மனித உரிமை பொதுச் சபையின் முகப்புரை - வாழ்வுரிமை மற்றும் அரசியல் உரிமைகள் பற்றிய சர்வதேச அறிவிப்புகள் - பொருளாதார சமூக மற்றும் கலாச்சார உரிமைகள்.

#### அலகு - 2

மனித உரிமைகள் மீது அரசியல் சாசனத்தின் பாதுகாப்பு அறங்கள், அடிப்படை உரிமைகள், அரசு விதிமுறைகள், அரசியல் மற்றும் வாழ்வுரிமைகள்.

#### அலகு - 3

பொருளாதார உரிமைகள், வேலை செய்யும் உரிமைகள், போதிய கூலி பெறும் உரிமை, போதிய பணிக்கால உரிமை, சுதந்திரமாக கூறும் உரிமை, வலுக்கட்டாயம் மற்றும் கொத்தடிமை உழைப்பினைத் தடை செய்தல்.

#### அலகு - 4

இதர உரிமைகள் குழந்தைகள் உரிமை, கல்வி உரிமை, வாரிசை தத்தெடுக்கும் உரிமை, விவாகரத்துச் செய்யும் உரிமை, ஐ.நா சபை மற்றும் மனித உரிமை மீறல்கள்.

அலகு - 5

தேசிய மனித உரிமைகள் ஆணையத்தின் (நடைமுறை) ஒழுங்குமுறை விதிகள்:

தலைப்பும் துவக்கமும், பொருள் வரையறைகள், ஆணையத்தின் தலைமையகம், கூட்டங்கள் கூடுமிடம், சட்டங்களின் காலவெளி, தலைமைச் செயலகத்தின் உறுதுணை, பொருள் நிரல், புகார்களின் மீதான நடைவடிக்கைக்கான நடைமுறை, கூட்டத்தின் நடவடிக்கை குறிப்புக்கள், நடவடிக்கை குறிப்புகளின் பதிவேடு, மேற்கொள்ளப் பட்ட நடவடிக்கைகளின் மீதான அறிக்கை.

**பிரிவுகள்:**

தலைமையகத்திற்கு வெளியே அலுவல்களை மேற்கொள்ளுதல், உத்தரவுகள் மற்றும் முடிவுகள் சட்டச் சொல்லுடைமையாக்கம், ஆண்டு அறிக்கை, சிறப்பறிக்கைகள், விசாரணைகள் மற்றும் புகார்களின் மீதான அறிக்கைகள், அறிக்கைகளை அச்சிடுதல், புலனாய்வுக் குழு.

**பாடநூல்கள்**

மனித உரிமைகள் - சிவகாமி பரமசிவம் THAI PUBLICATION,  
மனித உரிமை ஓர் அறிமுகம் - இராஜமுத்திருளாண்டி  
மனித உரிமைகள் final  
தொகுப்பும் & மொழியாக்கமும் ATC நிறுவன ஆசிரியர் குழு

**பயன் :** மனித உரிமைகள், வாழ்வுரிமை மற்றும் அரசியல் உரிமைகளைத் தெரிந்துகொண்டனர்.

**பயன் :** மனித உரிமைகள், அரசியல் சாசனம் பற்றிய உரிமைகளைத் தெரிந்துகொண்டனர்.

**பயன் :** வலுக்கட்டாயம் மற்றும் கொத்தடிமை உழைப்பினை தடை செய்தல் உரிமைகளை தெரிந்துகொண்டனர்.

**பயன் :** ஐ.நா. சபை மற்றும் மனித உரிமை மீறல்கள் பற்றித் தெரிந்துகொண்டனர்.

**பயன் :** மனித உரிமைகள், வாழ்வுரிமை மற்றும் அரசியல் உரிமைகளைத் தெரிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	மனித உரிமைகான அடிப்படை கருத்துக்களை கற்றுக் கொண்டனர்.	K2
CO-2	மனித மேம்பாட்டிற்கான அரசியல் சாசன விதிகளை கற்று உணர்ந்தனர்.	K2
CO-3	தொழிலாளர்களுக்கான அடிப்படை சட்டங்களை கற்று விழிப்புணர்வு அடைந்தனர்.	K4
CO-4	பிறப்பு முதல் இறப்பு வரையிலான அடிப்படை உரிமைகளை தெரிந்து அதன்படி பயனடைந்தனர்.	K5
CO-5	தேசிய மனித உரிமை ஆணையத்தினுடைய விதிமுறைகளை அறிந்து கொண்டு சுதந்திரமாக செயல்படுகின்றனர்.	K6

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	M	M	S	M	M
CO-2	M	S	M	M	S
CO-3	S	M	S	M	S
CO-4	M	S	S	M	M
CO-5	M	S	S	S	S

**S – Strong M –Medium**

## EXTRA DISCIPLINARY COURSE

### பயன்பாட்டுத் தமிழ்

Programme : MA.,

Semester : II

Part - IV - EDC Paper - I (பயன்பாட்டுத் தமிழ்)

Course Code : 21P2TAED01

No.of hrs : 4

No.of Credits : 4

**நோக்கம் :** சந்திப்பிழை இல்லாமல் எழுதப் பயிற்சியளித்தல்

**நோக்கம் :** நிறுத்தற் குறிகளின் பயன்பாடு குறித்து விளக்குதல்

**நோக்கம் :** மாணவர்களுக்கு கடிதம் எழுதும் முறையை அறிதல்

**நோக்கம் :** கடிதம் மற்றும் பத்திரிக்கைகளில் எழுத்துப்பிழைகள் இல்லாமல் எழுதக்கற்றுத்தருதல்

**நோக்கம் :** அலுவலகக் கடிதங்களை தமிழ்நடையில் எழுதப் பயிற்சியளித்தல்

#### அலகு - 1

இக்காலத் தமிழின் இயல்புகள் - சந்தி விதிகள் சந்தி - வரையறை, சந்தியின் தேவை, சந்தி வகைப்பாடுகள் - அகச்சந்தி, புறச்சந்தி, சொற்சந்தி, சந்தி வருகையிடங்கள், வல்லினம் மிகும் இடங்கள், மிகா இடங்கள் , சில தனிக் குறிப்புகள் - பழஞ்சந்தி - இக்காலச் சந்தி வேறுபாடுகள், சிறப்புச் சந்திவிதிகள், நிறுத்தற் குறிப்பயன்பாடும் சந்தியும்.

#### அலகு - 2

நிறுத்தற் குறிகளின் பயன்பாடு, சொற்களைச் சேர்த்தும் பிரித்தும் எழுதும் முறைகள் பேசும் கால இடைவெளியும், நிறுத்தற் குறிகள் - கால்புள்ளி, அரைப்புள்ளி, முக்காற்புள்ளி, முற்றுப்புள்ளி, கேள்விக்குறிகள், உணர்ச்சிக் குறிகள், இரட்டை ஒற்றை மேற்கோள் குறிகள், மேற்படிக்குறி, அடைப்புக் குறிகள் (பிறை அடைப்பு, சதுர அடைப்பு, இணைப்புக்கோடு, இணைப்புச் சிறுகோடு, சாழக்கோடு, அடிக்கோடு, உடுக்குக் குறி) இவற்றின் முறையான பயன்பாட்டு முறைகள்.

சொற்களைச் சேர்த்தும் பிரித்தும் எழுதும் முறைகள் நீண்ட சொற்கள், ஒரே சீராக எழுதாத நிலை, இடம்போதாத போது பிரித்தல், பொதுவான சொல் - பிரிப்பு நெறிமுறைகள், இலக்கண அமைப்புச் சொற்கள் - பெயர்+பெயர், உடம்படுமெய் ,பெயர்+பெயர், பெயரடை+பெயர், பெயர்+இடைச்சொல் - பெயர்+வினை, வினையடி+பெயர், வினை+வினை, வினையெச்சம்+வினை இரட்டைச் சொற்கள், தனிச் சொற்களை (அருகில், அருகே, அளவு, அளவில், அளவிற்கு, இடையே, இடையில் போன்றவை) எழுதும் முறை, சொற்றொடர் பிரிப்பும் தவறுகளும், வாக்கிய வகைகளும் முறைகளும்



### அலகு - 3

நடைமுறை சார் மொழித்திறன்கள் (எழுத்துத் திறன்கள்) செய்திக் கடிதம் ஆவணம் எழுதும் முறைகள், செய்தி எழுதும் முறைகள் - செய்திக் கட்டமைப்பு, தலைப்பு, முகப்பு, உடல், செய்தியில் மொழிப் பயன்பாடு

கருத்துரைகள், தலையங்கம், நூல் மதிப்புரைகள், கடிதம் ஆவணம் எழுதும் முறைகள் கடிதவகைகள், வணிகக் கடிதம், தகவல் கடிதம், விற்பனைக் கடிதம், பிரச்சனைக் கடிதம், நல்லெண்ணக் கடிதம் ஆகியன எழுதும் முறைகள், அலுவலகக்கடிதம், நேர்முகக் கடிதம், அலுவல் கடிதம், நினைவூட்டுக் கடிதம், உறவு முறைக்கடிதம், எழுதும் முறைகள்

### அலகு - 4

சுருக்கி வரைதலும் வாய்மொழிக் கருத்துப் பரிமாற்றத்திறன்களும் - சுருக்கி வரைதலின் பயன்கள், முறைகள், முதல்வரைவு, செம்மையாக்கம், இரண்டாம் வரைவு, மூலத்தைச் சுருக்கல், முக்கியம் இல்லாதனவற்றை நீக்குதல், கூறியது கூறலைத் தவிர்த்தல், உரைநடை வகைகளைச் சுருக்கி வரைதல் - விவரிப்பு, நடை, வருணனை நடை, விவாத நடை, உரையாடல் சுருக்கம்,

### வாய்மொழிக் கருத்துப் பரிமாற்றம்

உரையாடல் திறன் - தடைகள், தேவையான நல்ல குணங்கள், உரையாடல் உத்திகள், மரியாதைவழி ஒருவர் இயல்பை, திறனைக் குறிப்பிடல், குறைகாட்டாமை, காரணகாரிய இயைபுடன் பேசுதல், வெறுப்பு தோன்றாத வகையில் பேசுதல்.

சொற்பொழிவுத் திறன் - நூலறிவு, சிந்தனைத் தெளிவு, திறம்பட உரைக்கும் ஆற்றல், பேசும் பொருளில் உள்ள ஈடுபாடு, நல்ல மொழிநடையில் அமைத்தல் காலம் இடம் எனும் சூழல்களுக்கு ஏற்பப் பேசுதல், உண்மை உள்ளவராக இருத்தல், தொடக்கச் சிறப்பு, இடையிடையே துணுக்கு கூறல், நகைச்சுவை கூறல், முடிவில் தொகுப்புரை தருதல், நேர்காணல், நேர்முகத்தேர்வு, வாய்மொழித் தேர்வு - செயற்பாட்டுத் திறன்களை வளர்க்கும் நெறிகள்

### அலகு - 5

கட்டுரை எழுதுதல், அடிக்குறிப்புத் தருதல் - துணைநூற்பட்டியல் தயாரித்தல் - கட்டுரை வரையறை, கட்டுரையின் இயல்பு, சுருக்கமான எளிமையான மொழிப்பயன்பாடு, இனிய தொடக்கம், சிறப்பான முடிவு, சுருங்கச் சொல்லல் முதலான பத்து அழகுகள் இருத்தல் - இலக்கணப் - பிழை தவிர்ப்பு, கட்டுரைவகைகள் - சிந்தனைக் கட்டுரை - கதைக்

கட்டுரை, வருணனைக் கட்டுரை, விளக்கக் கட்டுரை, ஆராய்ச்சிக் கட்டுரை, செய்தித்தாள் கட்டுரை, சிந்தித்தல், படித்தல், நல்ல தகவல்களைக் குறிப்பெடுத்தப் பத்தியமைப்பு

அடிக்குறிப்பு - விளக்கம், அடிக்குறிப்பு இறுதிக் குறிப்பு, அடைப்புக் குறிப்பு தரும் முறைகள், துணைநூற்பட்டியல் தகவல்கள் - ஆசிரியர், வெளியான ஆண்டு நூல்தலைப்பு அல்லது கட்டுரைத்தலைப்பு, வெளியீடு, வெளியிட்டவர் ஆசிரியர் பெயர் அகரநிரல், பழையநூல்கள், நூல்பெயர், அகர நிரல் (ஆசிரியர் பெயர் அடைப்புக் குறிக்குள்) உரையாசிரியர் பதிப்பாசிரியர் பெயர் தருதல், கையெழுத்துப் படியில் நூல் பெயரை அடிக்கோடிட்டுக் காட்டுதல் - அச்சில் தடித்த எழுத்தில் தருதல் - பிறமொழி நூல்கள் - கட்டுரைகள் தனி அகர வரிசை, ஆய்வேடு, ஆய்வறிக்கை - அச்சிடப்படாதவை என்பதன் அறிகுறியாக அடைப்புக் குறிக்குள் தருதல், இதழ்கள் நேர்காணல், மின் ஊடகத் தகவல் தரும் முறைகள்.

#### பாடநூல்கள்

1. தமிழ்நடைக் கையேடு - மொழி அறக்கட்டளை தமிழ்ப் பல்கலைக்கழகம் தஞ்சாவூர்.
2. பொற்கோ - தமிழில் நாமும் தவறில்லாமல் எழுதலாம் பூம்பொழில் வெளியீடு அடையாறு, சென்னை - 20
3. அ.கி. பரந்தாமனார் - நல்ல தமிழில் எழுத வேண்டுமா? அல்லி நிலையம் வேப்பேரி, சென்னை - 07

**பயன் :** சந்திப்பிழை இல்லாமல் எழுதும் முறையைத் தெரிந்துகொண்டனர்.

**பயன் :** நிறுத்தற் குறிகளின் பயன்பாட்டைத் தெரிந்துகொண்டனர்.

**பயன் :** மாணவர்கள் கடிதம் எழுதும் முறையைக் கற்றுக்கொண்டனர்.

**பயன் :** ஒவ்வொரு சொல்லிலும் எழுத்துப் பிழைகள் இல்லாமல் எழுத கற்றுத்தருதல்.

**பயன் :** அலுவலகக் கடிதங்கள் தமிழ்நடையில் எழுதும் முறையைத் தெரிந்துகொண்டனர்.

CO No.	Upon completion of this course, students will be able to	Knowledge Levels
CO-1	தமிழ் மொழியில் உள்ள சந்தி வகைகளை திறம்பட கற்றல்.	K1
CO-2	பிழையின்றி எழுதும் முறையை கற்றுக் கொண்டனர்.	K2
CO-3	கடிதம் எழுதும் முறையையும் வகைகளையும் கற்று பின் பற்றுகின்றனர்.	K5
CO-4	சுருங்கச் சொல்லி விளங்க வைக்கும் முறையை கற்று தேர்ந்தனர்.	K4
CO-5	ஆய்வேட்டின் வடிமைப்பு, எழுதும் முறையினை கற்று தங்களின் அய்வு திறனை மேம்படுத்திக் கொள்ள இயலும்.	K6

**K1-Remember, K2-Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6-Create**

### Course outcomes mapping with programme specific outcomes

COs/PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	S	M	S	M	S
CO-2	S	M	M	M	S
CO-3	M	S	S	M	S
CO-4	M	M	S	M	S
CO-5	M	S	S	S	S

**S – Strong M –Medium**

மூன்றாம் பருவம்  
தாள்: 9

தொல்காப்பியம் - பொருளதிகாரம்

Programme : MA.,  
Semester : III  
Core Paper – IX

Course Code : 21P3TA09  
No.of hrs : 6  
No.of Credits : 5

நோக்கம் : தமிழின் அக ஒழுக்கத்தையும் போர் முறைகளையும் அறிதல்.

நோக்கம் : களவு கற்பு கால வாழ்க்கையை விளக்குதல்.

நோக்கம் : மக்களின் வாழ்க்கை முறையைப் பிற பொருள்களோடு உவமிக்கப்படுவதையும் தெரிந்து கொண்டனர்.

நோக்கம் : செய்யுள் உறுப்புக்களின் பயன்பாடுகளை விளக்குதல்.

நோக்கம் : மனித மற்றும் விலங்குகளின் அறிவியல் பெயர்களை வகைப்படுத்தல்.

அலகு: 1

அகத்திணையியல்  
புறத்திணையியல்

அலகு: 2

களவியல்  
கற்பியல்

அலகு: 3

பொருளியல்  
உவமவியல்

அலகு: 4

செய்யுளியல்:

அலகு: 5

மெய்ப்பாட்டியல்:  
மரபியல்

**பாட நூல்:**

1. தொல்காப்பியம் பொருளதிகாரம், ஆராய்ச்சிக் காண்டிகையுரை தொகுதி-3, 1989 பாவலரேறு ச..பாலசுந்தரம், பெரியார் பல்கலைக்கழக பதிப்புத்துறை வெளியீடு, சேலம் - 636011.

**பார்வை நூல் :**

1. தொல்காப்பியம் - இளம்பூரணனார் உரை கழக வெளியீடு.

**பயன் :** தமிழரின் அகப்புற வாழ்க்கையைப் பயின்று பயனடைந்தனர்.

**பயன் :** தமிழரின் அகவாழ்க்கையைப் பயின்று பயனடைந்தனர்.

**பயன் :** உவம உருபுகளின் பயன்பாடுகளைப் புரிந்து கொண்டனர்.

**பயன் :** செய்யுளில் எழுத்து, அசை, சீர், தளை பயன்பாடுகளைக் கற்றுக்கொண்டனர்.

**பயன் :** உயிரினங்களின் வகைப்பாடுகளைத் தெரிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	பழந்தமிழர்களின் அக, புற வாழ்வின் பிரிவுகளை ஆராய்தல்.	K5
CO 2	பழந்தமிழர்களின் களவு வாழ்வின் இலக்கிய வழி உணர்த்தல்	K3
CO 3	இல்லற வாழ்வின் வழி கூற்று தன்மைகளை வெளிப்படுத்துதல்.	K4
CO 4	செய்யுள்களின் வடிவமைப்புக்களையும் கட்டமைப்பையும் கற்றுத் தருதல்.	K2
CO 5	மெய்ப்பாட்டு தன்மைகளையும், உயிரினங்களின் மரபுப் பெயர்களின் சிறப்புகளையும் காட்சிப்படுத்தல்.	K6

**K1 – REMEMBER, K2 – UNDERSTAND, K3-APPLY, K4 – ANALYZE, K5- EVALUATE,**

**K6 – CREATE**

**COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	M
CO 2	S	S	S	M	M
CO 3	S	S	S	M	M
CO 4	S	S	S	M	M
CO 5	S	S	S	M	M

**S – STRONG, M – MEDIUM**

தாள்: 10

அக இலக்கியங்கள்

Programme : MA.,  
Semester : III  
Core Paper :X

Course Code : 21P3TA10  
No.of hrs : 6  
No.of Credits : 5

நோக்கம் : தலைவியின் பண்பு நலன்களை அறிதல்.  
நோக்கம் : தலைவனின் குணங்களைப் பற்றி அறிந்து கொள்ளுதல்.  
நோக்கம் : தோழியானவள் நல்லவை தீயவை கூறுவதை அறிதல்.  
நோக்கம் : சங்ககால பழக்கவழக்கங்கள் நம்பிக்கைகள் மற்றும் மலர் வகைகளை அறிதல்.  
நோக்கம் : மழையின் காரணமாக நிகழும் வையை ஆற்றின் நிலை பற்றி அறிதல்.

அலகு: 1

ஐங்குறுநூறு - முதல் நாற்பது பாடல்கள் - வேட்கைப் பத்து, வேழப் பத்து, கள்வன் பத்து, தோழிக்குரைத்த பத்து (மருதத்திணை)

அலகு:2

குறுந்தொகை - பரணர் பாடல்கள் (14):

19,24,36,60,73,89,120,128,165,258,292,328,393,399.

நற்றிணை முல்லைத்திணை பாடல்கள் (14):

24, 42, 52, 59, 69, 81, 89, 97, 99, 115, 121, 139, 142, 161,

அலகு: 3

கலித்தொகை - பாலைக்கலி - முதல் பத்து பாடல்கள்

“தொடங்கற்கண் தோன்றிய முதியவன் முதலாக

அடங்காதார் மிடல் சாய, அமரர் வந்து இரத்தலின்” – முதல்

.....

“பல்லியும் பாங்கு ஒத்து இசைத்தன

நல் எழில் உண்கணும் ஆடுமால் இடனே” - வரை

அகநானூறு - நெய்தல் பாடல்கள் (10, 20, 30, 40, 50, 60, 70, 80, 90, 100) -

பத்து பாடல்கள்

அலகு: 4

குறிஞ்சிப்பாட்டு – (முழுவதும்)

“அன்னாய், வாழி! வேண்டு, அன்னை! ஒள் நுதல்,

ஒலிமென் கூந்தல், என் தோழி மேனி – முதல்

.....  
.....

மறையோர் மணம் எட்டின் ஐந்தாம் மணத்தின்  
குறையாக் குறிஞ்சிக் குணம்” வரை

#### அலகு: 5

பரிபாடல்கள் - வையைப் பாடல்கள்

ஆறாம் பாடல்

நிறைகடன் முகந்துராய்..... அடி முதல்

ஆடுவார் நெஞ்சத் தலர்ந்தமைந்த.... வரை

வாடற்க வையை நினக்கு ( 1 முதல் 106 அடிவரை)

ஏழாம் பாடல்

திரையிரும் பனிப்பெளவஞ் ...முதல்

நிற்பயம் பாடி.....

....நீங்காமை யின்றுபுணர்ந் தெனவே ... வரை ( 1 முதல் 85 அடி வரை)

முத்தொள்ளாயிரம் கைக்கிளைப் பாடல்கள்

#### சேரன்

தாயர் அடைப்ப மகளிர் ....முதல்புன்னாகச் சோலை... வரை ( 5 பாடல்கள்)

#### சோழன்

திறந்திடுமின் தீயவை ... முதல்

நாண் ஒருபால் வாங்க நலன்ஒருபால் ... வரை ) 5 பாடல்கள்

#### பாண்டியன்

காப்படங்கென்(று) அன்னை ... முதல்

வழுவில்எம் வீதியுள் மாறன் வருங்கால்... வரை ( 5 பாடல்கள்)

#### பார்வை நூல்கள்:

1. முனைவர் கு.வெ.பாலசுப்பிரமணியம், பத்துப்பாட்டு, நியூ செஞ்சரி புக் ஹவுஸ் பிலிட், 41, சிட்கோ இண்டஸ்டிரியல் எஸ்டேட், அம்பத்தூர், சென்னை – 600098.
2. வ.சுப. மாணிக்கம் - தமிழ்க்காதல், மணிவாசகர் பதிப்பகம், சிதம்பரம்
3. ஆ. இராமகிருஷ்ணன் - அகத்திணை மாந்தர் ஓர் ஆய்வு, சர்வோதய இலக்கியப் பண்ணை, மதுரை.
4. த. சுப்புரெட்டியார், அகத்திணைக் கொள்கைகள், பாரி நிலையம், சென்னை-1981
5. முத்தொள்ளாயிரம் (தெளிவுரை), ஆ. நாராயண வேலுப்பிள்ளை, வர்த்தமான் பதிப்பகம், சென்னை.

**பயன் :** தமிழரின் இல்லற வாழ்வியலை அறிந்து கொண்டனர்.

**பயன் :** அறத்தொடு நிறற்றலை கற்று உணர்ந்தனர்.

**பயன் :** தலைவியின் ஒழுக்க நிலையை மேம்படச் செய்வதை அறிந்து கொண்டனர்.

**பயன் :** சங்ககால மக்களின் பழக்கவழக்கங்கள் நம்பிக்கைகளை அறிந்து கொண்டனர்.

**பயன் :** மூவேந்தர் சிறப்பும் காலச்சூழ்நிலையையும் அறிந்து கொண்டனர்

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	திணை அடிப்படையில் களவு, கற்பு வாழ்வின் தன்மைகளை ஆராய்தல்.	K4
CO 2	எட்டுத்தொகை முதல் இரண்டு நூல்களின் அகக்கருத்துக்களை எடுத்துரைத்தல்.	K1
CO 3	கலித்தொகையில் தலைவன் தலைவியின் பிரிதல் துன்பத்தை கற்று உணர்தல்.	K3
CO 4	குறிஞ்சிப்பாட்டின் வழி கபிலரின் கவித்திறனும் களவு வாழ்வின் ஒழுக்க நிலைகளும் வெளிப்படுகிறது.	K5
CO 5	வையையின் சிறப்புகளையும் மூவேந்தர்களின் துன்பவியல் பாடல்களையும் கற்றுத் தெளிதல்.	K2

**K1 – REMEMBER, K2 – UNDERSTAND, K3-APPLY, K4 – ANALYZE, K5- EVALUATE,**

**K6 – CREATE**

**COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	M	S	M
CO 2	S	S	M	S	M
CO 3	S	S	M	S	M
CO 4	S	S	M	S	M
CO 5	S	S	M	S	M

**S – STRONG, M – MEDIUM**



## தாள்: 11

### இலக்கியத் திறனாய்வியல்

Programme : MA.,  
Semester : III  
Core Paper – XI

Course Code : 21P3TA11  
No.of hrs : 6  
No.of Credits : 5

**நோக்கம் :** மாணவர்கள் இலக்கியத் தோற்ற முறையைத் தெரிந்து கொள்ளுதல்

**நோக்கம் :** திறனாய்வு முறையைக் கற்றுக் கொள்ளுதல்.

**நோக்கம் :** இலக்கிய நூலின் வடிவம், நடையினை அறிந்துக் கொள்ளுதல்

**நோக்கம் :** காப்பியம், நாடகம், புதினத்தின் தோற்றமும் வளர்ச்சியும் அறிந்துக் கொள்ளுதல்

• **நோக்கம் :** உரையாசிரியர்களின் தோற்றமும் வளர்ச்சியும் அறிந்து கொள்ளுதல்

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• **அலகு: 1 இலக்கிய ஆய்வு**

• திறனாய்வுதிறன் - திறனாய்வின் இரண்டு வகை - திறனாய்வு யாது? - ஐ.ஏ.ரிச்சர்ட்ஸ் விளக்கம் - திறனாய்வு விளக்கம் - திறனாய்வு பணி - படைப்பிலக்கியம் திறனாய்வு வேற்றுமை - திறனாய்வின் பயன் - திறனாய்வின் இருவகைபணி - அறிவியல் முறை - எட்மண்டு சேரர் கொள்கை - இலக்கியம் அறிவியல் ஆகாது - மதிப்பீட்டின் இன்றியமையாமை.

• **அலகு: 2 திறனாய்வு இலக்கியம்**

திறனாய்வின் இலக்கியப்பண்புகள் - திறனாய்வாளனுக்குரிய திறன் - பலநூல் புலமை - மனபக்குவம் - திறனாய்வு இலக்கிய ஆய்வுக்கு நினைவில் கொள்ளவேண்டியவை - ஒப்பியல் முறையின் பயன் - திறனாய்வு வரலாற்று பயன் - படைப்பிலக்கங்களும் திறனாய்வும் - இலக்கிய மதிப்பீடு - திறனாய்வாளர் கருத்து மதிப்புடையது - செல்வாக்கு பெறுதல் - இலக்கியப்பண்பாடு - இலக்கியப்பயிற்சியின் பயன் - சிறந்த திறனாய்வாளனின் மதிப்பீடு - அனுபவங்களின் பாகுபாடு - மதிப்பு உளவியல் நோக்கு - மதிப்பின் விளக்கம் - இலக்கிய கலை விளக்கம் - அறிவும் உணர்ச்சியும் - இலக்கியம் படைப்பாளரின் ஆளுமையை புலப்படுத்துதல் - அறிவியலும் இலக்கியமும் - இலக்கியத்தின் இரு பெரும் பிரிவு.

• **அலகு: 3 பாட்டியல் இலக்கியங்கள்**

கவிதை பண்பு, தொல்காப்பியர் பாட்டு இலக்கணம் - யாப்பொலியின் வகை - கவிதையும் வாழ்க்கையும் பொருளுக்கேற்ற இசையொலி - தன்னுணர்ச்சி பாடல்கள் - காப்பியம் -

வீரயுகமும் தமிழ்க் காப்பியங்களும் - காப்பிய விதிகள் - கதை - தமிழ்க்காப்பியங்களில் கதைகள் - தொல்காப்பிய விதிகள் - நாடக விளக்கம் - நாடகம், புதினம் வேறுபாடு - புதினமும் பொருளும் - தமிழ்ப் புதின தொடக்கம் - இருபதாம் நூற்றாண்டில் புதினம் - இருவகை புதினம் - இருவகை படைப்பு - உரையாடல் - சிறுகதையும் புதினமும் - இலக்கிய வகைகளில் கட்டுரைகள் - கட்டுரைக்குரிய பண்பும் தன்மையும் - இலக்கிய இயக்கங்கள்

#### அலகு: 4 திறனாய்வாளனும் திறனாய்வு வகைகளும்

திறனாய்வின் அடிப்படை - நோக்கமும் பணியும் - திறனாய்வாளனின் தகுதிகள் விளக்கமுறை திறனாய்வு - ஒப்பீட்டு முறை திறனாய்வு - மதிப்பீட்டு முறை திறனாய்வு - ரசனைமுறை திறனாய்வு - பாராட்டு முறையும் பிறவும் - இலக்கிய வகை நிலையியல்.

#### அலகு -5

#### திறனாய்வுக் கொள்கைகளும் கோட்பாடும்

திறனாய்வு தத்துவ நெறி - மார்க்சிய திறனாய்வு - அமைப்பியல் - பின்னை அமைப்பியல், நவீனத்துவம், காலனித்துவம் - தமிழ் திறனாய்வின் வரலாறு - இலக்கிய கொள்கையும் திறனாய்வும் - தொல்காப்பியரின் இலக்கிய கொள்கை - தொகுப்பு முறைத் திறனாய்வு - இலக்கண, இலக்கிய உரைகள் - திறனாய்வின் வளர்ச்சியும் சொல்நெறிகளும்

#### பாடநூல்கள்

1. இலக்கியத் திறனாய்வியல் - முனைவர் தா.ஏ. ஞானமூர்த்தி.  
ஐந்திணைப் பதிப்பகம்  
ஏ.பி. 1108 , தென்றல் குடியிருப்பு  
மூன்றாவது தெரு, மேற்கு அண்ணா நகர்  
சென்னை - 40
2. திறனாய்வுக்கலை - தி.சு. நடராசன் - நியூ செஞ்சுரி புக் ஹவுஸ் பி(லிட்)  
41-பி சிட்கோ இண்டஸ்டிரியல் எஸ்டேட் அம்பத்தூர், சென்னை

#### பார்வை நூல்கள்:

1. இலக்கிய வகையும் வடிவும், உலகத் தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை.
2. தொல்காப்பியரின் இலக்கியக் கொள்கைகள் - மெய்ப்பாடு, இறைச்சி, நோக்கு - தமிழண்ணல், உலகத் தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை.

**பயன் :** பல்வேறு காலகட்ட இலக்கிய வகைகளை தெரிந்துக் கொண்டனர்.

**பயன் :** திறனாய்வு மற்றும் திறனாய்வாளர்களின் நுட்பங்களை தெரிந்து கொண்டனர்.

**பயன் :** மொழிகளின் கருத்தில் உள்ள சொல் நயம் பயன்பாட்டினை அறிந்துக் கொண்டனர்.

**பயன் :** இலக்கிய நூலினைப் படைக்கும் திறனாய்வு அனுகுமுறையை வளர்த்துக்கொண்டனர்.

**பயன் :** இலக்கண இலக்கிய உரையாசிரியர்கள் திறனாய்வு விதத்தை அறிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	திறனாய்வின் வகைகளையும் திறனாய்வாளரின் கலையையும் கற்றுத் தெளிதல்.	K2
CO 2	இலக்கியங்களில் காணப்படும் இலக்கிய நுட்பங்களின் திறனை ஆராய்தல்.	K4
CO 3	பாட்டியல் நூல்களையும் இருபதாம் நூற்றாண்டின் இலக்கிய நூல்களை ஒப்பிட்டு அறிதல்.	K5
CO 4	திறனாய்வாளரின் திறனை அறிந்து கொள்ளுதல்.	K1
CO 5	திறனாய்வின் தத்துவமுறைகளையும் தமிழ்த் திறனாய்வின் வளர்ச்சிநிலைகளையும் கற்று உணருதல்.	K3

**K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,**

**K6 - CREATE**

#### **COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	M	S	S
CO 2	M	M	M	M	M
CO 3	S	M	M	S	S
CO 4	M	M	M	S	S
CO 5	M	M	M	S	S

**S – STRONG, M – MEDIUM**

**தாள்கள்: 12**

## ஆராய்ச்சி நெறிமுறைகள்

Programme : MA.,

Semester :III

Core Paper –XII

Course Code : 21P3TA12

No.of hrs : 6

No.of Credits : 5

**நோக்கம் :** மாணவர்களிடம் ஆய்வு குறித்த சிந்தனையை வளர்த்தல்

**நோக்கம் :** மாணவர்களிடம் தரவுகள் சேகரிப்பு, நூலகப் பயன்பாடு வளர்த்தல்

**நோக்கம் :** ஆய்வு வகைகள், அணுகுமுறைகளை எடுத்துரைத்தல்.

**நோக்கம் :** மாணவர்களிடம் ஒப்பீட்டுமுறையை ஓங்கச்செய்தல்

**நோக்கம் :** ஆய்வேட்டின் அமைப்பு முறையை எடுத்துரைத்தல்

### அலகு: 1

ஆராய்ச்சி ஒரு விளக்கம் - அறிவும் அராய்ச்சியும் - ஆராய்ச்சி உறங்கும் நெருப்பு - புகழ்பெற்ற ஆய்வுகள் - ஆய்வாளருக்குரிய தகுதிகள் - ஆய்வுச் சிக்கல்கள் - சிக்கலை மையமிட்ட ஆய்வுகள் - சிக்கலை தேர்ந்தெடுத்தல் - சிக்கலை வரையறுத்தல் - ஆய்வு சிக்கலின் மூலங்கள் - சிக்கலைத் தேர்ந்தபின் - வழிகாட்டியைப் பின்பற்றுக - சிக்கலைத் தேடுவதில் நேரக்கூடிய தவறுகள்.

### அலகு: 2

ஆய்வியல் உத்திகள் - இக்கால ஆய்வியல் உத்திகள் - வெளிப்படுத்தம் உத்திகள் - அளவீட்டு உத்திகள் - கருதுகோள் - கருதகோலின் தேவை - கருதுகோளின் தகுதிகள் - கருதுகோளை எப்படித் தேர்வது - கருதுகோள் உருவாக்கம் - கருதுகோளை சோதித்தல் - கருதுகோளின் வகைகள் - கள ஆய்வு - கள ஆய்வு விளக்கம்.

### அலகு: 3

நேர்காணல் - நேர்காணல் உத்திகள் - நேர்காணலின் பயன் - நேர்காணலின் வகைகள் - நேர்காணல் உத்திக்குரிய எல்லைகள் - வினாநிரல் - வினாநிரல் பட்டியல் வெறுபாடு - வினாநிரலின் சிறப்பு கூறுகள் - வினாநிரல் வகைகள் - நூலகப் பயன்பாடு - நூலக வரலாறு - நூலகப்பயன் - களஞ்சியங்கய் - அகராதியியல் - ஆய்வடங்கள் - கணிப்பெறி, இணையம் உள்ளிட்ட நவீன கருவிகளைப் பயன்படுத்துதல்.

### அலகு: 4

ஆராய்ச்சி முறைகள் - அறிவியல் ஆய்வு நெறி - வரலாற்றியல் அணுகுமுறைகள்

- ஒப்பீட்டு முறை - சோதனை ஆய்வுமுறை - உய்த்துணர் ஆய்வு முறை - அமைப்பியல் முறை ஆய்வு - நடைமுறைசார் ஆய்வு - மாதிரி ஆய்வுமுறை - அளந்தறி ஆய்வுமுறை - மதிப்பீட்டு ஆய்வுமுறை - புள்ளி விவரமுறை - விளக்கவியல் ஆய்வு முறை - செயல் முறை ஆய்வு - ஒப்பிலக்கியம் அய்வு முறை - நாட்டுப்புறவியல் ஆய்வுமுறை.

#### அலகு: 5

ஆய்வேட்டின் கட்டமைப்பு - எழுதத்தொடங்கு முன் - தரவுகளை ஒழுங்கு படுத்திகொள்ளுதல் - எவருக்கு எழுதுதல் - ஆய்வேட்டின் பயன் - முடிவுகளைத் தெரிவித்தல் - கடைப்பிடித்த ஆய்வு முறை - தரவுகளின் ஒழுங்கு - இயல் பிரித்தல் - இன்னிணைப்புகளை முடிவு செய்தல் - ஆய்வேட்டின் அக அமைதி - அய்வு தலைப்பு விளக்கம் - மற்றொன்றும் ஆய்வு முறை விளக்கம் - இயல் முன்னுரையும் பத்தி பிரிப்பும் - எடுத்தரை உத்திகள் - இயல் முடிப்பு - அடிக்குறிப்பும் மேற்கோளும் - ஆய்வு நடை - இயல் இயைபு - முடிவுரை - பின்னிணைப்புகளில் இடம் பெற தக்கன - ஆய்வேட்டின் புற கட்டமைப்பு.

#### பாடநூல்

1. முனைவர் கு.வெ.பாலசுப்பிரமணியன் - ஆய்வியல் நெறிகள், அனூராதா பதிப்பகம், விடியல், கருப்பூர், சும்பகோணம் - 612605.

#### பார்வை நூல்கள்:

1. டாக்டர் தமிழண்ணல் - ஆய்வியல் அறிமுகம், மதுரை மீனாட்சி புத்தகநிலையம், 1977
2. முனைவர் ஆறு. இராமநாதன் - நாட்டுப்புறவியல் களாய்வு நெறிமுறைகள், தஞ்சாவூர்.
3. ச. பாஸ்கரன் - கணிப்பொறி தகவல் தொழில் நுட்பம், உமா பதிப்பகம், 61, ஐந்தாம் தெரு, நடராஜபுரம், மருத்தவக்கல்லூரி சாலை, தஞ்சாவூர் - 613007.
4. முனைவர் ஆர். சண்முகம் - ஆராய்ச்சி முறைமைகள், மதுரை முத்துப் பதிப்பகம், 1979
5. டாக்டர் பொற்கோ - ஆராய்ச்சி நெறிமுறைகள், சென்னை ஐந்திணைப்பதிப்பகம், 2005

**பயன் :** மாணவர்கள் ஆய்வு குறித்த சிந்தனையை வளர்த்துக் கொண்டனர்.

**பயன் :** தரவுகள் சேகரிப்பு, நூலகப் பயன்பாடுகளைத் தெரிந்து கொண்டனர்

**பயன் :** ஆய்வு வகைகள், அணுகுமுறைகள் பற்றி தெரிந்து கொண்டனர் **பயன் :** ஒப்பீட்டு ஆய்வுத் திறனை வளர்த்துக் கொண்டனர்

**பயன் :** ஆய்வேட்டு அமைக்கும் முறையைக் கற்றுக்கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	ஆய்வு மேற்கொள்ளும்போது கடைபிடிக்கவேண்டிய நெறிமுறைகளை அறிதல்.	K4
CO 2	தரவுகளைச் சேகரித்தலும் அதனைத் தொகுத்தலும்	K5
CO 3	ஆய்வு வகைகளை அறிந்து கொண்டனர்.	K2
CO 4	ஆய்வியல் அணுகுமுறைகளை ஆய்வுகளம் சார்ந்து அறிதல்.	K3
CO 5	ஆய்வேடு அமைக்கும் முறையினை உணர்ந்து திட்டக்கட்டுரை எழுதுதல்.	K6

K1 – REMEMBER, K2 – UNDERSTAND, K3-APPLY, K4 – ANALYZE, K5- EVALUATE,

K6 - CREATE

#### COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	M	M	S	S
CO 2	M	M	M	S	S
CO 3	M	M	M	S	S
CO 4	M	M	M	S	S
CO 5	M	M	M	S	S

S – STRONG, M - MEDIUM

## விருப்பப்பாடம் - III – A அகராதியியல்

Programme : MA.,

Course Code : 21P3TAE03

Semester : III

No.of hrs : 6

Elective Paper – III - A

No.of Credits : 4

**நோக்கம் :** அகராதி வரலாறு சொல்லிற்கான பொருள் பயன்பாட்டினை அறிதல்.

**நோக்கம் :** சொல்லுக்கும் பொருளுக்கும் உரிய கோட்பாட்டை உணர்த்துதல்

**நோக்கம் :** அகராதி வகைகள் பற்றி உணர்த்துதல்.

**நோக்கம் :** சொல் உருவாக்கம் அடிப்படை முறையை உணர்த்துதல்

**நோக்கம் :** அகராதி சொற்பொருள்களையும் பொருள் மாறுபாடுகளையும் உருவாக்கம் - சொல் தெளிவு முறையை உணர்த்துதல்

**அலகு: 1 அகராதி வரலாறும் மொழியியலும்:**

அகராதியியல் - சொற்பொருளியல் தமிழ் அகராதி கலைச்சொல் உருவாக்க அமைப்பு - அகராதியியலும் மொழியியலும் - அகராதியும் இலக்கணமும் - உலக அகராதி வரலாறு - ஐரோப்பிய மரபு - தமிழ் மரபு - இலக்கண மரபில் சொற்பொருள் மரபு, நிகண்டு மரபு- நிகண்டு சொற்பொருள் - நிகண்டு அமைப்பு - நிகண்டு வரலாறும் வகைகளும்.

**அலகு: 2 சொற்பொருண்மையியல்:**

சொல்லும் பொருளும் - விளக்கம் - உலகப்பொருள் தொடர்பு - பொருள் கோட்பாடுகள் - சூழல் பொருள் கொள்கை - பொருள் முக்கோணக் கொள்கை - சொற்பொருட் கூறுகள் - குறிப்பு பொருள் - பொருள் உறவும் சொல் வகைப்பாடும் - பொருட் பன்மை - சிறப்பு பொருட்பேறு - ஒப்புறுச் சொல் - ஒரு பொருள் பல சொல் - எதிர் பொருண்மை

**அலகு: 3 அகராதி வகைகள்:**

அகராதி வகைகள் - வகைப்பாட்டுக் காரணங்கள் - கலைக் களஞ்சியம் - மொழி அகராதியியல் - அகராதிகள் ஒருமொழி , இருமொழி, பன்மொழி அகராதிகள் - கால அடிப்படையிலான அகராதிகள் - சொற்பிறப்பு அகராதி - அகராதிகள் குறித்த காலநிலை அகராதி - வரலாற்று அகராதி - ஒப்பியல் அகராதி - மீ விளக்க அகராதி - தகுமொழி விளக்க அகராதி - சிறப்பு அகராதிகள் - கிளை மொழி அகராதி - சொல்வகை அகராதி - மரபு சொற்சேர்க்கை அகராதிகள்

**அலகு: 4 அகராதி உருவாக்க அடிப்படைகள்:**

திட்டமிடல் - தரவு சேகரிப்பு - அகராதி உருவாக்கப்படிநிலைகள் - அகராதித் திட்டம் - மொழி வேறுபாடு - ஆதார நூல்தொகுதி - சொல் உருவாக்கம் - சொல் தெரிவு முறைகள் - அகராதிப்பணி பெரும் பணி - அகராதி சொற்கூழல் - கலைச்சொற்கள் - சொல் வேறுபாடுகள் - உரிச்சொற் சிறப்பு - கூட்டுச் சொற்கள் - ஆக்கச்சொற்கள் - சொல் விரிவும் அடிப்படை வடிவமும் - வடிவ, பொருள் வேறுபாடு - மொழி வேறுபாடுகள் - தனிமனிதப் பேச்சு

**அலகு: 5 அகராதி உருவாக்கம்:**

அகராதி பதிவுக் கூறுகள் - தலைச்சொல் பகுதி - தலைச்சொல் - அடிப்படை வடிவம் - எழுத்துப் பெயர்ப்பு, உச்சரிப்பு, இலக்கணக் குறிப்பு - சொற்பிறப்பு - சொற்பொருள் தருநெறிகள் - எதிர்ச்சொல் - விளக்கச் சொற்பொருள், வெளிப்படைக் குறுக்கு நோக்கீடு - மறைமுகக் குறுக்கு நோக்கீடு - மேற்கோள் தருநெறி - விளக்கக் குறிப்புகள் - கலைக்களஞ்சியம் - இலக்கணக் குறிப்பு - அச்சுப்படி தயாரித்தல் - வரிசை முறை - அகர வரிசைமுறை - பொருண்மை வரிசை முறை - பிற வரிசை முறைகள்.

**பாட நூல்:**

1. பெ. மாதையன், அகராதியியல் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

**பார்வை நூல்கள்:**

1. வ. ஜெயதேவன், தமிழ் அகராதியியல் வளர்ச்சி வரலாறு, ஐந்திணை பதிப்பகம், சென்னை.
2. சுந்தர சண்முகனார், தமிழ் அகராதிக் கலை, மெய்யப்பன் தமிழாய்வகம், சிதம்பரம்.
3. தா.வே. வீராசாமி, அகராதிக்கலை, தமிழ்ப் புத்தகாலயம், சென்னை.
4. எச். சித்திரபுத்தன், அகராதியியல், அனன்யா பதிப்பகம், தஞ்சாவூர்.
5. மா. சற்குணம், தமிழ் நிகண்டுகள், இளவழகன் பதிப்பகம், சென்னை.
6. தொல்காப்பியம் - சொல்லதிகாரம் (இடையியல், உரியியல்) முனைவர்.ச.திருஞானசம்பந்தம், திருவையாறு - 613204.
7. தொல்காப்பியம் - பொருளதிகாரம் (மரபியல்) பேராசிரியர், திருநெல்வேலித் தென்னிந்திய சைவசித்தாந்த நூற்பதிப்புக் கழகம் லிமிடெட்., திருநெல்வேலி.

**பயன் :** அகராதி வரலாற்றைத் தெரிந்து கொண்டனர்

**பயன் :** சொல்லும் பொருளும் - விளக்கும் முறையைக் கற்றுக்கொண்டனர்

**பயன் :** அகராதி வகைகளை தெரிந்துகொண்டனர்.

**பயன் :** சொல் உருவாக்கம் - சொல் தெளிவு முறையைக் கற்றுக்கொண்டனர்.

**பயன் :** அகராதி உருவாக்கம் முறையைத் தெரிந்து கொண்டனர்.



CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	அகராதி மரபும் விளக்கமும் குறித்து அறிதல்.	K1
CO 2	சொற்பொருண்மையின் வகைகளை உணர்த்துதல்.	K2
CO 3	அகராதியின் வகைகள் அதன் சிறப்புகள் குறித்து விளக்குதல்.	K3
CO 4	அகராதி உருவாக்கமும் திட்டமிடுதலும்	K4
CO 5	அகராதி உருவாக்கத்தில் இலக்கண வகைகள் பங்களிப்பை அறிந்து ஒப்பிடுதல்.	K5

K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,

K6 - CREATE

#### COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	M	M	S
CO 2	S	M	M	M	S
CO 3	S	M	M	M	S
CO 4	S	M	M	M	S
CO 5	S	M	M	M	S

S – STRONG, M – MEDIUM

**பருவம் - நான்கு**  
**தாள் - 13 புற இலக்கியங்கள்**

**Programme : MA.,**  
**Semester : IV**  
**Core Paper – XIII**

**Course Code : 21P4TA13**  
**No.of hrs : 5**  
**No.of Credits : 4**

- நோக்கம் :** பெண் புலவரான ஓளவையாரின் கவித்திறனை அறிந்து கொள்ளுதல்.  
**நோக்கம் :** போர் நிகழ்வுகளின் காரணங்களையும் சிறப்புகளையும் அறிந்து கொள்ளுதல்.  
**நோக்கம் :** சேரமன்னர்களின் வரலாறுகளையும் திருமால் சிறப்பினையும் அறிந்து கொள்ளுதல்.  
**நோக்கம் :** பாணர் வாழ்வியல், அரசர்களின் கொடை உணர்த்தல்  
**நோக்கம் :** மூவேந்தர்களின் சிறப்பினையும் யானைப்படையின் மேன்மையையும் விளக்குதல்.

**அலகு: 1**

**புறநானூறு - ஓளவையார் பாடல்கள்:**

(87,104, 140,187,206,231,232,235,269,286,290,295, 311,315,367,390,392)

**அலகு: 2**

**புறநானூறு - மகட்பாற் காஞ்சி: 336,341,342,345,347,349 (6 பாடல்கள்)**

**பொருண்மொழிக்காஞ்சி: 75,121,185,190,192,214 (6 பாடல்கள்)**

**பரிசில் கடாநிலை: 196,199,200,201,205,206 (6 பாடல்கள்)**

**குதிரை மறம்: 273,299,302,303,304, (5 பாடல்கள்)**

**அலகு: 3**

**பதிற்றுப்பத்து - இரண்டாம் பத்து – குமட்டுரீக் கண்ணனார் (முழுவதும்)**

“வரைமருள் புணரி வான் பிசிர் உடைய,  
வளி பாய்ந்து அட்ட துளங்கு இருங்கமஞ்சூல்” முதல்

.....  
.....

வயிறு பசி கூர ஈயலன்

வயிறு மாசு இலீயர், அவன் ஈன்ற தாயே” வரை

**பரிபாடல் 4 - திருமால் கடுவன் இளவெயினனார்**

**அலகு: 4**

**பத்துப்பாட்டு - சிறுபாணாற்றுப்படை (முழுவதும்)**

“மணிமலைப் பனைத்தோள் மாநில மடந்தை  
அணிமுலைத் துயல்வருஉம் ஆரம் போல” முதல்

பண்பின்,

நல்லியக்கோடனை நயந்தனிர் செலினே” வரை

அலகு: 5

முத்தொள்ளாயிரம் புறப்பாடல்கள்

சேரன்

அரும்பவிழ்தார்க் கோதை ...முதல்

வேறுகை பம்பிச் ... பாடல் வரை (18 -23) 6 பாடல்கள்

சோழன்

அந்தணர் ஆவொடு பொன்பெற்றார் ...முதல்

இரியல் மகளிர் இலைஞெமலுள் .. பாடல்வரை (46 -52) 7 பாடல்கள்

பாண்டியன்

அடுமதில் பாய அழிந்ததன் ...முதல்

தொழில்தேற்றாப் பாலகனை ... பாடல் வரை ( 102-108) 7 பாடல்கள்

களவழி நாற்பது

நாண் ஞாயிறு றுற்ற செருவிற்கு ...முதல்

இருசிறகர் ஈர்க்கும் பரப்பி ... பாடல் வரை ( 1-120 பாடல்கள்)

பார்வை நூல்கள்:

1. சோ.ந. கந்தசாமி, புறத்திணை வாழ்வியல் - தமிழ்ப் பல்கலைக்கழகம் - தஞ்சாவூர்.
2. கு.வெ. பாலசுப்பிரமணியன், புறப்பொருள் - மெய்யப்பன் பதிப்பகம்.
3. சாரங்கபாணி, பரிபாடல் திறன் - கோவிலூர் மடாலயம் - கோவிலூர்
4. சுந்தர மகாலிங்கம், புறத்திணை விருந்து.

பயன் : பழந்தமிழர்களின் வீர வாழ்வினை அறிந்து கொண்டனர்.

பயன் : துறைத்தொடர்பான வாழ்வியல் சிறப்பினை அறிந்து கொண்டனர்.

பயன் : பண், இசை தொடர்பான இலக்கியச் சிறப்பினை அறிந்து கொண்டனர்.

பயன் : பாணர் வாழ்வியல், அரசர்களின் கொடைப் பற்றி தெரிந்து கொண்டனர்.

பயன் : மூவேந்தர்களின் இன்றியமையாமையும் படைகளில் சிறந்த யானைபடையும் போர் தன்மையும் அறிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	ஒளவையார் பாடல்வழி புறவாழ்வியல் சிந்தனைகளைக் கற்று உணர்தல்.	K3
CO 2	துறைகளின் அடிப்படையில் புறப்பாடல்களின் சிறப்புகளை அறிதல்.	K1
CO 3	சேர அரசர்களின் மரபின் பெருமையை உணரச் செய்தல்.	K2
CO 4	ஆற்றுப்படை நூல்களின் பாடல் வழி பாணர்களின் சிறப்புக்களைக் கூறுதல்.	K4
CO 5	மூவேந்தர்களின் கையறுநிலைப்பாடல்களும் பண்டைய நாளில் யானைப்போரின் சிறப்புகளையும் ஒப்பிட்டு அறிந்தனர்.	K5

K1 – REMEMBER, K2 – UNDERSTAND, K3-APPLY, K4 – ANALYZE, K5- EVALUATE,

K6 - CREATE

#### COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	S	M	M
CO 2	M	S	S	M	M
CO 3	M	S	S	M	M
CO 4	M	S	S	M	M
CO 5	M	S	S	M	M

S – STRONG, M – MEDIUM

**தாள்: 14**  
**ஒப்பிலக்கியம்**

Programme : MA.,  
Semester : IV  
Core Paper – XIV

Course Code : 21P4TA14  
No.of hrs : 5  
No.of Credits : 4

**நோக்கம் :** ஒப்பீட்டின் பண்பின் சிறப்பையும் வளர்ச்சியையும் அறிதல்.

**நோக்கம் :** இலக்கிய வளர்ச்சியை ஒப்பீடு செய்யும் முறையைத் தெரிந்துக் கொள்ளுதல்.

**நோக்கம் :** பண்டைய இலக்கண இலக்கியக் கொள்களை அறிதல்.

**நோக்கம் :** திருக்குறளோடு பிறநாட்டு நூல்களை ஒப்பிட்டு அறிதல்.

**நோக்கம் :** ஒப்பியலின் நோக்கமும் நோக்கும் பற்றி அறிதல்

**அலகு: 1**

ஒப்பிலக்கிய அறிமுகம் - ஒப்பிலக்கியத்தின் தோற்றமும் வளர்ச்சியும் - ஒப்பிலக்கியத்தின் பண்பும் பயனும் - மனித இனப் பொதுமை - இலக்கியப் பொதுமை - தனித்திறன் - பொதுத்திறன் - முழுமை நோக்கம். தமிழ் ஒப்பிலக்கிய வளர்ச்சியின் நிலை - ஒருமொழி இலக்கிய ஒப்பீடு - பன்மொழி இலக்கிய ஒப்பீடு அமெரிக்க, பிரெஞ்சுக் கோட்பாடுகள்.

**அலகு: 2**

உலக தமிழ் இலக்கியத்தில் இடம் - திராவிட மொழிகளின் ஒப்பிலக்கணம் - தமிழ் வடமொழி இலக்கிய ஒப்பீடு - இலக்கிய வகைகள் - தேசிய இலக்கியம் - உலக இலக்கியம் - பொதுமை இலக்கியம் - கிரேக்க இலக்கியம் - இலத்தீன் இலக்கியம் - ஒப்பீட்டுச் செய்திகள்.

**அலகு: 3**

ஒப்பிலக்கியக் கோட்பாடுகள் - இலக்கியமும் உளவியலும் - படைப்பாளி உளவியல் - படைப்பாக்கம், இலக்கிய உளவியல் - இலக்கியமும் இசையும், கூத்தும் - இலக்கியமும் ஓவியமும் - வாய்மொழி இலக்கியமும் வரிவடிவ இலக்கியமும் - இலக்கிய வகை கோட்பாடு - வரலாற்று இலக்கியம் - வகைமை சிறப்பு - ஒப்பிலக்கியத்தின் ஆய்வுப்பரப்பு

**அலகு: 4**

தமிழில் ஒப்பியல் ஆய்வு - தமிழ் வீரயுகப்பாடல்கள் - பெரும் பெயர் உலகம் - பொற்காலமும் புதுயுகமும் - ஒப்பிலக்கிய ஆய்வில் இலக்கிய வகைகளின் இடம்: இலக்கியத்தை இனம் பிரிக்க உதவுதல் - இலக்கியத்தை உள்ளும் புறமும் உணர வழிச் செய்தல் - இலக்கிய வகைகளின் அரிமா நோக்குப் பண்பு

**.அலகு: 5**

சங்கப்பாடல்களும் கிரேக்கப் பாடல்களும் ஒப்பீடு - கம்பராமாயணம், வால்மீகி, இராமாயணம் ஒப்பீடு - பாரதியும் விட்மனும் - இளங்கோவும் சேக்ஸ்பியர் - சங்க இலக்கியங்கள் - தமிழ் நாவல்கள் - மலையாள, கன்னட, வங்காள மொழி நாவல்கள் - தமிழ் மலையாள கவிதை ஒப்பீடு.

**பாடநூல்கள்**

1. இராம. பெரிய கருப்பன் (தமிழண்ணல்) ஒப்பிலக்கிய அறிமுகம் - மதுரை மீனாட்சி புத்தகநிலையம் - மதுரை
2. கைலாசபதி - ஒப்பியல் இலக்கியம் - குமரன் புத்தக இல்லம்.

**பார்வை நூல்கள்:**

1. இராம. பெரிய கருப்பன் சங்க இலக்கிய ஒப்பீடு - இலக்கிய வகைகள். மதுரை மீனாட்சி புத்தகநிலையம் - மதுரை
2. முனைவர் கி.இராசா - ஒப்பிலக்கியம், 41-பி, சிட்கோ இண்டஸ்டிரியல் எஸ்டேட், அம்பத்தூர், சென்னை - 600098.

3. ஜான் சாமுவேலின் - ஒப்பாய்வுக் களங்கள். ஆசியவியல் நிறுவனம், சென்னை - 600119.

**பயன் :** ஒப்பிலக்கியத்தின் தோற்றம் வளர்ச்சியைக் கற்று பயனடைந்தனர்.

**பயன் :** இலக்கிய வகைகளை அறிவியல் நோக்கில் கண்டு பயனடைந்தனர்.

**பயன் :** பண்டைய தமிழரின் வாழ்வுடன் கூடிய வீரத்தைக் கற்று பயனடைந்தனர்.

**பயன் :** உலக அரங்கில் திருக்குறள் பெற்றுள்ள இடத்தை ஒப்பீட்டு நூல்கள் வழி கற்று உணர்ந்தனர்.

**பயன் :** நூலாசிரியர்களுக்கிடையிலான ஒற்றுமை வேற்றுமையை ஒப்பீட்டின் மூலம் அறிந்து கொண்டனர் .

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	ஒப்பிலக்கியத்தின் தோற்றம் வளர்ச்சியைக் குறித்து அறிதல்.	K1

<b>CO 2</b>	திராவிட மொழிகளின் ஒப்பிலக்கணம் குறித்து அறிதல்.	<b>K4</b>
<b>CO 3</b>	இலக்கியக் கோட்பாடு குறித்த வகைகளை உணர்த்துதல்.	<b>K2</b>
<b>CO 4</b>	ஒப்பாய்வு நோக்கில் தமிழ் இலக்கியங்களை ஆராய்தல்.	<b>K5</b>
<b>CO 5</b>	பிறமொழி இலக்கியங்களில் வீரயுகப்பாடல்களின் தன்மைகளை அறிந்து வெளிப்படுத்தினர்.	<b>K6</b>

**K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE, K6 – CREATE**

### **COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

<b>COS/PSOS</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 2</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 3</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 4</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 5</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – STRONG, M - MEDIUM**

**தாள்: 15**  
**பெரியாரியல்**

Programme : MA.,  
Semester : IV  
Core Paper –XV

Course Code : 21P4TA15  
No.of hrs : 5  
No.of Credits : 4

**நோக்கம் :** பெரியார் வாழ்வும் பணியும் பற்றி உணர்த்தல்

**நோக்கம் :** தமிழகச் சமூகச்சீர்திருத்த இயக்க வரலாறு பற்றி உணர்த்தல்

**நோக்கம் :** சுயமரியாதை இயக்க வரலாறு பற்றி உணர்த்தல்

**நோக்கம் :** ஆண், பெண் உயர்வு, தாழ்வு, கற்பு, விதவை மறுமணம் பற்றி உணர்த்தல்

**நோக்கம் :** வருணாசிரம அமைப்பும் தீண்டாமையும் பற்றி உணர்த்தல்

**அலகு: 1 பெரியார் வாழ்வும் பணியும்:**

பிறப்பு, கல்வி, திருமணம், பகுத்தறிவு மனப்பாங்கு, கள்ளுக்கடை மறியல், வைக்கம் போர், பொது வாழ்வு, காங்கிரஸ் நுழைவு, காங்கிரஸ் மாநாட்டிலிருந்து வெளியேறல், குடியரசு இதழ் தொடக்கம், சுயமரியாதை இயக்கம், பார்ப்பனரல்லாதார் மாநாடு, வருணாசிரம ஒழிப்பு, இந்தி எதிர்ப்பு போராட்டமும் சிறையும், தமிழ்நாடு தமிழருக்கே, திராவிடக் கழகத் தோற்றம், நீதிக்கட்சித் தலைவர், மக்கள் இயக்கமாதல், திராவிட முன்னேற்றக் கழகம் - தமிழ் மக்கள் நலப் போராட்டங்கள்.

**அலகு: 2 தமிழகச் சமூகச்சீர்திருத்த இயக்க வரலாறு**

ஆந்திரநாடு, பசவர், கவிஞர் வேமணா, பிராமணிய எதிர்ப்பு, இராசாராம் மோகன்ராய், பிரம்ம சமாஜம், சுவாமி தயானந்தர், ஆரிய சமாஜம், சூரத்துக்காராம், தாதோபா பாண்டூராவ், மாணவர் தர்மசபை, சோதிபாபூலே, சத்யசோத சமாசம், தந்தை பெரியாரின் தன்மதிப்பு இலக்கிய முன்னோடி கேரளா நாராயண குரு, ஈழவர், தீயவர் சமூக விடுதலை, தீண்டாமை ஒழிப்பு.

திருமந்திரம், பக்தி இயக்கம், சம்பந்தர் அப்பர் உறவு, இராமானுசர் சூத்திரப் பெரிய நம்பிக்கையைக் குருவாக ஏற்றல், திலகவதியார், காரைக்காலம்மையார், ஆண்டாள், சித்தர் மரபு, சிவவாக்கியர், சிற்றிலக்கிய மரபு, அத்திப்பாக்கம் அ.வேங்கடாசல நாயகர், வைகுண்டசாமி, இராமலிங்க அடிகளார், திரு.வி.க

**அலகு: 3 சுயமரியாதை இயக்க வரலாறு**

சுயமரியாதை இயக்கத் தோற்றம், சுயமரியாதைச் சங்கம், நோக்கம், தன்மதிப்பு, சமத்துவம், சகோதரத்துவம், பார்ப்பனரல்லாதார் 10 வது மாகாண மாநாடு, வகுப்பு வாரி உரிமை, சாதி, பேதம் உயர்வு, தாழ்வு, வருணாசிரம மறுப்பு, பெண்ணின் திருமண வயது, விதவை மறுமணம், இளைஞர் சங்கம், சுயமரியாதை வடிவங்கள்.

**அலகு: 4 பெண் விடுதலை**

ஆண், பெண் உயர்வு, தாழ்வு, கற்பு, விதவை மறுமணம், குழந்தை மணம், சொத்துரிமை, பெண் கிளர்ச்சியின் தேவை, பெண்ணடிமைக்குக் காரணம், சொத்துரிமை இல்லை, ஆண் பெண்



சமத்துவம், ஒத்த உரிமை இன்மை, தனிச்சொத்துடைமை, அரசியல் பதவி வேலைகளில் ஐந்து விழுக்காடு வேண்டல்.

#### அலகு: 5 வைதீக எதிர்ப்பு

வருணாசிரம அமைப்பும் தீண்டாமையும், வைக்கம் கிளர்ச்சி, ஈழவர்களுக்கான அழைப்பு, கமுதி, ஈரோடு கோயில் நுழைவுப் போராட்டம், கோயில் நுழைவும் தீண்டாமையும் வகுப்புவாரி உரிமை

#### எழுத்து

ஈ.வே.ரா கருத்து, கருத்துப் பரிமாற்றக் கருவி, பழக்க வழக்கப் பண்பு வேறுபாடுகளும், கருத்தாக்க வேறுபாடுகளும், வடமொழி எதிர்ப்பு, அடிமைப்படுத்தும் மொழி, தமிழ்மொழி விடுதலைக்கான வழிகாட்டி, வேற்று மொழி எதிர்ப்பு, இந்தி எதிர்ப்புப் போராட்டம், தமிழ்மொழிக் காப்பு, கலைச் சொல்லாக்கம், எழுத்துச் சீர்திருத்தம்.

#### பாட நூல்கள்

1. பெரியாரியல் தொகுதி (1,2,) 2004, வே. ஆனைமுத்து, தையல் நாயகி நினைவு நூல் வெளியீட்டகம், புதுச்சேரி.
2. சுய மரியாதை இயக்கம், 1990, மங்கள முருகேசன், பாரிநிலையம், சென்னை.

#### பார்வை நூல்கள்:

1. பெரியார் ஈ.வே.ரா சிந்தனைத் தொகுதி 1,3, வே. ஆனைமுத்து, சிந்தனையாளர் கழகம், திருச்சிராப்பள்ளி.

**பயன் :** பெரியார் வாழ்வும் பணியும் பற்றி தெரிந்து கொண்டனர்.

**பயன் :** தமிழகச் சமூகச்சீர்திருத்த இயக்க வரலாறு பற்றி தெரிந்து கொண்டனர்.

**பயன் :** சுயமரியாதை இயக்க வரலாறு பற்றி தெரிந்து கொண்டனர்.

**பயன் :** ஆண், பெண் உயர்வு, தாழ்வு, கற்பு, விதவை மறுமணம் பற்றி தெரிந்து கொண்டனர்.

**பயன் :** வருணாசிரம அமைப்பும் தீண்டாமையும் பற்றி தெரிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	பெரியார் வாழ்வும் பணியும் பற்றி அறிதல்.	K1
CO 2	சீர்திருத்த இயக்கங்கள் பற்றி அறியச் செய்தல்.	K2
CO 3	பெரியாரின் சுயமரியாதை இயக்கக் கருத்துக்களை பின்பற்றுதல்.	K3
CO 4	பெண்களுக்குண்டான உரிமைகளை பெரியார் கால கருத்துக்களை ஒப்பிட்டு அறிந்தனர்.	K5
CO 5	பெரியாரின் எழுத்துச் சீர்திருத்த புரட்சிகளை அறியச்செய்தல்.	K4

**K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,**

**K6 - CREATECOURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

<b>COS/PSOS</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO 2</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO 3</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO 4</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO 5</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>

**S – STRONG, M - MEDIUM**

**தாள்: 16**  
**தமிழர் நுண்கலைகள்**

Programme : MA.,

Course Code : 21P4TA16

Semester : IV

No.of hrs : 5

**Core Paper –XVI**

**No.of Credits : 4**

**நோக்கம் :** தமிழர்களின் கோயில் அமைப்பு முறையை உணர்த்தல்

**நோக்கம் :** சிற்பக்கலையின் வடிவமைப்புகளை பற்றி உணர்த்தல்

**நோக்கம் :** ஓவியக்கலையின் சிறப்பினை பற்றி உணர்த்தல்

**நோக்கம் :** கலைகளில் பாமர மக்களின் வாழ்வியலை வெளிப்படுத்தும் கூத்துகலையை அறிதல்.

**நோக்கம் :** இசையின் நூல்களையும் கருவிகளையும் பற்றி உணர்த்தல்.

**அலகு: 1**

கட்டலக்கலை – விளக்கம் - மரக்கட்டலங்கள் - செங்கல் கட்டலங்கள் - பாறைக்கோயில்கள் - குகைக்கோயில்கள் - கற்றளிகள் - கட்டலங்களின் மூவகைப்பிரிவுகள் - கோயில்களின் தரையமைப்பு – மாடக்கோயில்கள் - கட்டல அமைப்பும் உறுப்புகளும் - கோயில் வகைகள். - மரக்கோயில்கள் - ஆலக்கோயில் - இளங்கோயில் - கரக்கோயில் - ஞாழற் கோயில் - கொகுடிக்கோயில் - மணிக்கோயில் - உயரமான கோயில்கள் - சுவர் உறுப்புகள் - கோஷ்ட பஞ்சரம் - கும்ப பஞ்சரம் - தோள் உறுப்புகள் .

**அலகு – 2**

சிற்பக்கலை – விளக்கம் - சிற்பம் அமைக்கும் பொருள்கள் - இரண்டு வகைச் சிற்பங்கள் - கல்லும் உலோகமும் - தத்ருப உருவங்கள் - யவன நாட்டுச் சிற்பமும் நமது நாட்டுச் சிற்பமும் - மரச்சிற்பம் - சிற்பத்தில் மறைபொருள்கள் - பல்வகை மூர்த்தங்கள் - பௌத்த, ஜைன சிற்பங்கள் - பிரதிமை சிற்பங்கள் - சோழர் பிரதிமைகள் - நால்வகைப்பிரிவு – தெய்வ உருவங்கள்.

**அலகு – 3**

ஓவியக்கலை விளக்கம் - ஓவியக்கலையின் பழமை – சுவர் ஓவியங்கள் - பரங்குன்றத்துச் சுவர் ஓவியம் - பல்லவர்கால சோழர்கால ஓவியங்கள் - ஓவியம் அழிக்கப்படுதல் - கண்ணுள் வினைஞர் - ஓவியநூல்கள் - ஓவியம் பற்றிய பெயர்கள் - தென்னிந்திய ஓவியங்களின் சிறப்பு – சித்தன்னவாசல் ஓவியம் - கையிலாசநாதர் ஓவியம் - பனைமலை ஓவியம் - தஞ்சைக் கோயில் ஓவியம் - நாயக்கர் கால ஓவியங்கள்.

#### அலகு - 4

இசைக்கலை - விளக்கம் - இசை கற்றூண்கள் - பரிபாடலில் இசை - பரிபாடல் இசை மறைவு - இசைப்பாணர் - பஞ்சபாரதீயம் - இசை நுணுக்கம் - தமிழில் இசைநூல்கள் - பஞ்சமரபு இராகங்கள் - குலோத்துங்கன் இசை நூல் - இசைத் தமிழ்ச் செய்யுட்டுறைக் கோவை - இசைக்கலைச் சாசனம் - கீர்த்தனைகள் - இசைக்கருவிகள்.

#### அலகு - 5

கூத்துக்கலை விளக்கம் - பதினோராடல் - கூத்துநூல்கள் - பரதநாட்டியம் - தலைக்கோல் - தலைக்கோல் சிறப்பு - கலைப்போட்டி - யாழ்வென்றி, ஆடல்வென்றி - கலைஞர்களைப் போற்றுதல்.

#### பாடநூல்

1. தமிழர் வளர்த்த அழகுக்கலைகள் - மயிலை சீனிவேங்கடசாமி - மாணிக்கவாசகர் பதிப்பகம், 31, சிங்கர் தெரு, பாரிமுனை, சென்னை - 6000108 (2006)

#### பார்வைநூல்கள் :

1. நாட்டுப்புறக் கட்டடக்கலை மரபுகள் - புலவர் இராச , மணிவாசகர் பதிப்பகம், சென்னை.
2. தமிழகக்கோயிற்கலைகள் - இரா.நாகசாமி - தொல்பொருள் ஆய்வுத்துறை தமிழ்நாடு அரசு-சென்னை - (1976)
3. திருக்கோயில் அமைப்பும் திருவுருவ அமைதியும் - முனைவர் அம்பை லோ.மணிவண்ணன் (மதுரைக் கோவில் குறித்த செய்திகள்) வெளியீடு -ஏ.ஆர். பதிப்பகம்- 609, கே.கே.நகர் மதுரை - 625020

**பயன் :** கட்டடக்கலையின் சிறப்புகளைப் பற்றி தெரிந்து கொண்டனர்.

**பயன் :** சிற்பக்கலைகளின் அமைப்பையும் அது வெளிப்படுத்தும் பண்பாட்டையும் தெரிந்து கொண்டனர்.

**பயன் :** காலந்தோறும் மாறிவரும் அரசுக்கு ஏற்றவாறு தன்னை மாற்றிக் கொண்ட கலைத்தன்மையைத் தெரிந்து கொண்டனர்.

**பயன் :** அகப்புற செய்திகளில் கூறப்பட்டிருக்கும் இசை மரபுகளைத் தெரிந்து கொண்டனர்.

**பயன் :** கூத்தின் வளர்ச்சியே பிற்கால நாடகக்கலைக்கு ஆணிவேராக அமைந்ததது.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	கோயில் வகைகள் குறித்து அறிதல்.	K2
CO 2	சிற்பங்களில் பல்வேறு மதம் சார்ந்த கலைகளை உணர்த்துதல்.	K4
CO 3	பல்வேறு புகழ்பெற்ற தலங்களில் அமைந்துள்ள ஓவியங்களின் நுட்பங்களை அறிந்து வெளிப்படுத்துதல்.	K3
CO 4	இசைகளின் சிறப்புகளையும் காலந்தோறும் அதன் பரிணாமத்தையும் அறிதல்.	K1
CO 5	கூத்துக்கலையில் ஆடல் வகைகளை விளக்குதல்.	K5

K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,  
K6 – CREATE

#### COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	S	S	M	M
CO 2	M	S	S	M	M
CO 3	M	S	S	M	M
CO 4	M	S	S	S	S
CO 5	M	S	S	S	S

S – STRONG, M – MEDIUM

## விருப்பப்பாடம் – IV- A

### ஊடகவியல்

Programme : MA.,

Course Code : 21P4TAE04

Semester : IV

No.of hrs : 5

CORE Elective Paper – IV - A

No.of Credits : 4

**நோக்கம் :** இதழ்களில் வரலாறு, வளர்ச்சி, அமைப்பு, செயல்பாடு பற்றி உணர்த்தல்

**நோக்கம் :** விளம்பர உத்திகள் - வடிவமைப்பு பற்றி உணர்த்தல்

**நோக்கம் :** வானொலி, தொலைக்காட்சி நிகழ்ச்சி தொகுப்பு பற்றி உணர்த்தல்

**நோக்கம் :** திரைப்பட மொழி, கதை பற்றி உணர்த்தல்

**நோக்கம் :** செய்திப்படங்களும் மாற்று ஊடகங்கள் பற்றி உணர்த்தல்

#### அலகு: 1

இதழ்களின் தோற்றமும் வளர்ச்சியும் - இதழ் வகைகள் - இதழ்களின் இன்றியமையாமை - இதழ்களின் பணிகள் - கடமைகள் - பொறுப்புகள் - மக்களாட்சி இதழ்கள் - ஆட்சியியல் இதழ்களின் பங்கு , பணி - இதழ்களின் சுதந்திரம் - பத்திரிக்கைச் சுதந்திரம் - தேவைகள் - தடைகள் - வரையறைகள்.

#### அலகு: 2

விளம்பரங்களின் நோக்கம் - கூறுகள் - வகைகள் - அரசு, தனியார், வணிக விளம்பரம்- விளம்பரம் பெறும் முறைகள் - விளம்பர ஒழுக்க நெறிகள் - விளம்பரத்தின் நிறை குறைகள் - உத்திகள் - விளம்பர வடிவமைப்பு - புகைப்படங்களும் வாசகங்களும்.

#### அலகு: 3

வானொலி, தொலைக்காட்சி நிகழ்ச்சி தொகுப்பும் வர்ணனையும் - ஊடகத்தின் தாக்கம் - மின் ஊடகங்களில் எழுத்து மொழியும் உடல்மொழியும் பேட்டி-பேட்டி விளக்கமும் நோக்கமும் - பேட்டியின் வகைகள் - பேட்டி நடத்துதல் - கவனத்தில் கொள்ளவேண்டியவை - பேட்டி கட்டுரை எழுதுதல்.

#### அலகு: 4

திரைப்பட மொழியின் கூறுகள் - திரைப்படங்களின் காட்சிகள் - காட்சிகளின் போலி பிம்பங்கள் - திரைப்படத்துரையினரின் மனித நேயம் - கதையும் - திரைக்கதையும்

#### அலகு: 5

செய்தி நிறுவனங்கள் - வரலாற்று பின்புலம் - உலகம், இந்திய செய்தி நிறுவனங்கள் - செய்தித்தாள் நிர்வாக அமைப்பு - ஆசிரியர் பிரிவு - வாணிபப் பிரிவு - இயந்திரப்பகுதி - வளர்ச்சிப் பகுதி - புள்ளி விவரப்பகுதி - நிர்வாகப் பிரிவு - செய்திகளின் வகைகள் - மூலங்கள் செய்திக் கூறுகள் - அமைப்பு - சேகரிப்பு முறைகள் - தொகுத்தல் - எழுதுதல்

## பாடநூல்கள்

1. டாக்டர் மா.பா.குருசாமி - இதழியல்கலை  
குரு தேமொழி  
தாயன்பகம்  
ஆறாவது தெரு, ஏ.கே.எம்.ஜி.நகர்,  
திண்டுக்கல் - 624 001.
2. டாக்டர் சு.சக்திவேல் - இதழியல்  
மணிவாசகர் பதிப்பகம்,  
31, சிங்கர் தெரு, பாரிமுனை,  
சென்னை - 600108.
- 3.மக்கள் தகவல் தொடர்பியல் - கி . ராசா ,  
பாவை பப்ளிகேஷன்ஸ் ,  
142 ,ஜானி ஜான் சாலை ,  
இராயப்பேட்டை , சென்னை -14

## பார்வை நூல்கள்:

- 1.தகவல் தொடர்பியல் - வெ.கிருட்டிணசாமி ,மணிவாசகர் பதிப்பகம் , 31, சிங்கர்  
தெரு, பாரிமுனை, சென்னை - 600108.
- 2.கி.கார்த்திகேயன் - இன்றைய ஊடகங்களின் செயல்பாடும் கடமைகளும்  
மணிமேகலைப் பிரசுரம்,  
தியாகராய நகர்,  
சென்னை - 600 017.

**பயன் :** இதழ்களில் வரலாறு, வளர்ச்சி, அமைப்பு, செயல்பாடு பற்றி புரிந்து கொண்டனர்.

**பயன் :** விளம்பர உத்திகள் - வடிவமைப்பு பற்றி அறிந்து கொண்டனர்.

**பயன் :** வானொலி, தொலைக்காட்சி நிகழ்ச்சி தொகுப்பு பற்றி கற்றுக் கொண்டனர்.

**பயன் :** திரைப்பட மொழி, கதை பற்றி உணர்ந்து கொண்டனர்.

**பயன் :** செய்திப்படங்கள் பற்றியும் மாற்று ஊடகங்கள் பற்றியும் தெரிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
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<b>CO 1</b>	இதழ்களின் தோற்றம் வரலாறு குறித்து அறிதல்.	<b>K1</b>
<b>CO 2</b>	இதழ்களில் விளம்பரங்களின் பங்களிப்பை கற்று உணர்த்துதல்.	<b>K3</b>
<b>CO 3</b>	ஊடகங்களில் மேற்கொள்ளப்படும் பணிகளின் தேவைகள் குறித்து விளக்குதல்.	<b>K5</b>
<b>CO 4</b>	ஊடகங்களில் திரைப்படத்தின் பங்களிப்பினை உணர்த்துதல்.	<b>K4</b>
<b>CO 5</b>	செய்தி நிறுவனங்கள் - வரலாற்று பின்புலத்தையும் வகைகளையும் அறியச்செய்தல்.	<b>K2</b>

**K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,**

**K6 - CREATE**

#### **COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES**

<b>COS/PSOS</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 2</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 3</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 4</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>
<b>CO 5</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>S</b>

**S – STRONG, M - MEDIUM**



## விருப்பப்பாடம் - IV- B

### வாழ்வியல் பண்பாட்டுக் கல்வி

Programme : MA.,

Course Code : 21P4TAE08

Semester : IV

No.of hrs : 5

**CORE Elective Paper – IV - B**

**No.of Credits : 4**

**நோக்கம் :** ஆளுமை, துணிவு, நடத்தை, நம்பிக்கை பற்றி உணர்த்தல்

**நோக்கம் :** மனித உரிமைகள், சமூக உரிமைகள், தனிமனித உரிமைகள் பற்றி உணர்த்தல்

**நோக்கம் :** மனிதனும் சுற்றுச்சூழலும் - இயற்கை அமைப்பு பற்றி உணர்த்தல்

**நோக்கம் :** சுற்றுச்சூழலைப் பாதுகாக்கும் வழிமுறைகள் பற்றி உணர்த்தல்

**நோக்கம் :** பெண்ணிய விளக்கம், பெண்ணியத் தோற்றமும் வளர்ச்சியும் பற்றி உணர்த்தல்

**அலகு : 1 ஆளுமைத்திறன் மேம்பாடு**

ஆளுமை ஆற்றல் வெளிப்பாடுகள் - துணிவு - நடத்தை - நம்பிக்கை - தியானம் - நேர்முகச்சிந்தனை - தன்னை உணர்தல் - காலத்தின் அருமையை உணர்ந்து செயலாற்றல் - எண்ணங்கள் - மேம்பாடுகள் - மனிதப் பண்புகள் - மனிதநேயம் - வெற்றிக்கு ஒன்பது படிகள் - இலக்கியங்களில், வரலாற்றில், ஆன்மீகத்தில் மனிதப் பண்புகளும், மனித நேயமும் வெளிப்படும் விதம்.

**அலகு - 2 மனித உரிமைகள்**

மனித உரிமைகள் - சமூக உரிமைகள் - தனிமனித உரிமைகள் - அடிப்படை உரிமைகள் - பண்பாடு மற்றும் கல்வி உரிமைகள் - நீதிப்பேராணைகளின் தன்மைகள் - மனித உரிமை ஆணையங்கள் - ஆணையத்தின் கவன ஈர்ப்புகளான்கள் - உரிமையும் கடமையும் - மனித உரிமை ஆணையத்தின் குறிப்பிடத்தக்க நடவடிக்கைகள் - மனித உரிமையைக் காக்கும் அறிக்கைகள்.

**அலகு - 3 சுற்றுச்சூழல் விழிப்புணர்வு**

மனிதனும் சுற்றுச்சூழலும் - இயற்கை அமைப்பு - மலைகள் - காடுகள் - ஆறுகள் - கடல்கள் - கிராமங்கள் - நகரங்கள் - இயற்கை அழிவும் தீங்கும் - சுற்றுச்சூழல் கல்வி - தேசிய சுற்றுச்சூழல் கொள்கை - ஐம்பூதங்களை மாசடையச் செய்வதால் இன்று நம்முன் உள்ள சிக்கல்கள்.

#### அலகு :4 சுற்றுச்சூழல் பாதுகாப்பு

சுற்றுச்சூழலைப் பாதுகாக்கும் வழிமுறைகள் - வன வளப் பாதுகாப்பு - நீர் நிலைகளைப் பாதுகாத்தல் - நிலவளம் காத்தல் - நச்சில்லா வேளாண்மை - வளிமண்டலப் பாதுகாப்பு - இயற்கையை நேசித்தல் - வனவிலங்குகள் - பறவைகளைப் பாதுகாத்தல்.

#### அலகு - 5 பெண்ணியம்

பெண்ணிய விளக்கம் - பெண்ணிய வகைகள் - பெண்ணியத் தோற்றமும் வளர்ச்சியும் - பணிநிலையில் பெண்கள் - சமூகநிலையில் பெண்கள் - தமிழ்க் கவிஞர்களும் பெண்ணுரிமையும் - பெண்களின் ஆளுமைப் பதிவுகள் - பெண்ணுரிமையைப் பாதுகாக்க அரசு மேற்கொண்டுள்ள சிறப்புத் திட்டங்கள்

#### பாடநூல்

1. மனித வாழ்க்கையும், சுற்றுச்சூழலும், டாக்டர் கோ.தங்கவேலு, திருவரசு புத்தக நிலையம், தி.நகர், சென்னை

#### பார்வை நூல்கள்:

1. எண்ணங்கள் - டாக்டர் எம்.எஸ்.உதயமூர்த்தி, கங்கை புத்தக நிலையம் தி.நகர், சென்னை - 17
2. வெற்றி தரும் ஆளுமை ஆற்றல் - சி.எஸ் தேவநாத், நர்மதா பதிப்பகம், சென்னை
3. வாழ்க்கைப் பண்புகள் - டாக்டர்.என்.ஸ்ரீதரன், கங்கை புத்தக நிலையம், தி.நகர், சென்னை-17
4. அடிப்படை மனித உரிமைகள் - சி.எஸ். தேவநாத், நர்மதா பதிப்பகம், சென்னை
5. தமிழிலக்கியத்தில் மனிதநேயம், ச.கிருஷ்ணமூர்த்தி, உலகத்தமிழாரய்ச்சி நிறுவனம், சென்னை
6. மனவளக்கலை - வேதாத்திரி மகரிஷி, வேதாத்திரி பதிப்பகம், ஈரோடு
7. தமிழிலக்கியமும் பெண்ணியமும், அரக்கமல்லிகா, நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை
8. தமிழ்க் கவிதைகளில் பெண்ணுரிமை, டாக்டர் ச.விஜயலட்சுமி, பார்க்கர் பதிப்பகம் சென்னை
9. வெற்றிக்கு ஒன்பது படிிகள், வசந்தா (மொ.பெ), கண்ணதாசன் பதிப்பகம், சென்னை

**பயன் :** ஆளுமை, துணிவு, நடத்தை, நம்பிக்கை பற்றி புரிந்து கொண்டனர்.

**பயன் :** மனிதஉரிமைகள், சமூகஉரிமைகள், தனிமனித உரிமைகள் பற்றி புரிந்து கொண்டனர்.

**பயன் :** மனிதஉரிமைகள், சமூகஉரிமைகள், தனிமனித உரிமைகள் பற்றி புரிந்து கொண்டனர்.

**பயன் :** சுற்றுச்சூழலைப் பாதுகாக்கும் வழிமுறைகள் பற்றி புரிந்து கொண்டனர்.

**பயன் :** பெண்ணிய விளக்கம், பெண்ணியத் தோற்றமும் வளர்ச்சியும் பற்றி புரிந்து கொண்டனர்.

CO.NO.	Upon completion of this course, students will be able to	Knowledge levels
CO 1	ஆளுமைத் திறனை இலக்கியம் வழி அறிதல்.	K1
CO 2	தனி மனித உரிமைகள் குறித்து விளங்க வைத்தல்.	K4
CO 3	சுற்றுச்சூழலைப் மேம்படுத்தும் வழிமுறைகள் பற்றிப் கற்று உணர்த்துதல்.	K3
CO 4	சுற்றுச்சூழலைப் பாதுகாக்கும் வழிமுறைகளைப் பற்றிப் அறியச் செய்தல்.	K2
CO 5	பெண்ணிய ஆளுமைக் குறித்த அறிவினை ஏற்படுத்துதல்.	K6

K1 – REMEMBER, K2 – UNDERSTAND, K3- APPLY, K4 – ANALYZE, K5- EVALUATE,

K6 - CREATE

#### COURSE OUT COMES MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COS/PSOS	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	M	S	S	M
CO 2	M	M	S	S	M
CO 3	M	M	S	S	M
CO 4	M	M	S	S	M
CO 5	M	M	S	S	M

S – STRONG, M – MEDIUM

## திட்டக் கட்டுரை

Programme : MA.,  
Semester : IV

Course Code : 21P4TAPR01  
No.of hrs : 3  
No.of Credits :

வகுப்பு : முதுகலைத் தமிழ்  
ஆண்டு : இரண்டாமாண்டு  
பருவம் : நான்காம் பருவம்

அகமதிப்பெண் - 25  
புறமதிப்பெண் - 75  
மொத்த மதிப்பெண் - 100

### திட்டக் கட்டுரைக்கான வரையறை

இதற்கு முன் ஆய்வு செய்யப்பெறாத புதியதொரு திட்டக் கட்டுரைக்கான தலைப்பினை ஆய்வாளர் தம்முடைய நெறியாளரின் வழிகாட்டுதலின் பேரில் தேர்ந்தெடுத்து பின்னிணைப்பு நீங்கலாக முன்னுரை முடிவுரை உட்பட ஐம்பது பக்கங்களுக்குக் குறையாமலும் எழுபது பக்கங்களுக்கு மிகாமலும் திட்டக் கட்டுரையை உருவாக்கி அந்தக் கல்வியாண்டின் பிப்ரவரி மாத இறுதிக்குள் நெறியாளர் துறைத்தலைவர் முதல்வர் ஒப்புதலுடன் ஒப்படைக்க வேண்டும்.

ஆய்வேட்டை எழுதி வடிவமைப்பதற்கு நெறியாளர் 40 மதிப்பெண்ணுக்கு மதிப்பீடு செய்வார். வாய்மொழித்தேர்வில் புறமதிப்பீட்டாளர் 60 மதிப்பெண்ணுக்கு மதிப்பீடு செய்வார்.