

SYLLABUS

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc. Botany

(Choice Based Credit System)

(with effect from the academic year 2017- 2018 onwards)

Semester-III				
Part	Subject Status	Subject Title	Subject Code	Credit
III	Core - 14	Taxonomy of Angiosperms and Economic Botany	PBOM31	4
	Core - 15	Biochemistry and Biophysics	PBOM32	4
	Core - 16	Computer Applications and Bioinformatics	PBOM33	4
	Core - 17	Research Methodology, Bioinstrumentation and Biological techniques	PBOM34	4
	Core - 18 Practical - 5	Taxonomy of Angiosperms, Economic Botany, Research Methodology, Bioinstrumentation and Biological techniques	PBOL31	2
	Core - 19 Practical - 6	Biochemistry, Biophysics, Computer Applications and Bioinformatics	PBOL32	2



Taxonomy of Angiosperms and Economic Botany

Prerequisite:

Basic knowledge in Plant Morphology and Taxonomy gained from Undergraduate programme

Objectives:

- To learn about identification and classification of plants
- To learn about preparation of herbarium and molecular Plant Systematics
- To understand the economic importance of plants in day to day life

Outcome:

- Graduates will easily identify common and economically important plants
- Acquisition of knowledge about conservation of economically important plants
- Herbal remedy knowledge acquisition

UNIT- I

Principles - Classification - (a) Artificial - Linnaeus (b) Natural -Bentham and Hooker (c)Phylogenetic – Cronquist.

Taxonomic hierarchy - Species concept - Binomial nomenclature: Principles of ICBN - Typification - Principles of Priority - Effective and Valid publication - Citation - Retention and Rejection of names. Preparation of Herbarium Identification and preparation of keys and its significance.

UNIT- II

A detailed study with special reference to the following families:

Study of **Polypetalae families**: Magnoliaceae, Zygophyllaceae, Sapindaceae, Combretaceae, Lythraceae, and Cucurbitaceae.

Study of **Gamopetalae families**: Apocynaceae Convolvulaceae, Pedaliaceae, Acanthaceae, Boraginaceae, Bignoniaceae, Scrophulariaceae, and Verbenaceae.

UNIT - III

Study of **Monochlamydeae families**: Euphorbiaceae, Amaranthaceae, Nyctaginaceae, Aristolochiaceae and Monocotyledons: Commelinaceae, Orchidaceae and Poaceae.

UNIT – IV

Modern Plant Systematics: Taxonomic evidences - from Morphology, Anatomy, Embryology, Chemotaxonomy. Digital / Virtual herbaria.

Molecular Systematics: Use of molecular markers and applications of RFLP, ISSR, DNA Bar-coding.

UNIT – V

General account on Economic Botany - Utilization of selected crop plants - Cereals- (Rice, Millets - Ragi); Spices and Condiments - (Cardamom, Pepper); Commercial crops - Fibre (Jute); Timbers (Teak, Red Sander); Resins and Gums



(Asafoetida, Gum Arabic); Fixed oils (Gingelly, Sunflower); Volatile oils - (Rosemary); Beverages (Tea, Coffee); Natural dyes (Indigo, Henna) and Drug Yielding Plants (Nilavembu and Indian Ginseng)

Text books:

1. N.S.Subramaniam, Modern Plant Taxonomy. Vikas Publishing House. New Delhi, 1995.
2. N. V. Naik, Taxonomy of Angiosperms. Tata McGraw–Hill Publ Co. Ltd., New Delhi, 2000.

Reference books:

1. M.Ahmedullah and M.P. Nayar. Endemic Plants of the Indian Region. Vol. I. Botanical Survey of India. Howrah, 1987.
2. A.Cronquist, An Integrated System of Classification of Flowering Plants. Columbia University Press, New York, 1981.
3. P.H. Davis, and V.H. Heywood, Principles of Angiosperms Taxonomy. Robert E. Kreiger Pub. Co., New York, 1973.
4. J.S. Gamble, and C.E.C. Fischer. Flora of the Presidency of Madras. Vols. I - III. Botanical Survey of India. Calcutta, 1967.
5. H.J. Harrison, New Concepts in Flowering Plant Taxonomy. Hieman Educational Books Ltd., London, 1971.
6. A.N. Henry and M. Chandrabose. An Aid to International Code of Botanical Nomenclature. Today & Tomorrow's Printers and Publishers. New Delhi, 1980.
7. Heywood, V.H. and Moore, D.M. Current Concepts in Plant Taxonomy. Academic Press, London, 1984.
8. C. Jeffrey, Introduction of Plant Taxonomy, Cambridge University Press, Cambridge, 1982.
9. G.H.M. Lawrence, Taxonomy of Vascular Plants. The Macmillan Company. New York, 1951.
10. M.P. Nayar, "Hot Spots" of Endemic plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Thiruvananthapuram, India, 1996.
11. M. G. Simpson, Plant Systematics. Elsevier Academic Press, California, USA, 2010.
12. V.V. Sivarajan, Introduction to the Principles of Plant Taxonomy. Oxford & IBH Publishing Company Ltd., New Delhi, 1996.

Practicals

1. Identification of plant species included in the syllabus.
2. Preparation of dichotomous key.
3. Identification of Binomial using flora (J.S. Gamble).
4. Dissection and technical description of plant species from any locally available plants.
5. A study tour of Taxonomic interest (any area) – Submission of an album with 10 photographs and 10 herbarium plant specimens from the prescribed families with a field note book.



6. Spotters for Economic Botany - to know the family, binomials of economically important plants, their parts and economic importance.



Biochemistry and Biophysics

Prerequisite:

Basic knowledge on structure and role of biomolecules - gained from undergraduate programme

Objectives:

- To gain advanced knowledge about plant biomolecules
- To understand different metabolic pathways occurring in a cell
- To provide an advanced integral knowledge and understanding of topics in Biochemistry and Biophysics

Outcome:

- Acquisition of analytical and presentational skills
- Graduates will have a solid foundation and in-depth understanding of current topics in Biochemistry
- knowledge gained about biofluorescent and bioluminescent compounds could be used in as molecular reporters in medical field

UNIT –I

Biochemistry and Biophysics

Biomolecules: Carbohydrates - properties of mono, oligo and polysaccharides. Structure and properties of trioses, tetroses, pentoses, hexoses, maltose, sucrose, starch and pectin- glycosidic linkage, isomerism and mutarotation. Glycoproteins, amino sugars.

UNIT- II

Amino acids and proteins, ionic forms of amino acids. Zwitterion, isoelectric pH, optical isomers of amino acids and physical properties of amino acids.

Formation of peptide bond - peptides - structure of polypeptides - primary, secondary, tertiary and quaternary protein structure - super secondary structures. Ramachandran plot - denaturation of proteins.

UNIT – III

Lipids - Classification, structure and properties - Fatty acids - saturated and unsaturated fatty acids - Structure of fatty acids and glycerol - phospholipids, glycolipids, steroids. Biosynthesis and Oxidation of fatty acid - Gluconeogenesis.

UNIT - IV

Enzymes - Properties - Cofactors, metallic activators, coenzymes. Nomenclature and Classification - Enzyme kinetics - Concept of active sites Michaelis-Menton constant - mechanism of enzyme action - enzyme inhibitors - competitive and non-competitive, allosteric control of enzymes. Enzyme regulation.

UNIT – V



Properties of light - Different components of electromagnetic radiation.
Emission -Excitation - Fluorescence and Phosphorescence - Bioluminescence.
Laws of Thermodynamics- free energy, Redox potential, activation energy.
High energy compounds in biology and their significance.

Text books:

1. J.L. Jain, Fundamentals of Biochemistry. S. Chand and Company, New Delhi, 2005.
2. U. Satyanarayana, Biochemistry. Books and Allied (P) Ltd, Kolkatta, 2005.

Reference Books

1. R.L.P. Adams, Burdon, R.H., Campbell, A.M., Leader, D.P. and Smile, R.M.S. The
2. Biochemistry of Nucleic acids. Chapman and Hall Ltd. New York, 1981.
3. O.P. Agarwal, Chemistry of organic natural products. Goel Publishing House, New Delhi, 1989.
4. Bonner and J. E. Varner, Plant Biochemistry. Academic Press, New York, 1976.
5. A.C. Deb, Fundamentals of Biochemistry. New Central Book Agency (P) Ltd., Kolkatta, 2011.
6. E.E. Conn and P.K. Stumpf, Outlines of Biochemistry. John Wiley and Sons, New York, 1987.
7. J. Jayaraman, Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi, 1995.
8. D.T. Plummer, An introduction to Practical Biochemistry. Tata Mc Graw Hill publishing
9. Company, New Delhi, 1990.
10. J. M. Berg, J. L. Tymoczko and L. Stryer Biochemistry, W.H. Freeman Company, New York, 2012.
11. S. Palanichamy and M. Shanmugavelu, Principles of Biophysics. Palani Paramount Publications. 1996.
12. P. Narayanan, Essentials of Biophysics. New Age International Publishers, New Delhi, 2008.

Practicals

1. Determination of neutralization point of acid-base mixture by titration method using pH meter.
2. Estimation of sugars by anthrone method - Colorimeter /Spectrophotometer.
3. Estimation of amino acids by ninhydrin method - Colorimeter / Spectrophotometer.
4. Estimation of proteins (Lowry's method).
5. Extraction and separation of known and unknown amino acids - Paper Chromatography method.
6. Determination of saponification value of any two vegetable oils.
7. Determination of K_m value of Nitrate Reductase enzyme.



Computer Application and Bioinformatics

Prerequisite:

Basic knowledge in Computer Operation

Objectives:

- To learn the basic applications of computer and internet
- To gain a working knowledge on computer and search strategies
- To understand the scope and application of bioinformatics

Outcome:

- Acquisition of working knowledge on computer and surfing the web
- Accumulation of knowledge in genomics and proteomics.
- Acquisition of skill in molecular docking and drug designing.
- Graduates will be able to use online databases

UNIT - I

Computer - Definition, Need for computers, Characteristics of computer- detail of input units, output units and storage devices. Classification of computers - Knowledge about windows and its scientific applications - MS Word, Power Point, Excel

UNIT - II

Internet - world wide web - Internet protocols - Internet Browsers - Search Engines -e-books e-journals and e-mail. Applications of internet.

UNIT - III

Introduction to Bioinformatics - Definition, Need and Potential of Bioinformatics - Genomics and Proteomics - Human Genome Project and medically relevant genes - Pharmacoinformatics.

UNIT - IV

Bioinformatics Databases: Nucleic acid sequence Databases - GenBank, EMBL, DDBJ. Protein Sequence Databases - SwissProt, TrEMBL. Structure Databases - PDB, CATH, CSD. Literature Databases - PubMed, Scopus.

UNIT - V

Techniques in Bioinformatics: FASTA - BLAST - Types. Pairwise and Multiple Sequence Alignment methods and significance. - Molecular Visualization - JS Mol / RasMol. Prediction of Activity Spectra - PASS.

Text Books :

1. Alexis Leon and Mathews Leon, Computer Applications in Business, Vijay Nicole Imprints, Chennai, 2013.



2. S. Ignacimuthu, Basic Bioinformatics, Narosa Publishing House. New Delhi-3, 2012.
3. P. Narayanan, Bioinformatics - A Primer, New Age International Publishers, New Delhi, 2005.
4. K.Teresa, Attwood and David J. Parry-Smith, Introduction to Bioinformatics Dorling Kindersley Pvt. Ltd. India, 2006.

Reference Books:

1. Alexis Leon and Mathews Leon, 2013. Computer Applications in Business, Vijay Nicole Imprints, Chennai.
2. Bryan Bergeron, Bioinformatics Computing, Prentice Hall of India, New Delhi, 2006.
3. N.Gautham, "Bioinformatics - Databases and Algorithms" Narosa Publishing House, Chennai, 2006.
4. P. Mohan, Fundamentals of Computers, Himalaya Publishing House, New Delhi, 2009.
5. P.Narayanan, Bioinformatics - A Primer, New Age International Publishers, New Delhi, 2005.
6. Neeru Mundra Renu Vashisth, Introduction to Information Technology, Himalaya Publishing House, New Delhi, 2011.
7. S.C. Rastogi, Mandiratta Namita and Rastogi Parag, Bioinformatics - Concepts, Skill Applications, CBS Publications, 2003.
8. S. Ravishankar and P.V. Raphael Computer Awareness and Applications, Himalaya Publishing House, New Delhi, 2004.
9. Saxena Sanjay, MS office for everyone, Vikas Publishing House, New Delhi, 2002.
10. T.K. Attwood and D.J. Parry-Smith, Introduction to Bioinformatics Dorling Kindersley Pvt. Ltd. India, 2006.

Practicals:

1. Working knowledge with computer in preparing word document, construction of line and bar graphs in Excel for the Botanical sample data provided.
2. E-mail creation.
3. Searching data bases prescribed in the syllabus.
4. Sequence alignment technique – FASTA and BLAST
5. Molecular Modeling



Research Methodology, Bioinstrumentation and Biological Techniques

Prerequisite:

Basic knowledge in biological and related informations to be useful for research and development during undergraduate programme

Objectives:

- To understand the basic aspects in research
- To learn mathematical and statistical technique for research
- To acquire basic knowledge about various instruments and techniques in biological research

Outcome:

- Training and participating in active research activities for their academic and professional levels
- Creation of novel ideas and simple techniques useful to the society (R/D)
- Acquire background knowledge in research publication and thesis writing

UNIT - I

Research Methodology: Choosing the problem for research - Review of Literature -Primary, Secondary and Tertiary sources - Bibliographs - Indexing and abstracting- Reference Collections- Planning and preparation of thesis: thesis format. Journal format - Editing & Proof correction, Abstract and keywords. Full paper, Short Communication, Monographs, Review Articles. Citation index, Impact Factor. Methods of Oral and Poster presentation.

UNIT- II

Biostatistics: Designing of Plot. Scope, Collection and classification of data, Tabulation, Graphical and Diagrammatic representation, Histograms. Probability analysis, Mean, Median, Mode. Students - t - test, ANOVA - Application software - SPSS.

UNIT – III

Microscopy - Principles and application - Light - Dark field - Phase contrast - Fluorescence - Polarization - Scanning and Transmission Electron Microscopy, Photomicrography.

Cytochemical and histochemical methods- Types of Microtomes: rotary, wood and cryo types. Microtome techniques: Fixation, dehydration, clearing, embedding, sectioning, staining, mounting. Cytochemistry and detection of nucleic acids, carbohydrates, proteins and lipids in plant cells / tissue.



UNIT - IV

Centrifugation: High speed, and Ultra centrifuges, **Spectroscopy:** Flame photometer; UV-Vis Spectrophotometer, AAS, **Chromatography:** TLC and GC.

UNIT - V

Electrophoresis: Basic principles, theory and applications of starch gel, agarose, native and denaturing PAGE. Radio labelling techniques: Handling of Radioisotopes in labs, Dosimetry, Ionization chamber, GM counter, Solid and liquid scintillation counters, Autoradiography. Radio Immuno Assay. Introduction to Nanobiotechnology methods in Nanodrugs delivery.

Text Books:

1. N. Gurumani, Research Methodology for Biological Sciences, 2011
2. N. Gurumani An introduction to Biostatistics. MJP Publishers New Delhi, 2009.

Suggested References

1. W.W. Daniel, 1995. Biostatistics. 7th edition, John Wiley and Sons, New York, USA.
2. C.I. Bliss, 1970. Statistics in Biology. Vol I and II, Mc Graw-Hill Inc. USA.
3. M. R. Green, and J. Sambrook, 2012. Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
4. I.A. Khan, and A. Khanum, 1994. Biostatistics. Vikas Publishing House Pvt. Ltd. New Delhi.
5. V.G. Panse, and P.V. Sukhatme, 1967. Statistical Methods for Agricultural Workers. ICAR, New Delhi.
6. D.T. Plummer, 1988. An Introduction to Practical Biochemistry. Tata McGraw Hill Publishing Company. New Delhi.
7. Raghuvanshi. 1995. Practical Exercises in Cytology, Genetics, Plant Breeding and Biostatistics. CBS Publishers & Distributors, New Delhi.
8. G.S. Sandhu, 1990. Research Techniques in Biological Sciences. 1st Edition. Anmol Publications, New Delhi.
9. R.G.D. Steel, and J.H. Torrie, 1960. Principles and Procedures of Statistics with special reference to Biological Sciences. McGraw-Hill.
10. K. Wilson, and J. Walker, 2000. Principles and Techniques of Practical Biochemistry. Cambridge University Press, London.
11. E. Balagurusamy, 2009. Fundamentals of Computers. Tata McGraw-Hill Education Pvt. Ltd., New Delhi.
12. V. Rajaraman, Introduction to Information Technology. PHI. New Delhi.



Practicals

1. Demonstration of microscopes (Light and Dark field, phase-contrast, fluorescence, SEM, TEM).
2. Demonstration of centrifugation (Ultra, high speed).
3. Demonstration of TLC, UV-Vis Spectrophotometer, Flame photometer.
4. Separation of plant proteins using SDS-PAGE, and DNA by AGE.
5. Demonstration Microtomy: preparation of thin sections and permanent slides.
6. Histo-chemical localization of soluble components in plant cells- proteins, sugars, polysaccharides, lipids, nucleic acids, tannins, phenols, etc.
7. Study on Bioinstruments and Biological techniques
8. Problems from Biostatistics – SD & SE, T-test.

Taxonomy of Angiosperms and Economic Botany, Research Methodology, Bioinstrumentation and Biological Techniques

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Biochemistry and Biophysics, Computer applications and Bioinformatics

Biochemistry and Biophysics

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