PSGR
Krishnammal College for Women

DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULAR FRAMEWORK (LOCF)

(Semester– I-III)

MASTER OF SCIENCE IN BOTANY (2024 – 2026 Batch)

MASTER OF SCIENCE - BOTANY
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULUM FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION
2024-2026 Batch, Semesters I- III

PROGRAMME LEARNING OUTCOMES (PLOs)

PLO 1: To produce graduates with more advanced knowledge and research skills in various disciplines of botany which are relevant to scientific development and conservation of plant diversity for socio-economic development of the country.

PLO 2: To remember, comprehend, apply, analyze, and synthesize the core concepts in botany, like biodiversity, structure and function, evolution, information flow, exchange and storage pathways and transformations of energy and matter, medicinal plants and their uses, food science and nutrition, forestry, energy and environment management.

PLO 3: To pursue advanced education, research and development, and other creative and innovative efforts in Life science.

PLO 4: To define the characteristics of the process of science; practice the skills of the scientific method, engage in research projects and apply quantitative skills to biological problems to understand the ambiguity in science.

PLO 5: To understand the relationship between science and society and will apply their skill to evaluate to solve the social problems like conservation and management of environment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

At the end of the programme, the student will

PSO1: To gain advanced knowledge in various disciplines to analyze, and understand the core concepts in Botany.

PSO2: To be well equipped to pursue research and development in Life science**.**

PSO3: To secure jobs in the field of education, research and industries that requires scientific thinking and critical problem solving skills.

PSO4: To apply the entrepreneur skills gained in Botany for socio-economic development of the Country.

PSGR Krishnammal College for Women

MASTER OF SCIENCE - BOTANY
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULUM FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION
2024-2026 Batch, Semester I-III

Sem	Subject Code	Title of the Paper		Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
								CA	ESE	TOTAL	
I	MPL2401	Plant Diversity	CC	5	73	2	3	25	75	100	5
	MPL2402	Plant Anatomy, Embryology and Tissue Culture.	CC	5	73	2	3	25	75	100	5
	MPL2303	Applied Microbiology	CC	5	73	2	3	25	75	100	5
	MPL2304	Cell Biology and Genetics	CC	5	73	2	3	25	75	100	5
	MPL24P1	Practical I	CC	3+3+ 2+2	150	-	4	25	75	100	5
I-III	17MONL1	Online Course- 1	ACC	-	-	-	-	-	-	-	-
II	MPL2405	Plant Physiology and Biochemistry	CC	5	73	2	3	25	75	100	4
	MPL2406	Molecular Biology	CC	5	73	2	3	25	75	100	4
	MPL2407	Bioinformatics and Nanobiotechnology	GE	5	73	2	3	25	75	100	5
II/III	MPL23CE / MPL2408	Coursera - Genomics and Drug Discovery/ Biotechniques	GE	3	45	-	-	100	-	100	3
					43	2	3	25	75		
III	MCP19A1	IDC -Clinical Microbiology &	AEC	4	60	-	3	-	100	100	4
	MPL24P2	Practical II	CC	3+3 +2	120	-	4	25	75	100	6

I-III	17MONL1	Online Course	ACC	-	-	-	-	-	-	-	-
III	MPL2408	Biotechniques	CC	3	43	2	3	25	75	100	3
	MPL2409	Plant Systematics	CC	4	58	2	3	25	75	100	4
	MPL2410	Medicinal Botany	CC	3	43	2	3	25	75	100	3
	MPL2311	Genetic Engineering	CC	4	58	2	3	25	75	100	4
	MPL2312	Plant Ecology and Phytogeography	CC	4	58	2	3	25	75	100	4
	MPL22S1	Research Methodology	AECC	2	30	-	3	--	100	100	2
	MPL24P3	Practical – III	CC	4	60	--	4	25	75	100	2
	MPL23P4	Practical – IV	CC	4	60	--	4	25	75	100	2
	MNM22CS2	Cyber Security II	AECC	2	30	--	--	100	--	100	Gr.
	MPL24COM	Comprehensive Examination	AECC	--	--		--	100		100	Gr.
I-III	17MONL1	Online course	ACC	--	--	--	--	--	--	--	--

CC – Core Courses **GE – Generic Elective**
AEC – Ability Enhancement Course **ACC – Additional Credit Course**
AECC – Ability Enhancement Compulsory Course
CA – Continuous Assessment **ESE–End Semester Examination**

Assessment pattern for 2024- 25 batch

CA Pattern

Section A – 3 x 2 = 6
Section B – 3 x 5 = 15 (either or – same CLO Level)
Section C – 3 x 8 = 24(either or – same CLO Level)
Total = 45

One question with a weightage of 2 Marks :2 x 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3=15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3=24
Total : 45 Marks

ESE Pattern

Section A – 5 x 2 = 10
Section B – 5 x 5 = 25 (either or – same CLO Level)
Section C – 5 x 8 = 40(either or – same CLO Level)
Total = 75

ESE Question Paper Pattern: 5 x 15 = 75 Marks
Question from each unit comprising of One question with a weightage of 2 Marks : 2 x 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5=25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5=40

CIA Test	-	5	Conducted for 45 marks after 50 days
Model Exam	-	7	Conducted for 75 marks
(Q.P. Pattern (2,5,8) Each Unit 15 Marks)			
Sem/Ass/Quiz	-	5	
Class Participation	-	5	
Attendance	-	3	
		25	**+ ESE 75 Marks**

Practical
Lab Performance : 7 marks
Regularity : 5 marks
Model Exam : 10 marks
Attendance : 3 marks
Total : 25 marks

ESE Practical Pattern
The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any

IDC and Special Course:
Section A 5 questions (Internal choice) :25 marks
Section B 5 questions (Internal choice) :75 marks
Total :100 marks

Attendance

91-100%	3Marks
81-90%	2 Marks
75-80%	1 Mark

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2401	Plant Diversity	Theory	73	2	--	5

Preamble

- To understand the diversity of plants and their distribution
- To study the evolution of plants.

Course Outcomes

On the successful completion of the course, students will be able to understand the following

CLOs	CLO Statement	KnowledgeLevel
CLO1	Classification of different plant forms	K2, K3.K4, K5
CLO2	To understand in detail about Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms	K2, K3.K4, K5
CLO3	Understand the life pattern of plants	K2, K3.K4, K5
CLO4	Able to identify the plant diseases	K2, K3.K4, K5
CLO5	Distinguish different fossilized life forms with that of the present plants	K2, K3.K4, K5

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	M	S
CLO3	M	S	M	S	M
CLO4	M	M	S	M	S
CLO5	S	S	M	S	S

S- Strong; M-Medium

Syllabus

Unit: I **Phycology** **15 hrs**

Classification of algae by Fritsch 1945. Structural organization, Reproduction and Phylogeny of Chlorophyceae, Xanthophyceae, Phaeophyceae, Rhodophyceae, Myxophyceae and Bacillariophyceae. Algae in Biotechnology- Industrial, Nutraceutical and bioactive/Pharmaceutical.

Unit: II Mycology and Plant pathology **14 hrs**

Classification of Fungi by Alexopoulos and Mims, (1979). Salient features, Reproduction and Life cycle of Myxomycetes, Oomycetes, Ascomycetes Basidiomycetes and Deuteromyctes. Application of fungi–Industry, Agriculture and Forestry. Classification of plant diseases based on symptoms. Host - pathogen interaction, Defense mechanism.

Unit: III Bryology **14hrs**

Classification - Reimers (1954). Structural organization of the gametophyte, sporophyte, methods of spore dispersal in Hepaticopsida, Anthocerotopsida and Bryopsida Bryophytes as pollution indicators.

Unit: IV Pteridology **14 hrs**

Classification - Sporne (1966). Comparative Morphology, Reproduction and Life cycle of Lycopsida, Sphenopsida, Pteropsida. Heterospory and seed habit.

Unit:V Gymnosperms **15 hrs**

Classification of Gymnosperms by Sporne (1965). General account of Coniferales, Taxales, Ginkgoales, Gnetales and Bennettitales including fossils –*Williamsonia, Heterangium, Lagenostoma, Pentoxylon*and*Cordaites.*

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Charles Joseph Chamberlain.M,	Gymnosperm- Structure Evolution	CBS PublishersShadara, Delhi	1st ed., 1986
2.	Singh, R.S	Introduction to principles of Plant pathology	Oxford & IB publishing co. pvt.ltd. New Delhi.	4thedn. 2005.
3.	Vashishta B.R and Sinha A.K	Algae	S. Chand & Company, New Delhi	1st ed. 2008
4.	Vashishta B.R and Sinha A.K	Fungi	S. Chand & Company, New Delhi	1st ed. 2010

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Alexopoulos, C.J and C.W. Mims	Introductory mycology	John Wiley & Sons. Newyork	1st ed., 1985
2.	Chapman V.J and Chapman P.J,	The algae	Mac Milan, Newyork	2ndedn. 1973.
3.	Chamberlain C.J,	Gymnosperms-Structure Evolution	CBS Publishers, Shahdara, New Delhi	1st ed. 1986
4.	Fritsch F.E. 1979	The structure and reproduction of the algae.Vol I and II	Cambridge University Press, England.	Cup – Vikas student's edn
5.	Prempuri	Bryophytes - A Broad Prospective	Atma Ram & Sons, New Delhi	2ndEdn 1985

Pedagogy: Power point presentation, Lecture, seminar, quiz and discussion

Course Designers:

Dr. R. Sumathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2402	Plant Anatomy, Embryology and Tissue Culture	Theory	73	2	-	5

Preamble

- knowledge on Plant Anatomy
- Predict anomalous growth into normal plant anatomy
- Compare dicot and monocot embryology
- Knowledge on tissue culture

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Illustrate the internal structure of plant tissue	K2, K3.K4, K5
CLO2	Interpret anomalous secondary growth in plants	K2, K3.K4, K5
CLO3	Critically analyze the embryological process in plants	K2, K3.K4, K5
CLO4	Appraise the knowledge of tissue culture	K2, K3.K4, K5
CLO5	Apply tissue culture techniques to conserve plants	K2, K3.K4, K5

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	S
CLO2	S	S	S	S	S
CLO3	S	M	M	S	M
CLO4	M	M	S	S	M
CLO5	M	M	S	S	M

S- Strong; M-Medium

Syllabus

Unit:I **15 hrs**

Introduction to meristems and its derivatives. Cytological characteristics and growth pattern of meristem. Epidermal tissue system – trichomes, glands, Stomata. Secretory tissues- nectaries and laticifers. Detailed structure of Vascular cambium, Secondary Xylem-Xylem rays, ray tracheids ,wood parenchyma, tyloses, sap and heart wood, false annual rings, ring porous and diffuse porous wood, Compression wood and Secondary phloem, Phylogenetic specialisation.

Unit: II **14 hrs**

Nodal anatomy., Periderm-Structure, morphology, Function and Lenticels, Anomalous secondary thickening in dicots- *Achyranthus, Aristolochia, Bignonia, Leptadaenia*, Mirabilis, Piper and arborescent monocots-*Dracaena*

Unit: III **15 hrs**

Microsporogenesis. Male gametophyte - structure, pollen wall morphogenesis and chemistry. Pollen-stigma interaction and incompatibility. megasporogenesis, Embryo sac structure and types - monosporic, biosporic and tetrasporic. Fertilization and its control, parthenocarpy endosperm - types and haustoria. Structure and development of dicot embryo – *Ceratocephalusfalcatum,* monocot embryo – *Najaslacerata,* anomalous embryo development – *Triticum*. Polyembryony and its significance.

Unit:IV **14hrs**

Tissue and cell culture techniques: Types of media, preparation of Murashige and Skoog medium, macro and micro nutrients, Growth hormones.Explant culture: Selectionof explants, preparation of explants for inoculation. Callus production, micropropagation. Organ culture- meristem culture, anther and pollen culture and embryo culture. Cell culture techniques and its applications.

Unit: V **15 hrs**

Protoplast culture -somatic hybridisation, somatic embryogenesis and artificial seed production. Somaclonal variation and its applications. Cryopreservation techniques. Application of tissue culture in the field of Agriculture, forestry and horticulture.

Text Book

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Maheswari.P	Introduction to the Embryology of Angiosperms	Tata McGraw Hill Publishing Co., NewDelhi	1991
2.	Pandey.B.P	Plant Anatomy	S.Chand and Compnay Ltd. New Delhi.	2001. 6thEdn
3.	Ramawat, K.G	Plant Biotechnology	S.Chand and Company Ltd. New Delhi	2004.

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Katherine Esau	Plant anatomy of Seed Plants	Wiley Eastern Limited, New Delhi	1963. Second Edition
2.	Reinert Bajaj	Applied and fundamental aspects of Plant cell, Tissue culture and Organ	Narosa publishers. New Delhi	1977

Pedagogy: Power point presentation, Lecture, seminar, quiz and discussion

Course Designers:

Dr.C.KrishnaveniDr.E.Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2303	Applied Microbiology	Theory	73	2	--	5

Preamble

- To understand the use of microbes at industrial level.
- Application of microbes for environmental aspects.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Identify the microbes and to preserve microbes	K2, K3.K4, K5
CLO2	Understand the fermentation technology and its application	K2, K3.K4, K5
CLO3	Know the application of microbial products at pharmaceutical level	K2, K3.K4, K5
CLO4	Use microbes for biofertilizers	K2, K3.K4, K5
CLO5	Apply microbes to clean the polluted environment	K2, K3.K4, K5

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	M	S
CLO3	M	S	M	S	S
CLO4	S	M	S	S	M
CLO5	M	M	M	S	S

S- Strong; M-Medium

Syllabus

Unit I: Introduction to microbiology **15 hrs**

History and scope of Microbiology- study of microbial structure: Microscopy and specimen preparation, Preservation of microbes- freeze drying(lyophilisation); outline of microbial diversity – Archaea, Gram Bacteria (Non Proteobacteria and Proteobacteria) Gram positive bacteria (Low G+C gram positives, High G+C Gram positives) Fungi, Slime molds and water molds, algae and protozoa.

Unit II : Industrial microbiology **14 hrs**

Upstream process –Fermentation, Media for industrial fermentation, principles of microbial growth and culture systems, solid substrate fermentation. Fermenters- Principle, Mode of operation, Types of fermenters – Conventional fermenter, Continuous stirred tank fermenter, Airlift fermenter, Packed bed fermenter and Photobioreactor. Downstream process –Solid-liquid separation, Release of intracellular products, Concentration, Purification and Formulation.

Unit III **15hrs**

Microbial products and its uses: Production, harvest, recovery, uses and mode of action of enzymes- lipase and amylase; Pharmaceutical products: Antibiotics- Streptomycin; Vitamins B2; Ethanol and Probiotics. Therapeutic proteins– Insulin. Mass culture and utilization of bacteria as SCP.

Unit IV : Agriculture microbiology **14 hrs**

Microbes as Bio-fertilizers. Nitrogenous Biofertilizers – Bacteria, Cyanobacteria, Phosphate solubilisers and mobilisers, Zinc solubilisers, PGPR, Effective microorganisms (EM), Bio-pesticides – Bacteria and Fungi

Unit V :**Environmental Microbiology** **15hrs**

Pollution microbiology- Biodeterioration of paper, textiles and wood microbes in Bioremediation - Oil Spills, Super Bugs, microbes in mining, ore- leaching, oil recovery. Biodegradation of xenobiotics.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Casida. L.E. JR	Industrial Microbiology	New age Intl (P) Limited, New York.	2006. (1^{th} Ed).
2.	Prescott, Harley and Klein	Microbiology	McGraw Hill, Higher education, New York	2005. (VI^{th} Ed).
3.	Stainer R.Y	General Microbiology	The Macmillan Press Ltd, Hong kong	1984. (IV^{th} Ed).
4.	Sathyanarayana, U	Biotechnology	., Books & Allied (P) Ltd, Kolkata	2012

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Dubey, R.C	Text book of Biotechnology	S. Chand and Company Ltd, New delhi	1993. (I^{st} Ed).
2.	Pelczer,JR	Microbiology	Mc Graw Hill company. New Delhi	1988. (V^{th} Ed).
3.	Rita singh,	Industrial Biotechnology	Global vision publishing, New delhi	(I^{st} Ed). 2004

Pedagogy: Power point presentation, Lecture, seminar, quiz and discussion

Course Designers:

Dr.K.S. Tamil Selvi
Dr. B.S. Chithra Devi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2304	Cell Biology and Genetics	Theory	73	2	-	5

Preamble

- To differentiate the structure and functions of both prokaryotic and eukaryotic cell organelles and cell membrane
- To distinguish the basic processes of cell signaling and signaling pathways
- To differentiate the Mendelian inheritance with non-Mendelian inheritance patterns.
- To detect the mutation types and causes, and identify the structural and numerical changes of chromosomes.
- To examine the different types of gene transfer mechanism and genome variation role in health and disease.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Differentiate Structure and functions of cell organelles and cell membrane	K2, K3.K4, K5
CLO2	Relate the cell signalling pathways and cell communication	K2, K3.K4, K5
CLO3	Compare and contrast the mendelian inheritance with non-Mendelian inheritance	K2, K3.K4, K5
CLO4	Classify the mutation types, structural and numerical alterations of chromosomal implication	K2, K3.K4, K5
CLO5	Compare the horizontal and vertical gene transfer mechanism and genetic disorders	K2, K3.K4, K5

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	M
CLO2	M	S	M	M	S
CLO3	S	S	S	M	S
CLO4	S	S	M	M	S
CLO5	M	S	S	S	M

S- Strong; M-Medium

Syllabus

Unit – I **15 hrs**

Structural organization and function of cell organelles - cell wall, nucleus, mitochondria, ER, golgibodies, chloroplast, lysosomes, exosomes, peroxisomes, vacuoles, structure and function of cytoskeleton and its role in motility. Membrane structure and function – lipid bilayer, ion channels, membrane pumps, intracellular transport, electrical properties of membrane. Cell division and cell cycle. Organization of genes and chromosomes – unique and repetitive DNA, interrupted genes, structure of chromatin and chromosomes, transposons.

Unit – II **14 hrs**

Cell signalling: Hormones and their receptors, cell surface receptor, signalling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signalling pathways, bacterial and plant two-component signalling systems.

Unit – III **14 hrs**

Cellular communication: general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extra cellular matrix, neurotransmission and its regulation.

Cancer: oncogenes, tumor suppressor genes, cancer and the cell cycle, virus induced cancer, metastasis.

Unit – IV **15 hrs**

Mendelian Genetics- Mendelian Principles and gene interaction; Multiple alleles – ABO blood group, MN blood group, Rh factor; sex limited and sex influenced characters; Linkage and crossing over, linkage maps. Inheritance of mitochondrial and chloroplast genes, maternal inheritance. Mutation – types, causes and detection, structural and numerical alterations of chromosomes and their genetic implications.

Unit – V **15 hrs**

Microbial genetics:Methods of genetic transfers – transformation, conjugation, transduction and sex-duction. Gene mapping,mapping genes by interrupted mating, fine structure analysis of genes. Recombination- homologous and nonhomologous recombination. Human genetic disorders. Population genetics – gene pool, gene frequency, Hardy -Weinberg equilibrium-factors affecting the equilibrium, genetic drift.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Gupta, P.K	Cell and Molecular Biology	Rastogi publications, UP.	I Edn.1988.
2.	Sambamurty.A.V.S.S	Genetics.	Narosa Publishers, New Delhi	I edn.1999
3.	Verma, P.S. and Agarwal V.K	Cell Biology, Genetics, Molecular Biology, Evolution and Ecology	S.Chand and Co. New Delhi	2007

Reference Books

S.No.	**Author name**	**Title of the book**	**Publishers name**	**Edition & Year of publication**
1.	De Robertis and De Robertis.	Cell and Molecular biology	Lippincott Williams and Wilkins. UK.	I EdN 2005
2.	Gardener, E. J.	Principles of Genetics	John Wiley. New York	5thEdn. 1975.
3.	Gilmartin and Bowler	Molecular Plant Biology: A practical	Oxford University press, UK	2002

		approach(Vol. I and II),		
4.	Joseph K. John.	Biomembranes and Biosignalling.	Campus Books International, New Delhi	2006

Pedagogy: Power point presentation, Lecture, videos, seminar, quiz and discussion

Course Designers:

Dr. K.Gajalakshmi
Dr. E.Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL24P1	Practical I (Theory paper I, II, III & IV)	Practical	-	-	150	5

Preamble

- To observe, characterize and identify the different forms of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
- To identify the plants by their anatomical characters.
- To identify the embryological characters of the plants.
- To standardize the media for tissue culture.
- To isolate microorganisms from the various sources and to establish pure cultures.
- To gain knowledge about the fundamental processes of cell division
- To be skilled in solving problems in genetics

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Learn and compare different life forms of the plants	K2
CLO2	Identify the anatomical characters	K3
CLO3	Identify the embryological characters	K3
CLO4	Examine the explants and callus culture	K4
CLO5	Isolation of microbes from various samples in different media	K5
CLO6	Assess the biological processes of cells and Calculate and categorize problems in genetics	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	S
CLO3	S	M	S	S	S
CLO4	M	S	S	S	M
CLO5	S	M	S	S	S

S- Strong; M-Medium

Syllabus

Plant Diversity - **45 hrs**

Algae - *Scenedesmus, Pithophora, Bulbochaete, Nitella, Diatoms- Cyclotella and Navicula, Padina, Batrochospermum, Gelidium, Scytonema,Gracilaria and Lyngbya*

Mycology -Isolation of coprophilous fungi. *Saprolegnia, Lycoperdon, Phyllochora, Cercospora*

Plant pathology -Herbarium of Paddy Blast, Angular Leaf spot of Cotton and Cucumber

Mosaic Virus.

Bryophytes - Vegetative and reproductive structures of *Reboulia, Lunularia, Anthoceros, Pogonatum*and *Sphagnum*

Pteridophytes - *Selaginella, Isoetes, Osmunda, Adiantum, Angiopteris, Pteris, Azolla*

Gymnosperms - *Cycas, Pinus, Araucaria, Cupressus*

Plant Anatomy, Embryology and Tissue Culture. 45 hrs

Plant Anatomy - Anomalous secondary thickening - *Aristolochia, Bignonia, Piper, Leptadaenia, Mirabilis, Achyranthes, Dracaena*.

Nodal anatomy – unilacunar, trilacunar and multilacunar nodes.

Submission of 5 permanent slides of Stem/ root/ leaf / petiole (**only hand sections**)

Embryology - T. S. of anther - archesporial, pollen mother cell stage and mature anther. Pollen germination. Embryo sac – 4 nucleate and 8-nucleate. Endosperm haustoria, dicot and monocot embryo. Embryo dissection-*Tridax*

Tissue culture - Preparation of MS medium, Inoculation of Explants Callus culture and Micropropagation

Applied Microbiology 30 hrs

Preparation of PDA medium.

Preparation of Mueller Hinton Agar (MHA) medium. Preparation of Sabouraud Dextrose Agar (SDA) medium, Preparation of selective medium-Pikovskaya's medium,

Isolation of micro organisms from soil, spoiled vegetables and fruits. Isolation of phosphorus solubilizing micro organism.

Milk spoilage test.

Edible mushroom production. Preparation of vermicompost.

Cell Biology and Genetics 30 hrs

Mitosis and Meiosis**.**

Spotters – plasma membrane, cell organelles, chromosomes, lamp brush chromosomes.

Simple problems in genetics – Monohybrid cross, dihybrid cross and factor interaction. Linkage maps.

Course designers

Dr. M. Kamalam,
Dr. K.S.Tamil Selvi
Dr. R. Sumathi,
Dr. E. Uma

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2405	**Plant physiology and Biochemistry**	**CORE**	**73**	**2**	**-**	**4**

Preamble

- To develop an advanced understanding of plant physiological processes, including photosynthesis, respiration, and nutrient regulation at multiple levels.
- To apply plant physiology knowledge to address practical challenges in agriculture, environment, and biotechnology through critical thinking.
- To make students understand the structure and function of carbohydrates, Proteins and lipids
- To gain a comprehensive idea of bioenergetics and the role of enzymes in regulation of cellular activity

Course learning Outcomes

On successful completion of this course, the students will be able to		
CLOs	**CLO Statement**	**Knowledge Level**
CLO1	Analyze the biochemical and physiological processes in plants, including photosynthesis, respiration, and nitrogen metabolism, and explain their role in plant growth and development.	K5
CLO2	Understand the structural and functional characteristics of carbohydrates, proteins, lipids, and secondary metabolites, and their significance in plant biochemistry.	K6
CLO3	Apply enzyme kinetics principles to evaluate enzyme activity and inhibition, and relate these mechanisms to metabolic regulation in plants.	K5
CLO4	Interpret the thermodynamic principles of bioenergetics, emphasizing the role of ATP and energy transfer in cellular processes.	K4
CLO5	Integrate knowledge of plant physiology, molecular biology, and biochemistry to explain the synthesis and functioning of key biomolecules essential for plant survival and adaptation	K5

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	M	S
CLO3	M	S	M	S	S
CLO4	S	M	S	M	S
CLO5	S	M	M	S	S

S- Strong; M-Medium

Syllabus

Unit-I Plant physiology **15**

Hours

Photosynthetic apparatus, Photosynthetic pigments and absorption of light energy, Fluorescence and Phosphorescence, Quantum requirement and Quantum yield. Red drop and Emerson's enhancement effects. Two pigment system, Action spectrum, Light and dark reactions, Hatch slack pathway. Differences between C3 and C4 plants. Photorespiration and Glycolate metabolism (C2- cycle), Chemosynthesis. Biochemistry and Molecular Biology of RUBISCO

Unit-II **15 Hours**

An overview of plant respiration – Glycolysis – TCA cycle– Electron Transport – oxidative phosphorylation and ATP synthesis – Chemiosmotic Theory - Pentose Phosphate Pathway– Nitrogen in plants, Sources of nitrogen to plants. Conversion of nitrate into Ammonia, biological Nitrogen fixation, Mechanism of Biological Nitrogen fixation, Biosynthesis of Amino acids. Synthesis of Proteins in plants

Unit-III Biochemistry **15 Hours**

Classification of carbohydrates; Structure and properties of monosaccharides, Oligosaccharides, Polysaccharides – Glycoproteins. Protein and Amino acids: Structure, Classification and properties; Peptides - Structure: Primary, secondary, Ramachandran plot, tertiary and quaternary structures.

Unit-IV **14 Hours**

Classification of Lipids: Structure and properties of fatty acids, phospholipids, glycolipids, lipoproteins, cholesterol - structure and functions. Secondary Metabolites: Structure, classification and properties of alkaloids, terpenoids, flavonoids. Glycosides - their chemical nature and role.

Unit-V **14 Hours**

Enzymes- Classification and nomenclature chemical nature of enzymes – factors affecting enzyme action – Michaelis – Menton constant, Lineweaver Burk plot, Enzyme inhibition, co enzymes- mechanism of enzyme action, isoenzymes. Bioenergetics- Concept of energy, Thermodynamic principles in biology, Concepts of entropy, enthalpy, free energy and standard free energy, ATP as energy currency of the cell.

Text books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	William, G.H., & Norman, P.A.	Introduction to Plant Physiology	John Wiley & Sons	4th Ed., 2009
2	Taiz, L., Zeiger, E., Moller, I.M., & Murphy, A.	Plant Physiology	Sinauer Associates	6th Ed., 2015
3	Lubert, S.	Biochemistry	W.H. Freeman & Co.	2005
4	Nelson, D.L., Lehninger, A.L., & Cox, M.M.	Lehninger, Principles of Biochemistry	W.H. Freeman and Company	5th Ed., 2008
5	Voet, D., & Voet, J.G.	Biochemistry	John Wiley & Sons	14th Ed., 2011

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication

1	Noggle, G.R., & Fritz, G.J.	Introductory Plant Physiology	Prentice-Hall	2001
2	Devlin, R.M.	Plant Physiology	Affiliated East West Press Pvt. Ltd.	2000
3	Salisbury, F.B., & Ross, C.W.	Plant Physiology	Wadsworth Publishing CO.	4th Ed., 1992
4	Caret et al.	Inorganic, Organic and Biological Chemistry	WMC Brown	1993
5	Jeremy, M.B., John, L.T., & Lubert, S.	Biochemistry	W.H. Freeman	17th Ed., 2010

Websites and eLearning Sources

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5593313/
2. .https://www.nobelprize.org/prizes/chemistry/1997/boyer/25946-the-binding-change-mechanism/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3645666/
4. https://www.frontiersin.org/articles/10.3389/fpls.2018.01771
5. https://www.medicalnewstoday.com/articles/161547#chemistry
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2642958/
7. 3.https://bio.libretexts.org/Bookshelves/Biochemistry/Fundamentals_of_Biochemistry_(Jakubowski_and_Flatt)
8. https://infinitabiotech.com/blog/principles-of-enzyme-catalysis/

Course Designers:

Dr. C.Krishnaveni
Dr.R.Sumathi

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2406	Paper-VII- Molecular Biology	CORE	73	2	--	4

Preamble

- To develop a detailed understanding of the organization of genetic material in prokaryotic and eukaryotic cells.
- To acquire a thorough knowledge of DNA replication, repair and recombination
- To comprehend the importance of RNA synthesis and processing
- To explore the mechanisms of protein synthesis and processing
- To understand the various mechanisms of gene regulation.

Course learning Outcomes

On the successful completion of the course, students will be able to understand the following

CLOs Number	CLO Statement	Knowledge Level
CLO1	Gain insight into the structure and properties of nucleic acids and genome organization.	K3
CLO2	Comprehend the processes of DNA replication, repair, and recombination.	K3
CLO3	Acquire knowledge of transcription processes	K4
CLO4	Explore and critically analyze how genetic information is translated into proteins.	K4
CLO5	Develop an understanding of the various mechanisms of gene regulation.	K5

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	M	S	S
CLO4	S	S	M	M	S
CLO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus

Unit-I (15 hours)

Nucleic acid: Nucleic acid as the genetic material (Griffith's experiment, Avery, MacLeod and McCarty's experiment, Hershey-Chase experiment), Nucleic acids types (A, B and Z forms) – Chemistry and structural organization – supercoiling – triple helix of DNA. Denaturation and renaturation of DNA – hyper and hypochromicity – Tm. Structure and functions of t-RNA – hnRNA – and non-coding regulatory RNAs (siRNA– miRNA, etc.). The genomes of bacteria, plasmids, mitochondria, and chloroplasts.

Unit-II (15 hours)

DNA replication, repair and recombination: Prokaryotic and eukaryotic DNA replication: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms. **RNA synthesis and processing:** Transcription in prokaryotes & eukaryotes - factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing and polyadenylation, RNA transport. Inhibitors of transcription

Unit-III **(15 hours)**

Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post- translational modification of proteins. Protein targeting (chloroplast, mitochondria and nucleus) and protein degradation.

Unit-IV **(14 hours)**

Transcriptional regulatory mechanism in Prokaryotes: Gene amplification – Regulation of transcription – Post transcriptional regulation – translational regulation – post-translational regulation – Types of regulation of the gene- types of operons – Negative inducible operon (lac operon) – Negative repressible operon (trp operon) – Positive inducible operon (Arabinose operon). Attenuation – mechanism of attenuation – Anti-termination mechanism

Unit-V **(14 hours)**

Transcriptional regulatory mechanism in Eukaryotes: Cis acting regulatory sequences : Promoters – Basal transcription and activated transcription. Silencers - Transcriptionally silent chromatin, mediated by Rap1 and SIR proteins. Enhancers - Heterochromatin and Euchromatin. Transcriptional regulatory proteins – structure and function of transcriptional activators. Gene regulations at DNA level Acetylation/Deacetylation of DNA-DNA methylation. Epigenic inheritance – History, Mechanisms: DNA methylation, Histone modification and non-coding RNA associated genes.

Text Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Gupta, P.K.	Molecular Biology and Genetic Engineering	Rastogi Publications, Meerut	2004
2	Veer Bala Rastogi	Fundamentals of Molecular Biology	Ane Books Pvt Ltd.	2010
3	Satyanarayana, U.	Biotechnology	Books And Allied (P) Limited	2005
4	James D. Watson	Molecular Biology of the Gene	Pearson Publications	2014
5	Gerald Karp	Cell and Molecular Biology-Concepts and Experiments	Wiley Publishers	2002

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	De Robertis E.D.P. and De Robertis, Jr. E.M.F.	Cell and Molecular Biology	Lippincott Williams and Wilkins	2nd Ed., 2001
2	Verma, P.S. and Agarwal, V.K.	Molecular Biology	S. Chand Limited	2009
3	Dubey, R.C.	A Textbook of Biotechnology	S. Chand Limited	1993
4	Ramawat K.G. and Shaily Goyal	Molecular Biology and Biotechnology	S Chand Publishing	2010
5	Burton E. Tropp	Molecular Biology	Jones And Bartlett Publishers	2007

Course Designers:

Dr. M. Kanchana

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL2407	Bioinformatics and Nanobiotechnology	Theory	73	2	--	5

Preamble

- To develop the knowledge about the information and applications of databases.
- To operate the algorithm and alignment type software tools
- To perform sequence alignment between nucleotide or amino acid sequences and find out structural or functional similarity.
- To construct the phylogeny tree
- To categorise the genome diversity by gene identification and gene prediction.
- To identify the protein expression and function in a genome.

Course learning Outcomes

CLO No.	CLO-Statements	Knowledge Levels
On successful completion of this course, students will be able to		
CLO-1	study the basic elements of interface, concepts between biology and nanotechnology.	**K4**
CLO-2	outline the basics of sequence alignment and analysis.	**K5**
CLO-3	classify different types of biological databases.	**K5**
CLO-4	explain the synthesis approaches for nanomaterial and its characterization.	**K5**
CLO-5	construct various types of nanomaterial for application and evaluate the impact on environment.	**K6**

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	M	S
CLO2	M	S	S	M	S
CLO3	S	S	M	S	M
CLO4	S	M	S	S	M
CLO5	M	M	M	S	M

S- Strong; M-Medium

Syllabus

Unit-I **14 Hours**

Overview of Bioinformatics, Need for Bioinformatics technology, Data format and processing, secondary resources and applications. Role of structural bioinformatics, Biological data integration system. Bioinformatics and its applications. Biological Database Retrieval System - NCBI, PUBMED, EBI, EMBL, DDBJ and Gen- Bank.

Unit-II **15 Hours**

Database searches for homology using BLAST and FASTA. Proteomic data bases - Swiss-Prot, Uni-Prot, ExPASY and PDB. RNA data bases-Rfam and GtRNA. Phylogenetic analysis-Construction of Phylogenetic tree with reference to DNA and

Protein sequences. Biological importance of computerized Phylogenetic analysis.

Unit-III **14 Hours**

Genomics– Functional genomics- Introduction of transcriptomics, proteomics, metabolomics. **Comparitive genomics**- Bacterial, Yeast, *Arabidopsis thaliana*. Gene identification and prediction: Basis of gene prediction, codon bias; pattern identification **Annotation of Genome:** structural annotation – gene prediction approaches – Open Reading Frame (ORF) prediction – Hidden Markov Model – Pattern identification – Prediction of promoter sequences. Functional annotation – prediction of gene function.

Unit-IV **15 Hours**

Introduction to Proteomics - Protein arrays: basic principles. Computational methods for identification of polypeptides from mass spectrometry. Protein arrays: bioinformatics-based tools for analysis of proteomics data (Tools available at ExPASy Proteomics server); databases (such as InterPro) and analysis tools. Protein-protein interactions: databases such as DIP, PPI server and tools for analysis of protein-protein interactions

Unit-V Nanobiotechnology **15 Hours**

Nanotechnology – definition, origin, scope and importance. Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape and surface area. Types of nanomaterials: Nanoclusters, thin films, nanocomposites, coreshell nanostructure, nanotubes, liposomes and dendrimers. Essentials of nanostructure generation: top-down vs. bottom-up. Characterization of nanomaterials. Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, imaging agents, biosensors, manipulation of cells and biomolecules.

Text Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Alam Khan, I.	Elementary Bioinformatics	Pharma Book Syndicate, Adithya Art Printers, Hyderabad	1st Ed., 2005
2	Arthur M. and Lesk	Introduction to Bioinformatics	Oxford University Press, UK	1st Ed., 2002
3	Attwood, T.K. and Parry-Smith, D.J.	Introduction to Bioinformatics	Pearson Education, New Delhi	3rd Ed., 2002
4	Chowdhary, K.R. and Bansal, V.S.	Bioinformatics and Computational Technologies	Scientific Publishers, New Delhi	1st Ed., 2011
5	Mani, K. and Vijayaraj, N.	Bioinformatics A Practical Approach	Aparnaa Publication, Coimbatore	1st Ed., 2004
6	Ranga, M.M.	Bioinformatics	Agrobios, Jodhpur	2nd Ed., 2009
7	Westhead, D.R., Parish, J.H., and Twyman,	Bioinformatics	Viva Books Private Limited, New Delhi	1st Indian Ed., 2003

	R.M.			
8	Sharon, M. & Sharon, M.	Bio-Nanotechnology-Concepts and Applications	CRC Press	2012
9	Atkinson WI	Nanotechnology	Jaico Book House, New Delhi	2011
10	Imtiaz Alam Khan	Elementary Bioinformatics	Pharma Book Syndicate, Hyderabad	2005
11	Rastogi, S.C., Mediratta, N., and Rastogi, P.	Bioinformatics, Methods and Applications	Prentice Hall of India, Pvt. Ltd., New Delhi	2004
12	Nalwa H.S.	Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology	American Scientific Publ.	2005
13	Niemeyer C.M. & Mirkin C.A.	Nanobiotechnology	Wiley Interscience	2005
14	S.M. Lindsay	Introduction to Nanoscience	Oxford Universal Press	1st Ed., 2010
15	Ben Rogers, Sumita Pennathur, and Jesse Adams	Nanotechnology: Understanding Small Systems	CRC Press	2nd Ed., 2011

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Dunn, S.R., M.J., and Pennington	Proteomics: From Protein Sequence to Function	Viva Books Pvt. Ltd., New Delhi	3rd Ed., 2002
2	Liebler, C.D.	Introduction to Proteomics: Tools for the New Biology	Humana Press Inc., New Jersey	1st Ed., 2002
3	Mehrotra, P., Kumund Sarin, Swapna, and Srivastava	The New Handbook of Bioinformatics	Vikas Publishing House Pvt. Ltd., Noida, Uttar Pradesh	1st Ed., 2005
4	Barbara Panessa-Warren	Understanding Cell-Nanoparticle Interactions Making Nanoparticles More Biocompatible	Brookhaven National Laboratory	2006
5	European Commission, SCENIHR	Potential Risks Associated with Engineered and Adventitious Products of Nanotechnologies	European Union	2006
6	Gysell Mortimer	The Interaction of Synthetic Nanoparticles with	School of Biomedical	PhD Thesis, 2011

		Biological Systems	Sciences, Univ. of Queensland	
7	Jain, K.K.	Nanobiotechnology Molecular Diagnostics: Current Techniques and Application	Taylor & Francis	1st Ed., 2006

Web Resources

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/
2. https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html
3. http://www.particle-works.com/applications/controlled-drug-release/Applications

Course Designers:

Dr. B.S. Chithra Devi
Dr.E.Uma

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL23SBCE	**Coursera – Genomics and Drug Discovery**	**ELECTIVE**	**45**	**-**	**-**	**3**

S.No.	Topic of the Course	Link of the Course	Duration in hrs
1.	Drug Discovery	https://www.coursera.org/learn/drug-discovery	**9**
2.	Genomics: Decoding the Universal Language of Life	https://www.coursera.org/learn/genomics-research	**36**

1. Drug Discovery

Week 1 - Pharmaceutical & Biotechnology Industry Landscape **3 hours**
Week 2 - Drug Discovery: Proteomics, Genomics **3 hours**
Week 3 - Challenges in Fragment Based Drug Discovery for Protein Kinases **3 hours**

2. Genomics: Decoding the Universal Language of Life

Week 1 - What Is a Genome and Why Do We Care? **6 hours**
Week 2 - What Were the First Genomes Like and How Do They Work Now? **4 hours**
Week 3 - How Can We Use Genomes to Understand the Healthy Body and Fight Diseases? **5 hours**
Week 4 - What Can Genomes Tell Us About How to Grow New Organs or New Crops? **7hours**
Week 5 - How Might Genomes Allow Us to Predict Health Problems Before They Occur? **7 hours**
Week 6 - How Do the Genomes of Ecosystem Members Cooperate or Conflict? **7 hours**

COURSE CODE	COURSE NAME	L	T	P	CREDIT
MPL2408	Biotechniques	43	2	-	3

Preamble

- To develop a detailed understanding of microscopy and its applications
- To acquire a thorough knowledge of Centrifugation and its application
- To comprehend the importance of spectrophotometry in biology
- To explore the mechanisms of chromatography
- To understand the various mechanisms of solution preparation

CLO. No.	CLO-Statements	Knowledge Levels
On successful completion of this course, students will be able to		
CLO-1	Understand and explain the principles and techniques of light, fluorescence, and electron microscopy, including sample preparation methods and applications in biological research.	**K5**
CLO-2	Demonstrate and apply the principles of pH measurement, centrifugation, sonication, and freeze drying, with an understanding of their instrumentation and applications in biological processes.	**K5**
CLO-3	Analyze and interpret the principles, instrumentation, and applications of spectrophotometric techniques in biological analysis.	**K5**
CLO-4	Apply and evaluate chromatographic and electrophoretic techniques for the separation and analysis of biological molecules, understanding their principles, methodologies, and practical applications.	**K4**
CLO-5	Develop and demonstrate the skills to prepare molar, molal, percentage, and normal solutions, handle micropipettes effectively, and ensure safety in the handling of toxic chemicals and reagents.	**K6**

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S
CLO5	S	S	M	S	S

S- Strong; M-Medium

Syllabus

Unit I **9 hrs**

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy (a) Flow cytometry (b) Applications

of fluorescence microscopy: Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit II **9 hrs**

pH and Centrifugation: pH meter: Principles and instrumentation, Centrifugation: Principles, types of centrifuges, types of rotors, differential and density gradient centrifugation, application. Sonication, Freeze drying.

Unit III **8 hrs**

Spectrophotometry: Principle involved in Spectrophotometer; Spectrophotometric techniques, Instrumentation: ultraviolet and visible spectrophotometry (single and double beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy-principles of analysis, application in Biology.

Unit IV **8 hrs**

Chromatography: Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gas chromatography - Gel filtration - Ion exchange and High-performance liquid chromatography techniques– Examples of application for each chromatographic system - Basic principles of electrophoresis.

Unit V **9 hrs**

Preparation of molar, molal Percentage solutions and normal solutions, buffers, Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases. Dilutions. Techniques of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.

Text Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Sadasivam, S and Manickam, A.	Biochemical Methods for Agricultural Sciences	Wiley Eastern Limited, New Delhi	1st Ed., 1992
2	Rana, S.V.S.	Biotechniques Theory and Practice	Rastogi Publication, Meerut	2005
3	Plummer, D.T.	An Introduction to Practical Biochemistry	Tata McGraw-Hill Publishing Co. Ltd., New Delhi	3rd Ed., 1996
4	Ruzin, S.E.	Plant Microtechnique and Microscopy	Oxford University Press, New York, U.S.A.	1999
5	Ausubel, F., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K.	Short Protocols in Molecular Biology	John Wiley & Sons	3rd Ed., 1995
6	M.H. Gabb & W.E. Latchem	A Handbook of Laboratory Solutions	Scientific Publishers, Rajasthan, India	2013

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Berlyn, G.P. and Miksche, J.P.	Botanical Microtechnique and Cytochemistry	The Iowa State University Press, Ames, U.S.A.	1st Ed., 1976
2	Harborne, J.B.	Phytochemical Methods	Chapman and Hall, New Delhi	1998
3	Sharma, K.	Manual of Microbiology: Tools and Techniques	Parwana Bhawan, New Delhi	2007
4	Wilson, K. and Walker, J.	Principles and Techniques of Practical Biochemistry	Cambridge University Press, Cambridge	5th Ed., 1999
5	Mahajan, R.	Practical Manual of Biotechnology	Vayu Education of India, New Delhi	2010

Course Designers

Dr. K.S.Tamil Selvi
Dr.B.S.Chithra Devi

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCP19A1	IDC –Clinical Microbiology & Biochemistry	IDC	60	-	-	4

Preamble

- To enable the students to understand the principles of clinical chemistry
- To gain the importance of hypertension and hypotension
- To enable the students to understand the principles and the concepts underlying clinical laboratory tests in clinical chemistry
- To differentiate the blotting technique and vaccination types
- To acquire knowledge on basic mechanisms involved in the causation and treatment of common disease and their influence on clinical presentation and therapy

Course learning Outcomes

On the successful completion of the course, students will be able to

CLOs Number	CO Statement	Knowledge Level
CLO1	Differentiate the clinical specimens	K_3
CLO2	Classify the composition of blood, Perform analysis of chemical analytes in blood and other body fluids	K_2 ,K_3
CLO3	Calculate the test results and convert them to form meaningful in patient assessment	K_3
CLO4	Compare and contrast the different types of blotting techniques and vaccination.	K_6
CLO5	Correlate laboratory results with infectious diseases processes	K_4

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	M	S	M	S	S
CLO2	S	S	S	S	L	L
CLO3	S	S	M	S	M	M
CLO4	S	M	M	M	S	S
CLO5	S	M	M	S	S	S

S- Strong; M-Medium

Syllabus

Unit I **12 Hrs**

Clinical microbiology: Clinical specimens –Collection- needle aspiration, Incubation, Catheter; handling, transport. Isolation of microbes from specimens-selective media, differential media, enrichment media, characteristic media. Identification of microbes (virus, bacteria, fungi and parasites) through morphological and biochemical characteristics.

Unit II **12 Hrs**

Principles of clinical biochemical analysis: Basis of analysis of body fluids for

diagnostic prognostic and monitoring purposes.

Blood Analysis: Composition of blood, blood grouping & matching, physiological function of Plasma protein, role of blood as oxygen carrier, blood pressure - Hypertension & hypotension, coagulation of blood, Anaemia – causes & control .Urea determination- the urease method, estimation of bile pigment in serum, estimation of total protein in serum, estimation of total proteins and albumin based on biuret method and BCG method.

Unit III **12Hrs**

Clinical Chemistry: Determination of Glucose in Serum by Folin& Wu's method, Determination of Serum Cholesterol - Sackett's method for total cholesterol. Diagnostic test for Sugar in Urine. Test for salt in Serum, Test for Chlorides. Detection of Cholesterol in Urine, Detection of Diabetes . Typical reference ranges for biochemical analyst Viz, sodium, potassium, urea, creatinum, AST, ALT, AP and cholesterol and their significance.Biological role of sodium, potassium, calcium, iodine, copper and zinc.

Unit IV **12Hrs**

Electrophoresis, Blotting and Vaccination : Principles, Techniques: southern, western and northern blotting. Vaccines and immunizations: Active immunization,passive immunization, Type of vaccines-whole organism vaccines, purified macromolecules as vaccines, Recombinant –vector vaccines, DNA vaccines.

Unit V **12 Hrs**

Common Diseases & their treatments: Insect borne diseases: Malaria, Filarisis& Plague. Air Borne diseases: Diphtheria, Whooping cough, Influenza, Measles mumps, Tuberculosis, Water borne diseases: Cholera, Typhoid, &Dysentry. Common disease of the digestive system- jaundice, respiratory system- asthma, nervous system- epilepsy. Some other common diseases-piles, leprosy. First aid for accidents. Common poisons & their antidotes - acid poisoning, alkali poisoning, Poisoning by disinfectants, hallucinogens. Toxic effects of metals: Toxicity of Iron , Copper , Arsenic , Mercury, Lead, Cadmium, Aluminium& Radionuclide & Wilson's disease.

Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Ambika Shanmugam	Fundamentals of Biochemistry for Medical Students	Nagaraj and Company Private Limited	2005
2	Asim. K. Das	Bioinorganic Chemistry	Books & Allied Pvt Ltd.	1st Ed., 2007
3	Jayashree Ghosh	Textbook of Pharmaceutical Chemistry	S. Chand & Co.	3rd Ed., 2003
4	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand & Co.	1st Ed., 2006
5	Mallikarjuna Rao, N.	Medical Biochemistry	New Age International (P) Limited, Publishers	6th Ed., 2006
6	Rana, S.V.S.	Bio Techniques: Theory and Practice	Rastogi Publications, Meerut	2005

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year of Publication
1	Lensing, M., Prescott, John P., Harley, Donald A. Klein	Microbiology	Tata McGraw Hill, New Delhi	6th Ed., 2005
2	Lowrie, D.B., Whalen, R.G.	DNA Vaccines: Methods and Protocols	Humana Press, Totowa, New Jersey	2000
3	Keith Wilson, John Walker	Principles and Techniques of Biochemistry and Molecular Biology	Cambridge University Press	6th Ed., 2008

Pedagogy: Lecture by chalk & talk, power point presentation, e-content, simulation, numerical exercises, group discussion, assignment, quiz, seminar.

Course Designers:

1. Mrs. N. ShyamalaDevi, Dr. N. Aruna Devi - Department of Chemistry
2. Dr. K. Gajalakshmi, Dr. K. S. Tamilselvi - Department of Botany

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MPL24P2	PRACTICAL - II	Practical	-	-	120	6

Preamble

- To discern and appreciate the physiological and biochemical process in plants
- To acquire the capability of identifying and quantifying prokaryotic and eukaryotic genome.
- To refine the skills in nano-particle identification
- To know the importance of Bioinformatics in Biology

Course learning Outcomes

On the successful completion of the course, students will be able to understand the following

CLOs	CO Statement	Knowledge Level
CLO1	Understand and perform key physiological experiments	K3
CLO2	Demonstrate proficiency in biochemical techniques, including the estimation of carbohydrates, proteins, lipids, phenolics, and tannins.	K4
CLO3	Apply molecular biology skills to isolate, purify, and analyze DNA, RNA, and proteins from bacterial and plant sources, techniques such as gel electrophoresis and spectrophotometry.	K5
CLO4	Utilize bioinformatics tools and databases to analyze biological data, including sequence alignment, gene finding, phylogenetic analysis, tools such as JMOL.	K5
CLO5	Develop competence in good laboratory practices, including the preparation of reagents and buffers, adherence to safety protocols	K5

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S
CLO5	S	S	M	S	S

S- Strong; M-Medium

Syllabus

Physiology and Biochemistry **45 hrs**

Physiology Experiments

1. Determination of water potential of any tuber
2. Separation of leaf pigments (Paper chromatography)
3. Separation of flower pigments (Thin Layer Chromatography)
4. Effects of CO_2 Concentration and light intensity on photosynthesis- Wilmot's bubbler

5. Absorption spectrum of chlorophyll a and b
6. Test for Fat/oils.
7. Test for proteins.
8. Hill's reaction by isolated chloroplast.
9. Column chromatography - leaf pigment separation
10. Determination of activity of peroxidase and catalase influenced by pH and temperature

Biochemistry Experiments

1. Estimation of total carbohydrates
2. Determination of total proteins (Bradford's / Lowry's)
3. Effect of temperature on membrane permeability - beetroot discs.
4. Estimation of Phenolics (Folin –Ciocalteau)
5. Estimation of Tannins (Folin-Denis / Vanillin hydrochloride
6. Estimation of total lipids.
7. Thin Layer Chromatography of Sugars
8. Thin Layer Chromatography of amino acids

Molecular Biology **45 hrs**

1. Good lab practices: Preparation of buffers and reagents.
2. Growth of bacterial culture and preparation of growth curve
1. Isolation and purification of plasmid DNA from bacteria
2. Isolation and purification of bacterial genomic DNA
3. Isolation and purification of plant DNA (Onion and Cauliflower)
4. Isolation and purification of proteins from plant sources.
5. Analysis of DNA by gel electrophoresis and Nanodrop Spectrophotometer.
6. Isolation and purification of RNA (Demonstration).

Spotters: Structure of Plasmid DNA, Bacterial genomic DNA and Plant genomic DNA, Structure of RNA (t-RNA and r-RNA), Agarose Gel Electrophoresis, Gel documentation, Nanodrop Spectrophotometer

Bioinformatics **30 hrs**

1. Familiarizing with biological data bases-nucleic acid databases- NCBI, DDBJ, EMBL and GenBank. Protein databases - SWISS-PROT and PDB.
2. Sequence similarity search using BLAST
3. Multiple Sequence Alignment- Clustal W
4. Gene finding tools - Genmark
5. Phylogenetic Analysis of protein and nucleic acids – Tree Top
6. Prediction of secondary structure of proteins
7. Prediction of tertiary structure of proteins
8. 3-D Molecular visualization using JMOL

Text Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year
1.	S.K. Singh	Practical Manual of Plant Physiology and Biochemistry	Saras Publication	2006
2.	Pandey, S.N., and B.K. Sinha	Plant Physiology: Theory and Techniques	Vikas Publishing House	1994
3.	Dr. A. A.	Biochemical and Physiological	Scientific	2010

	Nandeshwar	Techniques in Plant Science	Publishers	
4.	N.C. Pant	Plant Biochemistry and Enzymology	Central Book House	2008
5.	Dr. N. K. Gupta	Experimental Plant Physiology	Meerut Publications	2007
6.	Plummer, D.T.	Practical Biochemistry	Tata McGraw-Hill	3rd Ed., 1996
7.	Sambrook, J., and Russell, D.W.	Molecular Cloning: A Laboratory Manual	Cold Spring Harbor Laboratory Press	3rd Ed., 2001
8.	Wilson, K., and Walker, J.	Principles and Techniques of Biochemistry and Molecular Biology	Cambridge University Press	7th Ed., 2010
9.	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P.	Molecular Biology of the Cell	Garland Science	6th Ed., 2014
10.	Berg, J.M., Tymoczko, J.L., and Gatto, G.J.	Biochemistry	W.H. Freeman	9th Ed., 2019
11.	Mount, D.W.	Bioinformatics: Sequence and Genome Analysis	Cold Spring Harbor Laboratory Press	2nd Ed., 2004
12.	Lesk, A.M.	Introduction to Bioinformatics	Oxford University Press	5th Ed., 2019

Reference Books

S.No.	Author Name	Title of the Book	Publisher's Name	Edition & Year
1.	Wilson, K., and Walker, J.	Principles and Techniques of Biochemistry and Molecular Biology	Cambridge University Press	6th Ed., 2008
2.	S. Sadasivam and A. Manickam	Biochemical Methods	Wiley Eastern Limited	1992
3.	David T. Plummer	Introduction to Practical Biochemistry	Tata McGraw-Hill	3rd Ed., 1996
4.	Keith Wilson and John Walker	Practical Biochemistry for Undergraduates	Cambridge University Press	2005
5.	Wilson, K., and Walker, J.	Principles and Techniques of Biochemistry and Molecular Biology	Cambridge University Press	7th Ed., 2010
6.	Brown, T.A.	Genomes	Garland Science	3rd Ed., 2007

7.	Lodish, H., Berk, A., Kaiser, C.A., et al.	Molecular Cell Biology	W.H. Freeman	8th Ed., 2016
8.	Gasteiger, J., and Engel, T.	Chemoinformatics: A Textbook	Wiley-VCH	2003
9.	Krawetz, S.A., and Womble, D.D.	Introduction to Bioinformatics: A Theoretical and Practical Approach	Humana Press	2003
10.	Rastogi, S.C., Mendiratta, N., and Rastogi, P.	Bioinformatics: Methods and Applications	Prentice Hall of India	4th Ed., 2013

Course designers

Dr.C. Krishnaveni, Dr. B. S. Chithradevi, Dr. R. Sumathi, Dr. M. Kanchana, Dr. Sunithakumari

Dr.Gajalakshmi & Dr.H. RehanaBanu

COURSE CODE	COURSE TITLE	L	T	P	CREDIT
MPL2408	Biotechniques	43	2	-	3

Preamble

- To develop a detailed understanding of microscopy and its applications
- To acquire a thorough knowledge of Centrifugation and its application
- To comprehend the importance of spectrophotometry in biology
- To explore the mechanisms of chromatography
- To understand the various mechanisms of solution preparation

CLO. No.	CLO Statements	Knowledge Levels
On successful completion of this course, students will be able to		
CLO-1	Understand and explain the principles and techniques of light, fluorescence, and electron microscopy, including sample preparation methods and applications in biological research.	**K5**
CLO-2	Demonstrate and apply the principles of pH measurement, centrifugation, sonication, and freeze drying, with an understanding of their instrumentation and applications in biological processes.	**K5**
CLO-3	Analyze and interpret the principles, instrumentation, and applications of spectrophotometric techniques in biological analysis.	**K5**
CLO-4	Apply and evaluate chromatographic and electrophoretic techniques for the separation and analysis of biological molecules, understanding their principles, methodologies, and practical applications.	**K4**
CLO-5	Develop and demonstrate the skills to prepare molar, molal, percentage, and normal solutions, handle micropipettes effectively, and ensure safety in the handling of toxic chemicals and reagents.	**K6**

Mapping with Programme learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S
CLO5	S	S	M	S	S

S- Strong; M-Medium

Syllabus

Unit I **9 hrs**

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy (a) Flow cytometry (b) Applications of fluorescence microscopy: Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit II **9 hrs**

pH and Centrifugation: pH meter: Principles and instrumentation, Centrifugation: Principles, types of centrifuges, types of rotors, differential and density gradient centrifugation, application. Sonication, Freeze drying.

Unit III **8 hrs**

Spectrophotometry: Principle involved in Spectrophotometer; Spectrophotometric techniques, Instrumentation: ultraviolet and visible spectrophotometry (single and double beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy-principles of analysis, application in Biology.

Unit IV **8 hrs**

Chromatography: Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gas chromatography - Gel filtration - Ion exchange and High-performance liquid chromatography techniques– Examples of application for each chromatographic system - Basic principles of electrophoresis.

Unit V **9 hrs**

Preparation of molar, molal Percentage solutions and normal solutions, buffers, Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases. Dilutions. Techniques of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.

Text Books

S.No.	**Author Name**	**Title of the Book**	**Publishers**	**Year and Edition**
1	Sadasivam,S and Manickam, A.	Biochemical Methods for Agricultural Sciences	Wiley Eastern Limited, New Delhi	1992. 1 Edn.
2	Rana, S.V.S.	Biotechniques Theory and Practice	Rastogi Publication, Meerut	2005 1 Edn.
3	Plummer, D.T.	An Introduction to Practical Biochemistry	Tata McGraw-Hill Publishing Co. Ltd., New Delhi	1996. III Ed.,
4	Ruzin, S.E.	Plant Microtechnique and Microscopy	Oxford University Press, New York, U.S.A.	1999. I Edn.
5	Ausubel, F., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K.	Short Protocols in Molecular Biology	John Wiley & Sons	1995. III Edn.
6	M.H. Gabb & W.E. Latchem	A Handbook of Laboratory Solutions	Scientific Publishers, Rajasthan, India	2013, I Edn.

Reference Books

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1	Berlyn, G.P. and Miksche, J.P.	Botanical Microtechnique and Cytochemistry	The Iowa State University Press, Ames, U.S.A.	1976, 1 Edn.
2	Harborne, J.B.	Phytochemical Methods	Chapman and Hall,	1998,

			New Delhi	1 Edn.
3	Sharma, K.	Manual of Microbiology: Tools and Techniques	Parwana Bhawan, New Delhi	2007, 1 Edn.
4	Wilson, K. and Walker, J.	Principles and Techniques of Practical Biochemistry	Cambridge University Press, Cambridge	1999, V Edn.
5	Mahajan, R.	Practical Manual of Biotechnology	Vayu Education of India, New Delhi	2010, 1 Edn.

Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

Course Designers

Dr. K.S. Tamil Selvi

Dr. B.S Chitra Devi

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT

MPL2409	Plant Systematics	Theory	58	2	-	4

Preamble

- To understand the principles of plant systematics, taxonomic and phylogenetic relationships.
- To grasp the importance of taxonomy software and GIS.
- To gain a comprehensive idea of herbarium techniques.
- To develop skill in identification of plants.
- To acquire knowledge on the diagnostic characters and economic importance of plant families.

Course learning outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO statement	Knowledge level
CLO1	Illustrate the different systems of classification of flowering plants	**K5**
CLO2	Appraise the contributions of various disciplines of botany to Systematics and role of computers in taxonomy	**K5**
CLO3	Apply the knowledge of Herbarium technique, the role of International Code of Nomenclature (ICN) in naming of plants and the role of floras, monographs and botanical gardens	**K5**
CLO4	Compare and explain the diagnostic characters among different dicotyledonous plant families	**K5**
CLO5	Compare and explain the diagnostic characters among different dicotyledonous and monocotyledonous plant families	**K5**

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	M
CLO2	S	S	M	S	M
CLO3	S	S	M	S	M
CLO4	S	S	M	S	M
CLO5	S	S	M	M	M

S- Strong; M – Medium

Syllabus

Unit I **11 hrs**

History of classification. Systems of classification: Artificial, Natural and Phylogenetic – (Bentham and Hooker`s, Bessey`s, Hutchinson`s and Takhtajan`s system of classification): Principles, outline, merits and demerits of the systems. APG system of classification - Principles - APG IV (2016) - outline. Phylogeny of Angiosperms.

Unit II **11 hrs**

Modern trends in taxonomy: anatomy, embryology, cytology, chemical characters and their use in taxonomy. Molecular taxonomy and its applications. DNA bar coding, Computer aided taxonomy– DELTA, GRIN, IPNI. Biodiversity portal. GIS in

taxonomy.

Unit III **12hrs**

Botanical Nomenclature: Principles and recommendations of ICN –typification, priority, valid and effective publication, citation, retention, conservation and Rejection of names. Taxonomic keys for identification – types and construction. Herbarium technique, floras, monograph. Botanical gardens, major herbaria in India and World. Role of BSI.

Unit IV **12hrs**

Study of diagnostic characters, economic importance and phylogenetic relationship of: Magnoliaceae, Menispermaceae, Meliaceae,Rhamnaceae,Sapindaceae, Fabaceae, Combretaceae, Lythraceae, Passifloraceae, Aizoaceae and Apiaceae

Unit V **12 hrs**

Oleaceae, Boraginaceae, Convolvulaceae, Bignoniaceae, Pedaliaceae, Acanthaceae, Nyctaginaceae, Piperaceae, Loranthaceae, Santalaceae, Amaryllidaceae, Commelinaceae and Cyperaceae.

Text Books

1. Gurucharan Singh, 2004. Plant systematic – An Integrated Approach. 1st Edn Scientific Publishers, Inc. New Hampshire, USA.
2. Sambamurthy, A.V.V.S., 2005. Taxonomy of Angiosperms. IEdn. I.K. International Pvt. Ltd., New Delhi.
3. Sharma, O.P. 2009. Plant Taxonomy. Second Edition Tata McGraw Hill Education Private Limited, New Delhi.

Reference Books

1. Sivarajan, V.V., 1991. Introduction to the Principles of Plant Taxonomy. Ed. N.K.B. Robson, 2nd Edn, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Simpson, G.M., 2010. Plant Systematics. Second Edition. Elsevier, Amsterdam.
3. Stevens, P. F., 2012. Angiosperm Phylogeny Website. Version 12.

Pedagogy: Power point presentation, Lecture, seminar, quiz and discussion

Course Designers

Dr.K.S. Tamil Selvi and Dr. H. Rehana banu

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL2410	Medicinal Botany	Core	43	2	-	3

Preamble

- To study the importance of medicinal plants in human life
- To understand the drug designing and drug development

Course Learning Outcomes

CLOs	CLO Statement	Knowledge Level
CLO1	Understand the importance of traditional knowledge in human welfare	**K2**
CLO2	Apply the pharmacognostical techniques to evaluate plant drug	**K3**
CLO3	Identify the phytochemical constituents present in the plants	**K4**
CLO4	Apply the knowledge to bring out the herbal products at industrial level	**K5**

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	S
CLO3	S	M	S	S	S
CLO4	S	M	M	S	M

S- Strong; M-Medium

Syllabus

Unit I **9hours**

Introduction of Indian Knowledge system: Ethnobotany: concepts and tools to study. Distribution of tribes in India, *Basic knowledge of tribes and their contributions to herbal medicine; south Indian tribes Irulas, Kanis, Paliyars. History of medicine. Indian systems of Medicine- basic principles of Siddha and Ayurveda. Biopiracy and patenting issues on traditional knowledge.

Unit II **9hours**

Pharmacognosy: - Scheme for study of crude drugs. Classification of crude drugs - morphological (organized drugs), chemical and pharmacological method; unorganized crude drugs – gums, mucilages, and resins. Collection of crude drugs- Processing and preservation of crude drugs- Drying methods – Natural and Artificial methods; Marketing of drugs. Factors affecting the yield of drugs.

Unit III **9 hours**

Drug adulteration: Types of adulteration. Crude drug evaluation - organoleptic evaluation, Microscopic evaluation (Stomata, trichomes, vein islet), physical evaluation - Moisture content, ash value and Extractive value (Principles and applications of soxhlet extraction and steam distillation). Phytochemical evaluation by Histochemical studies- qualitative analysis of Alkaloids,

Flavonoids, Glycosides, Tannins and terpenoids. Biological evaluation-antimicrobial studies - Agar well diffusion method and determination of MIC

Unit IV **9hours**

Important Medicinal Plants used in Indian systems of medicine- Biological sources, important medicinal component and uses of *Justicia adhatoda* , *Cardiospermum halicacabum*; *Withania somnifera*, *Rauwolfia serpentine; Gloriosa superba, Coleus forskohlii; Terminalia chebula*, *Semecarpus anacardium, Saraca asoca, Terminalia arjuna; Cassia fistula* and *Nelumbo nucifera.*

Unit V **7 hours**

Applications of Herbs at Industrial level - Pharmaceutics, Neutraceutics and cosmetics. Plant drugs use in the treatment of various diseases - Arthritis, Constipation, diabetes, hyper tension, psoriasis and memory loss. Uses of Herbs as Biocides. .

Text Books

S.No.	Author Name	Title of the Book	Publisher's Name	Year of Publication & Edition
1	Kokate, K., Purohit, A.P., and Gokhale, S.B.	Pharmacognosy	Nirali Prakashan, India	2007, III Edn
2	Jain, S.K. and Mudgal, V.	A Handbook of Ethnobotany	Bishen Singh Mahendra Pal Singh, Dehradun	1999 I Edn
3	Jain, S.K.	Contributions to Indian Ethnobotany	Scientific Publishers, Jodhpur	1991, I Edn
4	Saharan, V.A., Moond, M.K., Chouhan, P.C., and Gupta, M.K.	Principles of Pharmacognosy	Agrobios, India	2008, I Edn

ReferenceBooks

S.No.	Author Name	Title of the Book	Publisher's Name	Year of Publication & Edition
1.	Tyler, E.V., Brady, R.L., and Robbers, E.J.	Pharmacognosy	Lea and Febiger, Philadelphia	1981, IX Edn
2.	Trease, G.E., and Evans, E.C.	Pharmacognosy	Bailliere Tindall, Eastbourne, U.K.	1983, XII Edn

Pedagogy

Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

Course Designers

Dr.M. Kamalam and

Dr. H. Rehana banu

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL2311	Genetic Engineering	Theory	58	2	-	4

Preamble

- To acquire a detailed idea about genome organization in plants, methodologies and markers in gene cloning
- To discern and appreciate the basic techniques and safety concerns in genetic engineering
- To realize the applications of genetic engineering in combating biotic and abiotic stress in economically important plants

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Apply the knowledge of vectors and gene manipulation techniques	K5
CLO2	Analyze and appraise the methodologies of gene transformation	K5
CLO3	Interpret the role of markers in genetic engineering	K5
CLO4	Categorize and deduce the effects of gene manipulation	K5
CLO5	Formulate techniques for stress tolerance in plants	K5

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	M	M	S
CLO3	S	S	M	S	S
CLO4	S	S	M	M	S
CLO5	S	M	M	S	S

S- Strong; M-Medium

Syllabus

Unit I **12 hrs**

Vectors in gene cloning: Plasmids, Phagemids, Cosmids. Artificial chromosomes:, BAC, YAC and PAC. Features of Ti and Ri plasmids and its use as vectors, binary vectors, viral vectors, Transposons as vectors. Promoters and terminators: inducible promoters and tissue specific promoters.

Unit II **11hrs**

Plant Genetic Transformation: Gene transfer methods in plant cells: Transfection, Electroporation, Ultra sonication, Particle Bombardment – Gun method, Agroinfection and Liposome fusion.Transgene stability and gene silencing.

Unit III **12hrs**

Molecular markers – Introduction, Classification of molecular markers – RFLP, RAPD, AFLP, Microsatellites (SSRs) and Minisatellites.Application of DNA markers in molecular breeding. QTL mapping and marker assisted selection breeding – MABB, MARS, Marker assisted QTL introgression and Gene pyramiding.

Unit IV **11hrs**

Concerns about GM crops - Golden rice and terminator seeds. Safety concerns Basic techniques in Genetic Engineering: Isolation and purification of nucleic acids, Agarose gel electrophoresis, PCR, Southern, Northern and Western blotting techniques.

Unit V **12hrs**

Application of Plant Transformation: Biotic stress: Herbicide resistance- phosphoinothricin. Insect resistance- *Bt*genes. Disease resistance - PR proteins. Virus resistance: Coat protein mediated and nucleocapsid gene. Abiotic stress: Drought, cold and salt resistance. Post-harvest losses: long shelf life of fruits and flowers.

Text Books

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Primrose, S.B. and Twyman, R.	Principles of Gene Manipulation and Genomics	Blackwell Publishing Company, U.S.A.	2006, VII Edn
2.	Slater, A., Scott, N.W. and Fowler, M.R.	Plant Biotechnology	Oxford University Press, U.K.	2008, II Edn
3.	Brown, T.A.	Gene Cloning and DNA Analysis: An Introduction	John Wiley & Sons, U.K.	2016, VII Edn

Reference Books

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Hammond, P., McGarvey, P., and Yusibov, V.	Plant Biotechnology: New Products and Applications	Springer-Verlag, Germany	2000
2.	Gilmartin, P.M. and Bowler, C.	Molecular Plant Biology: A Practical Approach (Vol. I & II)	Oxford University Press, U.K.	2002
3.	Chrispeels, M.J. and Sadava, D.E.	Plants, Genes and Crop Biotechnology	Jones and Bartlett Publishers, U.S.A.	2003, II Edn
4.	De Robertis, E.D.P. and De Robertis Jr., E.M.F.	Cell and Molecular Biology	Lippincott Williams & Wilkins, U.S.A.	2010, VIII Edn

Pedagogy

Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

Course Designers

Dr. M. Kanchana and Dr. K. Sunitha kumari

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL2312	Plant Ecology and Phytogeography	Theory	58	2	-	4

Preamble

- To provide in depth knowledge about ecology and the human impact on ecosystems.
- The course will give a picture on how an ecological approach and methods may be used to investigate different environmental issues.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Use ecological knowledge in order to understand the distribution of species in ecosystems.	K5
CLO2	Discuss different theories that may explain biological diversity and threats towards biological diversity.	K5
CLO3	Understand the concepts of ecological succession, concept of climax and ecosystem equilibrium and stability.	K5
CLO4	Explain the ecological background to the most important environmental problems in the world.	K5
CLO5	Interpretate geological history and the role of historical biogeography in plant distributions.	K5

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	-
CLO2	S	S	M	S	S
CLO3	S	M	S	-	M
CLO4	S	S	S	S	S
CLO5	S	M	M	M	-

S- Strong; Medium

Syllabus

UNIT-I: Ecosystem Structure and function **11hrs**

Structure- Abiotic, Biotic, Ecological pyramids. Function of ecosystem: Productivity- primary, secondary, Food chains- Grazing, Detritus. Food webs and tropic levels and energy flow.

UNIT II: Community Ecology **11hrs**

Characteristics of communities Analytical Quantitative – Frequency, density, Abundance, Cover and Basal area. Qualitative – Physiognomy, Phenology, Stratification, sociability, vitality and Life form. Synthetic characters- Prensence and constance, Fidelity, Dominance. Method of study of communities- Raunkiaer's Life form, Physiological methods- Sampling units, Quadrat method, Transect method, Point method.

UNIT III: Ecological Succession **11hrs**

Causes, trends of succession, Types of succession- Primary, secondary and allogenic, Process of succession- Nudation, Invasion, competition and coactions-reaction, stabilization. Concept of climax- Monoclimax and Polyclimax theories.

Population Ecology: Characteristics of a population (Population size and Density, Dispersion, Age structure Natality (Birth Rate), Mortality (Death rate), Biotic potential, Life Tables, Population growth curves.

UNIT IV: Applied Ecology **12hrs**

Global environmental change -Atmosphere composition and structure, Global warming-Green house gases and Ozone depletion. Remote sensing and Geographic Information System (GIS).

Conservation strategies: IUCN categorization- *In-situ* conservation (National parks, Biosphere reserves, Wildlife sanctuaries) *Ex-situ* conservation –(Seed bank, Botanical gardens). Sacred groves.

UNIT V: Phytogeography **12hrs**

Principles and importance of plant geography- Phytogeographic regions of India. Agro-climatic regions of India, Patterns of distribution – Disjunction and Variance. Theories of present day distribution of plants- Continental drift hypothesis- Gondwana land factors involved in distribution. Factors involved in distribution – Endemism, Age and Area hypothesis; Dispersal and Migration and their aims and methods.

TextBooks

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Sharma, P.D.	Ecology and Environment	Rastogi Publications, Meerut	2013, XI Edn.
2.	Kumaresan, V. and Arumugam, N.	Plant Ecology and Phytogeography	Saras Publication, Nagercoil, India	2016, IV Edn.
3.	Odum, E., Barrick, M., & Barrett, G.W.	Fundamentals of Ecology	Cengage Publishers (India Edition)	2005
4.	Verma, V.	Plant Ecology	Ane Books Pvt. Ltd., New Delhi	2011

ReferenceBooks

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Odum, E.P.	Ecology	Oxford & IBH Publishing Co., New Delhi	1975, II Edn
2.	Krebs, C.J.	Ecology	Harper & Row, New York	1985
3.	Sinha, R.K. and Singh, D.	Global Biodiversity	INA Shree Publishers, Jaipur	1997

Flipped mode: online links [MOOC, SWAYAM, NPTEL, Websites etc.]

1 https://swayam.gov.in/

2. https://swayam.gov.in/nd1_noc19_ge23/preview 3

3. https://www.classcentral.com/course/swayam-ecology-and-environment-14021

- *www.pdst.ie/sites/default/files/1.5.3%20Quantiative%20Studies.pptx*
- *https://www.youtube.com/watch?v=KuG-UjpQzm0*
- *https://www.youtube.com/watch?v=_hqjXWEkByg*
- *www.smtasmc.org/images/phytogeographical_regions_of_India.pptx*
- *https://www.slideshare.net/ranjithkumarbs/agro-climatic-regions*
- https://www.youtube.com/watch?v=_5q8hzF9VVE
- *https://www.youtube.com/watch?v=-XPzj95nEHY*

- *https://www.youtube.com/watch?v=cS4qwSK-Mqw*

Pedagogy

Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

Course Designers

Dr K. Gajalakshmi and Dr.RS.Sumathi

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL22S1	Research Methodology	Theory	30	-	-	2

Preamble

- To give background on history and methodologies of scientific research and scientific reading
- To provide basic knowledge on research designs, IPR and especially patents and patent regulations
- To understand the importance of sampling, data collection and statistical analysis of data and interpret data
- To learn report writing and presentations, Gain knowledge of biosafety and risk assessment
- To become familiar with ethical issues in biological research

Syllabus

Unit I **6 hrs**

Meaning of research: objectives of research; Essential steps in research; types of research. Research methods Vs methodology. Research process– formulating the research problem. Selecting the problem, defining the problem, extensive literature survey, use of internet for literature collections, development of working hypotheses

Unit II **6hrs**

Research Design:- Definition and importance of research design, features of a good design;–Classification of different search designs – a) exploratory research studies b) Descriptive, diagnostic research, c) Hypothesis testing research – experimental studies. Basic principles of experimental designs – Principle of replication, Principle of randomization, Principle of local control. IPR and patents

Unit III **6hrs**

Sampling: Deliberate sampling, simple random sampling, systematic samples, stratified sampling, quota sampling, cluster sampling, multistage sampling, sequential sampling. Sampling errors and sample size. Data collection – by observation, through personal interviews, telephone interviews, mailing questionnaires, through schedule. Processing and analysis of data – editing, classification, tabulation, statistical analysis – DMRT, and ANOVA. Correlation and regression. Introduction to SPSS.

Unit IV **6hrs**

Report writing – logical analysis of the subject matter, preparation of final outline, preparation of rough draft, rewriting and polishing Bibliography – books and pamphlets; magazine and newspapers; thesis and dissertations. Final draft – layout – A) Preliminary pages, title, name of author, year; acknowledgement, declaration, preface/foreword; table of contents, list of tables and figures. B) Main text – introduction, review of literature; methods adopted, results, discussions, summary, bibliography. C) Appendices includes plates, publications of author. Research publications: Format of a research paper – preparation, submission of manuscripts to journals- local, national and international. Plagiarism, Impact factor, citation index. Safety measures in a research laboratory.

Unit V **6hrs**

Research Ethics and Responsible Conduct in Research

Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), The legal regulation of

research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research. Ethical conflicts in biological sciences - interference with nature, for experiments involving animals and humans.

Text Books

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Gurumani, N.	Research Methodology for Biological Science	MJP Publishers, Chennai	2007
2.	Kothari, C.R.	Research Methodology – Methods and Techniques	New Age International (P) Ltd., New Delhi	1990, II Edn
3.	Saravanavel, P.	Research Methodology	Kitab Mahal, Allahabad	2003, 1Edn

References

S.No.	Author Name	Title of the Book	Publishers	Year and Edition
1.	Ganguli, P.	Intellectual Property Rights: Unleashing the Knowledge Economy	Tata McGraw-Hill, New Delhi	2001
2.	Kuhse, H.	Bioethics: An Anthology	Blackwell, Malden, MA	2010
3.	Suckow, M. & Yates, B.	Research Regulatory Compliance	Academic Press	I Edn

Other materials

1. *National IPR Policy*, Department of Industrial Policy & Promotion, Ministry of Commerce, GoI
2. *Complete Reference to Intellectual Property Rights Laws*. (2007). Snow White Publication Oct.
3. Office of the Controller General of Patents, Design & Trademarks; Department of Industrial Policy & Promotion; Ministry of Commerce & Industry; Government of India. http://www.ipindia.nic.in/
4. Karen F. Greif and Jon F. Merz, *Current Controversies in the Biological Sciences -Case Studies of Policy Challenges from New Technologies*, MIT Press
5. World Trade Organisation. http://www.wto.org
6. World Intellectual Property Organisation. http://www.wipo.int
7. International Union for the Protection of New Varieties of Plants. http://www.upov.int
8. National Portal of India. http://www.archive.india.gov.in
9. National Biodiversity Authority. http://www.nbaindia.org
10. On Being a Scientist, A Guide to Responsible Conduct in Research: Third Edition (2009)
11. Role of the Ethics Committee: Helping To Address Value Conflicts or Uncertainties Author links open overlay panel Mark P.Aulisio, Robert M.Arnold

12. https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf
13. Research Regulatory Compliance 1st Edition (Mark Suckow, Bill Yates eBook ISBN: 9780124200654)
14. Recent research ethics policy from Government of India.

Pedagogy

Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL24P3	Practical III (Plant Systematics & Medicinal Botany)	Practical	-	-	60	2

Preamble

- Collection, identification and classification of plants.
- Preparation and maintenance of Herbarium
- Extraction of medicinal plants
- Qualitative analysis of phytochemical components by Histochemical studies
- Microscopical evaluation of plant drugs

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge Level
CLO1	Study the morphological features of the plants	K3
CLO2	Identify and classify the plants taxonomically	K4
CLO3	Evaluate the medicinal plants for their phytochemical constituents using Histochemical analysis	K4
CLO4	Analyse microscopical and physico chemical characters of medicinal plants quantitatively	K4
CLO5	Testing the ability of plant extracts for their antimicrobial properties	K5

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	M	S
CLO4	S	M	S	S	S
CLO 5	S	M	S	S	S

S- Strong; M-Medium

Syllabus

Plant Systematics **30 hrs**

- Study of the morphological, floral characters, economic importance of the families- Magnoliaceae, Menispermaceae, Meliaceae, Rhamnaceae, Sapindaceae, Fabaceae, Combretaceae, Lythraceae, Passifloraceae, Aizoaceae, Apiaceae, Oleaceae, Boraginaceae, Convolvulaceae, Bignoniaceae, Pedaliaceae, Acanthaceae, Nyctaginaceae, Piperaceae, Loranthaceae, Santalaceae, Amaryllidaceae, Commelinaceae and Cyperaceae.
- Preparation of artificial key with 5 or 6 species of a genus.
- Preparation and submission of 30 herbarium specimens of common /wild plants.
- Two or Three days field visit for herbarium preparation

Medicinal Botany **30hrs**

1. Study of morphology and medicinal importance of the following live plant materials as **Spotters**

i) **Organized drugs:**

a. **Leaves** – *Justicia adhatoda, Cardiospermum halicacabum*
b. **Bark** – *Saraca asoca, Terminalia arjuna*
c. **Rhizome** – *Gloriosa superba, Coleus forskohlii*
d. **Root** - *Withania somnifera, Curculigo orchioides*
e. **Flower** – *Senna auriculata, Nelumbo nucifera*
f. **Nuts&seeds**- *Terminalia chebula, Semecarpus anacardium*

ii) **Unorganized drugs -** organoleptic characters and medicinal uses of the following

f. Resin - *Ferula asafoetida*
g. **Gum** –*Acacia nilotica*
h. Mucilage – *Aloe vera*

Individual experiment:

2**. Microscopic evaluation**: : Identification of Stomata and stomatal index

3**. Histochemical evaluation** - Detection of Alkaloids, Flavonoids, Glycosides, Tannins and terpenoids

Group Experiment:

4. Physical evaluation (Quantitative analysis)

i **) Estimation of Moisture** content by loss on drying method

ii) **Estimation of extractive values (Soxhlet extraction)** of any one medicinal plant using polar and non polar solvent.

1. **Biological evaluation method -** antimicrobial studies.

Course designers

Dr.C. Krishnaveni
Dr.M.Kamalam

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MPL23P4	**Practical IV: (Genetic Engineering & Plant Ecology and Phytogeography)**	**Practical**	**-**	**-**	**60**	**2**

Preamble

- To gain knowledge about the fundamental processes of genetic engineering
- To be skilled in handling various equipments
- To acquire the capability of performing immunological studies.

Course Learning Outcomes

On the successful completion of te course, students will be able to understand the following

CLO's	CLO Statement	Knowledge Level
CLO1	Assess the various aspects of genetic engineering	K3
CLO2	Categorize and handle the scientific equipments	K4
CLO3	Resolve, criticize and defend problems at molecular level	K5
CLO4	Examples of vegetation patterns and processes, including a class walk to visit and discuss the vegetation ecology.	K6
CLO5	Recognize the complexity of ecological interactions at different spatial and temporal scales in plant communities.	K5
CLO6	Gain appreciation for the importance of proper sampling design in ecological field studies.	K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S
CLO5	S	M	S	M	S
CLO6	S	S	S	S	M

S- Strong; M-Medium

Syllabus

Genetic Engineering **30hrs**

1. Restriction and Digestion of DNA
2. Polymerase Chain Reaction
3. Southern Blotting
4. Protein isolation
5. SDS PAGE

Spotters: RNA isolation, Western Blotting, gene Gun, *Agrobacterium* mediated gene transformation, Bt Cotton, Golden rice.

Plant Ecology and Phytogeography **30 hrs**

To determine the quantitative characters in the community by using quadrat method.

a) Frequency b) abundance c) density d) basal cover e) IVI.

1. Synthetic characters: Similarity index, FICC, dominance index, diversity index.
2. Raunkiaer's life form classes and percentage distribution of species in vegetation.

3. Stratification, Zonation – Demonstration.
4. Field visit – Report preparation on vegetation types, conservation measures under taken in biosphere reserves/ national parks/ sanctuaries etc.

Course designers

Dr. M. Kanchana
Dr. K.Gajalakshmi
Dr. B. S. Chithra Devi

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
MNM22CS2	Cyber Security II	Ability Enhancement Compulsory Courses	30	-	-	Grade

Preamble

This course provides the classification of cyber security and cyber crime and its laws and dataprivacy and security in social media

Prerequisite

Basics of Internet

Course Learning Outcomes

On successful completion of the course, the students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of Cybersecurity andCybersecurity threat landscape.	K2
CLO2	Apply the methods to identify the cyber-attacks and crimes.	K3
CLO3	Analyze the legal framework that exists in India for cybercrimeand legal frame work followed by other countries.	K4
CLO4	Estimate the data privacy and security issues related to personaldata privacy and security.	K5
CLO5	Create a privacy setting on social media platform and register complaints on a social media platform.	K6

UNIT I **6 hrs**

Overview of cyber security: Cyber security terminologies- Cyberspace- Cyber attack- Cyber threats -Cyber terrorism – Cyber warfare.

UNIT II **8 hrs**

Cyber crimes: Cyber Crimes targeting computer system and mobiles- Online scam frauds: emails Scams- Phishing- Vishing- Smishing- Online job fraud- online sextortion- Debit and credit card fraud- Online payment fraud- cyberbullying. Social Media Scam & Frauda: Impersonation- Identify theft -Job scams- Misinformation- Fake newcyber crime against persons -Cyber grooming -Child pornography - cyber stalking-Cyber police station -Crime reporting produce.

UNIT III **4 hrs**

Cyber law: Cyber laws and legal and ethical aspects related to new technologies: AI/ML-IoT- Blockchain- Darknet and social media- Cyber law of other countries.

UNIT IV **5 hrs**

Data privacy and Data security: Defining data- Metro-Big data- Non personal data- Data protection- General Data Protection Regulations (GDPR)- 2016 Personal Information Protection and the Electronic document Act(PIPEDA)- Social media Data privacy and Security issues.

UNIT V **7 hrs**

Social Media Platforms and Cyber Security : Case Study on Platform for reporting Cyber Crimes, Checklist for reporting cyber crimes online, Setting privacy settings on social media platforms, Registering complaints on social media platforms, Do’s and

Don’ts for posting content on social media platforms, prepare password policy for computer and mobile device, security controls for computer and mobile phones , digital Forenics, Cyber Bulling, Phishing, Facebook Attack, Cyber Security audit and Compliance and National Security Policies.

Reference Books:

1. Anand Shinde (2021), Introduction to Cyber Security – Guide to the world of Cyber Security, Notion Press Sumit Belapure, Nina Godbole (2011), Cyber security understanding cyber crimes, computer forensics and legal Perspectives, Wiley India Pvt Ltd.
2. Dorothy F. Denning (1998), Information warfare and security, Addison Wesley.
3. Henry A. Oliver, (2014), Security in the digital age: social media security threats and vulnerabilities, Social Wise Media Group Nataraj Venkataramanan, Ashwin Shriram (2016), Dataprivacy principle and practice. CRC Press
4. W. KragBrothy (2006), Information security governance guidelines for information securitymanager, Wiley Publication.
5. Martin Weiss, Michael G. Solomon (2015), Auditing IT Infrastructure for compliance, 2/e, Jones Bartlett Learning.
