PSGR KRISHNAMMAL COLLEGE FOR WOMEN

College with Potential for Excellence

(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
Peelamedu, Coimbatore-641004

DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM

MASTER OF BOTANY (M.Sc Botany)

2015 - 2017

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DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM SYLLABUS & SCHEME OF EXAMINATION

2015 - 2017

Sem	Subject Code	Title of the Paper	Inst Hrs/ week	Total Hours		Durtion of exam Hrs	Maximum Marks			
				Contact Hrs	Tutorial Hrs		CA	ESE	Total	Credit
I	MPL1401	Paper I – Plant Diversity	5	71	4	3	40	60	100	4
	MPL1402	Paper II -Anatomy, Embryology and Tissue Culture.	5	71	4	3	40	60	100	4
	MPL1403	Paper III – Applied Microbiology	5	71	4	3	40	60	100	4
	MPL1404	Paper – IV – Cell Biology and Genetics	5	71	4	3	40	60	100	4
	MPL14P1	Practical I (Theory papers I, II & III)	7	105	-	-	-	-	-	-
	MPL14P2	Practical II (Theory paper IV)	2	30	-	-	-	-	-	-
		Library	1	15	-	-	-	-	-	-
II	MPL1405	Paper- V - Plant Physiology	5	71	4	3	40	60	100	4
	MPL1406	Paper- VI – Biochemistry	5	71	4	3	40	60	100	4

	MPL1407	Paper –VII- Molecular Biology	5	71	4	3	40	60	100	4
	MPL1308 MPL1409	Elective –I Paper – VIII- Horticulture techniques and postharvest management **or** Paper- IX- Bioinformatics	4	56	4	3	40	60	100	4
	MCE14A1/ MPL14A1	IDC -Clinical Microbiology & Biochemistry	4	60	-	-	-	100	100	4
	MPL14P1	Practical I (Theory papers I, II& III)	-	-	-	4	40	60	100	5
	MPL14P2	Practical II (Theory papers IV, V, VI & VII)	6	90	-	4	40	60	100	5
		Library	1	15	-	-	-	-	-	-
III	MPL1410	Paper X- Taxonomy of Angiosperms	4	56	4	3	40	60	100	5
	MPL1411	Paper XI– Phytopharmaceutical Science	3	41	4	3	40	60	100	3
	MPL1412	Paper XII– Genetic Engineering	4	56	4	3	40	60	100	4
	MPL1413	Paper XIII– Biotechniques	3	41	4	3	40	60	100	3
	MPL1414 MPL1215	Elective –II Paper XIV – Food Biotechnology Or Paper XV - Immunology	4	56	4	3	40	60	100	4
	MPL06S1	Special paper- Research Methodology	2	30	-	3	-	100	100	2

	MPL14P3	Practical – III (Theory Papers X, XI)	4	60	-	4	40	60	100	5
	MPL14P4	Practical – IV (Theory Paper XII and XIV/ XV)	4	60	-	4	40	60	100	5
	MNM15CS	Cyber Security	2	26	4	-	#100	-	100	-
		Comprehensive Exam	-	-	-	2	-	-	-	Grade
IV	MPL1416	Paper- XVI- Energy and Environmental Management	5	71	4	3	40	60	100	4
	MPL1417	Paper-XVII Forestry	5	71	4	3	40	60	100	4
	MPL1408	Advanced Learners' Course – Food Science and Nutrition	Self study	-	-	3	-	100	*100	*5
	MPL14PROJ	Projects	20	300	-	-	20	80	100	5
							Total		**2300**	**90**

***Not considered for grand total and CGPA**

 # CA

Tests	2× 40 Marks	= 80 Marks
Quiz		10 Marks
Assignment		10 Marks
Total		**100 Marks**

Question Paper Pattern

Section A	5/7	5x6	= 30 marks	Answer not to exceed one page
Section B	4/6	4 x 12	= 48 marks	Answer not to exceed four pages
Section C	Compulsory	2 x 11	= 22 marks	Answer not to exceed four pages
	Total		**= 100 marks**	

INTER DISCIPLINARY COURSE & Special Paper –Research Methodology

Question Paper Pattern

Section A: 5*5= 25 marks

5 questions from each unit either or type – short answer type

Section B: 5*15 = 75 marks

5 questions from each unit either or type - Essay type answers

INFORMATION SECURITY

Question paper pattern

Section A

Answer in two sentences	2x5= 10 marks (5 out of 8)

Section B

Answers in one page	5x6= 30 marks (6 out of 8)
Total	**40 marks**

ADVANCED LEARNERS COURSE

Question Paper Pattern

Section A

5 questions out of 8- open choice	5×5	= 25 Marks

Section B

5 questions out of 8- open choice	5×10	= 50 Marks
	Total	**= 75 Marks**

Paper I - Plant Diversity

Semester – I **Total Marks: 100**
Sub.Code:MPL1401 **CA : 40**
Hours: 71 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective:

To understand the diversity, their distribution and economic importance.

Unit: I **Phycology** **14hrs**

Classification of algae by Fritsch 1945. Structural organization, Reproduction and Phylogeny of Chlorophyceae, Xanthophyceae, Chrysophyceae, Phaeophyceae, Rhodophyceae and Myxophyceae. Parallelism, Algae in Biotechnology- Industrial, Nuturaceutical 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 and Basidiomycetes Classification of plant diseases based on symptoms. Host - pathogen interaction, Defense mechanism. *Economic importance of fungi.

Unit: III Bryophytes **14 hrs**

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

Unit: IV Pteridophytes **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 and Gnetales including fossils –*Williamsonia, Heterangium, Lagenostoma, Pentoxylon* and *Cordaites.*

***self study**

Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Charles Joseph Chamberlain.M	Gymnosperm- Structure Evolution, 1st edn.	CBS PublishersShadara, Delhi	1986.
2	Dasgupta, M.K.	Principles of plant pathology. I edn	Allied Publ.New Delhi	1988
3	Mehrotra ,R.S. and Aneja,K.R.	An Introduction to Mycology.	Wiley east Ltd. Published by V.S. Joshi. I edn, New Delhi.	1990
4	Pandey,P.B	College Botany Vol II	7th edn. S.Chand&co ltd, NewDelhi	2009
5	Rashid, D.A.	An Introduction to	Vikas Publishing	1979

		Pteridophyta. Ist edn	House, New Delhi	
6	Singh, R.S	Introduction to principles of Plant pathology, 4th edn.	Oxford & IB publishing co.pvt.ltd. New Delhi	2005.
7	Sporne K.R	The Morphology of Pteridophytes. Ist Indian edition	B.I. Publications, London	1974.
8	Vashishta B.R and Sinha A.K.	Fungi.	S.Chand and Co. Ltd., New Delhi	2008.
9	Vashishta.B.R., Sinha.A.K and Singh.V.P.	Algae.	S.Chand and Co. Ltd., New Delhi.	2013

Reference Books

S.No.	Author's	Title of the Book	Publishers	Year of Publication
1	Ainsworth, S.C., Sparrow F.E and A.D Sussman.	The fungi and advanced treatise	Vol I, II, III, IVa and Ivb. AndraPradesh	1965
2	Alexopoulos, C.J and C.W. Mims.	Introductory mycology	John Wiley & Sons. I edn, Newyork	1985
3	Bold, H.C and H.J Wyne	Introduction to the algal structure and reproduction. 1st edn	Prentice Hall, New Jersey	1978
4	Chandrakant Pathak	The latest portfolio of theory and practice in Pteriodophyta. I edn.	Dominant publishers and distributors, NewDelhi	2003.
5	Chapman V.J and P.J Chapman.	The algae	Mac Milan 2nd Edition, Newyork	1973
6	Charles Joseph Chamberlain	Gymnosperms-Structure Evolution. Ist edition	CBS Publishers, Shahdara, Delhi.	1986
7	Fritsch F.E.	The structure and reproduction of the algae.Vol I and II	Cambridge University Press. Cup – Vikas students edn, England.	1979
8	Prem puri	Bryophyes –A Broad Prospective –2nd Edition	Atma Ram & Sons, New Delhi	1985
9	Smith G.M	Manual of Phycology.	Ronald Press Company. I edn, Newyork	1951

Paper II - Anatomy, Embryology and Tissue Culture

Semester I **Total Marks : 100**
Sub Code: MPL1402 **CA : 40**
Hours: 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective

To understand the internal structure of the plant organs, embryological features and tissue culture of different plant parts.

Unit: I **14 hrs**

*Introduction to meristems and its derivatives. Epidermal tissue system – trichomes, glands, *Stomata. Secretory tissues- nectaries and laticifers. Detailed structure of Vascular cambium, Secondary Xylem-Xylem rays, ray tracheids ,wood paremchyma, 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-*Dracena*

Unit: III **14 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 – *Ceratocephalus falcatum*, monocot embryo – *Najas lacerata*, anomalous embryo development – *Triticum.*

Unit: IV **14 hrs**

Tissue and cell culture techniques: Types of media, preparation of Murashige and Skoog medium, macro and micro nutrients, Growth hormones. Explant cultre: Selection of 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.

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Bhojwani S.S and Bhatnagar. S.P	The Embryology of Angiosperms. III edition.	Vikas Publishing House Pvt.Ltd.New Delhi.	2008
2.	Eames , A.J.,	An Introduction to	Tata McGraw	2001

		Plant Anatomy,	Hill Publishing Co. NewDelhi.	
3.	Kalyan Kumar, De.	An Introduction to Plant Tissue Culture..	New Central Book Agency. Pvt.Ltd. Howrah	2004
4.	Pandey.B.P,	Plant Anatomy. Sixth Revised Edition..	S.Chand and Compnay Ltd. New Delhi	2001
5.	Ramawat, K.G.	Plant Biotechnology	S.Chand and Compnay Ltd. New Delhi	2004
6.	Vargesh .A.T.M.	An Intorduction to Experimental and applied Embryology of Angiosperms,	Oxford and IBH Publishing Company, NewDelhi.	2004

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Reference books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Chadnurkar P J.	Plant Anatomy, Fifth edition.	Oxford and IBH Publishing Co.New Delhi.	1980
2.	Cutter,D.F.,C.E.J Bottla, D.W.Stevenson,	Plant Anatomy .An applied Approach.	Blackwell Publishing. Australia.	2011
3.	Elizabeth G Cutter,	Plant Anatomy Part I: Cells and Tissues.	Edward Arnold Publishers Ltd. London	1979
4.	Fahn, A.,	Plant Anatomy,	Wiley Eastern Publishiners, NewDelhi.	1997
5.	Foster.A.S	Practical Plant Anatomy	East west Ed.D Van Nostrand	2000
6.	Katherine Esau, K.	Plant anatomy of Seed Plants. Second Edition.	Wiley Eastern Limited, New Delhi	1963
7	Maheswari.P., 1991,	Introduction to the Embryology of	Tata McGraw Hill Pvt. Ltd, NewDelhi.	1991

		Angiosperms,		
8	Reinert Bajaj. .	Applied and fundamental aspects of Plant cell, Tissue culture and Organ Culture.	Narosa publishers. New Delhi	1977

Paper – III - Applied Microbiology

Semester : I **Total Marks : 100**
Sub Code : MPL1403 **CA : 40**
Hours : 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives:

To understand the various aspects of applications of microbes to mankind and his environment.

Unit I **14 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 **14hrs**

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

Unit III **14 hrs**

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 **14 hrs**

Microbes as Bio-fertilizers. Nitrogenous Biofertilizers, PGPR, Solid Waste - Biomanure technology, Effective microorganisms (EM), Vermicomposting, Bio-pesticides, Edible Mushroom production.

Unit V **15 hrs**

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.

***self study**

Text Books:

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Casida.L.E. JR	Industrial Microbiology (1st edition)	New age Intl (P) Limited, New York.	2006
2.	Patel.A.H,	Industrial Microbiology (I st Ed).	Macmillan India limited,New Delhi.	1985.
3.	Prescott, Harley and Klein.	Microbiology (VIth Ed).	McGraw Hill, Higher education, New York.	2005.
4.	Roger Y. Stainer	General Microbiology. (IV Ed).	The Macmillan Press Ltd, Hong kong.	1984.
5.	Sathyanarayana, U.	Biotechnology	Books & Allied (P) Ltd, Kolkata	2012

References:

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Dubey, R.C.	(I st Ed). Text book of Biotechnology.	S.Chand and Company Ltd, New delhi.	1993.
2.	John E.Smith.	Biotechnology. (IIIrd Ed).	Cambridge University press, New york.	1996.
3.	Michael J.Pelczar, Jr/ E.C.S.Chan.	(I st Ed). Elements of Microbology	Mcgraw-Hill International Book Company, Tokyo.	1981.
4.	Pelczer,JR	Microbiology. (Vth Ed).	Mc Graw Hill company. New Delhi	1988.
5.	Rita singh	(I st Ed). Industrial Biotechnology.	Global vision publishing, New delhi.	2004.
6.	Sathyanarayana, U.	Biotechnology	Books & Allied (P) Ltd, Kolkata.	2012.

Paper- IV – Cell Biology and Genetics

Semester: I **Total Marks : 100**
Sub Code: MPL1404 **CA : 40**
Hours: 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective:

The major objective is to envisage thorough knowledge in cell biology, genetics and genome organization.

Unit – I **14 hrs**

*Structural organization and function of cell organelles - cell wall, nucleus, mitochondria, ER, golgibodies, chloroplast, lysosomes, 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 signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component signaling 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 **14 hrs**

*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.

***self study**

Text Books:

S.No.	Author's	Title of the Book	Publishers	Year of

				Publication
1	Gupta, P.K..	Genetics. I edn	Rastogi Publishers, UP	1999
2	Gupta, P.K.	Cell and Molecular Biology. I Edn.	Rastogi publications, UP	1988.
3	Sambamurty.A.V.S.S.	Genetics. I edn.	Narosa Publishers, New Delhi	1999
4	Verma, P.S. and AgarwalV.K.	Cell Biology, Genetics, Molecular Biology, Evolution and Ecology	S.Chand and Co. New Delhi.	2007
5	Winter,P.C., Hickey,G.E and H.L. Fletcher.	Instant notes in Genetics.	Viva Books Publ, New Delhi	1999

Reference Books:

S.No.	**Author's**	**Title of the Book**	**Publishers**	**Year of Publication**
1	De Robertis and De Robertis.	Cell and Molecular biology. I Ed.	Lippincott Williams and Wilkins. UK	2005
2	Gardener, E. J.	Principles of Genetics. 5th Edition.	John Wiley. New York.	1975
3	Tamarin,R.H.	Principles of Genetics. I edn.	Tata McGraw Hills, New Delhi	2002
4	Gilmartin and Bowler	Molecular Plant Biology: A practical approach (Vol. I and II),	Oxford University press, UK.	2002
5	Joseph K. John.	Biomembranes and Biosignalling.	Campus Books International, New Delhi.	2006

Practical I

Theory paper I, II and III

Semester I **Total Marks : 100**
Sub Code: MPL14P1 **CA : 40**
Hours: 105 **ESE : 60**
Credit : 5

Algae **45 hrs**

Scenedesmus, Pithophora, Bulbochaete, Nitella, Diatoms- Cyclotella and Navicula, Padina, Batrochospermum, 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

Lycopodium, Selaginella, Isoetes, Osmunda, Adiantum, Angiopteris, Pteris, Azolla

Gymnosperms

Cycas, Pinus, Araucaria, Cupressus..

Anatomy **30 hrs**

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. 4-nucleate and 8-nucleate embryo sac. Different types of ovule. Endosperm haustoria, dicot and monocot embryo. Embryo dissection-*Tridax*

Tissue culture

Preparation of MS medium and inoculation of Explants. Anther culture, pollen culture, Organogenesis.

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.

PRACTICAL - II

Theory Papers (IV, V, VI and VII)

Semester: II **Total Marks : 100**
Sub Code: MPL14P2 **CA : 40**
Hours : 120 **ESE : 60**
Credit : 5

Cell Biology and Genetics **30 hrs**

Mitosis and Meiosis**.**

Spotters – plasma membrane, cell organelles, chromosomes, lamp brush chromosomes. Simple problems in genetics – Monohybrid, dihybrid and factor interaction. Linkage maps.

Physiology and Biochemistry **45 hrs**

Physiology

Individual experiments

Separation of leaf and flower pigments by paper and TLC
Effects of CO_2 Concentration and light intensity on photosynthesis- Wilmot's bubbler
Absorption spectrum of chlorophyll a and b
Test for Fat/oils.
Test for proteins.

Demonstration

Hill's reaction by isolated chloroplast.
Column chromatography - leaf pigment separation
Effect of cytokinin on leaf senescence.
Effect of auxin on etiolated seeds.
Effect of GA_3 on amylase.

Biochemistry

Individual experiments:

Estimation of total carbohydratesand total proteins.
Effect of temperature on membrane permeability - beetroot discs.

Demonstration Experiments

TLC of Sugars, amino acids and Estimation of total lipids.

Spotters

Basic structure of immunoglobulin molecule, structure of IgA and IgM

Molecular Biology **45 hrs**

Isolation of Plasmid DNA, Plant genomic DNA. Agarose gel electrophoresis, Restriction & digestion of plant DNA and Plasmid DNA, SDS - PAGE for protein.

Spotters: Fullerene C60, Gold nanoparticles and Carbon nano tubes.

Paper V - Plant Physiology

Semester II **Total Marks : 100**
Sub Code: MPL1405 **CA : 40**
Hours : 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives-To obtain knowledge on various metabolic processes and role of growth hormones

Unit I **14 hrs**

Carbon metabolism-*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 C_3 and C_4 plants. Photorespiration and Glycolate metabolism (C_2- cycle), Chemosynthesis. Breakdown and Synthesis in Sucrose , Starch and Cellulose.

Unit II **14 hrs**

Nitrogen metabolism-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 **14 hrs**

Lipid metabolism- Fats, distribution in plants, Breakdown of fats, Oxidation of glycerol, Breakdown of fatty acids-α-oxidation, β- oxidation. Glyoxylate cycle, significance. Fat synthesis-synthesis of Glycerol, synthesis of Fatty acids, Condensation of Fatty acids and Glycerol. Phosolipids.

Unit IV **14 hrs**

Growth and Movements: Natural growth hormones in plants- physiological effects and Biosynthesis of Auxins, Gibberllins, Cytokinin and Ethylene. Morphactins. *Photoperiodism –Photoperiodism, photoperiodic induction and Phytochrome. Vernalisation- perception of the cold stimulus, presence of a floral hormone. Conditions necessary for vernalization. Mechanism, Devernalization. Senescence in plants– Programmed Cell Death (PCD), Abscission of Leaves, Dormancy – Factors causing dormancy, Secondary dormancy, Artificial methods of breaking the dormancy of seeds and advantages of dormancy of seeds.

Unit V **15 hrs**

Stress Physiology: Introduction, water deficit and drought resistance in xerophytes and mesophytes.Salt stress and salt resistance. Cold injury and cold resistance, High temperature (Heat) stress in higher plants. Heavy metal stress in plants, Biotic resistance in plants.

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Jain.V.K.	Fundamentals of Plant Physiology.	S.Chand & Company, New Delhi.	2013

2.	Khan, A.A.	Physiology and Bio-chemistry of Seed Dormancy and Germination.	North Holland Co., Amsterdam, New York	1982
3.	Mukherji S. & Ghosh, A. K.	Plant Physiology. I edn.	New Central Book agency.India.	1996
4.	Verma, V.	Plant Physiology.1st edition	Ane Books India, New Delhi	2007

Refere nce books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Bernard. S. Meyer & Donald B. Anderson	Plant physiology.	East west Press Private limited, New Delhi.	1963
2.	Bidwell, R. G. S.	Plant Physiology. II edn.	MacMilan Publishing Company Inc.Gurgaon.	1979
3.	Devlin,M.	Plant physiology.	Van Nastrand Reinhold Company New York.	1969
4.	Noggle, G.J. and Fritz, G.J.	Introductory to Plant physiology. Second edition,	Prentice Hall of India, New Delhi.	2005
5.	Salisbury F.B & Ross.C.W .	Plant physiology.4th Edition,	Wards worth Pvt. Co. California.	1992
6.	Trivedi,P.C., Trivedi,P.C. and Kirsty Sword – Gusmao.	Advances in Plant Physiology.	I.K.International Pvt., Ltd., India.	2006

Paper VI - Biochemistry

Semester: II **Total Marks : 100**
Sub Code: MPL1406 **CA : 40**
Hours: 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives: To gain a comprehensive idea of the structure of biomolecules and membranes.

Unit I **14 hrs**

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.

Enzymes-*Nomenclature, classification and properties, Enzymes as catalyst, enzyme specificity, Michaelis-Menton constant, mechanism of enzyme catalysis, factors affecting enzyme activities, enzyme regulators and inhibitors. Allosteric enzymes. Ribozymes.

Unit II **14 hrs**

Carbohydrates- Importance, structure and *classification of monosaccharides, oligosaccharides and polysaccharides. Monosaccharides - Structure of glucose, reaction of monosaccharides - Esterification, oxidation, reduction reactions, derivatives of monosaccharides. Oligosaccharides- Maltose, sucrose, lactose. Polysaccharides- Cellulose, starch, glycogen, chitin and glycoproteins.

Unit III **14 hrs**

Proteins- General structure- Amino acid structure, classification and properties. Structure of proteins - Primary, secondary, tertiary and quaternary structure, properties of proteins, denaturation. Classification of proteins- based on functions, based on chemical nature and solubility, and based on nutrition. Important structural proteins- keratins, collagens. Important functional proteins- antibodies, ribonuclease.

Unit IV **14 hrs**

Lipids – Classification and *functions, Fatty acids – Saturated, unsaturated, Nomenclature, essential fatty acids; Triacylglycerols- properties. Test to check purity of fat and oils,

Phospolipids- types and functions, Glycolipids- cholesterol- structure and occurance, properties, functions, hypercholesterolemia, Lipoproteins- structure and classification,conversion of VLDL to LDL, HDL, metabolism of HDL, disorders of plasma lipoproteins, fatty liver, lipotropic factors,obesity, Steroids and Amphipathic lipids.

Unit V **15hrs**

Immunity- Types of immunity, Antigen and Antibodies. Antigen- haptens,superantigens and cluster of differentiation molecules. Antibodies- Structure, classes of immunoglobulins, structure of antibodies, functions, specificity and sources of antibodies, Components of immune system and antigen-antibody interaction.

***self study**

Text Books

S.No.	Author's	Title of the Book	Publishers	Year of Publication
1	Rastogi, S.C	Biochemistry	McGraw Hill publishers, New Delhi.	2010
2	Satyanarayana, U.	Biochemistry	Books and allied (P) Ltd. Andra pradesh	2005
3	Hames and Hooper	Instant notes – Biochemistry	Taylor & Francis Group, Newyork.	2001
4	Jain, J.L	Biochemistry	S. Chand and Company, New Delhi.	1988
5	Lubert Stryer	Biochemistry	. Freeman Company, Newyork	1975

Reference books

S.No.	Author's	Title of the Book	Publishers	Year of Publication
1	Jain, J.L, Sunjay Jain and Nitin Jain	Biochemistry	S. Chand and Company, New Delhi	2010
2	David L. Nelson and Michael, M. Cox	Principles of Biochemistry-	Freeman Company, New York	2005
3	Lehninger	Biochemistry Fourth edition	Freeman Company, New York	2005
4	Prescott, Harley Klein	Microbiology- Sixth Edition	McGraw Hill publishers, New Delhi	2005
5	Jayaram. J	Laboratory manual of Biochemistry	New Age International Limited, New Delhi	1981
6	James Bonner and Joseph E. Vanner	Plant Biochemistry- III edn.	Academic Press, USA	1976
7	Wood, W.B., Wilson, J.H., Benbow, R.M. and Hood, L.E	Biochemistry – A problems approach	Biochemistry – A problems Approach	1974

Paper-VII- Molecular Biology

Semester : II **Total Marks : 100**
Sub.Code :MPL1407 **CA : 40**
Hours : 71+ 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective:

To obtain in depth understanding of the organization, replication and expression of the genetic material in prokaryotic and eukaryotic cells.

Unit-I **14 hrs**

DNA- structure – types; DNA replication, repair and recombination : Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination.

Unit-II **14 hrs**

RNA synthesis and processing: structure and function of different types of RNA. 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.

Unit-III **14 hrs**

Translation in Prokaryotes - Regulation of gene activity in prokaryotes: Operon concept-trp operon & Lac operon. Translation in eukaryotes: 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, and translational proof-reading, translational inhibitors.

Unit IV **14 hrs**

Protein transport and processing: Post- translational modification of proteins. Protein sorting – Transport of proteins into chloroplast, mitochondria, endoplasmic reticulum and nucleus. Protein targeting and protein degradation.

Unit- V **15 hrs**

Nanobiotechnology: Introduction to nanoscale materials: Bucky ball, carbon nanotubes and nanowires. Synthesis and characterization of nanoparticles from biological sources: Active nanoparticles from microbes and plants. *****Applications of nano in biology and current status of nanobiotechnology.

***Self study**

Text books

S.No	Authors	Title of the Book	Publisher	Year of Publication
1.	Gupta, P.K	Cell and Molecular Biology. 3rd edition .	Rastogi Publications.Meerut	2004.

2.	Gupta, P.K	Molecular Biology and Genetic Engineering	Rastogi Publications.Meerut	2004-05
3.	Purohit. S.	Biotechnology: fundamentals and applications. 1st edition	Agrobios (India) Jodhpur.	2005.
4.	Pradeep, T	Nano: The Essentials. 1st edition	Tata McGraw-Hill, New Delhi	2008,
5.	Richard Booker and Earl Boysen	Nanaotechnology, 1st edition	Wiley India Pvt. Ltd.New Delhi	2008.
6.	Satyanarayana.U.	Biotechnology. 2nd edition	Books and Allied pvt. Ltd.	2005
7.	Tiwari, M.D.	Modern dictionary of nanatechnology. 1st edition	Deep and Deep Publications Pvt Ltd., New Delhi.	2008
8.	Turner.P.C.,A.G. Mclennan, A.D.Bates and M.R.K.White	Molecular Biology 2ndt edition	Viva Books Pvt.Ltd. New Delhi	2001.

Reference Books

S.No	Authors	Title of the Book	Publisher	Year of Publication
1.	Arora, M.P,	Nanomedicine, , I ed.	Discovery publishing house pvt. Ltd, New Delhi.	2008
2.	De Robertis E.D.P. and De Robertis, Jr. E.M.F..	Cell and Molecular Biology. 2nd edition	Lippincott Williams and Wilkins	2001
3.	Goodsell, D. S	Bionanotechnology, I edn.	Willey Liss Publications, USA.	2004
4.	Kumar, U	Nanotechnology a fundamental approach. I ed	Agrobios, India. Jodhpur	2008
5.	Turner, P.C, A.G. McLennan, A.D. Bates and M.R.H.White	Instant notes in Molecular Biology.1st edition	Viva Books. New Delhi	2001

Elective I–Paper VIII-Horticulture techniques and postharvest management

Semester: II **Total Marks : 100**
Sub Code: MPL1308 **CA : 40**
Hours : 56 + 4 Hrs tutorial **ESE : 60**
Credits : 4

Aim

To teach the basic and fundamental aspects of horticulture and post harvest management

Theory

Unit I Basic concepts of horticulture **11 hrs**

Scope and importance – Global scenario of horticultural crops- Divisions of horticulture - area and production – export and import - classification of horticultural crops – Nutritive value of horticultural crops – horticultural therapy – Horticulture Zones of India and Tamil Nadu .

Unit II Soil and climatic factors on crop production **11 hrs**

Influence of soil – physical and chemical properties and climatic factors – light, temperature, photoperiod, relative humidity, rainfall, micro climate, pollution – influence of biotic and abiotic stresses on crop production.

Unit III Nursery techniques **11 hrs**

Nursery techniques Establishment of nursery,selection of site, methods of production, seeds, cutting, layering, budding, tissue culture. Principles and methods of pruning and training of horticultural crops–Management of nursery,Hydroponics.

Unit IV: vegetable cultivation **11 hrs**

Vegetable production in nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden – types of vegetable farming and contract farming- rice fallow cultivation, river bed cultivation, rain fed cultivation, organic farming, vermicomposting, export standards of vegetables.

Unit V Orchards **12 hrs**

Planting systems – planning, layout and management of an orchard- after-cultural practices – clonal orchards- use of growth regulators – water management – drip and fertigation - weed management - nutrient management - soil fertility management - cropping systems - intercropping - multi-tier cropping, post harvest processing and value addition, storage and marketing of horticultural produce.

Practical

Lay out of nursery

Nursery techniques

Vermicompost technology

Study of different features of an orchard

Planning and layout of orchard

Tools and implements used in cultivation

Layout of nutrition garden

Preparation of nursery bed and sowing of vegetable seeds

Layout of different irrigation systems and irrigation methods

Preparation of fertilizer mixtures and method of application

Preparation and application of growth regulators

Identification and correction of nutritional and physiological disorders

Study of maturity standards, harvesting, grading, packing and storage of horticultural crops

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Adams, C.R. and M. P. Early	Principles of horticulture	Butterworth – Heinemam, Oxford University Press	2004
2.	Bansil. P.C.	Horticulture in India	CBS Publishers and Distributors, NewDelhi	2008
3.	Kumar, N.	Introduction to Horticulture	Rajalakshmi Publication,	1997

Reference books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Bhattacharjee.S.K.	Amenity Horticulture, Biotechnology and Post harvest technology	Pointer publishers. Jaipur	2006
2.	Chadha, K.L.	Handbook of	ICAR, New Delhi	2001

		Horticulture		
3.	Chandra, R. and M. Mishra	Micropropagation of horticulturalcrops	International Book Distributing Co., Lucknow	2003
4.	Chattopadhyaya, P.K	A text book on Pomology (Fundamentals of fruit growing)	Kalyani Publication, New Delhi	2001
5.	Christopher, E.P.	Introductory Horticulture	Biotech Books, New Delhi	2001
6.	Edmond,J.B. T.L.Senn, F.S. Andrews and P.G.Halfacre	Fundamentals of Horticulture	Tata MC. Graw Hill Publishing Co.New Delhi	1975
7.	George Acquaah	Horticulture-principles and practices	Prentice-Hall of India pvt. Ltd., New Delhi	2002
8.	Hartman, H.T. and Kester, D.E.	Plant propagation – Principle And Practices	Prentice Hall of India Ltd., New Delhi.	1986
9.	Jacob John. P.	A hand book of post harvest management of fruits and vegetables	Daya publishers	2008
10.	Jitendra Singh	Basic Horticulture	Kalyani Publishers, New Delhi	2006
11.	Rajan, S. and B.L. Markose	Propagation of horticultural crops	New India Publishing, New Delhi	2007

Elective-I - Paper IX- Bioinformatics

Semester: II **Total Marks : 100**
Sub Code: MPL1409 **CA : 40**
Hours: 56 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives

To gain an insight into the recently developing field in biology namely Bioinformatics, its varied aspects and applications.

UNIT I **11 hrs**

Introduction to bioinformatics. *Classification of biological databases. Biological data formats. Application of bioinformatics in various fields. Introduction to single letter code of amino acids, symbols used in nucleotides, data retrieval – *Entrez* and SRS.

UNIT II **11 hrs**

Sequence alignment algorithms: pairwise alignment - Local and Global alignment. Methods of alignment: dot plot; dynamic programming algorithm -Needleman and Wunsch algorithm, Smith-Waterman algorithm. Database searches for homologous sequences - FASTA and BLAST. Sequence filters. Statistics of alignment score and scoring matrices – PAM and BLOSSUM.

UNIT III **11 hrs**

Multiple sequence alignment – methods of multiple sequence alignment -. Profiles, PRINTS, BLOCKS, PRINTS, PRODOM, PFAM. Progressive alignment – Clustal W, T-Coffee. Iterative Alignment method. Evaluating multiple alignments. Application of multiple sequence alignment. Principles and methods of phylogenetic tree construction and analysis– Distance method, Neighbour-Joining method (NJ), Maximum Likelihood method (ML) and Maximum Parsimony (MP) method – evolutionary models.

UNIT IV **11 hrs**

Genome diversity – taxonomy and significance of genomes – Bacterial, Yeast, *Homo sapiens, Arabidopsis thaliana*. Gene identification and prediction: Basis of gene prediction, codon bias; pattern recognition. Annotation of Genome: structural annotation – gene prediction approaches – Open Reading Frame (ORF) prediction – Hidden Markov Model – Pattern discrimination – Prediction of promoter sequences. Functional annotation – prediction of gene function.

UNIT V **12 hrs**

Introduction to Proteome - proteome and technology. Primary attributes for protein identification - protein species of origin, Protein isoelectric point, Protein mass, aminoacid composition, Protein N- and C-terminal sequence tags and cross species protein identification. Modifications that influence protein change on 2-D PAGE - Detection and analysis of co- and post-translational modification.

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Alam Khan, I..	Elementary Bioinformatics. 1st edn.	Pharma Book Syndicate, Adithya Art Printers, Hyderabad.	2005
2.	Arthur. M. and Lesk,	Introduction to Bioinformatics, 1st edn.	Oxford University Press, UK.	2002
3.	Attwood, T.K and Parry-Smith, D. J.	Introduction to Bioinformatics. 3rd edn,	Pearson education, New Delhi.	2002
4.	Chowdhary, K.R. andV.S. Bansal.	Bioinformatics and Computational Technologies. Ist edn.	Scientific Publishers, New Delhi.	2011
5.	Mani, K and Vijayaraj, N.	Bioinformatics for Beginners. 1st edn	Kalaikathir Achagam, Coimbatore	2002
6.	Mani. K and Vijayaraj. N.	Bioinformatics A Practical Approach, 1st edn.	Aparnaa Publication. Coimbatore	2004
7	Ranga, M.M.	Bioinformatics, 2nd edn	Agrobios, Jodhpur.	2009.
8	Westhead, D.R., Parish, J .H and Twyman, R. M.	Bioinformatics. 1st Indian edn	Viva Books Private Limited, New Delhi	2003

References

S.No	Authors	Title of the Book	Publisher	Year of Publication
1	Dunn S.R., M.J., Pennington.	Proteomics from Protein sequence to function. 3rd edn.	Viva Books Pvt., Ltd. New Delhi.	2002.
2	Mehrotra.P, Kumund Sarin, Swapna. K. and	The New hand Book of Bioinformatics, 1st edn..	Vikas Publishing House Pvt. Ltd,	2005

	Srivastava		Noida, Uttar pradesh.	
3	Liebler, C.D.	Introduction to Proteomics: Tools for the New Biology. 1st Edn.	Humana Press Inc. New Jersey.	2002

Online Reference Books

S.No	Authors	Title of the Book	Publisher	Year of Publication
1	Charless A.Lunn ,. ISBN: 978-0-12-381288-9.	Molecular biology and Translational science, Volume-91, - Membrane Proteins as Drug Targets Ist Edn.	Academic Press imprint of Elsevier, London.	2010
2	David J. Triggle, Murali Gopalakrishnan, David Rampe, Wei Zheng,	Voltage-Gated Ion Channels as Drug Targets. Volume-29	Wiley VCH, Weinheim.	2006
3	Hanzlik RP, Koen YM, Theertham B, Dong Y, Fang J,	The reactive Metabolite target protein database (TPDB) – a web-accessible resource	http://www.crcpress.com	2007
4	Wilkins, M.R., K.L. Williams, R.D. Appel, D.F. Hochstrasser,	Proteome Research: New frontiers in functional genomics	Springer –Verlag, Berlin	1997

INTER DISCIPLINARY COURSE
(For M. Sc., Chemistry/ Botany Students)
CLINICAL MICROBIOLOGY & BIOCHEMISTRY
MCE14A1/ MPL14A1

Credit -4 **(60 Hrs)**

Objectives:

- To enable the students to understand the principles of clinical chemistry
- To understand the importance of clinical microbiology in disease identification
- To acquire knowledge on common disease

Unit I **(12 Hrs)**

Cinical microbiology: Clinical specimens –Collection- needle aspiration, Intubation, 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 **(12 Hrs)**

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 **(12 Hrs)**

Electrophoresis: 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.

***Self study portions**

S.no	Author	Title	Publishers	Year of publication
1.	Asim. K. Das	Bioinorganic chemistry 1st edn.	Books & Allied Pvt Ltd.	2007#
2.	Jayashree Ghosh	Textbook of Pharmaceutical Chemistry 3rd edn	S. Chand & Co	2003#
3	Jayashree Ghosh	Fundamental concepts of Applied Chemistry 1st edn	S. Chand & Co	2006#
4	Lensing M.Prescott, John P, Harley, Donald A Klein.	Microbiology,6th Edition,	Tata mc Graw Hill, New Delhi	2005#
5	Rana, S.V.S	Bio Techniques. Theory and Practice.	Rastogi Publications, Meerut.	2005#
6	Ambika Shanmugam	Fundamentals of Biochemistry for Medical Students	Nagaraj and Company Private Limited	2005 ##
7	Keith Wilson, John Walker,	Principles and Techniques of Biochemistry and Molecular Biology, 6th Edition	Cambridge University Press	2008 ##
8	Mallikarjuna Rao N	Medical Biochemistry 6th edn.	New Age International (P) Limited, Publishers	2006 ##

#Text Books:
Reference book

Semester III
Paper X - Taxonomy of Angiosperms

Total Marks : 100

Sub Code: MPL1410 **CA : 40**
Hours: 56 + 4 Hrs tutorial **ESE : 60**
Credit : 5

Objectives

To understand the principles of plant systematics, taxonomic and phylogenetic relationship, understanding the importance to develop skill in identification and conservation of flora.

Unit I **11 hrs**

History of classification - Contributions of Linnaeus. Systems of classification – Bentham and Hooker, Engler and Prantl* and Hutchinson : Principles, merits and demerits of the systems. APG system of classification III (2009). 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. *Herbarium technique, floras, monograph and revision. Computer aided taxonomy – taxonomy softwares – DELTA, GRIN, IPNI. Biodiversity portal. GIS in taxonomy.

Unit III **11 hrs**

Botanical Nomenclature: Principles and recommendations of ICN –typification, priority, valid and effective publication, citation, retention, and conservation. Botanical gardens, major herbaria in India and World. Plant distribution-continuous and discontinuous distribution; Endemism – types with examples.

Unit IV **11 hrs**

Study of diagnostic characters, economic importance and phylogenetic relationship of: Magnoliaceae, Menispermaceae, Polygalaceae. Caryophyllaceae, Portulacaceae, Oxalidaceae, Meliaceae, Vitaceae, Rhamnaceae, Sapindaceae, and Fabaceae,

Unit V **12 hrs**

Combretaceae, Lythraceae, Aizoaceae, Oleaceae, Apocynaceae, Boraginaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Aristolochiaceae, Santalaceae, Araceae, and Cyperaceae.

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	APG III.	An update of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants: APG III.	Bot. J. Linn. Soc. 161: 105-121.2	2009
2.	Gurucharan Singh	Plant systematic – An Integrated Approach. 1st Edn	Scientific Publishers, Inc. New Hampshire, USA	2004
3.	Judd, W. S., Campbell, C. S., Kellogg, E.A., Stevens, P.F. and Donoghue, M. J.	Plant Systematics: a Phylogenetic Approach. 3rd edn.	Smauer Associates, INC., Sundarlands, Massachusetts	2008.
4.	Lawrence, G.H.M.	Taxonomy of Vascular plants, Fifth edition	Mac Millan and Co., New Delhi	1978.
5.	Mondal, A.K.	Advanced Plant Taxonomy. 1st Edn	New Central Book Agency, Kolkata	2005
6	Pandey, S. N. and S. P. Misra	Taxonomy of Angiosperms. Reprint Edn	Ane Books Pvt. Ltd, New Delhi	2009
7	Sambamurthy, A.V.V.S.	Taxonomy of Angiosperms. Ist Edn.	I.K. International Pvt. Ltd., New Delhi.	2005
8	Sharma, O.P.	Plant Taxonomy. Second Edition	Tata McGraw Hill Education Private Limited, New Delhi	2009
9	Sivarajan, V.V.	Introduction to the Principles of Plant Taxonomy. Ed. N.K.B. Robson, 2nd Edn	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	1991

Reference Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Bensen, L.	Plant Classification. 2nd Edn.	Oxford IBH Publication, New Delhi.	1976.

2.	Davis, P.H. and Heywood, V.M.	Principles of Angiosperm Taxonomy I Reprint Edn.	Oliver Boyd, London	1973
3.	Henry, A. N. and M. Chandrabose.	An aid to the International Code of Botanical Nomenclature, Ist Edn	Today and Tomorrow's Printers and Publisher, New Delhi.	1980
4.	Jain, S.K. and R.R. Rao.	A Handbook of Field and Herbarium Methods. I Edn. .	Today & Tomorrows Printers and Publishers, New Delhi	1977.
5.	Simpson, G.M.	Plant Systematics. Second Edition.	Elsevier, Amsterdam	2010.
6	Stevens, P. F.	Angiosperm Phylogeny Website. Version 12.		2012
7	http://www.systbot.uu.se/classification/APGclassification.html			
8	http://www.mobot.org/MOBOT/research/APweb/			

Paper – XI – Phytopharmaceutical Science

SEMESTER – III **Total Marks : 100**
Sub Code: MPL1411 **CA : 40**
Hours: 41 + 4 Hrs tutorial **ESE : 60**
Credit : 3

Objectives: To know the importance and potency of herbal medicine and standardization through scientific techniques.

Unit I **8 hours**

*Origin of Pharmacognosy. Role of Ethno-Botany in human welfare. Classification of organized crude drugs- morphological, chemical and pharmacological method; unorganized crude drugs – gums, mucilages, and resins.

Unit II **8 hours**

Scheme for pharmacognostic studies of crude drugs: Collection and processing of crude drugs, factors affecting the yield of drugs. Extraction of phytochemicals – soxhlet extraction and steam distillation.

Unit III **8 hours**

Evaluation of drugs – Chemical evaluation- qualitative estimation of alkaloids, glycosides, phytosterols, tannins and terpenoids. Physical evaluation of drugs – moisture content, solubility, ash value, and extractive value.

Unit IV **8 hours**

Secondary metabolites: Importance of secondary metabolites in pharmaceutical industry – Biological sources and uses of drugs containing alkaloids, tannins, glycosides, flavonoids and volatile oils.

Unit V **9 hours**

Outlines of Medicinal chemistry: Definition, classification of drugs based on biochemical process, chemical structure and molecular targets. Drug discovery – lead compounds. Drug design- target oriented and pharmacokinetic oriented drug design. Drug testing - In vitro and in vivo. Drug development - toxicology, pharmacology, drug metabolism, clinical trials and marketing.

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Kokate, K., A.P. Purohit and S.B. Gokhale	Pharmacognosy	39th Edn. Nirali Prakahan, India.	2007
2.	Purohit, S.S., Kakrani,H.N. and Saluja, A.K	Pharmaceutical Biotechnology	Student Edition	2010
3.	Patrick, G	Instant Notes – Medicinal chemistry	Viva Books Private Ltd., Chennai.	2002

4.	Saharan, Moond, Chouhan and Gupta	Principles of Pharmacognosy	Agrobios, India.	2008
5.	Wallis, T.E	Text book of Pharmacognosy	Fifth Edn. CBS Publishers and Distributors, India.	1985

Reference Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Harbone, J.B.	Phytochemical Methods	1st edn International Edition. Chapman and Hall. London.	1973
2.	Ramawat, K.G. and J.M. Merillon	Biotechnology-Secondary metabolites	1st edn. Oxford & IBH Publishing Co.Pvt Ltd., New Delhi.	1999
3.	Trease,G.E. and E.C.Evans	Pharmacognosy.	12th edition, Bailliere Tindall, Eastbourne, U.K.	1983
4.	Tyler,E.V.,Brady,R.L., Robbers,E.J.	Pharmacognosy	9th edn. Lea and Febiger, Philadelphia.	1981

Paper XII – Genetic Engineering

Semester III **Total Marks : 100**
Sub Code: MPL1412 **CA : 40**
Hours: 56 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective

To acquire detailed idea about genome organization in plants, basic techniques in genetic transformations in plants, basic techniques and applications.

Unit I **11 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 **11 hrs**

Reporter genes: definition, list of reporter genes used for gene transfer in plants. Marker genes: SNP markers, Indels and CNV (SV), RAPD markers, STS, Microsatellites, AFLP, QTL mapping – quantitative trait identification, method and their merits and demerits.. Marker assisted selection breeding.

Unit III **11 hrs**

Plant Genetic Transformation: Gene transfer methods in plants: direct method- *Agrobacterium* mediated gene transformation and indirect DNA transfer – Biolistic gun method of gene transformation. Chloroplast transformation and its advantages. Transgene stability and gene silencing.

Unit IV **11 hrs**

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

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.

***Self study**

Text Books

S.No	Authors	Title of the Book	Publisher	Year of Publication
1.	Adrian Slater, Nigel W. Scott and Mark R. Fowler,	Plant Biotechnology (The genetic manipulation of plants)	Oxford University press, UK.	2003
2.	Brown, T.A.	Gene cloning. IV edn.	Blackwell science.U.K	2003

3.	Bandana Ghosh, Ranganathan M S, Rabindra Narain.	A textbook of Biotechnology,	Wisdom press.NewDelhi	2011
4.	Lingaraj patro,	Recent trends in Biotechnology.	Sonali publications. NewDelhi	2010
5.	Primrose. S. B., R. M. Twyman and R. W. Old	Principles of gene manipulation. VI edition.	Blackwell Science Ltd, Blackwell Publishing Company, Australia	2001.
6.	Sandhya Mitra.	Genetic Engineering. I edn.	Macmillan Principles and Practice, India Ltd.NewDelhi	2004.
7.	Slater.A, N.W. Scott. and M.R.Fowler.	Plant Biotechnology. I edn.	Oxford University Press.U.K.	2003
8.	Verma,P.S. and AgarwalV.K	Cell Biology, Genetics, Molecular Biology, Evolution and Ecology.	S.Chand and Co. New Delhi.	.2007

Reference Books

S.No	Authors	Title of the Book	Publisher	Year of Publication
1.	Chrispeels, M. J and D.F. Sadava	Plants, genes and agriculture.	The American Scientific Publishers, USA.	2000.
2.	De Robertis and De Robertis.	Cell and Molecular biology. I Ed.	Lippincott Williams and Wilkins.Hall Saunders International Edition.	2005
3.	Gilmartin and Bowler	Molecular Plant Biology: A practical approach (Vol. I and II),	Oxford University press, UK	2002.
4.	Hammond, P. Mc Garvey and V.	Plant Biotechnology	Springer Verlag, UK	2000

	Yusibov			
5.	Hartwell, L. L. Hood, .L.Goldberg, A.E. Reymolds, L.M. Silver and R.C. Vers.	Principles of Genetics. I edn.	Tata McGraw Hills.NewDelhi.	2002
6.	Mantel, Mathews and Mickee,	An introduction to genetic engineering in plants,	Blackwell Scientific Publishers. London.	1985
7.	M.J. Chrispeels and D.F. Sadava.	Plants, genes and agriculture.	The American Scientific Publishers, USA.	2000
8.	Primrose. S. B., R. M. Twyman and R. W. Old	Principles of gene manipulation. VI edition.	Blackwell Science Ltd, Blackwell Publishing Company, Australia	2001
	Sandhya Mitra.	Genetic Engineering. I edn..	Macmillan Principles and Practice,India Ltd.NewDelhi	2004.

Paper - XIII - Biotechniques

Semester – III **Total Marks : 100**
Code: MPL1413 **CA : 40**
Hours: 41 + 4 Hrs tutorial **ESE : 60**
Credit : 3

Objectives:

To know about the various techniques used in the study of biological organism

Unit I **8 hrs**

Microtechnique – Killing, Fixing, Preparation of Paraffin blocks –dehydration and infiltration with paraffin, Sectioning, Staining, and Mounting. Ocular and Stage Micrometer, Camera Lucida, Photomicrography

Unit II **8 hrs**

Principles and uses of *pH meter, spectrophotometer- Beer-Lambert's Law, Principle, types-UV Visible spectrophotometer, Atomic Absorption Spectrophotometry and Applications, Centrifugation-Principle, Types of Centrifuges - *clinical centrifuge, refrigerated centrifuge, High speed centrifuge - ultra centrifuge, Applications of Centrifugation.

Unit III **8 hrs**

Principles and applications of chromatography: *Paper Chromatography, Thin layer Chromatography, Column Chromatography, Gas Liquid Chromatography (GLC), High Pressure Liquid Chromatography (HPLC).

Unit IV **8 hrs**

Enzymology- protein purification - analytical and preparative methods. Extraction, Repeated freezing and thawing, sonication, homogenization, Filtration, precipitation, Dialysis, purification, Gel Electrophoresis, SDS PAGE, Gel Documentation. Concentration of the purified protein-Lyophilisation

Unit V **9 hrs**

Monoclonal Antibodies- Production - immunization, selection of myolema cell line, Fusion with myeloma Lymphocytes. Selection of Hybridoma Cells- Isolation of Monoclonal Antibodies producing hybridoma cells. Polyclonal Vs Monoclonal antibodies. Commercial production of Monoclonal Antibodies. Invitro production of Monoclonal Antibodies, Microencapsulation Technology**.**

***self study**

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1	Dubey, R.C.	A Text book of Biotechnology,(Ist Ed).	S.Chand and Company Ltd, New Delhi.	2009.
2	Jayaraman.J.	Laboratory Manual in Biochemistry.	Wilsey Eastern Ltd. New Delhi.	1992

3	Rana,S.V.S.	Biotechniques theory and practice,	Rastogi Publication. Meerut.	2005
4	Sadasivam, S and Manickam,A.	Biochemical Methods for Agricultural Sciences. (I^{st} Ed).	Wiley Eastern Limited, New Delhi.	1992.
5	Trivedi.P.C.	Biotechnological Techniques and its Application	Pointer Publishers, Jaipur.	2010

Reference Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1	Berylyn and Miksche	Botanical Microtechnique and Cytochemistry.(I^{st} Ed).	The Iowaw State University Press. Ames.Iowa.	1976
2	Harborne.J.B.	Phytochemical methods	Chapman and Hall,New Delhi.	1998
3	Kanika Sharma	Manual of Microbiology Tools and Techniques.	Parwana Bhawan, New Delhi.	2007
4	Ritu Mahajan,	Practical manual of Biotechnology	Vayu education of India, New Delhi.	2010

Elective II –Paper XIV- Food Biotechnology

Semester – III **Total Marks : 100**
Sub Code: MPL1414 **CA : 40**
Hours: 56 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objective

To develop skill of the student in the area of food biotechnology and its application
To understand the various components of food sources
To develop skills in the area of food preservation and package

UNIT 1 **11 hrs**

Introduction – Basic principles, *Nutritive importance of proteins, carbohydrates, fats, bioavailability of nutrients, stability of nutrients. Food sources – cereals, millets and pulses, oil seeds, vegetables, fruits – composition. Fermented vegetables.

UNIT II **11 hrs**

Food as substrate for microorganisms-types of microorganisms in food, primary sources of microorganisms found in food, Intrinsic and Extrinsic parameters of food affecting microbial growth; Food spoilage-principles, spoilage of various types of foods; Alcoholic fermentation; Microbes as food; Food borne diseases- food infection, food poisoning; Food borne pathogens.

UNIT III **11 hrs**

Milk products – production and types -cheese, flavoured milk, ice cream; Fermented Products- soysauce, pickle, Bakers yeast, bread. Food additives- production of mono-sodium glutamate, aspartame for flavor, enzymes for texture modification; Food coloring agents.

UNIT IV **11 hrs**

Food preservation: Physical, chemical and biological methods - drying, cooling, deep-freezing, heating, curing, jellying, chemical additives, salting, pickling, smoking, canning, and irradiation. Packaging – concepts, definition, significance, classification, Packaging of foods – fresh and processed; Primary packaging materials, methods of packaging - vacuum packaging, MAP, CAP & bio-degradable packages, costs of packaging and recycling of materials.

UNIT V **12 hrs**

Food sanitation- safe methods of handling food; sterilization & disinfection- different methods used- detergents, heat, chemicals; Cleaning of equipment and premises; Safety limits of sanitizers; pest control; management and disposal of waste; Quality control - food quality and standards like BIS; AGMARK, FPO and PFA; the difference between mandatory and optional standards; Good laboratory practice (GLP)Good Manufacturing Practice and HACCP; fortification, nutrition Information on Labels, GM foods.

***self study**

Text books

1	Jay, J. M	Modern Food Microbiology	CBS Publishers & Distributors, New Delhi	1996
2	Rastogi, S.C.	Biochemistry	Tata Mc Graw Hill, New Delhi	1998
3	Sivasankar, B.	Food processing and preservation	Prentice Hall of India, New Delhi	2002

Reference Books:

S.No.	**Author's**	**Title of the Book**	**Publishers**	**Year of Publication**
1	Banwari, G. J.	Basic food Microbiology	CBS Publishers and distributors, New Delhi	1998
2	Casida, L.E.	Industrial Microbiology	New Age International publishers, New Delhi	2007
3	Towers, J.	Food Theory and Applications	Mc Milan Publishing Co., UK	1992

Elective II Paper – XV – Immunology

Semester: III **Total Marks : 100**
Sub Code: MPL1215 **CA : 40**
Hours: 56 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives

To gain knowledge on immune systems, mechanism of immunity and their relation to cancer.

Unit I **11 hrs**

Immune system:- Phagocytes, mast cells, basophils, lymphocytes, lymphoid organs and tissues; T cells, B cells. Immunity in the newborn.

Unit II **11 hrs**

Antibody:- Basic stricture, classes and functions. A brief account of cytokines. Antigens; tumor antigens; B cell recognition of antigen; T cell recognition of antigen. *Major histocompatibility complex.

Unit III **11 hrs**

Immunodeficiency:- Deficiency in the immune system, Primary / congenital (inherited), secondary (acquired) immunodeficiency. Diagnosis and treatment of immunodeficiency. Transplantation:- Transplantation problems, transplantation antigens, rejection mechanism, prevention of graft rejection.

Unit IV **11 hrs**

Vaccination:- Principles of vaccination, immunization, antigen preparations, vaccines to pathogens, tumor vaccines. Hypersensitivity- Definition, classification, a brief account of various types. Brief account on edible vaccines.

Unit V **12 hrs**

Immunity in health and disease: autoimmune diseases-insulin dependent diabetes, rheumatoid arthritis and autoimmune hemolytic anemia. Organ transplantation, cancer and AIDS.

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Satyanarayana, U	Biotechnology	Uppala Auther-Publisher Interlinks, Vijayawada	2009
2.	Kuby,J.	Immunology, 3rd edition	W.H. Freeman, Oxford. UK	1997

Reference Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Lydyard, P. M., Whelan, A.and M. W. Fanger	Instant Notes in Immunology, 1st edition	Viva Books Private Limited. Chennai	2000.
2.	Roitt, I.M.	Essential Immunology, 9th edition	Blackwell Scientific, Oxford, UK	1997

Special Paper – Research Methodology

Semester: III **Total Marks : 100**
Sub Code: MPL06S1 **Credits : 2**
Hours : 30

Objective: To gain knowledge of scientific approach and importance of statistical analysis.

Unit I **6 hrs**

Meaning of research: objectives of research;Essential steps in research; types of research – descriptive Vs analytical, applied Vs fundamental, quantitative Vs qualitative, Conceptual Vs empirical. Research methods Vs methodology.

Unit II: **6 hrs**

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. Intellectual Property Rights and patents.

Unit III: **6 hrs**

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.

Unit IV: **6 hrs**

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.

Unit V : **6 hrs**

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. Impact factor, citation index. *Safety measures in a research laboratory.

***Selfstudy**

References:

S.No.	Author	Title of the Book	Publishers	Year of Publication
1	Kothari, C. R. (Text book)	Research Methodology – Methods and techniques 2nd edition.	Wishwa Prakashan, New Age International	**1990**

			(P) Ltd.,New Delhi.	
2	Saravanavel, P. (Text book)	Research methodology, 1st edn.	Kitab Mahal, Allahabad.	**2003**
3	Gurumani.N. (reference book)	Research Methodology for Biological Science.	MJP Publishers,chennai	**2007**

Practical- III

[Theory papers –X and XI]

Semester: III

Sub Code: MPL14P3 **Total Marks : 100**
Hours : 60 **CA : 40**
ESE : 60
Credit : 5

Taxonomy **30 hrs**

Study of the morphological, floral characters, economic importance of the families mentioned in the theory syllabus. Preparation of artificial keys with 4 species of a genus.

Preparation and submission of 25 herbarium specimens of common weeds/wild plants by field trip.

Phytopharmaceutical science **30 hrs**

1. Collection of any five medicinal plants mounted on herbarium sheets and recording their medicinal properties.

2. Analysis of morphological features and medicinal importance of the following

   a. Bark – *Cinnamomum zeylanicum*

   b. Rhizome – *Alpinia galanga*

   c. Root - *Vetiveria Zizanoides*

   d. Bulb – *Gloriosa superba*

   e. Gum – *Cyamopsis tetragonolobus*

   f. Mucilage – *Trigonella foenum-graecum*

   g. Leaves – *Solanum trilobatum*

3. Qualitative phytochemical studies-

   i) Group experiments

   a. Extraction of alkaloids and separation by TLC

   ii) Individual experiment

   Qualitative analysis of powder of any 2 medicinal plants

   a. Alkaloids, b. Tannins, c. flavonoids d. sGlycosides.

4. Antimicrobial properties of any two plant extracts.

Practical IV

[Theory papers –XII, XIV/ XV]

Sub Code MPL14P4 **Total Marks : 100**
Hours: 60 **CA : 40**
ESE : 60
Credit : 5

Genetic Engineering **30 hrs**

Plasmid DNA isolation, Plant genomic DNA isolation, Polymerase Chain Reaction, and Western Blotting

Spotters: Agrobacterium mediated gene transformation, Bt Cotton, Golden rice, Yeast Artificial Chromosomes and Bacterial Artificial Chromosomes.

Food Biotechnology **30 hrs**

1. Separation of food colorants from microbes by TLC.
2. Isolation and identification of storage mycoflora from food stuffs/vegetables/fruits.
3. Extraction and characterization of gluten and dough rising capacity
4. Preparation of cheese.
5. Extraction and estimation of antioxidant in vegetables/fruits/food.
6. Extraction and detection of aflatoxins from mycoflora.
7. Extraction and estimation of α- amylase from vegetables/fruits.
8. Determination of quality parameters in milk
9. Study the drying characteristics of given sample
10. Extraction of Beta carotene from given samples

Immunology

Demonstration: Antibiotic sensitivity test – Penicillin, Ampicillin, Cefotoxin, Kanamycin.

Immunoprecipitation, Double Immunodiffusion, Single Radial Immunodiffusion,

Electroimmunoassay (Rocket Immunoelectrophoresis), Hemagglutination Assay.

Cyber Security

Semester: III **Total Marks : 100**
Sub code: MNM15CS **CA : 100**
Hours: 26

Objective

This course presents the principles of Cyber Security and its attack. It covers all aspects of cyberspace, botnet, cyber crime and its case studies.

Unit I **(5 hrs.)**

Cyberspace: Introduction- Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing - Social Computing and the Associated Challenges for Organizations - Protecting People's Privacy in the Organization- Organizational Guidelines for Internet Usage- Safe Computing Guidelines and Computer Usage Policy.

Unit II **(5 hrs.)**

Security Threats: Malicious Software, Types of Attacks, Threats to E-commerce, e-cash, Credit/Debit Cards.

Unit III **(5 hrs.)**

Cyber Security: Introduction - An Essential Component of Cyber security - Forensics Best Practices for Organizations - Media and Asset Protection - Importance of Endpoint Security in Organizations

Unit IV **(5 hrs.)**

Cyber Attacks: Introduction - How Criminals Plan the Attacks - Social Engineering - Cyberstalking -Cybercafe and Cybercrimes - Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing

Unit V **(6 hrs.)**

Case Study on Cyber Crime & Security: lntroduction on Cyber Crime - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era. Illustrations, Examples and Mini-Cases - Introduction - Real-Life Examples - Mini-Cases Illustrations of Financial Frauds in Cyber Domain - Digital Signature-Related Crime Scenarios - Digital Forensics Case Illustrations - Online Scams.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publish
1	Faculty of Computer Science – PG	Essentials of Cyber Security	KalaiKathir Achachagam	2016

Reference Books

S.No	Author	Title of the Book	Publisher	Year of Publish
1	Nina Godbole and Sunit Belpure	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Publication Wiley	2011
2	William Stallings	Network Security Essentials – Applications and Standards	Pearson Education	2011

Paper –XVI- Energy and Environmental Management

Semester IV **Total marks : 100**
Sub. Code: MPL1416 **CA : 40**
Hours: 71 + 4 Hrs tutorial **ESE : 60**
Credit : 4

Objectives

To give the basic knowledge on conventional energy resources, alternative energy resources and environmental management.

Unit I **14 hrs**

Non renewable energy resources: Definition, types of fossil fuels – coal, oil shale, Natural gas and petroleum; Atomic energy – Thorium and Uranium as sources of atomic energy.

Unit II **14 hrs**

Renewable energy resources: Definition, types – solar energy, wind energy, tidal energy, geothermal energy and hydroelectric energy. Hydrogen as energy resources.

Unit III **14 hrs**

Biomass energy resources: Types – terrestrial and aquatic biomass. Bio fuel Production by chemical and enzyme catalysis. Methods for energy production- biogas and electricity. Advantages and disadvantages of using biomass as energy source.

Unit IV **14 hrs**

Natural resources and their management: Classification of natural resources. Land resource management – soil erosion, water erosion, wind erosion and their management; Water resource management – surface water resources and ground water resources. *Problems of water management. *Forest resource management.

Unit V **15 hrs**

Phytoremediation: Definition, phytostabilization, phytodegradation, phytofiltration, rhizodegradation, phytoextraction. Strategies to enhance phytoremediation. Advantages and disadvantages of phytoremediation. *Application of genetic engineering in phytoremediation. Case studies of the above types of phytoremediation.

***Self study**

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publish
1	Purohit, S.S	Biotechnology – Fundamentals and Applications. IV Edn.	Agrobios, India.	2005
2	Purohit,S.S. and Ranjan, R	Ecology, Environment and Pollution.	Agrobios India.	2003 #
3	Singh, J.S. and Sing,S.P. and Gupta, S.R	Ecology, Environment and Resource conservation	Anamaya publishers, New Delhi	2008 #
4	Trivedi, R.K. and Sadhana Sharma (Eds.)	Biotechnological application in environmental management.	BS Publication, Hydrabad	2005 #

Reference Books

S.No.	Author	Title of the Book	Publishers	Year of Publication

1.	Abbasi, S.A. and Naseema Abbasi.	Renewable energy sources and their environmental impact. 1st edn. 4th reprint.	Prentice Hall of India Pvt. Ltd., New Delhi	2006
2.	Jefferson W Tester,	Sustainable energy – Choosing among options	Indian Reprint. Prentice Hall of India Pvt. Ltd., New Delhi.	2006
3.	John Twidell and Tony Weir	Renewable energy resources (IIedn.)	Taylor and Francis group, London and New York.	2007
4.	Sudhakara Reddy and Balachandra,P.	Energy, Environment and development	Narose Publishing House, Chennai	2006

Paper –XVII- Forestry

Semester- IV **Total marks : 100**
Sub. Code: MPL1417 **CA : 40**
Hours: 71 + 4 Hrs tutorial **ESE : 60**
Credit : 4

UNIT I **14 hrs**

Introduction to Forestry– Forest - Definition, natural and man made; different examples: tropical, temperate, evergreen, semi evergreen, deciduous, monoculture, multipurpose, agroforestry, social, industrial. Classification of world forests and Indian forests. Classification based on site quality density, tolerance, crown; water cycles of forest.

Silviculture: concept, Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; Seed dynamics in forest: seed production, dissemination, germination, establishment and mortality.

UNIT II **14 hrs**

Methods of propagation, grafting techniques; site factors; nursery and planting techniques - nursery beds, polybags and maintenance, water budgeting, grading and hardening of seedlings; special approaches; establishment and tending. Silviculture of some of the economically important species in India such as *Bamboo* spp, *Casuarina equisetifolia, Santalum album, Shorea robusta, Tectona grandis.*

UNIT III **14 hrs**

Forest utilization: Environmentally sound forest harvesting practices; logging and extraction techniques and principles, transportation system, storage and sale; Timber and Non-Timber Forest Products (NTFPs) definition and scope; gums, resins, oleo-resins, fibres, oil seeds, nuts, rubber, canes, bamboos, medicinal plants, charcoal, lac and shellac collection; processing and disposal. Pulp-paper and rayon.

UNIT IV **14 hrs**

Tree Improvement and Seed Technology General concept of tree improvement, methods and techniques, variation and its use, provenance, seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, genetic testing programming, selection and breeding for resistance to diseases, insects, and adverse environment; the genetic base, forest genetic resources and gene conservation in situ and ex-situ. Cost benefit ratio, economic evaluation.

UNIT V **15 hrs**

Forest and Environment : Role of forests in conserving soils. Maintenance and build up of soil organic matter, forest leaf litter and composting; Role of microorganisms in ameliorating soils; *N and C cycles, Role of forest in environmental amleoration. Climate change and Forests. Carbon trading

Forest protection: Forest protection – injuries to forest – biotic and abiotic agencies, control measures. Major pest and disease problems in forestry. General forest protection against fire. Forest policies and laws for protection of forests, biodiversity act. Man and Biosphere and Biosphere –II.

***self study**

Text books

S.No.	Author's	Title of the Book	Publishers	Year of Publication
1	Dhanai. R.	Forest and urban environment Planning and Development.	Cyber Tech Publications, New Delhi	2011
2	Negi, S.S	A hand book of forestry	International Book Distributor, Dehra Dun	1986
3	Pankaj Panwar and S.D. Bharadwaj	Handbook of Practical Forestry	Agrobios(India). Jodhpur	2007
4	Reginald D Forbes and Arthur B. Meyer	Forestry handbook	Greenworld Publishers, Lucknow	2001
5	Singh,M.P., B.C. Oraon and Narendra Prasad	Afforestation	APH Publishing Corporation, New Delhi	2009
6	Tek Bahadur Subba.	Forest Ecosystem in Modern world	Cyber Tech Publications, New Delhi	2010
7	Richards, A.J.	Plant Breeding Systems	Chapman Hall publishers	1997

Reference Books

S.No.	Author's	Title of the Book	Publishers	Year of Publication
1	Burley S. and Von Carlowitz P.(Eds.)	Multipurpose tree germplasm	International council for research in agroforestry, Nairobi	1984
2	Gary L. Rolfe, Johan M. Edington, I. Irving Holland, Gayle C. Fortenberry	Forests and Forestry	International Book. Distributor, Dehra Dun.	2005

Self study
Advanced Learners course - Food Science and Nutrition

Semester: IV **ESE : 100**
Sub Code: MPL1408 **Credit : 5**

Objectives

To study about the nutritional importance of various food substances, dietary allowances, toxic effects, and adulteration of food materials.

Unit I

Introduction to food science and nutrition. Recommended Dietary Allowances (RDA): Factors affecting RDA, methods used for deriving RDA, requirement and RDA. Reference man and Woman. Indian standards for height and weight. Comparison of Indian recommended allowances with that of FAO\WHO standards.

Unit II

Composition and nutritive value of different food groups: cereals, pulses, nuts, fruits, vegetables, meat and egg. Milk – composition, physical properties, nutritive value. Effect of heat, acid and enzyme on milk. Processing of milk- Pasteurisation. Milk products:non fermented and fermented milk products. Methods of cooking – Objectives, moist heat method, pressure cooking, dry heat method and microwave cooking.

Unit III

Nutritional importance, digestion and absorption of macronutrients: Carbohydrates, proteins and lipids. Detailed study of diabetes- 2 types, glucose tolerance, diagnosis and control, diabetes and hypoglycemia; Amino acid requirement, and essential amino acids; indices of protein quality evaluation, protein and iron malnutrition-kwashiorkore, essential fatty acids, deficiency and excess of fats, role of fats in heart disease – atherosclerosis.

Unit IV

Nutritional importance, cheaper sources, deficiency diseases and their control of micronutrients- vitamins and minerals : vitamins- Vitamin A-night blindness, B-Beriberi, C - Scurvey, D- Rickets, E and K. Heat sensitivity of vitamins. Minerals: Macro minerals: Calcium and Phosphorous - Osteroporosis. Microminerals : Iron and Iodine – anemia and goiter.

Unit V

Naturally occurring food toxicants: protease inhibitors, haemeagglutinins, cyanogens, saponins, lathyrogens. Allergy and allergens. Food spoilage and preservation: Role of microorganisms in food spoilage, health disorder – botulism. Food preservation – Methods of food preservation using low temperature, high temperature, osmotic pressure and dehydration.

Text Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Sheel Sharma	Human nutrition and meal planning. 1st	Jnananda Prakashan, P&D, New Delhi.	2000

		edition,		
2.	Srilakshmi, R.	Food Science. 1st edn.	New Age International Limited, Publishers,. New Delhi.	1997
3.	Srilakshmi, R.	Nutrition Science. Revised 2nd edition.	New Age International Limited, Publishers, New Delhi.	2006
4.	Swaminathan, M.S.	Essential of Food and Nutrition Vols. I & II. 2nd edition.	Ganesh & Co., Madras	1974.
5.	Swaminathan, M.S.	Advanced text book on Food and Nutrition. 2nd edition	Bangalore Printing and Publishing Company, Bangalore	2002.

Reference Books

S.No.	Authors	Title of the Book	Publisher	Year of Publication
1.	Arti Bhatia	Nutrition and Dietetics, 1st edition	Anmol Publications Pvt. Ltd., New Delhi	2000
2.	Francis Sizer and Eleanar Whitney	Nutrition: concepts and controversies. 8th edn.	Thompson Learning, Wadsworth, U.S.A.	2000
3.	Gitanjali Chatterjee	Hand book of Food and Nutrition, 1st edition.	Rajat Publications, New Delhi.	1999

Project

Semester: IV **Total Marks : 100**
Code: MPL14PROJ **Evaluation of project : 80**
Hours: 300 **Viva voce : 20**
Credit : 5

Objective

To make the students understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society and to educate and train the students to write scientific papers.

Execution procedure for the allotment of students for the Project

Project students are assigned through lot system. Students are listed out based on their marks scored in the end semester examinations and segregated as student with distinction (Group 1) and below distinction (Group 2). Staff members are allowed to choose the project students from both the groups by lot system. Projects allotted based on the interest of the students.

Execution of research

*The research work can be carried at the department or any other organization approved by the staff coordinator and the Head of the Department.

*One review meeting will be conducted in-between to monitor the progress of the research.

*Viva voce examination will be conducted by external examiner and the staff co-ordinator guiding the project.

Area of work

Taxonomy, Anatomy, Embryology, Physiology, Cytogenetics, Genetic engineering, Seed technology, Biotechnology, Microbiology, Enzyme technology, Bioremediation, Solid waste management, Organic Farming, Tissue culture & Medicinal Botany.

Methodology

Each project should contain the following details

- Brief introduction about the topic
- Review of literature
- Materials and Methods
- Experimental Results and Discussion – evidences in the form of figures, tables, graphs and photographs can be enclosed.
- Summary
- References

The above content should not exceed 100 pages.

Evaluation of the Project

Relevance of the topic to the academic / society		- 10 marks
Objectives		- 10 marks
Experimental design		- 30 marks
Expression of results and discussion		- 30 marks
	Total	**- 80 marks**
Viva voce:-	Presentation	- 10 marks
	Discussion	- 10 marks
	Total	**- 20 marks**
	Total	**100 marks**