# **SYLLABUS**

#### MANONMANIAM SUNDARANAR UNIVERISTY, 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, ComputerApplications 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

Nesamony Memorial Christian College, Marthandam



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.

# $\mathbf{UNIT} - \mathbf{V}$

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 (Asaefoetida, 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.
- 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.

# $\mathbf{UNIT} - \mathbf{V}$



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, Fundamantals 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, NewYork, 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, NewYork, 1987.
- 7. J. Jayaraman, Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi,1895.
- 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 aminoacids 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 Km 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.Biostastistics.7th edition, John Wiley and Sons, Newyork, 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 Bioststistics. 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 cellsproteins, 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

#### **Practicals**

#### **Taxonomy of Angiosperms and Economic Botany**

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- 2. Preparation of dichotomous key.
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# **Biochemistry and Biophysics, Computer applications and Bioinformatics**

# **Biochemistry and Biophysics**

# 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.
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