

**HOLY CROSS COLLEGE**  
**(AUTONOMOUS),**  
**TIRUCHIRAPPALLI**  
**DEPARTMENT OF BOTANY**  
**M.Sc BOTANY**  
**SYLLABUS 2017-18**

**HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI – 2**  
**DEPARTMENT OF BOTANY**

**PG COURSE PATTERN 2017-18**

**M.Sc. BOTANY WITH SPECIALIZATION IN PLANT BIOTECHNOLOGY**

Sem	Course	Title of the course	Code	Hrs/ Week	Credits	Marks	
<b>I</b>	Major Core – 1	Phycology, Mycology and Phytopathology	<b>P15BO1MCT01</b>	6	5	100	
	Major Core – 2	Bryology, Pteridology and Gymnospermology	<b>P15BO1MCT02</b>	6	5	100	
	Major Core – 3	Plant Anatomy, Developmental Biology and Morphogenesis	<b>P15BO1MCT03</b>	5	4	100	
	Major Core – 4	General Microbiology	<b>P15BO1MCT04</b>	6	5	100	
	Major Core – 5	Practical 1-Plant Diversity, Phytopathology, Plant Anatomy, Developmental Biology and General Microbiology	<b>P15BO1MCP05</b>	6	3	100	
		Ethics			1		
	<b>Total</b>			<b>30</b>	<b>22</b>	<b>500</b>	
<b>II</b>	Major Core – 6	Inheritance Biology and Molecular Biology	<b>P15BO2MCT06</b>	7	6	100	
	Major Core – 7	Plant Biotechnology	<b>P15BO2MCT07</b>	6	6	100	
	Major Core – 8	Environmental Biotechnology, Conservation of Resources and Remote Sensing	<b>P15BO2MCT08</b>	6	6	100	
	Major Core – 9	Practical 2- Inheritance Biology, Molecular Biology, Plant Biotechnology, Environmental Biotechnology and Remote Sensing	<b>P15BO2MCP09</b>	4	2	100	
	Non Major Elective 1						
		Ethics			1		
		Library			1		
	<b>Total</b>			<b>30</b>	<b>23</b>	<b>500</b>	
<b>III</b>	Major Core – 10	Angiosperm Systematics	<b>P15BO3MCT10</b>	6	6	100	
	Major Core – 11	Research methodology	<b>P15BO3MCT11</b>	6	6	100	
	Major Core – 12	Practical 3- Angiosperm Systematics and Research Methodology	<b>P15BO3MCP12</b>	6	3	100	
	Major Elective - 1	Recombinant DNA Technology/Nanotechnology	<b>P15BO3MET01/ P15BO3MET04</b>	6	5	100	
	Non Major Elective -2						
		Library			1		
	<b>Total</b>			<b>30</b>	<b>23</b>	<b>500</b>	
<b>IV</b>	Major Core – 13	Plant Physiology, Biochemistry and Biophysics	<b>P15BO4MCT13</b>	7	6	100	
	Major Core – 14	Practical 4- Plant Physiology, Biochemistry and Biophysics	<b>P15BO4MCP14</b>	4	3	100	
	Major Core – 15	Project	<b>P15BO4DIS01</b>	6	3	100	
	Major Elective -2	Biometrics and Bioinformatics/Genomics and Proteomics	<b>P15BO4MET02/ P15BO4MET05</b>	6	5	100	

	Major Elective 3	Clinical Microbiology and Basics of Immunology/Plant diseases and Pest management	<b>P15BO4MET03/ P15BO4MET06</b>	6	5	100
		Library		1		
		<b>Total</b>		<b>30</b>	<b>22</b>	<b>500</b>
		<b>Grand Total</b>		<b>120</b>	<b>90</b>	<b>2000</b>

**List of Non-Major Elective Courses  
Offered by the Department of Botany to Other Students**

**PG**

Sem	Course	Title of the course	Code	Hrs/ Week	Credits	Marks
II	Non Major elective 1	1. Plants and Human Welfare	<b>P15BO2NMT01</b>	5	3	100
III	Non Major elective 2	2. Man and Microbes	<b>P15BO3NMT02</b>	5	3	100

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**SEMESTER- I**  
**MC 1- PHYCOLOGY, MYCOLOGY AND PHYTOPATHOLOGY**

**Hours 6**  
**Credits 5**

**Code: P15BO1MCT01**  
**Marks:100**

**UNIT - IPhycology:** Classification of algae (F.E. Fritsch, 1979). Structure of prokaryotic and eukaryotic cells. Types of chloroplasts, flagellation, pigmentation & nutrition. Thallus organization – unicellular, colonial & multicellular. Reproduction & sexuality in algae. Phylogenetic importance of heterotrichy. Life cycle patterns with reference to Cyanophyceae, Chlorophyceae, Phaeophyceae, Rhodophyceae.

**UNIT - II**Algae in symbiotic association – nitrogen fixation – enrichment of soil nitrogen. Phytoplanktons and its importance. Water blooms – toxicity, algae as indicators of pollution and algicide. Parasitic algae. Uses of algae as food, fodder, medicine and fertilizer. Soil algae and its significance. Fossil algae.

**UNIT - IIIMycology:** Classification of fungi (Ainsworth,1973). Ecology, Structure of thallus, flagellation, asexual & sexual reproduction, and fructification in fungi. Origin and evolutionary trends & life cycle patterns in main groups of fungi – Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Fossil fungi.

**UNIT – IV** Nutrition in fungi. Heterothallism in fungi. Physiology of reproduction. Hormonal involvement in sexual reproduction. Parasexuality and heterokaryosis. Classification and importance of mycorrhizae. Economic importance of fungi.

**UNIT - VPhytopathology:** Plant diseases. Concept (Koch's Postulates). Host parasite interaction – pathogenesis – entry of plant pathogen – development inside the host. Defense mechanism in plants – structural and biochemical. Role of enzymes and toxins in disease development. Effect of infection on photosynthesis and respiration under pathogenesis. Changes in nitrogen metabolism and phenol content in infected plants.

1. Fritsch, F. E. 1945. The structure & reproduction of the algae Vol I & II. The Syndics of the Cambridge University Press, London.
2. Ion Morris. 1968. An introduction to algae. Hutchinson University Library Company, London.
3. Kumar, H. D. 1990. Introductory Phycology. Affiliated East-West Press Pvt. Ltd., New Delhi
4. Prescott, C. W. 1969. The algae- a review. Butler and Tanner Ltd., London. 5. Smith, G. M. 1951. Manual of Phycology. Waltham Mass, USA, Chronica Botanica Company.

### **Fungi**

1. Ainsworth, G. C., Frederick K. Sparrow and Alfred S. Sussman. 1973. The Fungi – First Edition. Academic Press, INC, New York.
2. Alexopoulos, C. J. and Mims, C. W. 1993. Introductory Mycology - Third Edition. Wiley Eastern limited, New Delhi.
3. Bilgrami, K. S. and Verma, R. N. 1978. Physiology of Fungi – First Edition. Vikas Publishing house Pvt. Ltd., New Delhi.

4. Mehrotra, R. S. and Aneja, K. R. 1990. An introduction to Mycology – First Edition. Wiley Eastern limited, New Delhi.
5. Webster, J. 1993. Introduction to Fungi – Cambridge University Press, Cambridge.

### **Plant Pathology**

1. Pandey, B.P. 1997. Plant pathology. S. chand & Company Ltd. NewDelhi.
2. Sambamurty, A.V.S.S. 2006. Text Book of Plant Pathology. I.K. International Pvt. Ltd. New Delhi.

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**SEMESTER- I**  
**MC 2- BRYOLOGY, PTERIDOLOGY & GYMNOSPERMOLOGY**

**Hours 6**  
**Credits 5**

**Code:P15BO1MCT02**  
**Marks:100**

**UNIT – I Bryology :** Classification of Bryophytes (Rothmaler, 1951). General & reproductive characters of major classes. Range of structural variation in the gametophytes. Methods of vegetative and sexual reproduction. Comparative study of gametophytes and sporophytes of major classes. Spore dispersal mechanisms and evolution of the sporophytes. Ecology and economic importance of Bryophytes.

**UNIT – II Pteridology:** Classification of Pteridophytes (Reimers, 1975). General characters and life cycle patterns of major classes of pteridophytes (Psilophytopsida, Psilotopsida, Lycopsidea, Sphenopsida and Pteropsida).

**UNIT – III** General characters and life cycle patterns of homosporous and heterosporous ferns. Evolutionary significance of gametophytes and sporophytes. Spore germination in Pteridophytes. Stear evolution in pteridophytes. Soral evolution in Pteropsida. Heterospory and seed habit.

**UNIT – IV Gymnospermology:** Classification ( K.R. Sporne, 1965). General structure & evolutionary significance of Pteridospermales, Cycadeoideales, Pentoxylales & Cordaitales. Economic importance of Gymnosperms.

**UNIT - V** Comparative study of morphology, reproduction and phylogeny of Ginkgoales, Coniferales, Taxales & Gnetales. Evolution of male and female gametophytes.

**References:**

**Bryophytes**

1. Cavers, F. 1964. The interrelationship of the Bryophyta. Dawsons of Pall Mall, London.
2. Prempuri. 1981. Bryophytes – a Broad perspective. Atma Ram and Sons, Delhi.
3. Rashid, A. 1998. An introduction to Bryophyta. Vikas Publishing house Pvt. Ltd., New Delhi.
4. Watson, E. V. 1971. The structure and life of Bryophytes. Hutchinson and Co. (Publishers) Ltd., London.
5. Vashista, B. R. 1994. Botany for degree students- Bryophyta. Chand & Co (Publishers) Ltd. New Delhi.

**Pteridophytes**

1. Bierhorst, D. W. 1971. Morphology of Vascular plants. The Macmillan company, New York.
2. Bower, F. D. 1963. The Ferns – Vol I, II & III. Today and Tomorrow's book agency, New Delhi.

3. Campbell, D. H. 1961. The evolution of land plants. Indian Universities Press, Allahabad.
4. Rashid, A. 1976. An introduction to Pteridophyta. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Sporne, K. R. 1970. The morphology of Pteridophytes (The structure of ferns and allied plants). Hutchinson and Co (Publishers) Ltd., London.

### **Gymnosperms**

1. Coulter, J. M. and Chamberlain, C. J. 1971. Morphology of Gymnosperms. Central Book Dept, Allahabad.
2. Datta, S. C. 1984. An introduction to Gymnosperms. Kalyani Publishers, New Delhi.
3. Sahni, K. C. 1990. Gymnosperms of India & adjacent Countries. Shiva Offset Press, Dehra Dun.
4. Sporne, K. R. 1969. The Morphology of Gymnosperms. Hutchinson and Co. (Publishers) Ltd., London.
5. Vashista, P. C., Sinha, A. K. and Anil kumar. 2007. Botany for degree student-Gymnosperms. Chand & company Ltd Publishers). New Delhi.

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**SEMESTER- I**  
**MC 3- PLANT ANATOMY, DEVELOPMENTAL BIOLOGY AND**  
**MORPHOGENESIS**

**Hours 5**  
**Credits 4**

**Code: P15BO1MCT03**  
**Marks:100**

**UNIT – I Plant Anatomy:** Theories related to apical organization of shoot & root. Structural diversity and phylogenetic trends of specialization of xylem & phloem. Electron microscopic structure of phloem. Root – stem transition and seedling anatomy. Vascular and cork cambium: origin, structure, function & distribution.

**UNIT – II Wood:** Structure of wood, sap wood – heart wood transition, properties of wood (physical, chemical & mechanical). Processing & seasoning of wood. Reaction wood – compression and tension wood. Dendrochronology and its significance. Commercial uses of woods and Principal and diagnostic features of woods of South India - Teak (*Tectona grandis*), Neem (*Azadirachta indica*), Indian Rose wood (*Dalbergia latifolia*) and Sal tree (*Shorea robusta*).

**UNIT – III Developmental Biology (Embryology):** Morphology and cytology of pollen. Pollen germination: Pollen mitosis – vegetative and generative cell formation. Pollination biology: Types, autogamy (homogamy and cleistogamy) and allogamy and their contrivances (dichogamy and herkogamy). Pollen - pistil interaction – role of pollen wall and stigmatic surface proteins ; structure and functions of style and stigma. Barriers to fertilization. Sexual incompatibility. Methods to overcome sexual incompatibility.

**UNIT – IV:** Endosperm types- cellular, nuclear, helobial and ruminant. Seed and fruit development. Parthenocarpy: Definition and types. Artificial induction and application. Polyembryony: Classification, types (true, false and adventive polyembryony) and causes. Experimental induction of polyembryony and its significance. Apomixis: vegetative reproduction. Agamospermy, apospory and diplospory, causes and significance.

**UNIT – V : Morphogenesis:** Morphogenesis at cellular level: Sachs & Erner's Law- Role of cytoplasm and nucleus in morphogenesis. Nuclear transplantation experiment – example – *Acetabularia*. Asymmetric division and its significance. Differentiation, dedifferentiation and redifferentiation of vascular tissues *in vivo*, *in vitro* and in wounds. Morphogenetic factors – polarity and growth regulators, physical- tension, bending and swaying. Plant galls and their importance in morphogenesis.

**References:**

**Anatomy**

1. Clowes, F.A.L. Apical meristems.
2. Elizabeth G. Cutter, 1979. Plant Anatomy. The English Language Book Society, and Edward Arnold Publishers Ltd. London.
3. Fahne, A. 1982. Plant Anatomy. Third Edition, Pergamon Press, Oxford.
4. Katherine Esau, 1972. Plant Anatomy. Wiley Eastern Private Limited, New Delhi.
5. Varghese, T. M. An Introduction to the Anatomy of Angiosperms. Allied Publishers, Private Ltd., New Delhi.



6. B.P. Pandey Modern practical Botany. Vol.III.

### **Embryology**

1. Bhojwani, S.S. Bhatnagar, S. P. 1999. The Embryology of Angiosperms. 4<sup>th</sup> revised & enlarged edition. Vikas Publishing House PVT. Ltd., New Delhi.
2. Maheswari, P. 1963. Recent Advances in the Embryology of Angiosperms. Catholic Press, Ranchi.
3. Shivanna, K. R. and Rangasamy, N.S. 1993. Pollen Biology – A laboratory manual. Narosa Publishing House, New Delhi.
4. Varghese, T. M. An Introduction to experimental and applied embryology of Angiosperms. Oxford and IBH Publishing Co., New Delhi.

### **Morphogenesis**

1. Bonner, J. T. 1965. Morphogenesis – An essay on development. First Edition, Oxford & IBH Publishing Co. New Delhi.
2. Elizabeth G. Cutter. 1966. Trends in Plant Morphogenesis. Longmans, Green and Co. Ltd. London.
3. Sinnott, E. W. 1960. Plant Morphogenesis. McGraw – Hill Book Company, INC., New York.

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**SEMESTER- I**

**MC 4- GENERAL MICROBIOLOGY**

**Hours 6**  
**Credits 5**

**Code: P15BO1MCT04**  
**Marks:100**

**UNIT - I** Introductory microbiology: Types of microorganisms - Outline classification of Bergey's manual of 9<sup>th</sup> edition. General structure and multiplication methods of bacteria (eubacteria & archaebacteria), actinomycetes, protozoa, spirochetes, rickettsias, chlamydias, mycoplasmas and viruses.

**UNIT – II** Methods of studying bacteria: Staining techniques – simple, differential (Gram staining and acid – fast staining), negative and endospore staining. Cultivation, growth and enumeration of bacteria. Cultivation of fungi. Cultivation of viruses – in embryonated egg and in plants.

**UNIT - III** Microbiology of soil: Microbial flora of soil and factors affecting the microbial community in soil. Interaction among soil microbes (positive and negative interactions) & with higher plants (rhizosphere & phyllosphere). Microorganisms in organic matter decomposition.

**UNIT – IV** Microbiology of water and air: Microorganisms in water quality. Assay for drinking water (coli form tests) & purification of potable water. Microorganisms in air – sources and types.  
Air borne microbial diseases (fungal- Aspergillosis, bacterial – Tuberculosis, viral – H<sub>1</sub>N<sub>1</sub>). Control of microorganisms in laboratories.

**UNIT – V** Microbiology of food & dairy products: Microorganisms in foods - cooked foods, fruits & vegetables, meats. Food poisoning and food borne infection. Microbial examination of foods. Microorganisms in milk. Pasteurization methods. Test for the quality of milk. Microorganisms in the production of milk products (yogurt, butter & cheese). Industrial production of vinegar.

## **REFERENCES**

### **Microbiology**

1. James, G. Cappuccino and Sherman, N. 1999. Microbiology – A Laboratory manual - 4<sup>th</sup> edition. Addison Wesley Longman, Inc, England.
2. James, M. Jay. 1986. Modern Food Microbiology. Van Nostrand Reinhold, New York.
3. Kannan, N. 1996. Laboratory manual in general microbiology. Palani paramount Publications, Palani.
4. Michel J. Pelczar, Chan, E. C. S. and Noel R. Krieg. 1993. Microbiology concepts & applications. Mc Graw- Hill, Inc, New York.
5. Nester, E. W., Roberts, C. E., Pearsall, N. N. & Anderson. 1998. Microbiology – A Human Perspective. Irwin Mc Graw – Hill / Bos
6. Power, C. B. and Dagainawala, H. F. 1993. General Microbiology Vol I & II. Himalaya Publishing House, New Delhi.
7. Prescott and Dunn. 1987. Industrial Microbiology. CBS publishers and Distributers, Bhol Nath Nagar, Delhi.
8. Prescott, Harley and Klein. 1999. Microbiology. Irwin Mc Graw – Hill / Bos.

9. Rangaswami, G. and Bagyaraj, D. J. 1993. Agricultural Microbiology. Prentice – Hall of India private Ltd, New Delhi.
10. Tortora, G. J., Funke, B. R. and Case, C. L. 1989. Microbiology – An Introduction. The Benjamin / Cummings Publishing company, Inc, California.

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**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER- I PAPER - VI MC 5 -PRACTICAL – I**  
**PLANT DIVERSITY, PHYTOPATHOLOGY, PLANT ANATOMY,**  
**DEVELOPMENTALBIOLOGY AND GENERAL MICROBIOLOGY**

**Hours 6**  
**Credits 3**

**Code:P15BO1MCP05**  
**Marks:100**

**Unit I: Phycology:** *Lyngbya, Chaetomorpha, Chara, Padina, Turbinaria*  
*Ceramium, Amphiroa.*

**Unit II: Mycology:** *Saprolegnia, Taphrina, Cercospora, Erysiphe, Phyllachora, Cyathus,*  
*Alternaria.*

**Phytopathology:** Bacterial - blight of paddy; Fungal - Ergot of Cholam; Viral  
– bhendi yellow leaf banding.

**Unit III: Bryology:** *Targionia, Notothylas, Pogonatum.*

**Pteridology:** *Lepidodendron*(stem genus), *Isoetes, Gleichenia* and *Salvinia.*

**Gymnospermology :** *Lyginopteris, Laginostoma, Cordaites* (stem, leaves & ovule),  
*Araucaria , Podocarpus* and *Pinus.*

**Unit IV: PlantAnatomy:** Structure of wood : T.S., R.L.S., & T.L.S. of *Azadirachta,*  
*Tectona* and *Mangifera.* Study of above wood materials using maceration  
technique. Use of micrometer in the measurement of wood elements (vessel and  
fibre). Observation of shoot apex (*Hydrilla*). **Developmental Biology (Embryology):**  
Effect of growth substances on pollen germination and pollen tube growth (IAA),  
pollen viability test (Tetrazolium salt).

**Unit V: General Microbiology:** Preparation of serial dilution, Cultivation and growth  
of Bacteria. Cultivation of Fungi. Simple and Gram staining. Methylene blue reductase  
test for testing milk quality. Test for water quality (Coliform test-MPN). Sensitivity of  
microorganisms to antibiotics. Isolation of *Rhizobium* from root nodules.

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**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY SEMESTER II**  
**PAPER VI**  
**MC 6 INHERITANCE BIOLOGY AND MOLECULAR BIOLOGY**

**Hours 7**  
**Credits 6**

**Code: P15BO2MCT06**  
**Marks:100**

**UNIT – I Inheritance Biology:** Allelic and non allelic gene interactions, linkage, recombination (homologous and non- homologous) and chromosome mapping - Sex linkage in diploids. Multiple alleles and blood group systems - Male sterility. Bio chemical genetics (Drosophila, Neurospora). Regulation of gene action in prokaryotes – Role of operators, repressors, co-repressors and inducers – lac. operon, trp. operon. An outline of gene regulation in eukaryotes. Environmental effects and gene expression :- effects of external & internal environment.

**UNIT – II Microbial genetics:-** Transduction, transformation, conjugation, sexduction. Recombination in viruses.

Quantitative genetics :- Multiple gene concepts, analysis of quantitative characters, components of phenotypic variance.

Population genetics :- Hardy – Weinberg’s principle & application, changes in gene frequencies. Genetics behavior of E. coli.

Genetic Mechanisms of evolution :- Mutation, differential selection, recombination, kinds of reproductive systems and adaptability.

**UNIT – III Molecular biology:** Organization of Genetic elements: Chromosome: Alternative forms of chromosomal DNA – A, B, C and Z forms. Palindromic DNA, Repetitive DNA, circular and super helical DNA. Chromosomal proteins : Histones and Protamines, Nucleosome concept, Assembly of nucleosomes, C – value paradox. Extra chromosomal structures - Plasmids, chloroplast and mitochondrial genomes. Mobile Genetic element : Transposons in yeast (Ty), Bacteria (Tn elements). Application of recent advances in the study of hereditary material – RFLP, PCR, DNA finger printing.

**UNIT – IV DNA Replication :** Unit of replication, Enzymology of DNA replication, Discontinuous & bidirectional replication, initiation, elongation, termination of replication. Models of replication, correction of mistakes during replication, DNA polymerases.

Mutation: Molecular basis of mutation, detection of mutation in Drosophila. Reverse mutation, random mutation, para mutation. Induced mutation - Mutagens – physical and chemical. DNA damage and repair mechanisms (photoreactivation, excision repair and recombination repair & mismatch repair).

**UNIT – V Transcription :** Mechanism of transcription in prokaryotes (Initiation, elongation and termination) and transcription in eukaryotes, RNA polymerases.

Post transcriptional modification – capping, methylation, polyadenylation. RNA splicing with reference to exons, introns, reverse transcription.

Structure of tRNA, mRNA and rRNA and their promoters – TATA BOX, CAAT. GC and SOS BOX. Editing RNA.

Translation :-Genetic code, Antisense RNA. Mechanism of translation in prokaryotes, eukaryotes and post translation modification. Protein targeting – signal hypothesis.

**References:****Text Books**

1. David Freifelder. 1990. Molecular Biology. Narosa Publishing House, New Delhi.
2. De Robertis, E. D. P., Francisco A. Salny and De Robertis, E. M. F. 1995. Cell Biology. W. B. Saunders company, London (International Edition).
3. Gardner / Simmons / Smustad. 1984. Principles of Genetics. John Wiley and Sons, Inc, New York.
4. Gupta, P. K. 1996. Genetics. Rastogi Publication, Meerut, India.

**Reference Books**

1. Power, C. B. 1997. Cell Biology – Third Edition. Himalaya Publishing house, Mumbai.
2. Sarin. 1994. Genetics. Tata McGrew-Hill Publication Co., New Delhi.
3. Sheeler, P and Blanche, D. E. 2002. Cell and Molecular Biology. John Wiley and Sons, Singapore.

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**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER II PAPER VII**

**MC 7 PLANT BIOTECHNOLOGY**

**Hours 6**  
**Credits 6**

**Code: P15BO2MCT07**  
**Marks:100**

**UNIT - I** Introduction, history and scope of biotechnology. Brief history of plant tissue culture. Basic techniques of plant tissue culture. Types of culture – callus culture, organ culture and embryo culture. Micropropagation and its importance. somaclonal variation. Single cell culture. Commercial production of secondary metabolites in plant cell cultures. Elicitors induced production of secondary metabolites, biotransformation using plant cell culture.

**UNIT- II** Protoplast isolation, culture and methods of fusion of protoplast and its applications. Haploid production & its significance. Somatic hybridization and applications. Cybridization and its applications. Somatic embryogenesis and synthetic seed production and applications. Cryopreservation and its applications.

**UNIT – III** Transgenic plants – strategies and production of transgenics for crop improvement – herbicide resistance (sulphonyl urease), insect resistance (gene for Bt toxin). Disease resistant plants, stress tolerant plants (drought and salt). Crops with improved yield and quality (long shelf life, delayed softening, ripening - tomato). Golden rice and mustard for rich vitamin A. GM crops and their impacts on agriculture, human health and environment.

**UNIT – IV** Molecular Pharming: Types – medical and non-medical. Medical pharming – pharmaceutical, production, properties, advantages and application of plantibodies. Edible vaccines and their importance. Non- medical pharming – production and application of industrial enzymes (cellulase and amylase). Bioplastics and biopolymers from higher plants. Terminator seed technology - mechanism and applications.

**UNIT – V** Principles of plant genomics and proteomics – structural and functional genomics. Genome sequencing of *Arabidopsis thaliana*, gene annotation and insertional mutagenesis. Analysis of gene function by employing transcript analysis. Phytohormone action and signal transduction in tissue cultures. Phosphoinositide signaling in plants.

**References:**

**Text Books**

1. Gamborg, O. L., Phillips, G. C. 1998. Plant Cell, Tissue & Organ culture. Fundamental methods. Narosa Publishing House, New Delhi.
2. Gupta, P.K. 1999. Elements of Biotechnology - First Edition. Rastogi Publication, Meerut.
3. Kalyan Kumar De. 1992. An Introduction to Plant Tissue Culture. New Central Book Agency, Calcutta.
4. Jogdand, S. N. 1997. Gene Biotechnology. Himalaya Publishing House.
5. Dubey, R.C. 2007. A text book of Biotechnology. S. Chand & Company Ltd. New Delhi.

6.Gupta, P.K. 2001. Elements of Biotechnology. Rastogi Publications, Meerut.

7.Satyanarayana, U. 2008. Biotechnology. Books Allied (P) Ltd, Kolkata.

### **Reference Books**

1. Ignacimuthu, S. J. 1996. Applied Biotechnology. Tata Mc Graw -Hill Publishing Co Ltd. New Delhi.

2. Razdan, M. K. 1993. An Introduction to Plant Tissue culture. The Mac Millan Co. of India Ltd. Bombay.

3. Nirmala, C.B., Rajalakshmi, G., Chandra Karthick, 2009. Plant Biotechnology. MJP Publishers, Chennai.

4.Reman, L.P. 2006. Applied biotechnology. MJP Publishers, Chennai.

5. Mahipal Singh., Shekhawat Vikrant. 2011. Plant biotechnology. *In vitro* principles, techniques and applications. MJP Publishers, Chennai.



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M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY SEMESTER II  
PAPER VIII

MC 8 ENVIRONMENTAL BIOTECHNOLOGY, CONSERVATION OF  
RESOURCES AND REMOTE SENSING

Hours 6  
Credits 6

Code: P15BO2MCT08  
Marks: 100

**UNIT – I Natural Resources and their depletion:** Natural resources: Classification – renewable and non-renewable. Types of natural resources – water, land, forest & energy. Water resources: Over utilization of surface & ground water. Land resources: Land degradation – man induced land slides, use of pesticides & environmental degradation, soil erosion (types, causes and control) and desertification (causes, consequences and control). Forest resources: over exploitation, deforestation, shifting cultivation and impact of dams.

**UNIT – II Environmental pollution, monitoring and abatement:** Pollution – types, causes and effects (air, water, sea, noise, thermal and nuclear radiation). Global environmental problems: Green house effect, ozone depletion, UV radiation, Acid rains and their impact on climate. Pollution monitoring – Bioassay (algal, bacterial, lichens, higher plants and fishes) and use of biosensors in environmental monitoring and pollution abatement. Disaster management – flood, drought and famines. Disposal of solid wastes. Biotechnology in paper and pulp industry – process, production, physico- chemical characteristics and treatment of pulp and paper mill effluent pollutants.

**UNIT - III Restoration and reclamation of land:** Restoration through micro propagation, reforestation, use of microbes in restoration of soil fertility, role of microbes in biogeocycles. Waste as a resource: organic compost, vermicompost and biogas. Waste water (sewage) treatment: primary, secondary (biological treatment) – aerobic (oxidation pond, trickling filters and activated sludge) and anaerobic treatment (anaerobic digestion) and tertiary treatments. Role of GMOs in biodegradation and bioremediation – types and techniques.

**UNIT – IV Biodiversity and its conservation:** Introduction, definition, levels of biodiversity (Genetic and species), types (alpha, beta and gamma). Values of biodiversity (ethical, aesthetic and optional). Biodiversity at global, national and local levels. India as a mega diversity nation. Importance of Hot spots of biodiversity at global, and hot spots in India. Threats and loss of biodiversity – habitat loss, poaching of wild life and man – wild life conflicts. Endangered and endemic plant species of India. Conservation of biodiversity – definition and types - in-situ (Biosphere Reserves, National parks and sanctuaries) and ex-situ (gene bank, seed bank and botanical gardens).

**UNIT - V Environment and Social issues:** Awareness and the role of individuals in conservation of the environment: Sustainable development – concepts and basic aspects of sustainability. Ecodevelopment and importance of eco- tourism. Environmental, social and ethical issues of biotechnology. Environmental legislation: Global efforts in protecting the environment – Environmental Protection Act 1986, Green Peace Movement, Role of IUCN, UNESCO, WWF, FAO, WHF, CITES, WTO, NBPGR, IPR (patents, trade, secretes, copy rights and trade marks), PBR and TRIPS.

Role and applications of Remote sensing technology in the analysis of vegetation, management of environment and human health. Role of GIS and GPS (Global Position System) and their applications.

### **References:**

#### **Text Books**

1. Asthana, D. K. and Meera Asthana. 1999. Environment : Problems and solutions. S. Chand and Company, New Delhi.
2. Dubey, R. C. 1998. A text book of Biotechnology. S. Chand and Company, New Delhi.
3. Gupta, P. K. 1999. Elements of Biotechnology. Rastogi publications, Meerut.
4. Harvinder Sohal and Srivastava, A. K. 1994. Environment and Biotechnology. Ashish Publication, New delhi.
5. Ignacimuthu, S. J. 1998. Environmental Awareness and Protection. Phoenix Publishing house Pvt, Ltd., New Delhi.
6. Kumar, H. D. 1997. Modern Concepts of Ecology. Vikas Publishing house Pvt, Ltd.

#### **References**

1. Vikas Ahlluwalia. 2007. Global Climate change. Paragon International Publishers.
2. Kumar, U. and M. Asija. 2004. Biodiversity: Principles and Conservation. 2<sup>nd</sup> Edition, Agrobios, India.
3. Saxena, H.M. 2006. Environmental Studies. Rawat Publications, Jaipur, New Delhi.
4. Pradipta Kumar Mohapatra. 2006. Text book of Environmental Biotechnology. I.K. International publishing House, New Delhi.
5. Anubha Kaushik and C.P. Kaushik. Perspectives in Environmental Studies. 2<sup>nd</sup> Edition. New Age International (P) Limited, Publishers, New Delhi.
6. Ignacimuthu, S. J. 1996. Applied Plant Biotechnology. Tata McGraw – Hill Publishing Company Limited, New Delhi.
7. Bhattacharyya, B.C. and Rintu Banerjee. 2008. Environmental Biotechnology. Oxford University Press.
8. Ranjit Daniels and Jagdish Krishnaswamy. 2009. Environmental Studies. Wiley India Pvt. Ltd., New Delhi.
9. Satyanarayana, U. 2008. Biotechnology. Books and Allied (P) Ltd, Kolkata India.
10. B.S Raman, Environmental Studies for Under graduate courses of all branches of higher education. United Publishers, Mangalore- 575 002.
11. K.V. Krishnamurthy, 2003 A Text Book on Biodiversity (Principles and Practice), Science Publishers,USA.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2.**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER- II MC 9 PRACTICAL – II**  
**INHERITANCE BIOLOGY, MOLECULAR BIOLOGY, PLANT BIOTECHNOLOGY,**  
**ENVIRONMENTAL BIOTECHNOLOGY AND REMOTE SENSING**

**Hours 4**  
**Credits 2**

**Code:P15BO2MCP09**  
**Marks: 100**

**Unit I: Inheritance Biology:** Analysis of F<sub>2</sub> and test cross progeny data (collected or supplied from standard works) to identify segregation patterns, linkage (3 point ), percentage of crossing over.

Solving simple problems involving multiple gene inheritance. Determination of gene sequence and map distances.

**Unit II: Molecular Biology:** Study of plant cells and cell preparations. Staining methods using acetocarmine and acetoorcein, squash and smear techniques (root tips/anthers).

**Unit III: Plant Biotechnology:** Basic techniques of tissue culture - Sterilization of glass wares & preparation of MS medium. Micropropagation. Callus induction from explants of leaf, stem & root; regeneration of shoots, rooting and hardening.

**Unit IV:** Direct organogenesis. Embryo culture. Protoplast isolation by mechanical & enzymatic methods. Somatic embryogenesis. Preparation of synthetic seeds.

**Unit V: Environmental Biotechnology and Remote Sensing:** Water Analysis : Estimation of dissolved O<sub>2</sub> and CO<sub>2</sub>. BOD Determination, Soil Analysis : Soil nitrogen estimation, soil organic matter estimation and soil pH. Vegetation analysis : Determination of Important Value Index ( I V I ). Determination of Basal area and relative Dominance by count quadrat method.

Visit to an industry and to an ecosystem.

A visit to a biotechnology laboratory.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER II NON MAJOR ELECTIVE I - PLANTS AND HUMAN WELFARE**

**Hours 5**  
**Credits 3**

**Code: P15BO2NMT01**  
**Marks:100**

**UNIT - I Plants as food:** Importance of plants and plant products to mankind. Use of lower plants as food. Mushrooms – introduction and cultivation of paddy straw mushroom. Higher plants as food – cereal – rice, pulses – pigeon pea.

**UNIT - II** Sugar – sugarcane. Fruits – banana, Vegetables - lady's finger, Greens - Amaranthus, Nuts – cashew nut, Oil - Sesame, Spices – cardamom, Beverage – tea.

**UNIT - III** **Plants as medicine:** Lower plants- algae and fungi. Higher plants- Roots – licorice, Bark - cinchona, Stem – turmeric, Leaves – tulsi, Flower – clove, Seeds –pepper, Masticatory – betel vine.

**UNIT - IV Plants and agriculture:** Organic farming, vermi composting. Leguminous plants in green manuring. Biofertilizer – *Nostoc*, *Azospirillum*, *Azolla*. Biopesticides – neem products.

**UNIT - V Plants in industry and forest:** Gums – gum arabic, fibres – cotton, dye – Henna, rubber – *Hevea*, essential oil – *Eucalyptus*. Wood – Teak, pulp wood – *Casuarina*, fuel - *Acacia*

.

**References:**

**Text Books**

1. Albert F. Hill. 1952. Economic Botany. Tata Mc Graw-Hill Publishing Company Ltd., New Delhi.
2. Pandey, B. P. 1983. A text book of Botany – The Fungi – S. Chand & Co., New Delhi.
3. Pandey, B. P. 1993. A Text book of Algae. S. Chand & Co., New Delhi.
4. Annie, R. & V. Kumaresan, 2002. Fungi & Plant pathology. Saras Pub. T. Nadu.

**Reference Books**

1. Dubey, R. C. 2001. Text Book of Biotechnology. S. Chand & Co., New Delhi.
2. Gupta, P. K. 1999. Elements of Biotechnology. Rastogi Publications, Meerut.

**HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI**  
**I P.G.CATECHISM– SEMESTER I & II**

**HRS / Wk : 1**

**UNIT – I:**

Growth in spiritual life – Love of God, Prayers, Meditation, Reflective scripture reading,  
Holy mass and sacraments.

**UNIT –II:**

Sin –Personal & Social Sin- Effects of Sin – Remission- Confession –Forgiveness

**UNIT – III:**

Rosary –Four mysteries-Meaning of the Rosary –Devotion to Mary

**UNIT – IV:**

Family life –Role of Parents, Love & Respect for Parents and Children - Prolife, Euthanasia,  
Mercy killing, Honour killing. A good Christian family and its influence in Church and society

**UNIT – V:**

Discernment – a way of life.

**REFERENCE :**

1. Discernment – Rex Paie. S.J, - Vaigai Publications
2. What Prayer is – Rex Paie. S.J. – Vaigai Publications
3. Vatican II Documents All Serfac Publications – Serfac, Chennai.
4. New leader publications.

**HOLY CROSS COLLEGE (AUTONOMOUS) – TIRUCHIRAPPALLI – 2**

**I P.G. ETHICS – SEMESTER I & II**

**VALUE EDUCATION FOR WOMAN**

**Hr/Wk:1**

**UNIT – I:**

Value education – Purpose and importance, Value of work, (Dignity of labour), Time Management, Motivation to develop the talents; Leadership Styles

**UNIT – II:**

Woman – In ancient period to modern days - Education of woman in the modern socio economic development - Strategies for Empowerment

**UNIT – III:**

Crimes against woman - Laws pertaining to woman – Dowry Prohibition Act; Anti Domestic Violence Act; Marriage Act Hindu, Islam & Christian; Property Right; Women's Liberation Movement

**UNIT – IV:**

Human Sexuality; Sex Education – Love, Lust, Friendship and Infatuations; Child Abuse; Gay, Lesbianism, Health care for women; Naturopathy, Home remedies; Health Problems faced by women

**UNIT – V:**

Sexual harassment – at home and in the workplace - Women in Media; Cell Phone and internet – uses and misuse - Evils of Drug Abuse - Notable Indian Women who have inspired

**HOLY CROSS COLLEGE (AUTONOMOUS), TRICHIRAPALLI - 2.**

**I PG BIBLE STUDIES – SEMESTER I &  
II EFFECTIVE CHRISTIAN LIVING**

**Hrs / Wk : 1**

**UNIT – I:** Teaching from Gospels for Christian living.

**UNIT – II:** Freedom and Service

Parable of prodigal son – Christian

Freedom Parable of Good Samaritan –

Love and Service

**UNIT – III:** Christian Leadership

Leader as a Shepherd (Psalm

23) Leader as a Steward

(Parable of talents)

Leader as a Servant (Jesus washing the feet of disciples)

**UNIT – IV:** Marriage, family and parenting

**UNIT – V:** Christian Commitment:

To the church – To the society – To the nation

**(For candidates admitted from 2017 onwards)**  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER III MC-10 ANGIOSPERM SYSTEMATICS**

**Hours 6**

**Code:P15BO3MCT10**

**Credits 6**

**Marks:100**

**UNIT-I** Scope and importance of plant taxonomy. Purpose of classification of plants. Types of classification- Artificial, natural and phylogenetic systems. Current systems of classifications Phylogenetic system (Takhtajan's system and Dahlgren's system) with merits and demerits. Taxonomic literature : Manuals, Monographs & revisions - need, methodology and applications. BSI - History, organization, achievements and functions.

**UNIT – II** Specimen preparation and Herbarium management and its functions. Major botanical gardens & herbaria of India and world. History of ICBN, ranks and nomenclature of taxa, typification, principles of priority and their limitations. Effective and valid publication. Citation of authors, retention, choice and rejection of names, nomina conservanda. Nomenclature terminologies, procedure for publication of species. Key preparation-types.

**UNIT-III** Modern trends in taxonomy: Anatomy in relation to taxonomy, palynology, embryology, cytology, molecular taxonomy, chemotaxonomy, serotaxonomy, numerical taxonomy. Computerized systematics- use of computers in taxonomy (numeric and word processing), converting data-card systems, paper tape system, scanning & sensing system, online system. Documented characters of plants in computers.

**UNIT – IV** Study of the following families of flowering plants with reference to their vegetative, floral characters & economic importance:  
Polypetalae:- Nymphaeaceae, Menispermaceae, Portulacaceae, Rosaceae, Vitaceae, Meliaceae, Myrtaceae, Sapindaceae.  
Gamopetalae:- Sapotaceae, Apocynaceae, Boraginaceae, Convolvulaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Verbenaceae.

**UNIT – V** Monochlamydeae:- Nyctaginaceae, Chenopodiaceae, Aristolochiaceae, Piperaceae, Loranthaceae, Amaranthaceae.  
Monocotyledons:- Amaryllidaceae, Hydrocharitaceae, Typhaceae, Palmae, Cyperaceae.



## **References:**

### **Text Books**

1. Rendle, A. B. 1979. Classification of flowering plants (Vol I & II). Vikas Publishing House Pvt Ltd, Ghaziabad.
2. Lawrence, G. H. M. 1967. Taxonomy of vascular plants. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
3. Plant Taxonomy . O.P.Sharma .2<sup>nd</sup> edition. Tata Mc Graw Hill Education Private Limited. New Delhi.
4. Taxonomy of Angiosperms. S.N. Pandey & S.P. Misra. Ane Books India, New Delhi, Chennai, Mumbai.

### **Reference Books**

1. Henry and Chandrabose. 1980. Botanical nomenclature. Today and Tomorrow printers and Publishers, New Delhi.
2. Heywood, V. H. 1968. Modern methods in plant taxonomy. Academic press, London.
3. Davis, P. H. and Heywood, V. H. 1973. Principles of angiosperm taxonomy. Robert E. Erieger Publishing Company, New York.
4. Heywood, V. K. and Moore, D. M. 1984. Current concepts in plant taxonomy. Academic Press, London.
5. Grant, W. F. 1984. Plant biosystematics. Academic Press, London.
6. Jeffrey, C. 1989. Botanical nomenclature. Edward Arnold, London.
7. Jeffrey, C. 1982. Introduction to plant taxonomy. Cambridge University Press, London.
8. Nashiq, A. R. 1993. An introduction to botanical nomenclature. Scientific Publishers. Jodhpur.
9. Clive A. Stace. 1980. Biosystematics. Edward Arnold. A division of Hodder and Stoughton, London Melbourne, Auckland.

**(For candidates admitted from 2017 onwards)**  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER III MC 11- RESEARCH METHODOLOGY**

**Hours 6**

**Code: P15BO3MCT11**

**Credits 6**

**Marks :100**

**UNIT - I** Construction, working principles of Bright Field, Phase Contrast, Fluorescent, Electron (TEM, SEM & STEM) and Confocal microscopy. Micrometry. Histochemistry of starch, total proteins, lipids, DNA & RNA.

**UNIT - II** Preparation of material for light & electron microscopy. Killing and Fixing. Types of fixatives for light microscopy. Processing of materials (dehydration, clearing, infiltration & embedding) . Principles of staining, double staining and mounting of materials for hand sections. Microtomy, types (Rotary & Ultra microtome) and their applications. Preparation of material for TEM & SEM.

**UNIT - III** Principle, components and applications of pH meters and preparation of buffers. Colorimeter & Spectrophotometer – principle, laws of absorption of light- uses. Principles of biophysical methods used for the analysis of biopolymer structure- X ray, ORD (optical rotary dispersion) / CD (Circular dichroism), NMR (nuclear magnetic resonance) & ESR (electron spin resonance) spectroscopy. Centrifugation-Principle and types.

**UNIT- IV** Principles and uses of Chromatography with reference to Ion exchange, Gas & High Performance Liquid Chromatography. Principles & uses of Atomic Absorption

Spectroscopy. Electrophoresis – principles, types – paper & gel electrophoresis (SDS- PAGE, 2DPAGE), operation and their applications. Radio isotopes— nature of radioactivity- type of radiations. Tracer technique, detection and measurement of radio activity using GM counters & Scintillation counters. Autoradiography & its applications in biology.

**UNIT - V** Research manuscript writing- problem selection- preliminary survey of literature for the topic selected—project design- experimental plan for given duration. Collection & processing of data. Presentation of data in suitable form (tables- graphs- bar diagram, line diagram & histogram & Photographs). Writing of the project report—organization of the report – title selection - abstract – interpretation results - literature citation – conclusion. Typing of the reports – proof reading and editing.

**References**

### **Text books**

1. Avinash Updhayay, Kakoli Updhayay and Nirmalendu Nath. 1998. Biophysical chemistry – Principles and techniques. Himalaya Publishing House, Mumbai.

### **Reference Books**

1. Van Norman R.W. 1971. Experimental biology. IInd Edition, Prentice Hall, Inc., New Jersey.
2. Berlyn & Mische, 1976. Botanical microtechnique & cytochemistry. Iowa State University Press.
3. Gahan P.B. 1984. Plant histochemistry & cytochemistry – An introduction. Academic Press, London.
4. Wilson K. & Walker J. 1994. Practical biochemistry. 4<sup>th</sup> edition, Cambridge University, London.
5. Krishnamurthy, K.V. 1988. Methods in Plant Histochemistry. Viswanathan Publishers, Madras.
6. Saravanavel P. 1985 Research report writing. Emerald Publishers, Madras.
7. Shirish C. and Ashok T. 2009. An introduction to Research. Cambridge University Press, India Pvt. Ltd. New Delhi.
8. Judith B. 1993. How to complete your Research Project Successfully (A Guide for First- time Researchers). UBS Publishers' Distributors Ltd. New Delhi.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER III**

**MC-12 PRACTICAL 3 ANGIOSPERM SYSTEMATICS AND  
RESEARCH METHODOLOGY**

**Hours 6**

**Code: P15BO3MCP12**

**Credits 3**

**Marks:100**

**UNIT 1**

1. Preparation of dichotomous keys.
2. Exercise in the important articles of the code.
3. Submission of 10 herbarium specimens (local) Field trips to identify the specimens.

**UNIT 2**

Identification of local specimens

Study of the families and technical descriptions of plant specimens included in the syllabus

Such as

Polypetalae:- Nymphaeaceae, Menispermaceae, Portulacaceae, Rosaceae, Vitaceae, Meliaceae, Myrtaceae, Sapindaceae.

Gamopetalae:- Sapotaceae, Apocynaceae, Boraginaceae, Convolvulaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Verbenaceae.

**UNIT 3**

Identification of local specimens

Study of the families and technical descriptions of plant specimens included in the syllabus

Such as

Monochlamydeae:- Nyctaginaceae, Chenopodiaceae, Aristolochiaceae, Piperaceae, Loranthaceae, Amaranthaceae.

Monocotyledons:- Amaryllidaceae, Hydrocharitaceae, Typhaceae, Palmae, Cyperaceae.

**UNIT 4**

1. Preparation of whole mounts.
2. Preparation of permanent slide for hand sections using double stains.
3. Paraffin block preparation for microtomy.
4. Taking sections with rotary microtome & affixing ribbons.

**UNIT 5**

1. Histochemical tests for polysaccharides, protein, lipids & minerals.

2. Preparation of buffers & pH measurement.
3. Preparation of standard graphs.
4. PAGE – SDS for proteins (demonstration).

**(For candidates admitted from 2017 onwards)**  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER III ME 1- RECOMBINANT DNA TECHNOLOGY**

**Hours 6**

**Code: P15BO3MET01**

**Credits 5**

**Marks:100**

**UNIT - I** Introduction, history, scope and principles of genetic engineering. Molecular tools for genetic engineering: restriction nucleases, DNA ligases, linkers and adaptors, reverse transcriptase, alkaline phosphatases and DNA polymerase. Cloning vectors: plasmids (natural – Ti & Ri plasmids and constructed plasmids – pUC) characteristics, nomenclature and uses. Phage vectors (phage  $\lambda$  and M13 vectors), cosmid and phagemid vectors, Pi vectors, shuttle vectors and yeast vectors. Construction of rDNA and applications of rDNA technology.

**UNIT - II** Techniques in genetic engineering : Agarose gel electrophoresis, PFGE and PAGE and its uses. Isolation and purification of DNA (cellular and plasmid DNA). Blotting techniques – Southern, Northern, Western, colony and plaque hybridization. DNA sequencing - Maxam & Gilbert, Sanger's and automated gene sequencing methods. DNA chips (micro arrays) and chemical synthesis of DNA.

**UNIT - III** DNA amplification: PCR – principle, types, techniques and its application. RFLP and RAPD. Cloning in prokaryotes and in higher organisms through Agrobacterium mediated gene transfer. Screening strategies: screening by DNA hybridization, DNA probes, immunological and protein assay. Gene libraries: construction and screening of genomic libraries, cDNA libraries and chromosome jumping libraries.

**UNIT - IV** Pharmaceutical products of DNA: Production of recombinant insulin and human growth hormones. Recombinant vaccines and DNA vaccines (Herpes simplex virus, BCG and meningitis). Hybridoma technology: principles, productions, advantages and applications of monoclonal antibodies. Gene therapy methods & applications. Antisense RNA technology: principles, methods and applications.

**UNIT - V** DNA in disease diagnosis and medical forensics : Methods of DNA assay and its diagnosis in infectious diseases (Tuberculosis, AIDs and malaria), genetic diseases (cancer, diabetes and obesity). DNA finger printing: techniques and its applications. Human Genome project: approach, mile stones, achievements, applications and ethical issues.

## **References**

### **Text books**

1. Gupta, P. K. 1999. Elements of Biotechnology – First Edition. Rastogi Publication, Meerut.
2. Dubey, R. C. 2001. A Text Book of Biotechnology. S. Chand and Co, New Delhi.
3. Satyanarayana U. 2015. Biotechnology. Books and Allied (P) Ltd. Kolkata.

### **Reference Books**

1. Old, R. N. and Primrose, S. B. 1994. Principle of gene manipulation. Blackwell Scientific Publications.
4. Joshi, P. 2001. Genetic Engineering and its application. Student Edition, Jodhpur.
5. Ignacimuthu, S. 1996. Applied Plant Biotechnology. Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.
6. Kumar, H. D. 1993. Molecular Biology and Biotechnology. Vikas Publishing House Pvt. Ltd, New Delhi.
7. John E. Smith. 1996. Biotechnology. Cambridge University Press, United Kingdom.
8. Sandhya Mitra. 1996. Genetic Engineering. MacMillan India Ltd., New Delhi.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2.**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT**  
**BIOTECHNOLOGY**

**SEMESTER- II**

**MAIN ELECTIVE- 1 NANOTECHNOLOGY**

**Hours 6**

**Credits 5**

**Code:P15BO3MET04**

**Marks: 100**

**UNIT I** Introduction- Interaction between Biomolecules and Nanoparticle Surfaces. Different types of Inorganic materials used for the synthesis of Hybrid Nano- Bio Assemblies.

Applications of Nano in Biology, Nanoprobes for Analytical Applications- A new methodology in medical diagnosis and biotechnology- Current status of Nanobiotechnology.

**UNIT II** Functional materials in food nanotechnology- Potential Food Applications, Nanodispersions and Nanocapsules, Association Colloids, Nano-emulsions, Nanostructured multiple emulsions, Nanostructured multilayer emulsions, Biopolymeric Nanoparticles, Nanolaminates, Nanocomposites, Polysaccharide/ clay Nanocomposites, Nanofibres, Nanotubes, Food Product Innovation.

**UNIT III** Approach to developing Nanomedicines, various kinds of nanosystems in use, Protocol for Nanodrug administration, Nanotechnology in diagnostic applications, Materials for use in Diagnostic and Therapeutic Applications, Biomaterials and Nanotechnology for tissue engineering.

**UNIT IV** Molecular Nanomachines- Introduction, Covalent and Non-covalent Approach, Molecular Motors and Machines, Molecular Devices- Single molecular devices- Switches- Supramolecular systems, Molecular ratchet, Molecular shuttles.

**UNIT V** Core Shell Nanoparticles- Introduction, Types of systems- Metal-Metal oxide core shell nanoparticles, Bimetallic core shell nanoparticles, Semiconductor core shell nanoparticles, polymer coated core shell nanoparticles- Characterization- Applications.

**Reference books:**

1. Nanotechnology-Basic Science and Emerging Technologies Mick Wilson, Kamali Kannangra Geoff Smith, Michelle Simons and Burkhard Raguse, Overseas Press.
2. Nanotechnology-A Gentle Introduction to the Next Big Idea Mark Ratner and Daniel Ratner, Prentice Hall
3. Nanotechnology Rebecca L Johnson, Lerner Publications.
4. Introduction to Nanotechnology Charles P. Poole Jr., Chapman and Hall/CR



(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI –2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER III NME 2 - MAN AND MICROBES**

**Hours 5**

**Code: P15BO3NMT02**

**Credits 3**

**Marks:100**

Microbiology, a branch of biological science that deals with the study of microorganisms. Microbes are of immense use to man. They impinge on nearly every aspect of human existence with beneficial or detrimental effects. It is important that students realize that all life on this planet ultimately depends on the activities of microorganisms.

**UNIT – I** Microbiology – definition. Scope and History (Anton van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch and Alexander Fleming). Types of microorganisms. Role of microbes in food processing – milk and milk products (curd, butter & cheese), idli, bread & pickle. Food spoilage - food poisoning. Food preservation methods – physical (temperature & radiation) chemical (Potassium meta bisulphate, Sodium benzoate).

**UNIT II** Role of microbes in agriculture: Enrichment of soil fertility through microorganisms – use of biofertilizers - algal (BGA) bacterial (*Azospirillum*), Fungal- (*Mycorrhiza*). Use of biopesticides in the control of microbial plant diseases (*Trichoderma* - Sheath blight of paddy, *Pseudomonas* – Citrus canker).

**UNIT III** Role of microbes in environment: Treatment and recycling of liquid and solid waste. Production of organic compost and its uses. Biogas production. Use of microbes in septic tank. Microbial biodecomposition of cellulose (coconut fibre & paddy straw), visit to sewage treatment plant.

**UNIT IV** Role of microbes in industry: Bioreactors, stock cultures of microorganisms, types of media for large scale production of ethanol, vinegar (acetic acid), antibiotic (penicillin) and vaccines. Microbes in biofuel generation (methane).

**UNIT V** Role of microbes in human health. Microflora of intestine and stomach-Beneficialprobiotics (*Lactobacillus&Saccharomyces*), Harmful (*E.coli&Proteus*). Role of microbes in disease development – causes, symptoms and control measures of typhoid, tuberculosis, measles, jaundice, amoebiosis, malaria, AIDS, Avian flu & SARS.

**References:**

1. Michel J. Pelczar, Chan, E. C. S. and Noel R. Krieg. 1993. Microbiology concepts & applications. Mc Graw- Hill, Inc, New York.
2. Rangaswami, G. and Bagyaraj, D. J. 1993. Agricultural Microbiology. Prentice – Hall of India private Ltd, New Delhi.
3. Power, C. B. and Dagainawala, H. F. 1993. General Microbiology Vol I & II. Himalaya Publishing House, New Delhi.
4. Tauro, P., Kapoor, K. K. and Yadav, K. S. 1997. An introduction to microbiology. Wiley Eastern Company Ltd., New Delhi.
5. Ronald M. Atlas & Richard Bartha. 1981. Microbiology - Fundamentals and applications – Addison & Wiley Publication, London.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER IV MC 13- PLANT PHYSIOLOGY, BIOCHEMISTRY AND**  
**BIOPHYSICS**

**Hours 7**

**Code: P15BO4MCT13**

**Credits 6**

**Marks:100**

**UNIT – I Plant physiology:** Water relation: Chemical potential, water potential and osmotic potential. Soil Plant Atmosphere Continuum (SPAC). Uptake, transport & translocation of water & minerals. Chelating agents. Importance of foliar nutrition. Photosynthesis: Electron flow through cyclic & non-cyclic photophosphorylation, C<sub>3</sub> & C<sub>4</sub> cycles, types of C<sub>4</sub> cycle. Difference between C<sub>3</sub> and C<sub>4</sub> cycles. CAM pathway & its adaptive advantages. Respiration: Glycolysis & Krebs's cycle. Plant mitochondrial electron transport & ATP synthesis. Photorespiratory pathway and intermediary metabolism.

**UNIT – II** Nitrogen cycle, Molecular mechanism of biological nitrogen fixation, assimilation of nitrates: reduction phase, NR, NIR. Synthesis of amino acids: Incorporation phase, GS – GOGAT system. Phytochrome and its role in flowering. Stress physiology – response of plants to biotic (pathogen & insects) & abiotic (water, temperature & salt) stresses; mechanism of resistance to biotic stress & tolerance to abiotic stress.

**UNIT – III Biochemistry:** Chemistry of biological molecules - Carbohydrates – Classification, Structure and Properties of monosaccharides, di, oligo and polysaccharides (starch, cellulose, hemicellulose and pectin). Lipids : Biosynthesis of lipids. Alpha and Beta oxidations. classification, occurrence, properties, structure of lipids & importance. Acyl lipids and phospholipids. Occurrence and properties of secondary metabolites, such as alkaloids, flavonoids, lignins, porphyrins, terpenes, suberins and vitamins.

**UNIT – IV** Amino acids: Classification and general properties- Optical activity, stereoisomers and amphoteric properties. Non – protein aminoacids and their functions. Proteins: Classification, structure and biological importance. Enzymes: Classification, enzyme as biocatalyst, mode of action, enzyme specificity, and active centers. Isozymes & ribozymes– occurrence & functions. Enzyme Kinetics - Effects of temperature, pH, inhibitors, end products, concentration of enzyme on reaction rate, concentration of substrate on enzyme action. Michaelis – Menton constant, V<sub>max</sub>, significance of K<sub>m</sub>, Line – Weaver Burk plot. Allosteric enzymes or feedback inhibition.

**UNIT –V Biophysics:** Photobiology- dual nature of light, Electromagnetic spectrum, absorption spectrum and photosynthesis. Energy states - singlet and

triplet states-excitation and de-excitation and light emissions (Fluorescence, Phosphorescence and Bioluminescence), Laws of Thermodynamics (First and Second) - Entropy in Biological systems, Redox potential- Redox couples - ATP as high-energy compound.

## **References:**

### **Physiology**

#### **Text Books**

1. Devlin, R. M., Witham, F. H. 1986. Plant Physiology. CBS publishers and Distributors, New Delhi.
2. Salisbury, C. B. and Ross, C. W. 1986. Plant Physiology. CBS Publishers and Distributors, New Delhi.

#### **Reference Books**

1. William G. Hopkins. 1995. Introduction to Plant Physiology – Second Edition. John Wiley and Sons, Inc. New York.
2. Noggle, G. R. and Fritz, G. J. 1992. Introductory Plant Physiology. Prentice – Hall of India Private Limited, New Delhi

### **Biochemistry & Biophysics**

#### **Text Books**

1. Murray, R. K., Granner, D. K., Mayes, P. A. and Rod Well, V. W. 1993. Harper's Biochemistry. Prentice – Hall of International limited, London.
2. Eric E. Cohn and Stumpf. 1976. Outlines of Biochemistry. Wiley eastern limited, New Delhi.
3. Satyanarayana, U. 2003. Biochemistry. Books and Allied (P) Ltd., Kolkatta.
4. Salil Bose., 1981, Elementary Biophysics, Vijaya Printers, Madurai.

#### **Reference Books**

1. Plummer, D. T. 1982. An introduction to Practical biochemistry. Tata Mc Graw – Hill publishing company, Ltd, New Delhi.
2. Voet, D. and Voet, J. G. 1990. Biochemistry. John Wiley and sons, Inc, New York.

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2 M.Sc.**  
**BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER IV**  
**MC 14 PRACTICAL 4 PLANT PHYSIOLOGY, BIOCHEMISTRY AND**  
**BIOPHYSICS**

**Hours 4**

**Code: P15BO4MCP14**

**Credits 3**

**Marks:100**

**Unit 1**

**Plant Physiology:**

1. Determination of water potential
2. Measurement of osmotic potential and plasmolysis.
3. Sensitivities of membrane to external factors - chemicals, pH and temperature.

**Unit 2**

1. Separation of chloroplast pigments by column chromatography and study of absorption Spectrum.
2. Hill reaction of isolated chloroplast.
3. Effect of GA<sub>3</sub> on Amylase activity.
4. Measurement of Nitrate reductase activity.

**Unit 3**

**Plant Biochemistry** Extraction and estimation of the following: Reducing sugars, Proteins, Ascorbic acid (titrimetric).

Estimation of the following enzymes- catalase, peroxidase, & amylase.

Estimation of secondary metabolites - Phenols.

**Unit 4**

Demostration

1. Saponification value of vegetable oils.
2. Separation of lipids by TLC.
3. Separation of amino acids by paper chromatography.
4. Calculation of V max of enzyme.
5. Estimation of proline

**Unit 5**

**Biophysics**

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**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER IV ME 2- BIOMETRICS AND BIOINFORMATICS**

**Hours 6**

**Code: P15BO4MET02**

**Credits 5**

**Marks: 100**

**BIOMETRICS**

**UNIT - I** Introduction – Definition & applications of statistics. Collection and presentation of data. Population and sample. Methods of sampling, advantages & disadvantages of sampling, random & non – random sampling. Measures of central location : mean, median & mode. Measures of variability : Range, mean deviation, variance, standard deviation & coefficient of variation.

**UNIT - II** Skewness & Kurtosis. Probability – Basic concepts. Measure of probability: addition, multiplication & conditional probabilities. Theoretical distribution: Binomial, Poisson & normal distributions. Correlation : Types, methods of studying correlation, rank correlation. Regression : Types of regression, methods of studying regression.

**UNIT - III** Test of significance : Null hypothesis, standard error, large samples & small samples. Tests of significance of large samples, tests of significance of small samples (t-test), chi – square test. Analysis of variance : One way and two way analysis. Designs of experiments : CRD, RBD & LSD.

**BIOINFORMATICS**

**UNIT - IV** Bioinformatics – introduction – need of computer in Biological research. Internet – a virtual library. Searching biological informations using internet.

Biological data base – generalized and specialized data base. Premier institutions maintaining data base - EMBL, NCBI, DDBJ.

**UNIT - V** Pairwise Alignment- dot matrix and BLOSUM matrix. Database Similarity search- FASTA, BLAST. Multiple sequence analysis –Logic behind MSA, softwares available and its applications. Phylogenetic analysis- construction of phylogentic tree. Gene prediction. Protein structure prediction (secondary and tertiary) and molecular visualization of proteins.

## **References:**

### **Biostatistics**

#### **Text books**

1. Palanichamy, S. and Manoharan, M. 1990. Statistical methods for Biologists. Palani Paramount, Palani.
2. Ramakrishnan, P. 2003. Biostatistics. Saras Publications, Nagercoil.

### **Reference Books**

1. Satguru Prasad. 1992. Fundamentals of Biostatistics. Emkay publications, New Delhi.
3. Khan, I. A. and Khanum, A. k. 1994. Fundamentals of BioStatistics. Ukaaz Publications, Andhra Pradesh.
4. Misra, B. N. and Misra, M. K. 1992. Introductory practical Biostatistics. Darbari Prakashan, Calcutta.
5. Mahajan, B. K. 1991. Methods in Biostatistics. Jaypee Brothers Medical Publishers (Pvt) Ltd, New Delhi.
6. Kenneth Mather. 1973. Statistical analysis in Biology. Chapman and Hall and Science Paperbacks.
7. Rangaswamy, R. 1995. Agricultural statistics. New age International Publishers Ltd. Wiley Eastern Ltd., New Delhi.
8. Gupta, B. N. 1989. An introduction to mathematical statistics. Sahityabavan, Agra.
9. Normal, T. J. and Bailey. 1965. Statistical methods in Biology. The English Language Book Society and the English Universities Press Ltd, Britain.

### **Bioinformatics**

#### **Text books**

5. Lohar, P.S. 2009. Bioinformatics. MJP Publishers, Chennai.
6. Mani. K. and Vijayraj. D., 2002. Bioinformatics to beginners, Kalaikathir pathippagam, Coimbatore

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER IV ME 2- GENOMICS AND PROTEOMICS**  
**Hours 6** **Code: P15 BO4MET05**  
**Credits 5** **Marks: 100**

## **GENOMICS**

**UNIT-I Introduction to Genomics:** Genome definition, Genomics and its diversifications, Structural organization of Prokaryotic and eukaryotic genomes; C value paradox, types and significance of repeats in the genome, Organelle genomes

**UNIT-II Sequencing techniques and Whole Genome Sequencing:** Conventional Sequencing techniques (Maxam Gilbert and Sanger Sequencing), Strategies for Whole Genome Sequencing – Hierarchical and Whole Genome Shotgun Sequencing, role of Genetic and Physical maps in Genome assembly, De novo and reference based assembly, Genome finishing – Gaps and their resolution, basic concepts of genome annotation – ORF, ab initio and homology based Gene prediction Second generation sequencing techniques – Pyrosequencing and Virtual terminator Sequencing.

**UNIT-III Assessing genomic variations:** Dominant and codominant markers, Homoplasmy concept, Identical by state Vs Identical by descent markers, Hybridization based marker system – RFLP, PCR based marker systems – RAPD, AFLP, CAPS, SCAR, SSRs, Microarray based SNP detection techniques, Applications of DNA markers

## **PROTEOMICS**

**UNIT-IV Proteomic technologies:** Transcriptomes and analysis; SAGE, Microarray technology; Analytical proteomics tools (1-D & 2-D gel electrophoresis); Mass spectrometry and analysis (ESI, MALDI and Hybrid), LC/MS-MS; Applications of mass spectrometry (PMF and PTMs)

**UNIT-V Interaction Proteomics:** Interactomes and Proteomic interactions (Y2H approaches, Co-IP); Proteome- wide interaction maps; Protein structure determinations and Structural proteomics tools (experimental and computational); Concepts of protein engineering.

**Reference Books:**



1. Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Campbell AM & Heyer LJ, Benjamin Cummings 2007; CSH Press, NY. ISBN-10: 8131715590
2. Introduction to Genomics. A.M Lesk, Oxford University press, 2007. ISBN-10: 0199557489
3. Genome III – T.A. Brown Garland Science Publ. June 08, 2006. ISBN-10: 0815341385
4. Introduction to Proteomics: Tools for the New Biology. Daniel C. Liebler, Humana Press Inc., 2002. ISBN-10: 0896039919
5. Bioinformatics and Functional Genomics – Jonathan Pevsner - 2nd edition, Wiley-Blackwell, 2009. ISBN-10: 0471210048

(For candidates admitted from 2017 onwards)  
**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER IV ME 3 - CLINICAL MICROBIOLOGY & BASICS OF**  
**IMMUNOLOGY**

**Hours 6**

**Code: P15BO4MET03**

**Credits 5**

**Marks:100**

**UNIT – I:Interaction of microbes with human:** Normal flora of human body – symbiotic relationships – importance in overall health of human. Pathogenic flora: Nosocomial and community infection. Mechanism of pathogenesis – reservoirs, portals of entry and mode of transmission (direct – droplets ; indirect – food, water & air). Colonization & establishment. Microbial virulence – exotoxins (botulism), endotoxins (gram negative bacteria).

**UNIT - II : Laboratory safety:**safety in handling of infectious materials – blood collection, specimen handling and transport. Containment equipment – biological safety cabinet (HEPA). Devices for protection against infection – laboratory garments (Apron, clothes, masks, caps) – sterilization, disinfection antiseptics in clinical labs, hospitals and equipments. Infectious waste management in hospitals and laboratories and disposal of treated waste.

**UNIT – III: Techniques for diagnosis:**Common serological tests – agglutination, immunoprecipitation, viral neutralization, complement fixation, Immunofluorescence technique, radio immuno assay, ELISA test.

**UNIT – IV: Diseases of human organs:**Causative agent, symptoms, clinical diagnosis and control measures of the following: Skin – Varicella or chicken pox (Herpes virus), Cutaneous mycoses (Ringworm diseases). Eyes – conjunctivitis (Bacteria & Virus). Nervous system – bacterial meningitis (*Neisseria meningitidis*). Respiratory system – Diphtheria. Digestive system – Jaundice (Hepatitis virus) and amoebiasis. Urinogenital system – Gonorrhoea (*Neisseria gonorrhoeae*).

**UNIT –V: Basics of immunology:** Natural host resistance – types of immunity – innate & acquired. The immune system – lymphocytes (T & B cells). Role of lymphocytes in specific immunity. Antigen – Antibodies. Nature of antigens – epitopes – haptens – their functions. Nature of antibodies ( immunoglobulins)-types & properties. Cell mediated immunity – natural killer cells.

## **References:**

### **Text Books:**

1. R.C. Dubey and D.K.Maheswari. A text book of microbiology. S.Chand & Company Ltd., New Delhi
2. G.J. Tortora, B.R. Funke, C.L. Case. 1989. Microbiology – An introduction. The Benjamin/Cummings Publishing company, Inc.
3. Nandini Shetty. 2006. Immunology – Introductory text book, New Age International Publishers, New Delhi.

### **Reference Books:**

1. Michel J. Pelczar, Chan, E. C. S. and Noel R. Krieg. 1993. Microbiology concepts & applications. Mc Graw- Hill, Inc, New York.
2. Prescott, Harley and Klein. 1999. Microbiology. Irwin Mc Graw – Hill / Bos.
3. Nester, E. W., Roberts, C. E., Pearsall, N. N. & Anderson. 1998. Microbiology – A Human Perspective. Irwin Mc Graw – Hill / Bos.
4. Albert and Balows, W.J.Hausler, JR. K.L.Herrmann, H.D. Isenberg, H.Geneshadomy. 1992. Manual of Clinical Microbiology. American society for Microbiology, Washington.
5. Sell, S. 1996. Basic immunology. North Holland, London.

(For candidates admitted from 2017 onwards)

**HOLY CROSS COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI-2.**  
**M.Sc. BOTANY WITH SPECIALISATION IN PLANT BIOTECHNOLOGY**  
**SEMESTER- PAPER -**  
**MAIN ELECTIVE- 3 PLANT DIASEASE AND PEST**  
**MANAGEMENT**

**Hours 6**  
**Credits 5**

**Code:P15BO4MET06**  
**Marks:100**

**UNIT-1** Plant diseases: Concept, importance and classification. Study of under mentioned diseases: Fungal diseases- Leaf spot of paddy & ergot of cholam. Bacterial diseases- Blight of paddy and Angular leaf spot of cotton. Mycoplasmal disease- Citrus Greening. Viral diseases- Cucumber mosaic and Bhendi yellow leaf banding.

**UNIT II** Host-Parasite Interactions:- Pathogenesis- Penetration and entry by plant pathogen- development inside the host tissue. Role of Enzymes and Toxins in disease development. Effect of infection on the physiology of the host- permeability changes in diseased plant. Photosynthesis and respiration under pathogenesis. Changes in nitrogen metabolism and phenol content in infected plants. Defence mechanisms in plants- Structural and biochemical defence mechanism.

**UNIT III** Plant disease management: Regulatory methods- Quarantines, Inspections. Cultural methods, physical and chemical methods. Biological control- Role of biotechnology in plant disease control (chitinase gene, Bt gene, Meri cloning, in vitro- thio-uracil inclusion in tissue culture media). IPM (Integrated Pest Management) IPM for rice, cotton, sugarcane, banana & ground nut.

**UNIT IV** Food grain situation and principles of grain storage. Insect pests of stored commodities- their ecology and infestation patterns. Damage and loses of stored commodities due to insect infestations. Detection and monitoring of insect infestation in stored products. Detection and estimation of contaminants in grains. Micro organisms and their role in commodity deterioration and their control.

**UNIT V** Principles of insect control- physical, mechanical, biological, biochemical and chemical methods. Fumigants, their properties and fumigations. Pesticides formulations, prophylaxis of bags, storage premises, application equipments. House hold insects and their control. Sanitation in food processing and handling units. Rodent test of food grain and their control. Birds and their control.

**Reference Books:**

1. Chiang, HC 1977. Pest management in the people's Republic of China monitoring and forecasting insect population in Rice, Wheat, Cotton, Maize, FAO Plant Protection Bulletin 25(1-8)
2. Agarwal, RA, Gupta, GP, Kishore, P and Chandra, D (Eds) 1983: Principles and concepts of Integrated Pest Management, Entomology Division, IARI, New Delhi 8
3. Atwal, A. S 1986: Agricultural Pests of India and South-East Asia. Kalyani Publishers, Ludhiana
4. Flint, ML and Bosch, R Vanden 1981: Introduction of Integrated Pest Management Plenum Press, London. S