Master of Science
in
Botany

Course Structure and Syllabus

For students admitted from academic year 2022-23 onwards

UNDER CHOICE BASED CREDIT SYSTEM (CBCS) & OUTCOME BASED EDUCATION (OBE)

(Regulations:R22)

Department of Biosciences & Biotechnology

Krishna University

Machilipatnam – 521004
Andhra Pradesh

➢ VISION

- ❖ To strive for all round development of students for attainment of scientific empowerment both in teaching and research and self-reliant as well.
- ❖ To establish multi-institutional, interdisciplinary and international collaborations in thrust areas of scientific research so as to acquire national and international recognition.
- ❖ To develop advanced characterization facilities for cutting edge research with a roadmap towards the establishment of Centre for plant tissue culture.
- ❖ To strive for transformation of laboratory research towards industrial scale so as to acquire industrial collaboration and funding as well**.**

➢ MISSION

- ❖ Dissemination of knowledge through research-based teaching and learning processes with a motive to inculcate strong research attitude in student community.
- ❖ Build good character and educate students so as to become enlightened individuals, improving the living standards of their families and society.

➢ PROGRAMME OBJECTIVES

- ❖ To develop the basic and applied concepts in core areas of Botany.
- ❖ To perform the experiments in order to inculcate the critical thinking with proper interpretation and analysis of results with logical thinking.
- ❖ To develop the critical analysis and problem-solving skills of students required in the application of principles of Botany.
- ❖ To undertake small academic and/or research projects in the area of interest and Preparation of document/present a technical report/ dissertation/document.
- ❖ To Prepare the students with a working knowledge of experimental techniques required to work independently.
- ❖ To strengthen student's capability in organizing and presenting the acquired knowledge both in oral and written discourse.

➢ PROGRAMME OUTCOMES

- ❖ To acquire knowledge and understanding of fundamental and applied concepts, principles and theories related to the identified subject areas.
- ❖ To plan, execute and analyze the experiments either individually or as a part of team.
- ❖ To develop skills to interpret and explain the limits of accuracy of experimental data in terms of significance and underlying theory**.**
- ❖ To demonstrate written and oral communication skills for dissemination of scientific results in report, article, or oral presentation formats, which helps to develop his/herprofessional development**.**

COURSE STRUCTURE AND REQUIREMENTS FOR M.Sc. BOTANY

(REGULATION: R22)

1	Title of the Program	M.Sc. BOTANY
2	Duration of the Program	2 years (Four Semesters)
3	Eligibility criteria for admission	The candidate seeking admission into M.Sc. Botany Program should have passed Bachelor's Degree Examination not less than three years duration in any discipline with Botany as one of the subjects or biological sciences with Botany at 10+2 level.
4	Level of the Program	Post Graduate.
5	Mode of Admission	The mode of admission is through APPGCET conducted by Andhra Pradesh State Council of HigherEducation or KRUCET conducted by Krishna University.
6	Objectives of the Program	The Objective of M.Sc. Botany Program is to impart knowledge in basic and applied concepts in core areasof Botany as well as recent advances in Botany, training in experimental skills with an aim to develop research in industry and academic orientation.
7	Program requirements	The Program shall include theory (core as well as non-core, open electives, specializations) papers, Laboratories, Tests, Seminars and Project Work.
8	Number of working days	In each semester at least ninety (90) working days must be dedicated for theory classes, practical classes, seminars and project work.

KRISHNA UNIVERSITY: :MACHILIPATNAM

PROPOSED COURSE STRUCTURE FOR M.Sc. BOTANY

UNDER CHOICE BASED CREDIT SYSTEM (CBCS) & OUTCOME BASED EDUCATION (OBE)

W.E.F 2022-23 (R22 Regulations)

I SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE /IDC/ DSE/ SEC/ OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture (L)	Practical (P)	Tutorial (T)				
22BOT101	Cell Biology	4	0	0	Core	30	70	4
22BOT102	Genetics	4	0	0	Core	30	70	4
22BOT103	Biomolecules	4	0	0	Core	30	70	4
22BOT104	Biodiversity of non-flowering plants	4	0	0	Core	30	70	4
22 BOT 105 Compulsory	Personality Development through Life Enlightenment Skills	3	1	0	Core	30	70	3
22BOTL101	Cell Biology & Genetics	0	6	0	Core	30	70	3
22BOTL102	Biomolecules and Biodiversity of non-flowering plants	0	6	0	Core	30	70	3
TOTAL FOR FIRST SEMESTER						**210**	**490**	**25**

II SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE /IDC/ DSE/ SEC/ OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture (L)	Practical (P)	Tutorial (T)				
22BOT201	Bioanalytical techniques	4	0	0	Core	30	70	4
22BOT202	Plant Ecology	4	0	0	Core	30	70	4
22BOT203	Biosystematics of Angiosperms	4	0	0	Core	30	70	4
22BOT204 Compulsory	Research Methodology& IPR	3	1	0	SEC	30	70	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22BOTDSE201	Plant Molecular Biology	4	0	0	DSE	30	70	4
22BOTDSE202	Horticulture	4	0	0	DSE	30	70	4
22BOTDSE203	Marine Botany	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22BOTL201	Bioanalytical techniques & Plant Ecology	0	6	0	Core	30	70	3
22BOTL202	Biosystematics of Angiosperms and plant molecular biology	0	6	0	Core	30	70	3
TOTAL FOR SECOND SEMESTER						**210**	**490**	**25**

At the end of 2nd semester, every student must undergo summer Internship/ Apprenticeship/Project work/Industrial training/research-based Project work for Six weeks and must prepare a report concerned as per approved project guidelines and submit the same to the University 14 days before the commencement of third semester end examinations.

III SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/ DSE/SEC/ OEC/MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture (L)	Practical (P)	Tutorial (T)				
22BOT301	Plant Reproduction	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
22BOTDSE301	Plant Physiology	4	0	0	DSE	30	70	4
22BOTDSE302	Plant Genetic Engineering	4	0	0	DSE	30	70	4
22BOTDSE303	Plant tissue culture	4	0	0	DSE	30	70	4
22BOTDSE304	Cytogenetics	4	0	0	DSE	30	70	4
22BOTDSE305	Ethnobotany	4	0	0	DSE	30	70	4
22BOTDSE306	Paleobotany	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22BOTLAB301	Plant Reproduction & Plant Physiology	0	6	0	Core	30	70	3
22BOTLAB302	Plant Genetic Engineering & Plant tissue culture	0	6	0	Core	30	70	3
OPEN ELECTIVE (INTERDISCIPLINARY/MULTIDISCIPLINARY) COURSES (CHOOSE ANY ONE)								
22BOTOEC301		3	0	0	OEC	30	70	3
22BOTOEC302		3	0	0	OEC	30	70	3
22BOTOEC303		3	0	0	OEC	30	70	3
TOTAL FOR III SEMESTER						**210**	**490**	**25**

IV SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture (L)	Practical (P)	Tutorial (T)				
22BOT401	Plant Breeding	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
22BOTDSE401	Plant resources and Utilization	4	0	0	DSE	30	70	4
22BOTDSE402	Sustainable agriculture	4	0	0	DSE	30	70	4
22BOTDSE403	Plant Biochemistry	4	0	0	DSE	30	70	4
22BOTDSE404	Plant Pathology	4	0	0	DSE	30	70	4
22BOTDSE405	Bio membranes &Bioenergetics	4	0	0	DSE	30	70	4
22BOTDSE406	Pharmacognosy	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22BOTL401	Plant Breeding	0	6	0	Core	30	70	3
ENTREPRENURAL & INNOVATION/IT SKILL RELATED TO DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22BOTSEC401	Mushroom cultivation	3	0	0	SEC	30	70	3
22BOTSEC402	Olericulture	3	0	0	SEC	30	70	3
22BOTSEC403	Seed technology	3	0	0	SEC	30	70	3
*** CHOOSE MOOCs FROM SWAYAM/NPTEL SOURCES**								
22 BOT MOOCS 401								4
							100	4
						180	**520**	**30**

Open electives offered by Biosciences & Biotechnology to the other departments

22BITOEC301	Entrepreneurship in Biotechnology
22BITOEC302	Gender based Health & Education
22BITOEC303	Food & Nutrition

L – Lecture, T- Tutorial & P – Practicals

Note: Students may be allowed to register and appear for MOOCS from the third semester itself. However, students are to complete the MOOCS successfully and submit pass certificate of the same to the University through the Principal of the College concerned for approval and endorsement of the same on grade cards and PCs and ODs as per the regulations of the University.

22 BOT P401: PROJECT WORK EVALUATION AND VIVA-VOCE

A). Research activity: A short research activity on any significant or interesting aspects of the works (preferably relevant to the students' field of study/specialization) has to be performed or observed by a student in the organization. As part of curriculum students are required to write a short report generally named as a Research activity under the guidance of supervisor.

B). Purpose of Research activity: The basic purpose of writing a Research activity is to allow students to explore the breadth of research that is performed within the organization. For students, this breadth of exposure to outside research may prove fruitful as a platform for their own research at some later point (can be extended to as a thesis topic for Ph.D. degree) and also for career connections/employment opportunities prior to post graduation through demonstrating their competences in research techniques. It is up to the student to choose/select the title/topic for Research activity from any interesting aspects of their duties they are involved. However, the supervisor may also assist the student in selecting the Research Activity Report title that can satisfy him/her expectation as well as it is related to the student's fields of study. It is expected that the supervisor stays in regular contact with the student for monitoring and checking the smooth progress of the research activity and assuring and contributing to the assessment. Supervisor is expected to provide feedback on student performance to the HoD.

c) Project Evaluation:

Out of a total of 100 marks, 20 marks for Pre- Project Review, 50 marks shall be for Project report/dissertation/record and 30 marks for the End Semester Examination (Viva-voce). The Viva- Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an Examiner nominated by the University.

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, I SEMESTER

Course Name	CELL BIOLOGY	L	T	P	C	IM	EM	TM
Course Code	22BOT101	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose:**

The focus of Cell Biology is the study of the structure and function of the cell. In this course we will focus on Eukaryotic cell biology and will cover topics such as membrane structure and composition, transport, and trafficking; the cytoskeleton and cell movement; the breakdown of macromolecules and generation of energy; and the integration of cells into tissues. We will also cover important cellular processes such as cell cycle regulation, signal transduction, apoptosis (programmed cell death), and cancer cell biology.

❖ **Course Learning Objective(s):**

- To make the learners understand the functional aspects of the cell at molecular level.
- To focus on the up-coming molecular mechanisms involving the membrane organization and signal transduction.
- To understand the inheritance pattern at molecular level.

❖ **Course Learning Outcome(s):**

- Students will be able to explain the basic concepts of cell biology.
- Students will learn a variety of skills necessary to function as a biologist in the workplace oras a candidate for an advanced degree.

❖ **Course Content**

UNIT – I: Structure and Functions of Cells

Discovery of the cell and the cell theory, exceptions to the cell theory. Cell shape, cell size and cell number. Prokaryotic *vs* eukaryotic cells. Cell motility in prokaryotes and eukaryotes by cilia and flagella. Chemotaxis and Quorum sensing. Cytoskeleton: microtubules, actin filaments and intermediate filaments.

UNIT – II: Structure and Function of Major Cellular Organelles

Structure and function of cell wall, plasma membrane, endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes, mitochondria and chloroplast. Structure and role of ribosomes.

UNIT – III: Nucleus and Chromatin

Structure and function of nuclear membrane. Organization of nuclear material in prokaryotes and eukaryotes. Eukaryotic chromosome – Histone proteins and nucleosomes. Organization of metaphase chromosome in eukaryotes. Chromosome banding pattern, polytene and lamp brush chromosomes. Organization of nucleolus.

UNIT – IV: Cell cycle, apoptosis and cancer

Phases of cell cycle- Regulation of cell cycle: Discovery of MPF, cyclins and cyclin dependent kinases, Check points- role of Rb and p53, Cell division by mitosis and meiosis.

Apoptosis- Neurotrophic factors, caspases, Pathways of apoptosis. Cancer- Types and stages of cancer, characteristics of cancer cell, carcinogenesis, carcinogens, oncogenes, Tumor suppressor genes and protooncogenes, Molecular basis of cancer, cell senescence.

UNIT – V: Cell –Cell Interactions and Signaling

Cell to cell interaction – Microvilli, tight junctions, gap junctions, desmosomes. Cell adhesion and cell signaling (autocrine, paracrine, synaptic and endocrine). Second messengers – Types and mechanism of action.

Text books:

1. Verma P.S and Agarwal V.K. 2006. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd
2. Lewin B. 2008. Genes IX. Jones and Bartlett publishers
3. Satyanarayana U. 2007. Biotechnology. Books and allied (P) Ltd
4. Darnell J, Lodish H and Baltimore D 1986. Molecular Cell Biology. Scientific American Books.
5. Watson JD, Hopkins NH, Roberts JW et al.1987. Molecular Biology of the Gene (4th ed.) The Benjamin/Cummings Publishing Company, Inc.
6. Albert's B, Bray D, Lewis J et al. 1989. Molecular Biology of the Cell. Garland publishing Inc.
7. Pasupuleti M. 2006. Molecular Biotechnology. MJP Publishers.
8. Hartl DL and Jones EW. 2000. Genetics – Analysis of Genes and Genomes (5th Ed.) Jonesdand Barlett Publishers.
9. Tamarin RH. 1999. Principles of Genetics (6th Ed.) WCB McGraw-Hill.
10. Karp G. 1998. Cell and Molecular Biology (2nd Ed.) John Wiley and Sons, Inc.
11. Lodish H, Berk A, Matsudaira P et al 2004. Molecular Cell Biology (5th ed.) W.H. Freemanand Company, New York.
12. Becker MW, Kleinsmith LJ and Hardin J. 2007. The world of the Cell (6th Ed.) Tata McGrawHill Publications.
13. Raven PH, Johnson GB, Losos JB and Singer SR.2006. Biology (7th Ed.) Tata McGraw Hill Publications.
14. Smith & Wood, Cell Biology, 2nd Edition, Chapman & Hall, London, 1996.

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DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY

M.Sc. – BOTANY, I SEMESTER

Course Name	GENETICS	L	T	P	C	IM	EM	TM
Course Code	22BOT102	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose:** This course provides an introductory overview of major and timely topics in genetics. The objective is to provide students with a broadly-based and fundamental understanding of genetics, and to present selected challenges and issues that currently face the genetics research and communities. This course provides students with an understanding of the principles and concepts of genetics and introduces transmission, nature and action of genetic material in organisms

❖ **Course Learning Objectives:**

- Use the principles of chromosome transmission to predict patterns of inheritance.
- Evaluate scientific data using the rules of probability.
- Understand how the structure of DNA enables it to function as genetic material.
- Explain the relationship between genotype and phenotype.
- Understand the molecular basis of mutation, and its role in genetic variation.
- Explain how the genetic code enables protein synthesis to be directed by genetic information.
- Understand how genomes are replicated, repaired, organized and packaged.
- Describe the modes of gene regulation in prokaryotes and eukaryotes.
- Use a computer to search public databases and manage bibliographic information.

❖ **Course Learning outcomes:**

- By completing Genetics course, students are expected to have achieved the following skills and capabilities.
- Comprehensive, detailed understanding of the chemical basis of heredity.
- Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- Understanding of how genetic concepts affect broad societal issues including health and disease,food and natural resources, environmental sustainability, etc.
- Understanding the role of genetic mechanisms in evolution.
- The knowledge required to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.
- The ability to evaluate conclusions that are based on genetic data.

❖ **Course Content:**

UNIT – I: Mendelian Laws of Inheritance

Mendel's laws-Monohybrid and dihybrid cross. Test cross and back cross. Sex chromosomes and determination. Sex-linked inheritance. Linkage and crossing over. Interference. Recombination frequency. Numerical changes in chromosomes – euploidy, haploidy, and their fundamental and

practical significance. Polyploidy – induction. Aneuploidy – type and genetic significance. Population genetics – Hardy and Weinberg law.

UNIT – II: Nature of Genetic Material

Evidence to prove DNA and RNA as genetic material. Gene as a unit of expression. Colinearity of gene and polypeptide. Modern concept of gene. Fine structure analysis of rII locus of T4 bacteriophage – Establishment of recon, muton and cistron. Complementation test. Types of genes – Pseudogenes, House-keeping genes, homeotic genes and regulatory genes.

UNIT – III: Plasmids and Transposons

Plasmids: Types, copy number, replication, amplification and curing. Regulation of col E1 plasmid replication. Methods of plasmid transfer – Microinjection, electroporation, calcium chloride treatment, triparental mating.

Transposons: Types of bacterial transposons - insertional sequences, complex transposons. Retroposons. Transposons of eukaryotes – Copia, P3 and TY elements. Mechanism of transposition – Replicative and non-replicative.

UNIT – IV: Genetic Recombination in Bacteria

Genetic recombination in bacteria. Models of genetic recombination (Break-join, Copy-choice, Break-copy). Role of recA protein. Genetic transfers in bacteria. Discovery and mechanism of transformation. Discovery and mechanism of Transduction (generalized, specialized and abortive). Discovery of sex among bacteria. Genetic transfer by Conjugation (F^+ and F^-, F' and F^- (sexduction), and Hfr and F^-). Mapping of bacterial chromosome by genetic recombination, transformation, conjugation and transduction.

UNIT – V: Mutations and Mutagenesis

Mutations and mutagenesis: Types of mutations, Mutagenic agents, Molecular basis of mutations, Mechanism of Mutagenesis. Transposon mutagenesis, Site-directed mutagenesis and their applications. Evaluation of mutagens by Ames test and micro nuclei test. Thymine dimerization. Repair of T-dimers: Photo-reactivation, Excision repair, Post-replication, Recombination and SOS repair mechanisms. Heat-shock and adaptive responses, role of recA in DNA repair.

Text books:

1. Cell Biology : DeRobertis and DeRobertis
2. Molecular biology of cell: B.Alberts et al Cell
3. Molecular biology: G.Karp
4. Molecular Biology of the cell: J.D.Watson et al
5. Genes VII: B.Lewin
6. Lehninger's Principles of Biochemistry: Nelson and Cox.Biochemistry: L.Stryer
7. Biochemistry: Voet and Voet.

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DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY

M.Sc. – BOTANY, I SEMESTER

Course Name	BIOMOLECULES	L	T	P	C	IM	EM	TM
Course Code	22BOT 103	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

Course description & Purpose: In this course you will learn about molecules of life. Biomolecules are important for the functioning of living organisms. These are building blocks of livingorganisms, so the presence of appropriate concentration of biomolecules are important for structure andproper function of living cells. Macro biomolecules are built from small organic compounds the same way a railroad train is built. Bylinking a lot of smaller units together into long chain. The course encompasses the structure, monomer, examples, functions, bonds of biomolecules. The overall goal of this course is to give students knowledge of biomolecules.

❖**Course Learning Objectives:**

- To provide details about the importance of the Biomolecules present in our system and the regulation of metabolic pathways.
- To expose the students to the biochemical methods used to study the biomolecules.
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❖**Course Learning Outcomes:**

- Students will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure and functions of Biomolecules structures and the functions of biological/biochemical processes.
- They will gain proficiency in basic laboratory techniques in both chemistry and biology, and be able to apply the scientific method to the processes of experimentation and hypothesis testing.

UNIT – I : Carbohydrates

Definition and Classification of carbohydrates, reactions of monosaccharides, acid Derivatives of monosaccharides, Amino sugars, disaccharides, oligo saccharides, mucopolysaccharides, polysaccharides, starch, cellulose, lectins, glycoproteins.

UNIT – II: Amino acids

Classification, structure and physico-chemical properties of amino acids, stereoisomerism, chemical reactions of amino acids and chemical procedures affecting amino acid side chains.

Peptides: Structure and confirmation of peptide bond; Peptide synthesis - reactive ester method and modified merrifield solid phase peptide synthesis. Non-ribosomal peptide synthesis - glutathione cyclic antibiotics (gramicidin). Identification of peptide sequence- protease treatment, site directed mutagenesis.

UNIT – III: Proteins

Classification and biological functions of proteins (Eg: RuBisCo, LegHemoglobin). Structural organization of proteins – primary, secondary, tertiary and quaternary structure of proteins. Protein folding and significance. Ramachandran plot.

UNIT – IV: Fatty acids & Lipids

Classification, physical and chemical properties of fatty acids. Characterization of natural fats, oils. Structure and biological role of triacyl glycerol, phospholipids, sphingolipids, prostaglandins, thromboxanes, leukotrienes, and steroids. Lipids as signaling molecules. Porphyrins- Structure and functions of porphyrins, protoporphyrin, cytochrome, heme, chlorophyll.

UNIT-V: Nucleic acids

Structure of purines and pyrimidines, modified bases. Structure of DNA (Primary, Secondary and Tertiary). Structure of RNA- mRNA, tRNA, rRNA (Primary, Secondary and Tertiary) Physico-chemical properties of nucleic acids, denaturation, hyper chromic effect, Tm, kinetics of reassociation, cot values.

Text books:

1. Textbook of Biochemistry. West and Todd. 1968. MacMillan.
2. Principles of Biochemistry. A. L. Lehninger. 1993. Nelson and Cox. C. B.S., India.
3. Principles of Biochemistry General Aspects. Smith et al, 1983. McGraw hill
4. Biochemistry Donald Voet and Judith Voet. 2nd Edn.
5. Biochemistry. Jeremy M. Berg, John L. Tymcozko and Lubert Stryer 2002. 5th Edn. Freeman
6. Textbook of Biochemistry with Clinical Correlation. Thomas M. Devlin. 4th Edn
7. Biochemistry. Zubay
8. Nucleic acid Biochemistry and Molecular Biology by Main Waring et al, Blackwell.
9. Biochemistry, 2nd Edn. by Albert L. Lehninger. 1978. Kalyani Publishers, New Delhi
10. Biochemical calculations, Irwin H. Segel, John Wiley and sons Inc.
11. Biochemistry, Reginald A. Garret, Charles M. Grisham. 1995. National Academy ofSciences, USA. 2nd Edn.
12. Organic Chemistry, DJ. Cram and GS Hammon.
13. Biochemistry. Mathews
14. Biochemistry. B.D. Hames, N.M. Hooper
15. Practical Biochemistry. Wilson and Walker.

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M.Sc. – BOTANY, I SEMESTER

Course Name	BIODIVERSITY OF NON-FLOWERING PLANTS	L	T	P	C	IM	EM	TM
Course Code	22 BOT104	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose:**

This course provides the basic information on the diversity of non-flowering plants and basic knowledge about Bacteria, Algae Fungi, Bryophyta and Gymnosperms. This course spot lights on basics of Viruses; morphological features, classification and properties. This course also focuses on principles of Paleobotany including plant fossil preservation techniques.

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❖ **Course Learning Objectives:**

-The Course will help the students to
-Understand the groups of non-flowering plants.
-Acquire basic knowledge on basics of Viruses; morphological features, classification and properties.
-Attain knowledge on Population and community dynamics.
-Introduce the principles of Paleobotany including plant fossil preservation techniques.

❖ **Course Learning Outcomes:**

-Student will gain knowledge on the general characters of non-flowering plants.
-Student will be able to know the Acquire basic knowledge on basics of Viruses; morphological features, classification and properties.
-Attain knowledge on Population and community dynamics - Student will be able to know about the importance and need for management of biodiversity.
-Student will be able to understand the application of applied ecological concepts.

❖ **Course Content**

UNIT – I: Viruses: Nomenclature and classification of viruses. Viroids. Properties of viruses. Ultra structure of Tobacco mosaic Virus(TMV) and Bacteriophage. Variability in viruses. Satellite viruses and satellite RNA. Mycoviruses and baculoviruses.

Replication of Viruses. Classification of Plant Viruses and isolation and purification of plant viruses.

UNIT-II : Bacteria : General characteristics of Bacteria. Ultra structure of bacteria, Bacterial growth (Phasesof Growth). Recombination in bacteria (transformation, transduction and conjugation). Bergey's classification.

General characters of Actinomycetes, Mycoplasmas and Cyanobacteria. Economic importance of Bacteria.

UNIT-III : Algae: General characteristics of Algae. Salient features of Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Cyanophyta. Economic importance of Algae.

Fungi: General Characteristics of fungi. Classification of fungi (Ainshworth system), Ecto and Endo-mycorrhizal associations. Economic importance of fungi.

UNIT-IV: Bryophyta: General characteristics of Bryophytes. Distribution, habit, morphology, reproduction of following classes: Hepaticopsida (Riccia and Marchantia), Anthocerotopsida (Anthoceros), Bryopsida(Funaria and Polytrichum). Economic importance of Bryophytes.

Pteridophyta: Distinguishing features of Pteridophytes**.** Distribution, habit, morphology and reproduction of Lycopodium and Selaginella. General characteristics of ferns. Economic importance of Pteridophytes.

UNIT-V: Gymnosperms: General characteristic and classification of Gymnosperms. Cycadophyta and Coniferophyta. Economic importance of Gymnosperms.

Paleobotany: - Palaeobotanical records and plant fossils. Preservation of fossil plants. Exploration of fossil fuels. Birbal Sahni Institute of Paleosciences.

Text books :

1. Kumar, H.D. and H. N. Singh (1971) Textbook of Algae
2. Sharma, O.P. (1986) Textbook of Algae
3. Pandey, B. P. (1994) Textbook of Botany – Algae
4. Vashista, B. R. (1995) Botany for degree students-Algae
5. Gangulee, H.C. and A. K. Kar (1992) College Botany Vol. III
6. Desikachary, T.V. (1972) Taxonomy and Biology of Blue - green algae
7. Alexopoulos, C.J. and C. W. Mims (1979) : Introductory Mycology
8. Sharma, O.O. (1989) : Textbook of Fungi
9. Ainsworth, G. G. and A.S. Sussman : The Fungi Vols. I, II, III, IV- A and IV-B
10. Cavers, R. (1964) : Inter-relationship of Bryophytes
11. Kashyap, S. R. (1929) : Liverworts of Western Himalayas and the Punjab
12. Plains Part I and II
13. Parihar, N. S. (1959) : An introduction to Embryophyta. Bol. I –
14. Trivedi, A. N. (2002) - Advances in Pteridology
15. Bierhorst, D.W.(1971) - Morphology of Vascular plants
14. Eames, A. J. and E. M. Giffard (1950) - Comparative morphology of vascular plants
15. Rashid, A. (1978) - An introduction otPeridophytes
16. Spome, K.R. (1966) - Morphology of Ptseridophytes
17. Bower, F. O. (1963) - The Ferns
18. Jermy, A. G. (1973) - The Phylogeny and Classification of ferns.
19. Vashishta, B.R. (1996) - Botany for degree students – Pteridophytes.
20. Spome, K.R. (1967) - Morphology of Gymosperms
21. Vashistha, P.C. (1976) - The Gymnosperms
22. Bhatnagar, S.P. and Moitra Alok (1996)- The Gymnosperms

KRISHNA UNIVERSITY: : MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, I SEMESTER

Course Name	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C	IM	EM	TM
Course Code	22 BOT105	3	0	1	3	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description:**

Personality development is the development of your behavior patterns and attitude. It is the result of where we are born, the circle we interact with and our personal temperament. Every person is different. There are some characteristics traits that make you „you". Personality development through life enlightenment course aims to help students identify negative behaviors which may be stopping them from reaching their desired goals. This course will help students both in their personal and desired professional life. The other purposes of personality development through life enlightenment course are to enable you lead stress-free and healthier life, ethical decision-making ability, enhanced confidence level, and building a more pleasing personality.

❖ **Course Objectives:**

The course aims to cause a basic awareness about the significance of soft skills in professional and inter personal communications and facilitate an all-round development of personality

Specific objectives include:

- Learn to achieve the highest goal happily.
- Become a person with stable mind, pleasing personality and determination.
- Learn to build positive attitude, self-motivation, enhancing self-esteem and emotional intelligence
- Learn to develop coping mechanism to mange stress through Yoga and meditationtechniques
- Awaken wisdom among them.

❖ **Course Learning Outcomes:**

At the end of this course the students should be able to:

- Develop their personality and achieve their highest goals of life.
- Lead the nation and mankind to peace and prosperity
- Develop a versatile personality
- Practice emotional self-regulation.
- Develop a positive approach to work and duties
- Develop a versatile personality

❖ **Course Content:**

UNIT- I: Introduction to Personality Development

The concept of personality - Dimensions of Personality – Theories of Personality development(Freud & Erickson)- The concept of Success and Failure- Factors responsible for Success –Hurdles in achieving Success and Overcoming Hurdles -Causes of failure – Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

UNIT- II: Attitude, Motivation and Self-esteem

Conceptual overview of Attitude-Types of Attitudes – Attitude Formation – Advantages/ Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude.

Concept of motivation: Definition and Nature of Motivation/Motive – Internal and external motives – Theories of Motivation – Importance of self- motivation- Factors leading to de- motivation.

Self-esteem - Definition and Nature of self-esteem – Do's and Don'ts to develop positive self-esteem – Low self-esteem – Personality having low self-esteem - Positive and negative self-esteem.

UNIT -III: Other Aspects of Personality Development

Body language - Problem-solving - Conflict Management and Negation skills - Decision-makingskills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics – Good manners and etiquette - Emotional Ability/Intelligence – Dimensions of Emotional Intelligence – Building Emotional Intelligence.

UNIT- IV: Neetisatakam-Holistic Development of Personality

Verses- 19,20,21,22 (wisdom) – Verses- 29,31,32 (pride and heroism) – Verses- 26,28,63,65(virtue)

Personality of Role Model – Shrimad Bhagwadgeeta

Chapter2-Verses 17, Chapter 3-Verses 36,37,42 – Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37, 38, 63

UNIT -V: **Yoga & Stress Management**

Meaning and definition of Yoga - Historical Perspective of Yoga - Principles of Astanga Yoga by Patanjali – Meaning and Definition of Stress - Types of Stress - Eustress and Distress –Stress Management – Pranayama-Pranayama: Anulom and Vilom Pranayama - Nadishudhi Pranayama– Kapalabhati-Pranayama - Bhramari Pranayama – Nadanusandhana Pranayama – Meditation techniques: Om Meditation - Cyclic meditation: Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).

PRACTICAL COMPONENTS:

- Students should identify different types of personality to know their own personality. Students are to describe the characteristics of their personalities and submit the same for assessment.
- Students are to form in groups (a group consists of 4-6 students) to identify and write a brief note on famous personalities of India and World.
- Students are required to identify different types of attitudes and give any five examplesof each.
- Students are expected to check their attitudes and develop ways to improve their attitudesat work place and home.
- Students are required to identify keys to self-motivation to achieve their goals.

Students are expected to identify at least seven types of body language and conductactivities with the following:

S. No.	Pose	Possible Interpretations
1	Standing with your hands on your hips	Aggressive, disgusted
2	Standing upright	Confidence
3	Arms crossed on your chest	Defensive
4	Resting your hand on your cheek	Thinking
5	Touching or rubbing your nose	Doubt, lying
6	Resting your head in your hands	Boredom, tired
7	Tapping your fingers	Impatience
8	Biting your nails	Nervous, insecure
9	Playing with your hair	Insecure
10	Rubbing your eyes	Disbelief, doubt

Conduct the following exercise to develop communication skills –Negotiation Skillsand Empathy

Exercise: Card Pieces

In this activity, team members trade pieces of playing cards to put together completecards.

Uses-This exercise is useful for showing team members others' perspectives. It builds communication and negotiation skills **, and helps people to develop** empathy **.**

People and Materials

- Enough people for at least three teams of two.
- Playing cards – use between four and six for each person.
- A private room.

Time -15 minutes.Instructions:

1. Cut each playing card into half diagonally, then in half diagonally again, so you havefour triangular pieces for each card.
2. Mix all the pieces together and put equal numbers of cards into as many envelopes asyou have teams.
3. Divide people up into teams of three or four. You need at least three teams. If you'reshort of people, teams of two will work just as well. \
4. Give each team an envelope of playing card pieces.
5. Each team has three minutes to sort its pieces, determine which ones it needs tomake complete cards, and develop a bargaining strategy.
6. After three minutes, allow the teams to start bartering for pieces. People can barter on their own or collectively with their team. Give the teams eight minutes to barter.
7. When the time is up, count each team's completed cards. Whichever team has themost cards wins the round.

Advice for the Teacher/Facilitator

After the activity, ask your team members to think about the strategies they used. Discussthese questions

1) Which negotiation strategies worked? Which didn't?
2) What could they have done better?
3) What other skills, such as **active listening** or **empathy** , did they need to use?

Conduct following Time management activity - Ribbon of Life

Take a colored ribbon length of approximately 1 meter/100 cm. and scissors.Start with the following questions:

1. If the life span of an individual is say, 100 years. Consider that each cm representsone year. The response will be that few live that long. Assuming a life of 75 to 90years, cut 10 to 25 cm off the ribbon, accordingly.
2. What is the average age of the participants sitting here, the response would be 25 to 30 depending on the group, in that case, cut another 25 cms of the ribbon and say that is gone you cannot do anything.

3. What is left is 50 years? People will say, “Yes,” but the answer is NO.
4. Every year we have 52 weeks, that is 52 Sundays. If we multiply that by 50 years,it comes to 7.14 years. Reduce the ribbon by another 7.14 cm.
5. We also usually have Saturdays off, so reduce another 7. cms.
6. Public/National holidays are 10 multiple with 50 years. That comes to another 1.5years. Reduce ribbon by another 1.5 cms.
7. Your casual leave, sick leave, and annual holidays approx. 40 days a year, multiplied by 50. Cut off another 5 cms. Now you are left with about 29.5 years. But, the calculation is not over yet.
8. You sleep an average of 8 hours daily; multiply that by 365 days and again by 50 years (i.e. 122 days X 50 = almost 17 years). Cut off another 17 cm.
9. You spend time eating lunch, breakfast, snacks, and dinner total 2 hours daily (i.e.30 days a year X 50 years= 4 years or so). Cut off another 4 cm.
10. Last, let‟s figure we spend about 1 hour a day traveling from place to place for activities and such. (that‟s about 2 more years). We‟re down to 6 (SIX) years of life to make it or break it.

- **Exercise Decision making skills - Create Your Own**

In this exercise, teams must create their own, brand new, problem-solving activity.
Uses: This game encourages participants to think about the problem-solving process. It builds skills such as creativity, negotiation and decision making, as well as communication and time management. After the activity, teams should be better equipped to work together, and to think on their feet.

What You'll Need

- Ideally four or five people in each team.
- A large, private room.
- Paper, pens and flip charts.

Time -Around one hour.

Instructions:

1. As the participants arrive, you announce that, rather than spending an hour on a problem-solving team building activity, they must design an original one of their own.
2. Divide participants into teams and tell them that they have to create a new problem-solving team building activity that will work well in their organization. The activity must not be one that they have already participated in or heard of.
3. After an hour, each team must present their new activity to everyone else, and outline its key benefits.

Advice for the Teacher/Facilitator:

There are four basic steps in problem solving : defining the problem, generating solutions, evaluating and selecting solutions, and implementing solutions. Help your team to think creatively at each stage by getting them to consider a wide range ofoptions. If ideas run dry, introduce an alternative brainstorming technique, such as brain writing . This allows your people to develop one others' ideas, while everyone has an equal chance to contribute.
After the presentations, encourage teams to discuss the different decision-making processes they followed. You might ask them how they communicated and managed their time . Another question could be about how they kept their discussion focused. And to round up, you might ask them whether they would have changed their approach after hearing the other teams' presentations.

- Students are asked to recite verses: 26,28,63,65 (virtue) of Neetisatakam-Holistic development of personality.
- Students are asked to identify personality of role Mmodels from Shrimad Bhagwadgeetaand portray the roles of the same.
- Students are asked to practice Yoga and meditation techniques

Text and Reference Books:

1. Hurlock, E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill,2006.
2. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari”s ThreeSatakam, Niti-sringar- vairagya, New Delhi, 2010
3. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram,Publication Department,Kolkata, 2016.

4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House.2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004
8. Yogic Asanas for Group Training - Part-I: Janardhan Swami Yogabhyasi Mandal,Nagpur.
9. Rajayoga or Conquering the Internal Nature by Swami Vivekananda,Advaita Ashrama (Publication Department), Kolkata.
10. Nagendra H.R nad Nagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

KRISHNA UNIVERSITY: : MACHILIPATNAM
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M.Sc. – BOTANY, I SEMESTER

Course Name	**CELL BIOLOGY & GENETICS**	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
Course Code	**22 BOTL101**	**0**	**0**	**6**	**3**	**30**	**70**	**100**

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

- **List of experiments**

- **Cell biology**

1. Light microscopic examination of various plant tissues
2. Determination of cell size (ocular micrometer)
3. Stages of mitosis and meiosis
4. Squash preparation.
5. Sub-cellular fractionation- separation of macromolecules
6. Study of polytene chromosomes.
7. Karyotypic study.

- **Genetics**

1. Demonstration of chromosomal (structural and numerical) aberrations.
2. Effect of colchicine on chromosomes.
3. Demonstration of Mendelian laws using color marbles or beads.
4. Evaluation of segregation and random assortment using Chi square test or test of fitness.
5. Construction of genetic maps based on problems in two and three factor crosses.

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Course Name	**BIOMOLECULES AND BIODIVERSITY OF NON-FLOWERING PLANTS**	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
Course Code	**22 BOTL102**	**0**	**0**	**6**	**3**	**30**	**70**	**100**

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

- **Biomolecules**

List of experiments

1. Titration of Amino acids
2. Calorimetric determination of Pka
3. Model building using space, filling/ ball and stick models
4. Reactions of amino acids, sugars and lipids, including diagnostic tests
5. Isolation, purity determination and quantization of cholesterol DNA and RNA
6. Quantization of proteins and sugars
7. Analysis of oils-iodine number, saponification value and acid number

- **Biodiversity of non-flowering plants**

List of Experiments

1. Major equipment used for a plant science laboratory
2. Nutrient Medium preparation
3. Techniques of isolation & Inoculation and Sub culturing of Bacteria& Fungi
4. Staining & Microscopic study of Bacteria and Fungi
5. Enumeration of isolated Bacteria and Fungi

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DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, II SEMESTER

CourseName	BIOANALYTICALTECHNIQUES	L	T	P	C	IM	EM	TM
Course Code	22BOT 201	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course description and Purpose**

This course is introduced to bridge the gap between academics, research and industry. This course begins with a review of basic bio analytical technique and an introduction to general terminologies. This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. This course will be equally beneficial to various scientific areas including, life science, chemical science, material science and environmental science.

❖ **Course Learning Objectives:**

1. To understand about the canonical structure of bio-instrumentation systems.
2. To learn the qualitative functions of the primary system components.
3. To learn the technical information's associated with instrumentation and design andbasic signal analysis.

❖ **Course Learning Outcomes:**

1. Describes and explains the principles of various bio-instrumental devices and sensors.
2. Demonstrate an ability to use appropriately and safely the techniques, sensors, and selected modern engineering tools necessary for bio-instrumentation practice.

❖ **Course Content:**

UNIT – I: Study of Solvents & Centrifugation

Measurement of pH, pH meter, biochemical buffers & non-aqueous solvents, Classification of colloids and their properties. Basic principles of centrifugation, types of centrifuges and rotors. Preparative ultracentrifugation-differential centrifugation, density-gradient. Analytical ultracentrifugation and applications.

UNIT – II: Chromatography

General principles of Chromatography. Methods based on polarity - partition chromatography (paper chromatography).Adsorption chromatography (thin- layer chromatography).Gas-liquid chromatography, reverse phase liquid chromatography. Methods based on size- Gel filtration chromatography

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Methods based on affinity: Affinity chromatography. High performance liquid chromatography and Ion- exchange chromatography.

UNIT – III: Electrophoresis

General principles of Electrophoresis and Factors affecting electrophoretic mobility. Types, methodology and applications of Electrophoresis.

PAGE (Native – PAGE, SDS-PAGE).2-dimensional electrophoresis Agarose gel electrophoresis (denaturing Agarose Gel Electrophoresis, recovery of DNA from gel). Pulse field gel electrophoresis.

UNIT – IV: Spectrophotometry

Basic principles – law of absorption (Beer – Lambert law).UV-visible spectrophotometry, Infrared spectroscopy, Fluorescence Spectroscopy, Atomic absorption spectrophotometry Mass spectrophotometry and NMR spectrophotometry.

Basic principles and application of X- ray diffraction and X- ray crystallography.

UNIT – V: Radioactivity

Nature and types of radioactivity, radioactive decay. Preparation of labeled biological compounds. Detection and measurement of radioactivity (GM counter, scintillation counter, Cerenkov radiation, autoradiography, gamma-ray counter).

Production, biological uses and safety measures in handling of radioisotopes.

Text books:

1. Nuclear Magnetic Resonance: Williams
2. Biochemical Techniques theory and practice: White R
3. Analytical Chemistry: Christion G. D.
4. A Biologist Guide to Principle and Techniques: Willson K. and Gounding K.H.
5. An Introduction to Practical Biochemistry: Plummer D. T.

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, II SEMESTER

Course Name	PLANT ECOLOGY	L	T	P	C	IM	EM	TM
Course Code	22 BOT202	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose:**

This course provides the basic information on the ecology including structural and functional aspects ofEcosystem. It mainly focuses on effects of ecological factors like climatic, light, temperature etc on plants. This course gives a clear picture of population ecology, Community ecology and other important aspects of Ecological succession. This course also emphasizes about phytogeography and also focusses on use of ecological concepts in management of natural resources including conservation of biodiversity to make students to understand integrated nature of ecological sciences.

❖ **Course Learning Objectives:**

The Course will help the students to

- Understand the structure and function of Ecosystems, the effect of ecological factors,climatic and edaphic on plants, and biogeochemical cycles.
- Acquire basic knowledge on environmental pollution and Global Environmental problems and their mitigation measures.
- Attain knowledge on Population and community dynamics.
- Learn the phytogeography and also use of ecological concepts in conservation of biodiversity to make students to understand integrated nature of ecological sciences.

❖ **Course Learning Outcomes:**

-Student will gain knowledge on the Structure, functioning of ecosystems and types ofecosystems.
- Student will be able to know the and process of ecological succession andConcept of population and community ecology.
- Student will be able to know about the importance and need for management of biodiversity.
- Student will be able to understand the application of applied ecological concepts.

❖ **Course Content**

UNIT-I: Ecosystem: Types of Ecosystems: Natural and engineered ecosystems. Structure of ecosystem (Biotic & Abiotic). Structure of Aquatic (Pond ecosystem & marine ecosystem), Terrestrial (Grassland, Forest & Desert) and Estuarine (Mangroves) Ecosystems. Trophic levels and Ecological pyramids.

Ecosystem Functional aspects: Food chain, food webs, ecological energetics: energy flow and laws of thermodynamics - ecological efficiencies, productivity of ecosystem and Homeostasis.

UNIT-II: Ecological Factors: Climatic factor, Fire factor and edaphic factors and their effect on plants. Conceptof limiting factors. Liebig's law of minimum and Shelford's law of tolerance.

Global Biogeochemical cycles: Gaseous: Carbon & Nitrogen cycles. Sedimentary: Phosphorus and Sulphur. Hydrological cycle.

UNIT-III: Population Ecology: Concept of Autecology. Population Characteristics and dynamics – :Population Size and Density, Dispersion, Age structure, Natality, Mortality and Life tables. Population Regulation.Biotic interrelationships.

Environmental Pollution: Causes, effects and control measures of Air, Water and Soil pollution. Global environmental problems; Causes, Effects and control measures of Greenhouse effect, Ozone layer depletion, acid rains and Climate change.

UNIT-IV: Community Ecology: Classification of communities, structure and characteristics (qualitative andquantitative) of communities. Habitat and Niche. Ecotone and Edge effect

Community Dynamics: Ecological Succession. General process of Ecological succession, Types of succession, Hydrosere, Xerosere and climax concept in succession.

UNIT- V: Biogeography: Descriptive or Static Phytogeography: The Arctic, the North temperate, the Tropical and the South temperate. Interpretative or Dynamic Phytogeography: basic principles. Age and Area theory. Indicator species.

Biodiversity: Importance of biodiversity, types of biodiversity and threats to Biodiversity. Hotspots of biodiversity and Endemism. Conservation of biodiversity.

Text books:

1. Ambasht R. S. and Ambasht, N. K. (2008) Text Book of Plant Ecology (15th edn.). CBS Publishers and Distributers, New Delhi.
2. Colbert, E.M. (1996) Evolution of the Vertebrates: A History of Backboned Animals through Times. Wiley Eastern Ltd., New Delhi.
3. Kormondy, E. J. (1996) Concepts of Ecology (4th edn.). Prentice-Hall of India Pvt. Ltd.
4. Krebs, C. J. (1985) Ecology: The Experimental Analysis of Distribution and Abundance.
5. Odum, E.P. and Barrett, G.W. (2005) Fundamentals of Ecology (5th edn.). Thompson.
6. Singh, J.S; Singh, S.P. and Gupta S.R. (2014) Ecology, Environmental Science and Conservation.S.Chand& Company Pvt.Ltd. New Delhi.

Reference books:

1. Brewer, R. (1994) Principles of Ecology. Saunders College Publishing, London.
2. Chiras, D.D. (2012) Environmental Science (9th edn.). Jones and Barlett Learning.
3. Dash, M.C.and Dash, S.P. (2009) Fundamentals of Ecology (3rd edn.). Tata McGraw-Hill Publishing Co., New Delhi.
4. Nobel, B.J. and Wright, R.T. (1995) Environmental Science. Prentice Hall.
5. Santra, S.C. (2005) Environmental Science (2nd edn.). Central Book Agency, Calcutta.

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M.Sc. – BOTANY, II SEMESTER

Course Name	**BIOSYSTEMATICS OF ANGIOSPERMS**	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
Course Code	**22 BOT 203**	**4**	**0**	**0**	**4**	**30**	**70**	**100**

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose:**

This course is an introduction to the theory, methods and practice of the taxonomy and classification of flowering plants

❖ **Course Learning Objectives:**

- To make students to understand the taxonomy of plants.
- The main objectives of plant taxonomy is to identify characteristics of undiscovered species by comparing with known species, to specify characteristics of recently discovered species, to arrange them in respective 'taxa' after looking at their similarities and to give them scientific names.
- To develop concepts on Plant systematic, encompasses traditional taxonomy; however, itsprimary goal is to reconstruct the evolutionary history of plant life.
- To attain knowledge on plants into taxonomic groups, using morphological, anatomical, embryological, chromosomal and chemical data.

❖ **Course Learning Outcomes:**

- Students can understand principles of general taxonomy and they can use nomenclaturerules plants. · *Understand historical development of taxonomy*.
- Students introduces the theory, methods and practice of the taxonomy and classificationof flowering plants.
- Students can learn field identification of plants.

❖ **Course Content**

UNIT-I: Plant Classification and Phylogeny History of Plant taxonomy, Plant taxonomy-scope and significance; brief history of plant classifications-natural and phylogenetic; salient features and classifications of Bentham and Hooker, The sexual system: Carolus Linnaeus.

UNIT-II: TAXONOMIC HIERARCHY: Ranks of Taxa, Forms of scientific names; major categories: division,class, order, family; minor categories: genus, species and intraspecific categories.

NOMENCLATURE: A brief history of International Code of Botanical Nomenclature [ICBN]; Divisions; Principles;
Nomenclatural terminology-Type method (typification)- holotype, isotype, syntype, lectotype, paratype,neotype; Effective and Valid publication; Priority;
Scientific names-Correct name, Autonym, Basionym, Homonym, Synonym, Tautonym; alternative, ambiguous, illegitimate

UNIT-III: Selected Families of Angiosperms and Trends in Taxonomy Systematic position, key characters, representative taxa and economic importance of the angiosperm families: Magnoliaceae, Fabaceae (Faboideae, Caesalpinioideae and Mimosoideae), Asteraceae, Apocynaceae, Solanaceae, Acanthaceae, Lamiaceae, Amarnathaceae, Euphorbiaceae, Orchidaceae, Araceae, Poaceae.

UNIT-IV: EMBRYOLOGY IN RELATION TO TAXONOMY: Embryological characters of taxonomic importance, utilisation of embryological data in solving taxonomic problems at different levels.
ANATOMY IN RELATION TO TAXONOMY: Vegetative, wood and floral anatomy, anatomical characters of taxonomic importance, use of anatomical data in understanding interrelationship and evolution of angiosperms and solving taxonomic problems.

UNIT-V: CHEMOTAXONOMY: Origin of chemotaxonomy, classes of compounds and their biological significance, Stages in chemotaxonomic investigations, techniques, Use of chemical criteria in plant taxonomy.
Numerical taxonomy: Phenetic methods in taxonomy[Taxometrics]: principles, Cladastics and cladogram, parsimony analysis, cladastics and classification.

MOLECULAR SYSTEMATICS: Molecular diagnostic tools, restriction fragment length polymorphism (RFLP's), Random amplified polymorphic DNA (RAPD), Polymerase chain reaction (PCR) analysis, specific applications of RAPD in molecular systematics.

Text Books:

1. O.P. Sharma, 2016. Plant Taxonomy
2. Gamble & Fischer 1915-1935. Flora of Presidency of Madras. 3 vols.BSMS, Dehradun.
3. Heywood, V.H., RK Brummitt, A. Culham, O. Seberg 2007, Flowering Plant Families of the World. Firefly books Ltd. New York.
4. Judd, W.S, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, and Michael
5. J. Donoghue. 2007. Plant Systematics: A Phylogenetic Approach, 3rd ed. Sinauer.
6. Lawrence, G.H.M 1951. Taxonomy of Vascular plants. McMillan, New York.
7. Naik, V.N. 1992. Taxonomy of Angiosperms. 2nd Edn. Tata Mc.Graw Hill.
8. Pullaiah, T. 2005. Taxonomy of Angiosperms. Regency publications, New Delhi.
9. Pullaiah, T. et al 1997. Flora of Andhra Pradesh. 4 vols. Scientific Publishers, Jodhpur.
10. Radford. A.E.et.al., 1974. Vascular plant systematics. Harper & Row. New York.
11. Ravi Prasad Rao, B. 2007. Plant Name Directory. ABCD, Planographers. Hyderabad.
12. Simpson, Michael G. 2006. Plant Systematics. Elseiver& Academic Press.
13. Singh, Gurucharan. 2005. Plant Systematics. Oxford & IBH. New Delhi.
14. Sivarajan, V.V.1991. Introduction to principles

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, II SEMESTER

Course Name	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTYRIGHTS (IPR)	L	T	P	C	IM	EM	TM
Course Code	22 BOT 204	3	0	1	3	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description:**

Research Methodology& IPR (PHYC204) course is aimed to develop research bent of mind (spirit of inquiry) and impart research skills to the all Post graduate students. It also encompasses the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. This course also covers intellectual property rights (IPR), and intended to equip students with conceptual understandings of current scenario of IPR, and the practical issues encountered in filing patents, trademarks and copyrights.

❖ **Course Learning Objectives:**

The objective of research is to find answers to the questions by applying scientific procedures. In other words, the main aim of research is to find out the truth which is hidden and has not yet been discovered

Specific objectives include:

- ✓ To understand some basic concepts of research and its methodologies
- ✓ To develop an understanding of the basic framework of research process.
- ✓ To develop an understanding of various research designs and techniques.
- ✓ To identify various sources of information for literature review and data collection.
- ✓ Ability to write a research Proposal, report and thesis
- ✓ To demonstrate knowledge and understanding of IPR Filing and Rights

❖ **Course Learning Outcomes:**

At the end of this course the students should be able to:

- Understand some basic concepts of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem and parameters
- Demonstrate the ability to choose methods appropriate to research aims and objectives
- Have adequate knowledge on measurement & scaling techniques
- Have basic awareness of data analysis-and hypothesis testing procedures
- Prepare a project proposal (to undertake a project)
- Write a research report and thesis
- File Patents, Trademarks and Copy Rights

❖ **Course Content:**

UNIT- I: Foundations of Research & Research Design

Meaning of Research – Definitions of Research – Motivation in Research – General Characteristics of Research – Criteria of Good Research – Types of Research – Research Process – Research Methods vs. Methodology – Defining and Formulating the Research Problem – Review of Literature – Approaches to Critical Literature Review – Importance of Literature Review in Identifying Research Gaps and Defining a Problem – Development of Working Hypothesis.

UNIT- II: Research Design, Sampling Concepts, and Data Collection Methods

Meaning, Significance and Characteristics of Good Research Design–Types of Research Design: Exploratory, Conclusive Research and Experimental – Sampling Theory: Types of Sampling and Errors in Sampling – Data Collection: Types of Data – Data Collection Methods and Techniques for Primary and Secondary Data.

UNIT-III: Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing

Basic measurement scales –Reliability & Validity – Definition and Types of Hypothesis– Hypothesis Formulation and Testing Procedure – Overview of Data Analysis: Methods, Process and Types–Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report Precautions for Writing Research Reports – How to Write a Research Proposal– Research Ethics, Conflict of Interest and Plagiarism.

UNIT- IV: Intellectual Property Rights (IPR)

Definition and Nature and Features of Intellectual Property Rights (IPR) –Types of IntellectualProperty Rights – Procedure for Grants of Patents –Rights of a Patent – Scope of a Patent Rights-Licensing and Transfer of Technology–Why protection of intellectual property is important? Enforcement of IPR – Infringement of IPR

UNIT -V: Indian and International Scenario and New Developments in IPR

IPR Developments in India for the past Five Years – Development of IPR Laws in India – International Cooperation on IPR – New Developments in IPR – Administration of Patent System –International Patent protection – Case Studies in Indian and Global Contexts.

PRACTICAL COMPONENTS:

1. Students should identify different research problems with examples and describe the characteristics of researchable problems in their academic area/society/community/organization concerned.
2. Students are to form in groups (a group consists of 4-6 students) and conduct critical literature survey with regard to the identified research problems and prepare a brief literature review coupled with research gaps and working hypothesis.
3. Students are required to identify and develop good research design to address the definedresearch problems.
4. Students are expected to write the research design on Exploratory and DescriptiveResearch.
5. Students are required to develop practical experience in writing a research proposal by conducting a thorough critical review of any three research proposals (examples).
6. Students are expected to develop templates for technical report writing.
7. Students should conduct a team based mini research project, which is a unified andpractical case on a topic of their choice, with approximately 4-6 students per group.
8. Students are expected to identify types of plagiarism in academic research, and how toavoid plagiarism in research.
9. Students are asked to identify and submit a brief report on Indian patents of internationalrepute.
10. Students are asked to write on Patent registration procedure, and visit Official website of Intellectual Property India **https://ipindia.gov.in** to know how to get IPR in India.
11. Students are asked to identity and summarize remedies available against the infringement of intellectual property rights in Indian and global contexts.
- Students are asked to submit any five examples of ethical issues in copyright and patents.

Text and Reference Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002, An introduction to Research Methodology, RBSA Publishers.
2. Cohen, L. Lawrence, M., & Morrison, K. (2005), Research Methods in Education (5thedition).
3. Oxford: Oxford University Press.
4. Kothari, C.R., 1990, Research Methodology: Methods and Techniques, New AgeInternational.
5. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford UniversityPress.
6. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009, Research Methods: A Process of Inquiry, Ally and Bacon.
7. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. SagePublications.
8. Day, R.A., 1992, How to Write and Publish a Scientific Paper, Cambridge University Press.
9. Wadehra, B.L. 2000, Law relating to patents, trade marks, copyright designs and geographical
10. indications. Universal Law Publishing.
11. Coley, S.M. and Scheinberg, C. A., 1990, Proposal Writing, Sage Publications.
12. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York.
13. Leedy, P.D. and Ormrod, J.E., 2004, Practical Research: Planning and Design, Prentice Hall.
14. Satarkar, S.V., 2000. Intellectual property rights and Copy right. Ess Ess Publications.

Important Websites:

- www.ipindia.nic.in - Intellectual Property Office, India
- www.patentoffice.nic.in – Patent office, India
- http://copyright.gov.in/ - Copyright Office, India
- ipr.icegate.gov.in – Automated Recordation & Targeting for IPR Protection
- http://www.icegate.gov.in- E- Commerce portal of Central Board of Excise and Customs
- www.ipab.tn.nic.in - Intellectual Property Appellate Board, India
- www.mit.gov.in – Department of Information Technology, India
- http://www.mit.gov.in/content/office-semiconductorintegrated-circuits-layout-designregistry
- Semiconductor Integrated Circuits Layout-Design Registry (SICLDR)
- www.plantauthority.gov.in – Plant Varieties and Farmers' Rights Authority, India
- http://nbaindia.org/ - National Biodiversity Authority
- www.nipo.in – The Indian IPR Foundation
- www.wipo.int – World Intellectual Property Organisation
- http://www.wto.org – World Trade Organisation

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, II SEMESTER

CourseName	PLANT MOLECULAR BIOLOGY	L	T	P	C	IM	EM	TM
Course Code	22BOTDSE 201	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course description**

Molecular biology is the study of biological systems at the molecular level. Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. The topics covered include; the structure and replication of DNA, chromosome organization, the molecular mechanisms underlying the recombination of DNA, the molecular basis of gene regulation and how gene expression is tied to intracellular and extracellular factors by signal transduction pathways. To provide students with an appreciation of the experimental approaches used to do research in molecular biology several important experiments including the methodologies used to perform them will be covered. This will introduce students to recombinant DNA methodologies such as gene cloning, DNA sequencing and in vitro mutagenesis. Emphasis will be placed on understanding basic concepts and on the integration of these concepts for problem solving.

❖ **Course Learning objectives:**

This course is designed to provide students with a background in molecular genetics. The two main learning objectives of this course are; the development of an understanding of gene expression and gene regulation, and the familiarization of students with the experimental approaches used in molecular biology.

❖ **Course Learning outcomes:**

After completing the course, the student should be able to:

- Explain the structure and function of cells and cell organelles for eukaryote and prokaryote cells
- Explain the structure and function of dna, rna, protein, fat substance and carbohydrates in acell biological relation
- Explain central cell biological processes and how they are regulated and quality assured (forinstance: replication and cell division, gene expression and signal transduction)
- Explain how different cell types get and transform energy
- Explain genetic variation and inheritance
- Understand how molecular cell biology forms the foundation of biotechnology in different social structures.

❖ **Course content**

UNIT – I: DNA Replication:

Models of DNA replication – Meselson and Stahl, Cairn's experiments. Enzymes involved in DNA replication. Structure of oriC. Mechanism of oriC open complex formation. Replication initiation. Elongation –Okazaki fragments synthesis and processing. Direction of replication fork movement and termination. Replication of single stranded DNA in ØX174. Replication of bacteriophage lambda DNA (rolling circle). Replication of closed covalent circular DNA (θ model). Problems associated with replication of linear DNA molecules. DNA replication in Eukaryotes – Histone dissociation, DNA replication and reassociation. Fidelity of DNA replication and inhibitors of DNA replication.

UNIT – II: RNA Biosynthesis:

Prokaryotic RNA polymerase – Core enzyme and σ factors (σ70, σ32).Promoter elements. Promotor–RNApolymerase interaction – DNAse protection method and Foot-printing assays. Mapping of transcription start point (TSP). Upstream activating sequences and their role in regulation of transcription. Transcription elongation. Transcription termination – Rho-independent and Rho-dependent. Monosystronic and polycistronic mRNA.

Eukaryotic RNA polymerases – Transcription factors. Structure and functions of RNA pol I, II and III dependent promoters. Enhancer sequences. Processing of RNA (capping, tailing and splicing). Inhibitors of transcription.

Unit – III: Protein Biosynthesis:

Central dogma theory and flow of genetic information. Genetic code and its elucidation. Wobble hypothesis. Structure and composition of prokaryotic and eukaryotic ribosomes. Structures of mRNA and tRNA. Events of protein synthesis (amino acid activation, initiation, elongation and termination) in prokaryotes and eukaryotes, Post-translational modification of proteins, Inhibitors of translation. Protein trafficking – Concept of signal peptide transport. Membrane targeting of proteins – Sec pathway. Alternative protein transport mechanisms.

Unit-IV: Regulation of Gene Expression in Prokaryotes

Regulation of gene expression in prokaryotes- levels of control. Operon concept. Inducible and repressible expression systems. Regulation of gene expression in lactose, arabinose and tryptophan operon in Escherechia coli. Regulation of nif (nitrogen fixation) gene expression in *Klebsiella pneumonia*. Mechanism of switch from lytic to lysogenic cycle in bacteriophage lambda.

Unit-V: Regulation of Gene Expression in Eukaryotes

Regulation of gene expression in Eukaryotes- Transcription factor domains and their role in regulation of gene expression: helix-turn-helix motif, zinc-finger motif, leucine-zipper and helix- loop-helix motif. Yeast gal genes. Anti-sense RNA. Gene Silencing; Mechanism of RNAi-mediated gene silencing-siRNA pathway. Potential of RNAi for crop protection against pathogens and pests. Artificial miRNA and its advantages.

Text Books:

1. Molecular Biology of the Gene (4th Edn) JD Watson, NH Hopkins, JW Roberts,JA Steitz and AM Weiner, The Bjnjamin/Cummings Publ, Co. Inc, California.
2. Molecular Cell Biology (2nd Edn) J. Darnell, H.Lodish and D. Baltimore,Scientific American Books, Inc. USA 1994.
3. Molecular Cloning: A Laboratory manual, J. Sambrook, E.Ffrisch and T.Maniatis, Old Spring Harbor Laboratory Press New York, 2000.
4. Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley & Sons Ltd,
5. Molecular Biology, TA Brown (Ed) Bios Scientific Publishers, Ltd.,Oxford, 1991

KRISHNA UNIVERSITY :: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. – BOTANY, II SEMESTER

Course Name	HORTICULTURE	L	T	P	C	IM	EM	TM
Course Code	22 BOT DSE 202	4	0	0	4	30	70	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

❖ **Course Description and Purpose**:
The course provides information about practice methods of Fruit yielding plants and various methods of pruning of fruit crops, different nursery techniques and their management.

❖ **Course Learning Objectives:**
- To study and practice methods of Fruit yielding plants Introduction and Principles ofHorticulture.
- To learn different nursery techniques and their management.
- To practice various methods of pruning of fruit crops.
- To practice Propagation methods.

❖ **Course Learning Outcomes:**
- Students will understand how to propagate, plant, sustainably grow, manage and harvest avariety of plants in a diverse set of environmental.
- Students develop the skill to explore and utilize the crops' genetic potentials for conservation purposes and developing new varieties
- Students will come to gain Knowledge about Integrated Crop Management / Integrated Disease Management of Horticultural crops

❖ **Course Content**

UNIT-I: Fundamentals of Horticulture. Theory Introduction and Principles of Horticulture: Definition of Horticulture. Importance of horticulture in terms of economy, production, employment. generation, environmental protection and human resource development. Scope for horticulture in India. Nutritive value of horticultural crops.
Divisions of horticulture with suitable examples and their importance. Classification of horticulture crops based on soil and climatic requirements. Fruit and Vegetable zones of India and Andhra Pradesh.

UNIT-II : Definition of a nursery. Different types of nursery beds – flat beds, raised beds and sunken beds, their merits and demerits. Different nursery techniques and their management. Vegetable gardens, nutrition and kitchen garden, truck garden, Vegetable forcing, market gardens and roof gardens. Different steps in planning and layout establishment and management of orchards. Different systems of planting orchards - square, rectangle, quincunx, hexagonal and contour systems of planting – their merits and demerits. Calculation of planting densities in different systems of planting.

UNIT-III: Pruning: Definition, objectives. Principles and methods of pruning of fruit crops. Training: Definition, objectives. Principles and methods of training of fruit crops: Open centre, Closed centre and Modified leader systems, their merits and demerits.
Bearing habits in horticultural crops. Irrigation: definition, different methods of irrigation followed in horticultural crops, their merits and demerits. Manures and fertilizers: Definition, different methods of

application of manures and fertilizers to horticultural crops. Pre-harvesting and Propagation of Horticultural Plants:

UNIT-IV : Cropping systems: Inter cropping and multi – tier cropping, their merits and demerits with suitable examples. Practical uses of growth regulators in horticulture . Fruitfulness and unfruitfulness: Definitions, Factors influencing the fruitfulness and unfruitfulness with suitable examples. Rejuvenation of old orchards, Importance of rejuvenation: Top working and Frame working. Maturity: Definition,Different methods to judge maturity in horticultural crops.

UNIT-V: Propagation: Definition, Methods (Cuttings, Layering &Grafting)advantages and disadvantages of each method. Plant propagation by grafting: Definition; methods of grafting: Attached scion methods of grafting, Simple inarching or approach grafting; Detached scion methods of grafting: Pre-curing ofscion, Side grafting methods: Veneer grafting, Apical grafting methods, Epicotyle grafting, Soft wood grafting, Double working, Top working. Plant propagation by budding: Definition of budding; Methods of budding: T- budding and Inverted T- budding, patch budding and ring budding.

Suggested Practicals:

1. Study of tools and implements in horticulture.
2. Layout of different planting systems.
3. Layout of nutrition garden.
4. Preparation of nursery beds for sowing of vegetable seeds.
5. Digging of pits for fruit plants
6. Preparation of fertilizer mixtures and field application.
7. Identification and management of nutritional disorders in vegetables.
8. Study and practicing of different propagation methods by cutting, layering, division.
9. Study and practicing of different propagation methods by grafting and budding.

Text Books:

1. Fundamentals of Horticulture, Edmond, J.B., Sen., T.L., Andrews, F.S and Halfacre R.G, 1963. TataMcGraw Hill Publishing Co., New Delhi.
2. Introduction to Horticulture, Kumar, N. 1990. Rajyalakshmi Publications, Nagarcoil, Tamilnadu.3 Basic Horticulture, Jitendra Sing, 2002. Kalyani Publishers, Hyderabad.
3. Fundamentals of Fruit Production, Garner V R, Bradford F C and Hooker Jr. H D, 1957. McGraw HillBook Co., New York.
4. Plant Propagation. Principles and Practices, Hartman, HT and Kester, D.E.1976, Prentice Hall of IndiaPvt. Ltd. Bombay.
5. Plant Propagation. Sadhu, M.K. 1996. New Age International Publishers, New Delhi.
6. Propagation of Fruit Crops, Mukherjee, S.K. and Majumdar, P.K.1973. ICAR, New Delhi.
7. Propagation of Tropical Fruit Trees, Ganner, R.J. and Choudari, S.A. 1972. Oxford & IBH PublishingCo., New Delhi.
8. Propagation of Horticultural Crops: Principles and Practices, Sarma, R.R. 2002. Kalyani Publishers,New Delhi.

KRISHNA UNIVERSITY::MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc.–BOTANY, IISEMESTER

Course Name	MARINE BOTANY	L	T	P	C	IM	EM	TM
Course Code	22 BOTDSE203	4	0	0	4	30	70	100

L-Lecture,**T**-Tutorial,**P**-Practical,**C**-Credits,**IM**-Internal Marks,**EM**-External Marks,**TM**-Total Marks

❖ **Course Description and Purpose:**
This course provides the basic information on marine flora. It mainly focuses on marine ecology and productivity of marine flora. This course gives a clear picture of sea weed and their uses.

❖ **Course Learning Objective(s):**
- To make students to understand the marine plants especially marine angiosperms andtheir physiology, biochemistry, applications and conservation strategies.

❖ **Course Learning Outcome(s):**
- Student understands the basic concepts and can get motivated towards research in Marine Botany.

❖ **Course Content**

UNIT-I: Marine plant groups and Organisms– Brief account on Marine Phytoplankton, Nekton and Benthos. Seaweeds, Sea grasses and Mangroves Marine fungi, Actinomycetes, Lichens, marine Bacteria in brief. Corals and Fossil Mangroves– general account.

UNIT-II: Marine Ecology: Abiotic factors (Chemicals, Physical and Geological) . Biotic factors : floral and faunal components. Impact of climate Change in marine ecosystem: Algal blooms. Red tide.Ecological significance of Algae (Seaweeds), Mangroves, Sea grasses and Corel reefs.

UNIT-III: Photosynthesis of algae (Micro and macro) in sea – algal plastids – Photosynthetic pigments –carbon fixation –Photosynthetic rate – C3 and C4 characters in algae. Photosynthesis of mangroves – carbon fixation. Salinity regulation of and Mangroves and their methods of regeneration.

UNIT-IV: Seaweed Polysaccharides–Commercial and economical products of Sea weed (Agar, Algin andCarrageenan) and Low molecular weight compounds in algae – Methods of collection and preservation of Marine algae –Commercial cultivation of seaweeds (Traditional and Recent methods) – Application and uses of Seaweeds –Economic importance of seaweeds.

UNIT-V: Seaweed, Sea grasses, Mangroves and Coral reefs research in India and World. Marine Pollution – human Impact - Conservation strategies of Marine vegetation - Use of Remote sensing techniques in mapping of marine vegetation with GIS.

➢ **Textbooks:**

1. Laura BarsantiandPaoloGudtier.2006. Algae-anatomy.
2. Biochemistry and Biotechnology. CRC Taylor and Francis, New York.
3. Jackson, D.F.1972, Algaeand Men.Plenum Press

4. Kannupandi, T. 1998. Coral reefs of India. State of Art report.
5. ENVIS Publication Series 2/98.Krishnamurthy, V.1985.MarinePlants.
6. Seaweed Research and utilization Association, madras
7. J.R.1973.HandbookofPhycologicalmethods.CambridgeUniversityPress.
8. Swaminathan,M.S.2003. Bioresources status in Selected Coastal Location. DBT.
9. Chapman,V.J.1976. Coastal Vegetation. Pergamon press. NewYork.
10. Daves,C.J.1985.Marine Botany Physiology and Ecology of Seaweeds.
11. Dawson.1960. Marine Botany.
12. Naskar, Kumundrajan and Rathindranathmandal.1999. Ecology and biodiversity of Indian mangroves.Vol.IandII.

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES AND BIOTECHNOLOGY
M.Sc. –BOTANY, II SEMESTER

Course Name	**BIOANALYTICAL TECHNIQUES AND PLANT ECOLOGY**	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
Course Code	**22 BOTL201**	**0**	**0**	**6**	**3**	**30**	**70**	**100**

- **List of Experiments**

- **Bioanalytical Techniques**

1. Separation of amino acids by paper chromatography.
2. Separation of amino acids/ sugars/ lipids by Thin Layer Chromatography.
3. Ultra violet absorption spectra of nucleic acids and proteins.
4. Gel filtration of proteins.
5. Ion exchange chromatography of amino acids.
6. Purification of enzyme by affinity chromatography.
7. Polyacrylamide gel electrophoresis of proteins.
8. Estimation of reducing sugars by Benedict's titrimetric method.
9. Estimation of total carbohydrates by anthrone method.
10. Estimation of proteins by Lowry and Bradford methods.
11. Estimation of ascorbic acid.

- **Plant Ecology**

1 Estimation of soil and water pH & Conductivity
2 To determine the Water Holding Capacity of Soils collected from different locations.
3 To determine Percent Organic Carbon and Organic Matter of different soil samples
4 To estimate the Dissolved Oxygen content in Eutrophic and Oligotrophic Lake water samplesby Azide modification of Winkler's method.
5 To determine minimum size and number of Quadrants required for reliable estimate of biomass Grasslands.
6 Vegetation Analysis: Frequency, Density, Abundance & IVI
7 Vegetation Sampling Transects.

. **Filed study/ visit**

1. Natural ecosystem:
   Terrestrial: Grassland, Hilly Terrain and Forest Ecosystems.
   Aquatic: Lake/Pond, Riverine and Estuarine (Mangrove) Ecosystems.
2. Engineered Ecosystem: Aquaculture and Agricultural ecosystems.

KRISHNA UNIVERSITY:: MACHILIPATNAM
DEPARTMENT OF BIOSCIENCES & BIOTECHNOLOGY
M.Sc. –BOTANY, II SEMESTER

Course Name	**BIOSYSTEMATICS OF ANGIOSPERMS AND PLANT MOLECULAR BIOLOGY**	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
Course Code	**22 BOTL202**	**0**	**0**	**6**	**3**	**30**	**70**	**100**

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

- **List of Experiments**

- **Biosystematics of Angiosperms**

1. Taxonomical identification and description of plants
2. Field trips minimum of 3 each with 2-3 days to acquaint with local flora. Submission of a report on field trips.
3. Study of about 50 wild taxa representing different families and identification to species level.
4. Preparation of 50 herbarium specimens of common wild plant taxa.
5. Study of flora of the college campus.
6. Construction of taxonomic keys.
7. Nomenclatural exercise.

- **Plant Molecular Biology**

1. Isolation of genomic DNA from bacteria.
2. Determination of purity of the isolated DNA by UV spectrophometry.
3. Colorimetric method (Diplhenylamine reagent).
4. Thermal denaturation of DNA and demonstration of hyperchromic effect.
5. Isolation of RNA by Trizol methods.
6. Estimation of RNA.
7. Determination of melting temperature (Tm) and estimation of GC content.
8. Isolation of plasmids from *E.coli* and separation of CCC, Open circular and linear forms of Plasmids.
9. Agarose gel electrophoresis – Separation and molecular size determination of DNA.
10. Isolation and separation of proteins by SDS- PAGE.
11. Western blot.
12. Purification of DNA fragment from agarose gels.