**Department of Undergraduate Botany**

B.Sc. – Botany Programme (CBCS)

(With effect from June 2015)

| Sem. | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1201 | Conversational Skills | 3 | 2 | 30 |
| | IIIC | BOT1531 | Ecology | 5 | 5 | 75 |
| | IIIC | BOT1433 | Learning Basic Skills In Biology(LBSB) | 4 | 4 | 60 |
| | IIIC | BOT1435 | LAB I (Ecology and LBSB) | 4 | 4 | 60 |
| | IIIS | CHE14XX | Chemistry for Botanist -1 | 3+2L | 3+1 | 45+15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -1 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | - | |
| | | | **Total** | **30** | **25** | |
| 2 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1202 | Reading and Writing Skills | 3 | 2 | 30 |
| | IIIC | BOT1532 | Economic Botany | 5 | 5 | 75 |
| | IIIC | BOT1434 | Horticulture Practices and Post-Harvest Technology (HPPHT) | 4 | 4 | 60 |
| | IIIC | BOT1436 | LAB II (Economic Botany and HPPHT) | 4 | 4 | 60 |
| | IIIS | CHE14XX | Chemistry for Botanist - 2 | 3+2L | 3+1 | 45+15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -2 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **25+1** | |
| 3 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2201 | Study Skills | 3 | 2 | 30 |
| | IIIC | BOT2531 | Microbiology and Phycology | 5 | 5 | 75 |
| | IIIC | BOT2533 | Archegoniatae | 5 | 5 | 75 |
| | IIIC | BOT2335 | Genetics and Plant Breeding | 3 | 3 | 45 |
| | IIIC | BOT2637 | LAB III (Micro+Arche +Genetics) | 2+2+2 | 6 | 90 |
| | IIIS | ZOO24XX | General Zoology-I | 3+2L | 3+1 | 45+15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | | |
| | | | **Total** | **30** | **27** | |
| 4 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2202 | Career Skills | 3 | 2 | 30 |
| | IIIC | BOT2532 | Mycology and Pathology | 5 | 5 | 75 |
| | IIIC | BOT2434 | Cell Biology | 4 | 4 | 60 |
| | IIIC | BOT2436 | Anatomy and Reproductive Biology of Angiosperms (ARBA) | 4 | 4 | 60 |
| | IIIC | BOT2638 | LAB IV (Myco+Cellbio+ARBA | 6 | 6 | 90 |
| | IIIS | ZOO24XX | General Zoology II | 3+2L | 3+1 | 45+15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **27+1** | |

| Sem. | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 5 | IIIC | BOT 3631 | Plant Systematics | 6 | 6 | 90 |
| | IIIC | BOT3633 | Biochemistry | 6 | 6 | 90 |
| | IIIC | BOT3535 | Analytical Techniques and Research Methodology | 5 | 5 | 75 |
| | IIIC | BOT3637 | LAB – V (Systematics + Biochem) | 3+3 | 6 | 90 |
| | IVLS | ***32XX | Life Skill - 3 | 3 | 2 | 30 |
| | IVEVS | BOT 3241 | Environment Studies | 4 | 2 | 30 |
| | | | | **30** | **27** | |
| 6 | IIIC | BOT3832 | Plant Biotechnology (Lab cum Theory) | 5+3L | 8 | 75+45 |
| | IIIC | BOT3434 | Entrepreneurial Botany | 4 | 4 | 60 |
| | IIIC | BOT3536 | Bioresource Management | 5 | 5 | 75 |
| | | BOT3538 | Botany Project | | | |
| | IIIC | BOT3642 | Plant Physiology (Lab cum Theory) | 4+2L | 6 | 60+30 |
| | IVLS | ***32XX | Life Skill IV | 3 | 2 | 30 |
| | IVVE | VAL32XX | Value Education | 4 | 2 | 30 |
| | | | **Total** | **30** | **27** | |
| | | | | | | |

**Supportive Courses (Lab Cum Theory Courses)**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IIIS | BOT1437 | Plant Biology I | 3+2L | 4 | 45+15 |
| 2 | IIIS | BOT1438 | Plant Biology II | 3+2L | 4 | 45+15 |
| 3 | IIIS | BOT 2439 | Botany for Chemists– I (Theory cum Lab | 3+2L | 4 | 45+15 |
| 4 | IIIS | BOT2440 | Botany for Chemists II (Theory cum Lab) | 3+2L | 4 | 45+15 |

**Life Skill Courses**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IVLS | BOT1231 | Mushroom Culture Technology | 3 | 2 | 30 |
| 2 | IVLS | BOT1236 | Nursery and Gardening | 3 | 2 | 30 |
| 5 | IVLS | BOT3239 | Medicinal Botany | 3 | 2 | 30 |
| 6 | IVLS | BOT3240 | Biofertilizer and Bio-Pesticide | 3 | 2 | 30 |

**Non Major Courses**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IVE | BOT1233 | Food and Nutrition | 3 | 2 | 30 |
| 2 | IVE | BOT1238 | Plant Wonders | 3 | 2 | 30 |

**BOT 2531 Microbiology and Phycology 5hr/5cr**

**Preamble:**
This course provides an overview of the diversity of microbial life forms to the students. Structure and functions of selected prokaryotic organisms and algae will be dealt in detail. The course introduces students to monera and protista of the five kingdoms, and proceeds with the milestones in the history of microbiology and phycology and contributions of eminent scientists. Viruses will be dealt separately with emphasise on the diseases caused by them to plants and animals. The unit on bacteria will have methods to isolate and study them in the lab and their patterns of growth and nutrition. The variations and pigmentation characteristics of prokaryotic, photosynthetic cyanobacteria will be dealt. Pitching discussions on selected forms in the cyanobacterial link between the heterotrophs and autotrophs will be explored.

**Objectives:**
1. Students will be able to comprehend the life and processes of prokaryotic organisms from viruses to algae which are the earliest photosynthetic forms.
2. Besides evolution and conservation aspects, commercial aspects of members will add the utility value for the course.

**Unit 1: Introduction**

Classification of life forms: Five kingdom and 3 domain- the advent of microbiology, (A. V. Leeuwenhoek, L.Pasteur and Robert Koch) and phycology (F E *Fritsch* and MOP Iyengar) - diversity based on habitat - isolation techniques for microbes (serial dilution and pour plate).

**Unit 2: Viruses**

Viruses: Discovery, DNA virus (T-phage), lytic and lysogenic cycle- RNA virus (HIV)- comparison of plant and animal viruses – common human viral diseases.

**Unit 3: Bacteria and Cyanobacterium**

Prokaryotic organisation:morphotypes, structure; nutritional types. A brief Introduction to Bergeys system of classification. Growth curve and measurements, Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction).

Cyanobacteria - Exomorphic variations, pigmentation, biological nitrogen fixers, Reproduction and adaptations.

**Unit 4: Algae**

General characteristics, major groups of algae - life-cycles of Caulerpa (Chlorophyta), Sargassum (Phaeophyta) and Gelidium (Rhodophyta).

**Unit 5: Economic Importance**

Harmful and beneficial microbes: microbial products –antibiotics(Streptomycin), vaccines (Rabies) and fermentation products - food spoilage. Biofertilizers & biopesticides, Agar, Carrageenan - Diatomite – Biofuel - large scale cultivation of algae.

**References:**

1.Pelczar, H.J. E.C.S. Chan and N.R. Kreig. (1993). Microbiology concepts and applications. Tata McGraw Hill Inc. ISBN 0-07-049234-4
2.Prescott, L.M., Harley J.P., Klein D. A. (2008). Microbiology.McGraw Hill, India.6th edition. ISBN 0071267271
3.Bold, H.C and Wyne. M.J. (1978). Introduction to the algae: Structure and reproduction. Prentice-Hall. ISBN 0134777867
4. Kumar, H.D.(1988).Introductory Phycology. East West press.ISBN: 81-859-3896-2
5.Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. ISBN: 978-0-521-14144-4
6.Ion Morris. (1971). An Introduction to the Algae. Hutchinson University Library. London. ISBN: 0-090-80713-8
7.Dubey,R C and Maheswari,D.K .(2013) A Textbook of Microbiology, S.Chand & Comp. ISBN 81-219-2620-3
8. Sharma,O.P (2007).Textbook of algae. Tata McGraw Hill, India ISBN 0-07-451928.

**BOT 2533 ARCHEGONIATAE 5hr/5cr**

**Preamble:**

This course will help the student to understand the evolutionary process in plant kingdoms which will commence from algal form. It seeks to give a account plants of plant adaptations from aquatic condition to a colonized terrestrial habitat. The changes in morphological, anatomical and reproductive structures that propel plant evolution will be investigated. In nutshell the course will trace evidences of plant evolution from extinct and extant plants.

Objectives:

1. To trace the evolutionary trend of land plants.
2. To guide students to travel across geological time scale and appreciate the prehistoric evidences of life forms.

**Unit 1: Morphological and life-cycle changes of typical land plants:**

General adaptations to terrestrial habitats (morphological and anatomical characters for heterotrichous habit) - evolution of plant sex organs:- (Antheridium, Oogonium with respect to sterile protective covering, archegonium, ovule).

**Unit 2: Bryophytes**:

Classification and Salient features; Introduction to Hepaticopsida, Anthocertopsida and Bryopsida, Morphology, anatomy and reproduction of Riccia, Anthoceros and Funaria. Ecological importance.

**Unit 3: Pteridophytes**:

Classification and Salient features; Introduction to Lycopsida, Sphenopsida and Filicopsida, Heterospory and seed habit. Morphology, anatomy and reproduction of Lycopodium

**Unit 4: Gymnosperms**:

Classification and Salient features; Introduction to Cycadopsida, Coniferopsida, Gnetopsida, Morphology, anatomy and reproduction of *Pinus* . Economic importance.

**Unit 5: Evolution of land plants**:

Paleoclimatic changes across the Geological time zones. Fossilization and fossil types ( Impression, compression, Petrifaction, cast, coal ball) - mega extinction - Origin of angiosperm.

**References:**


1. Muller,W,H. (1979). Botany: A functional approach, Collier Mac Millan ISBN 0-02-979440-4
2. Rashid,A.( 1998). An Introduction to Bryophytes, Vikas Publishers Co. New Delhi. ISBN: 81-259-0569-3
3. Rashid,A.(1982). An Introduction to Pteridophyta, Vikas Publishers Co. New Delhi. ISBN: 81-259-0709-2
4. Vasishta, P. C. (2006). Gymnosperms. S. Chand & Company New Delhi. ISBN 81-219-2618-1
5. Willis,K.J and McElwain.J.C (2002). The Evolution of Plants. Oxford University Press. ISBN 0-19-850065-3
6. Pandey, B. P. (2005). College Botany, Vol I. 5th Edn., S. Chand & Company New Delhi. ISBN 81-219-0593-1
7. Pandey, B. P. (2009). College Botany, Vol II. 7th Edn., S. Chand & Company New Delhi. ISBN 81-219-0601-6


**BOT 2335 Genetics and Plant breeding 3hr/3cr**

**Preamble:**

The course introduces the basics of genetics dealing with inheritance of characters, about principles pertaining to plant breeding and crop improvement.

Starting from the basic rules drawn from Mendels experiments, the idea of chromosomal theory of inheritance will be introduced that with this foundations students will be able to study applied studies, with real time examples. It will help them to understand DNA as the genetic material. The unit on population genetics will brief about the mutations, genetic drift and chances for speciation. Basics of plant breeding and traditional methods in crop improvement will be discussed citing regional examples. Discussion on plant breeding and crop improvement will not be exhaustive, but the content would suffice the learner to apprentice the need for breeding, conservation and management of genomes of useful plant stocks.

Objectives:

1. Students should be able to understand the science of inheritance of characters and reasons behind the variations noticed in the population.
2. They should be able to appreciate the importance of plant resources, need to develop hybrid varieties and to conserve them for the future generation.

**Unit 1: Fundamentals of genetics**

Mendel's experiment, laws of inheritance. Gene interactions- dominant epistasis, complementary gene, multiple allele inheritance ( human blood group), and polygenic interactions (ear length in Maize). Sex linked inheritance (color blindness).

**Unit 2: Chromosomal structure and inheritance**

Chromosome organization – types of chromosomes, sex chromosome, Sex determination in human and plants (*Melandrium*), chromosomal aberrations, linkage and mechanism of crossing over.

**Unit 3: Population genetics**

Hardy-Weinberg Law, penetrance and expressivity, spontaneous and induced mutation, mutagens, genetic drift and erosion. Introduction to speciation, Pedigree and family tree.

**Unit 4: Plant breeding**

Objectives - Qualitative and quantitative characters. Conventional methods of selection and hybridization . Traditional breeding programmes in Rice and Brinjal.

**Unit 5: Crop improvement issues**

Farmer's and breeder's rights.Crop improvement for resistant, tolerant and high yielding varieties.Plant genetic resources of India- Germplasm centres.

**References:**

1. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition. ISBN 0470388250
2. Klug, W.S., Cummings, M.R., Spencer, C.A. (2007). Concepts of Genetics. Pearson Education. 7 th edition. ISBN 813170811X
3. Sinnott,E.W., Dunn,L.C. and Dobzhansky,T. (2004).Principles of Genetics. Tata Mc Graw Hill. ISBN : 0-07-099-413-7.
4. Singh,B.D. (2014). Plant Breeding- Principles and methods. Kalyani Publishers.
5.Ahluwalia,K.B. (2009). Genetics, 2edn. New Age International Publishers. ISBN 978-81- 224-2390-7
6. Chahal, G.C and Gosal,S.S (2002) Principles and Procedures of Plant Breeding. Narosa Publishing House. ISBN 81-7319-374-6

**BOT 2637 Lab III 6 hr/ 6cr**

**A -- Microbiology and Phycology 2hrs/wk**

**I - Microbiology**

1. Good laboratory practices and observation of ubiquitous presence of microbes
2. Microscope and Simple Staining techniques
3. Gram staining
4. Media preparation& sterilization techniques
5. Microbial isolation from natural habitat– Serial Dilution
6. Smear, spread and pour plate & streaking techniques
7. Microbial analysis of legume root nodules

**II - Phycology**

1. Observation of common Cyanobacteria and algae from field
2. Microscopic green algae - Volvox and Spirogyra
3. Macro Green algae - Caulerpa and Chara
4. Brown algae – Sargassum
5. Red algae : Batrachospermum and Gracilaria
6. Mass Cultivation of Algae – Spirulina

*Outstation study:*

1. Visit to Aavin dairy – food microbiology & industrial unit
2. Field trip to Rameswaram (CMFRI) – marine algal collection

**References:**

1. Gunasekaran, P. (2000). Laboratory manual in microbiology, New Delhi
2. Cappuccino, J.G. and Sherman, N.(2002). Microbiology: a laboratory manual 6th ed. Pearson Education Ltd. Singapore.

**B - Archegoniatae** **2hr/wk**

1. Panoramic view of archegoniates : whole mount and charts
2. Liver worts and thalloid bryophytes: vegetative and reproductive features of Riccia
3. A study on mosses based on Funaria/Polytrichum
4. Study of Lycopodium – sectional view of stem
5. Study of Selaginella highlighting heterospory
6. Ecological adaptations of Equisetum: Study of shoot and strobilus
7. Collection and study of locally available Pteridophytes
8. Morphology, rachis, pinna & sori of a fern
9. *Pinus*– vegetative and reproductive structures
10. Plant evolution I –activity based learning with Geological time scale
11. Plant evolution II – study of fossils (preferably with a field visit to Ariyalur)
12. Visit to hill station

**References:**

Bendre, A. M., and Kumar, A. (2006). A text book of practical botany. (Vol I). Rastogi Publication New Delhi. ISBN 81-7133-809-7

Bendre, A. M. and Kumar,A. (2006). A text book of practical botany. (Vol II) Rastogi Publication New Delhi. ISBN 81-7133-852-6

**C - Genetics and Plant breeding** **2hrs/wk**

*Genetics*

1. Verification of Mendel's law – I ( Monohybrid ,test and back crosses)
2. Verification of Mendel's law - II (Dihybrid cross)
3. Gene interactions – problem solving
4. Study of Mendelian traits in human
5. Barr bodies & Giant chromosome - Chironema
6. Blood grouping- multiple alleles
7. Probability test – beads/coin/dice
8. Chromosome mapping
9. Drosophila experiment

*Plant breeding*

10. Collection and submission of local rice / vegetable cultivars
11. Determination of seed viability
12. Method of emasculation – pollen dusting and bagging
13. Visits - Cotton, millet, sugarcane research centres (Coimbatore), Banana Research Centre (Trichy), National facilities - NBPGR, ICRISAT.

**Reference**

1. Gardner,E.J.,Simmon,M.J and Snustad .D.P. (1991) . Principles of Genetics. John Willey and Son (Asian) Ltd. Singapore. ISBN:0-471-50487-4
2. Stansfield,W.D. (1991). Theory and problems of Genetics. 3rd ed. McGraw Hill Inc. ISBN 0-07-060877-6
3. Chahal,G.C and Gosal,S.S (2002) Principles and procedures of Plant breeding. Narosa Publi. House. ISBN 81-7319-374-6

**BOT 2439 Botany for Chemists– I (3+2)hr /(3+1)cr**

(Lab cum Theory)

**PREAMBLE:** This course is designed for the chemistry students as a major supportive course, hence a basic understanding of plant forms and functions are dealt. A general understanding of the abuse of earth's natural resources particularly hazards that the plants face due to habitat destruction and global climate change will be taught. Chemical composition and the uses of plant nutrient are informed.

Objectives:

1. To introduce a few representatives of plant kingdom in order to give a comprehensive picture of plant diversity.
2. To highlight the inorganic and organic chemicals that actively participate in plant growth and metabolism.

**Unit 1: An overview of plant groups:**

Salient features of Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

**Unit 2:Cell as the basic entity:**

Prokaryotic and eukaryotic cells, endosymbiosis, chemistry of cell wall and plasma membrane, Structure and function of chloroplast and mitochondria.

**Unit 3: Nucleus:**

Organization – nucleic acids and chromosome – functions of nucleus.

**Unit 4: Plant – water and plant - carbon relations:**

Biological significance of water molecule (uptake and conduction). Photosynthesis (light reaction and carbon assimilation). Respiration (Glycolysis, TCA cycle and ETS).

**Unit 5: Plant growth and nutrition:**

Plant nutrients – NPK (organic and inorganic sources) - deficiency symptoms – plant growth regulators (auxins, cytokinins, gibberellins, ABA and ethylene).

**References**:

1. Berg, L.R. (1997). Introductory Botany: Plants, People & the Environment. ISBN-13: 978-0030248443
2. Sheeler.P and Bianchi. E.D. (1987). Cell and Molecular Biology . 3rd ed. John . Willey and Son (Asian) Ltd. Singapore. ISBN: 9814-12-648-9
3. Devlin,R M and Witham,F.H. (1999). Plant Physiology, 4edn. CBS Publishers, New Delhi.

4. Pandey, B. P. (2005). College Botany, Vol I. 5th Edn., S. Chand & Company New Delhi. ISBN 81-219-0593-1
5. Pandey, B. P. (2009). College Botany, Vol II. 7th Edn., S. Chand & Company New Delhi. ISBN 81-219-0601-6
6. Sinha, R.K. (2004). Modern plant physiology. Narosa Publishing House New Delhi. ISBN 81-7319-333-9

**Suggested laboratory experiments / Field work**

1. Morphology of *Sargassum, Riccia, Fern* and identification of cryptogams in field
2. Morphology of *Cycas*
3. Angiosperms – morphology of monocot and dicot plant
4. Survey of campus trees.
5. A study on plant cell - Onion peel/ *Tradescantia ,Hydrilla&Vernonia* (c.s. of stem)
6. Soil test – pH, temperature, EC, alkalinity, acidity.
7. Plant growth measurement and movement – auxanometer, phototropism.
8. Plant water relations: Potato osmoscope
9. Photosynthesis – DCPIP experiment, starch test
10. Transpiration – Cobalt Chloride paper test, stomatal index
11. Respiration –Kuhns tube, Ganongs respiroscope
12. Collection and submission of plants with mineral deficiency symptoms

**References:**

1. Bendre, A. M., and Kumar, A. (2006). A text book of practical botany. (Vol I). Rastogi Publication New Delhi. ISBN 81-7133-809-7
2. Bendre, A. M. and Kumar,A. (2006). A text book of practical botany. (Vol II) Rastogi Publication New Delhi. ISBN 81-7133-852-6

**BOT 2532 MYCOLOGY & PATHOLOGY 5hr/5cr**

**Preamble:** This course uncovers the eukaryotic and achlorophyllous world of fungal biology, its classification and its biotic interaction. Later part of the course deals with the concept of pathogenesis and host response, citing examples of local disease occurrence and finally deals with conventional and modern methods of disease management. As an outcome of this course student will understand and appreciate the diversity and uniqueness of fungal kingdom and students are expected to identify, diagnose and manage the common disease of important crops.

**Objective:**

1. To understand the logic behind classification of fungi and to familiarise the suitable habitats that supply essential nutrition for growth and reproduction of fungi
2. To unravel pathogenic relationship between fungus and their host plants

**Unit 1: Basics of mycology**:

General features of fungi, reproductive biology, fruiting body and spore print, spore dispersal and dormancy – fungal habitats and mode of nutrition -Economic importance.

**Unit 2: Classification of fungi**:

Alexopoulos and Mims (1979) classification salient features of Gymnomycota (cellular and slime moulds), Mastigomycota (Oomycetes), and Amastigomycota (Ascomycetes and Basidiomycetes) – Fungal associations (lichens, mycorrhiza and endophytes)

**Unit 3: Introduction to Pathology**:

Concept of plant disease – Koch's postulates – Disease tetrahedron – Pathogenesis (enzymes and toxins) –Structural and functional defense in plants. Plant diseases and human civilization

**Unit 4: Plant diseases**:

Classification, symptoms and diagnosis – traditional and molecular methods. Case studies: Bacterial disease (Citrus canker), Fungal disease (Rice blast), Viral disease (TMV)

**Unit 5: Disease Management**:

Epidemiology and forecasting – agrometeorology - Disease severity and estimation of crop loss - Plant Quarantine – chemical, cultural and biological methods of disease management (*Pseudomonas fluorescens* and *Trichoderma viride*) – Integrated disease management.

**Reference:**

Agrios GN. 2006: Plant pathology. 5th Edn. Elseviers Publication, Academic press. New Delhi. ISBN- 13: 978-81-312-0639-3

Alexopoulos CG and Blackwell M. 1996: Introduction to modern mycology, John Wiley. New York. ISBN 9814-12-612-8

Chaube HS and Pundir VS. 2005. Crop disease and their management. Prentice Hall of India Pvt. Ltd. New Delhi. ISBN 81-203-2674-1

Hull.R .2002. Plant Virology. Elsevier Publication. Academic Press. New Delhi. ISBN 0-12-361160-1

Mehrotra RS and Agarwal A. 2003. Plant pathology. 2nd Edn. Tata McGraw Hills Publi. Co. New Delhi ISBN 0-07-047399-4

Singh RS. 2005. Plant disease. Oxford and IBH publishing. Co. Pvt. Ltd. New Delhi. ISBN 81-204-1658-9

**BOT 2434 CELL BIOLOGY 4hr/4cr**

This course is designed as an introductory course to understand and appreciate the living cells that serves as invisible backbones of all the life forms found in our earth. Architectural significance of organelles and other sub cellular components are highlighted for the students to explore and relate the structure and function of a typical cell. Various modes of cell multiplication mechanisms are also taught to motivate students to learn the basics of normal and abnormal cell division. A few tools and techniques commonly employed in cell biology are introduced to monitor and record the behaviour of a living cell. Students expected to get a holistic picture of life cycle pattern of a cell at the end of the course.

**Objectives:**

1. To gain a holistic understanding about structural and functional relationship of living cells.
2. To learn principles of basic tools and techniques used to highlight internal architecture of a cell.

**UNIT 1: Cell as a basic unit of life:**

Cell- Discovery, theory - Organization of prokaryotic and eukaryotic cells, endosymbiotic theory - Unique features of plant cell.

**UNIT 2: Cell Surface and Matrix**:

Cell wall organization, plasmodesmata, pit fields, middle lamella- Plasma membrane structure (Unit membrane, Fluid-mosaic models) and functions- Properties of Cytoplasm.

**UNIT 3: Sub cellular components**:

Ultrastructure of Chloroplast - Mitochondria- Endoplasmic reticulum, Golgi apparatus, lysosomes, ribosomes, Micro bodies, cytoskeletons, Vacuoles and Ergastic substances (Crystals and raphides). **Nucleus** – Membrane, nucleoplasm, chromatin reticulum, chromosome and nucleolus.

**Unit 4: Cell cycle and Cell Division**:

Cell division in lower forms- binary fission and budding. Cell cycle, mitosis &meiosis- Abnormal cell cycle (Tumour and Cancer cells).

**Unit 5: Microscopy and analytical procedures:**

Principle and working mechanism of compound and electron microscope – **S**ample preparation and Isolation of organelles (homogenisation, sub-cellular fractionation), Haemocytometry, Photomicrography.

**REFERENCES**

Gerald Karp (2003), Cell **B**iology 7 th Edn (international student version) John Willey ISBN :9781118318744

Geoffrey M. Cooper (2015), 7th Edn The Cell- A Molecular Approach, ASM publications Washington.

Albertis B,Johnson A,Lewis J Raff M, Roberts K and Walter P., 2002 Molecular Biology of cell, 4th Edn. Garland Science Publ. ISBN 0-8153-4072-9.

Singh and Tomer , (2015), 10th Edn Cell biology .Rastogi publications.Meerut.ISBN-978-81-7133-969-3

P.K.Gupta (2015) 4th Edn, A text book of cell and Molecular Biology. Rastogi publications ISBN-978-93-5078-072-5

**BOT 2436 Anatomy and Reproductive Biology of Angiosperms (ARBA) 4hr/4cr**

This course exposes students into the internal structure and organization of plants mostly angiosperms. Anatomy of vegetative and reproductive structure is given emphasis to know the complete changes in internal morphology that happens in the lifecycle of plants. Students will be trained to identify the tissue types and meristems which form the basis of growth. The reproductive organs which give rise to the gametes followed by the development of seed will be taught to the students to understand the essentials of reproduction.

**Objecives:**

1. To apply the theoretical knowledge of anatomy in applied botany.
2. To acquire additional skills in anatomy to improve employability, such as making permanent slides, anatomical structures in printing technology, use of stains and mordant to print textiles.
3. To learn the art of induction of polyembryony and parthenocarpy in horticulture.

**Unit 1: Cells and Tissues**:

Tissues as architectural skeleton of plants - Tissue types – structure and functions – localization of cell – Meristems– theories.

**Unit 2: Anatomy of vegetative structures**:

Primary structure of root and stem (Dicot and Monocot) – secondary structure – Anomalous secondary growth — Leaf anatomy – nodal anatomy.

**Unit 3: Reproductive structures**:

Stamen and pistil structure – pollen structure-male gametophyte -pollen germination-ovule structure and types – female gametophyte and embryo sac.

**Unit 4**: **Pollination and fertilization**:

Types of pollination- agents of pollination–pollen - pistil interaction, double fertilization – triple fusion- embryo formation -embryo types -endosperm formation and types- seed.

**Unit 5**: **Techniques in anatomy and applied embryology** :

Stains used in anatomy- Maceration techniques – procedure for sectioning-permanent slide preparation. Wood anatomy and pharmacognosy -Applied embryology: polyembryony - parthenocarpy.

**References:**

1. Maheshwari.P (1985) An introduction to the embryology of angiosperm. Tata McGraw Hill. ISBN 0 0709 9434 X
2. Fahn,A (1989) Plant Anatomy. Mac Millan pub. New York. ISBN 008 028030 7.
3. Raghavan V. 1986. Embryogenesis in angiosperms. Cambridge University Press. ISBN 0 5212 6771 4.
4. Esau,K . 2002. Plant Anatomy. John Wiley and sons. ISBN 9 8141 2649 7.
5. Burgess,J. 1985. An introduction to plant cell development. Cambridge University press. ISBN 05213 0273 0.

**BOT 2638 LAB IV (Myco+Cellbio+ARBA) 6hr/6cr**

**I -- Mycology & Pathology 2h/wk**

1. Observations of *Mucor* and *Rhizopus*
2. Observations of *Pilobolus*
3. Documentation of macro fungi from college campus
4. Documentation of plant diseases – rust, wilt, blast, rot, canker
5. Isolation of fungal plant pathogens
6. Isolation of plant pathogenic bacteria
7. Testing Koch's postulates – (*Rhizoctonia solani*) potted plants
8. Study of endophytes in plants
9. Disease assessment methods – different assessment scales (paddy)

10. Testing antagonistic property – biocontrol agent against pathogens – dual culture assay
11. Mass production and formulation of biocontrol strains
12. *In- vitro* screening of fungicides against pathogens
13. Disease forecasting – web based model

Visit to TNAU

Submission of summative Report on disease incidence in the state

**Reference:**

Aneja KR. 2009. Experiments in Microbiology, Plant Pathology, and Biotechnology. New Age International Publishers, New Delhi. ISBN 978-81-224-1494-3

Alexopoulos CG and Blackwell M. 1996: Introduction to modern mycology, John Wiley. New York. ISBN 9814-12-612-8

**II -- Cell Biology 2h/wk**

1. Light and electron microscope - working principles through models
2. Cytological investigations: animal (mouth swab) and plant cell (Onion peel).
3. Cell inclusions: Starch grains, raphides, Cystolith Cytoplasmic streaming (Hydrilla and Tradescantia)
4. Cytochemistry I: Staining for starch ,reducing sugar, proteins.
5. Cytochemistry II: Staining for lipids, terpenes and secondary metabolites.
6. Cytochemistry III: Chromosome staining
7. Microscopic observation of Chloroplast
8. Cell isolation technique
9. Mitosis: smear technique with onion.
10. Meiosis: Rheo / Tradescantia anther Squash.
11. Chromosomal structure: Satellite and Giant Chromosome.

**REFERENCES**

Sheeler P and Bianchi ED 1987.Cell and Molecular Biology.3rd ed. John willey and Son (Asian) Ltd. Singapore. ISBN: 9814-12-648-9.

Shanmugam G 1988 Cell biology A laboratory Manual, Macmillan India Limited ISBN 033392 087 2

Santra S.C Chatterjee T.P. Das A.P (1989) College Botany Practical – Volume 1, New central book agency, Kolkatta.

**III -- Plant Anatomy And Reproductive Biology Lab 2h/2wk**

1. Examination of plant tissues –types.
2. Anatomy of meristems – shoot tip and root tip
3. C.S. of primary structures (Dicot & monocot stem and root)
4. T.S. of secondary structure of stem
5. Anamolous secondary growth.
5. Anatomy of leaf (Dicot & monocot) & node.
6. Wood anatomy - any three timber
7. Maceration and micrometry
8. Study of reproductive structure (Stamen and pistil).
9. Pollen types and pollen germination.
10. Ovule structure and placentation.
11. Excision of embryo (*Tridax*) and poly embryony in citrus
12. Endosperm types, aril and haustoria

Submission – Report of group activity

**REFERENCES:**

1.Johri.B.M 1982. Experimental Embryology of Vascular plants –springer-verlag. Nerlin. ISBN 3 5401 0334 1.
2. Esau,K. 1977. Anatomy of seed plants.Wiley Eastern.Publ. ISBN 04712 4520 8.
3. Raghavan V. 1986. Embryogenesis in angiosperms, Cambridge University press . ISBN 05212 6771

**BOT 2440 Botany for Chemists II (Theory cum Lab) H(3+2)/C(4+1)**

**Preamble**: Plant life is essential for the survival of all animals and human being on earth. This course is aimed to inculcate the chemistry of economically important plants which are intertwining in our day today life and also the course is designed to cater the need of young mind of students who take chemistry as major. This course will kindle the inquisitiveness of the students. After completing this course the students will be able to appreciate the plants in terms of its chemical makeup.

**Objectives:**

1. To trace the source of biochemicals used in our everyday life
2. To estimate the value of plants that yield economically important drugs and bioresouces.
3. To understand the importance of plant conservation and restoration of natural landscapes.

**Unit 1: Introduction:**

Bioresources and human welfare – types of bioresources (food, beverages, fiber, medicine, industrial resources, fuel), food and culture.

**Unit 2: Chemistry of plant medicine**:

Brief study of Phytochemicals (secondary metabolites): source, useful part, active principles and uses of the following: Essential oil: menthol, citronella; Alkaloids: curcumin, Morphine and Vincristine; Glycosides – digitalin, steviosides; Steroids – *Dioscorea*; Flavanoids – *Pelargonium;* *T*erpenoids– cannabinoids (*Cannabis*) curcuminoids (mustard seed) an outline of drug discovery and design.

**Unit 3: Plant produce as industrial inputs:**

Botany and chemistry of Rubber. Pulp woods – grapes - papaya – potato – tapioca. Beverages: Non- alcoholic beverages -– history, botany, chemistry of tea, coffee and cocoa.

**Unit 4: Bioprospecting and drug development:**

Jeevani**,** Artemisin, Noni, Brahmi, Indian Ginseng. Traditional knowledge as marker for bioprospecting: access and benefit sharing. Drug abuse and addiction.

**Unit 5**: **Trade and conservation of resources**:

Supply and demand assessment –threats – loss of resources - sustainable management.

**References:**


1. Annonymus . The AyurvedicPharmacopia of India Volume-I and IV, Govt. of India, Ministry of Health and Family Welfare, Department of Ayush Page 41.
2. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
3. Kochhar, S.L. 2011. *Economic Botany in the Tropics*, MacMillan Publishers India Ltd., New Delhi. 4th edition. (ISBN ( 13) 978-0230- 63893-8)
4. Kokate C.K. 2014. Practical Pharmacognosy, Vallabhprakashan, New Delhi, 5 th edition
5. Trease G.E. and Evans. W.C. (2002) Pharmacognosy ELBS 15th Edition
6. Verma, V. 2009. *Text book of economic botany* Ane Books Pvt Ltd. New Delhi (ISBN ( 13) 978-81-8052-167-6)
7. Wallis,T.E. (2003)Test books of pharmacognosy CBS publishers and distributors New Delhi (Latest Edition )
8. Simpson, B B. . and Ogorzaly, M.C. (2000)Economic Botany: Plants in our World 3rd Edition, McGraw Hill Book Company, New Delhi, ISBN-13: 978- 0072909388.
9. Hill, a. F. 1937. *Economic botany: a textbook of useful plants and plant products,* mcgraw-hill book company, inc. New york and london 1937


**Suggested laboratory experiments / Field work**

**1.** Identification of plant resources mentioned in syllabus
**2.** Locating potential plant resources on and off campus
**3.** Survey of plant based medicines in local market
**4.** Histo-chemical staining and identification of important phytochemicals
**5.** Solvent extraction of selected plant ingredients
**6.** Distillation of essential oil
**7.** Extraction of bio-fuel from *Madhuca* / *Pongamia*
**8.** Tea adulteration and testing
**9.** Homemade chocolate preparation
**10.** Fermentation - Wine preparation
**11.** Biogas unit – design and demo
**12.** Natural dyes – extraction and dyeing of fibres

**References:**


1. Hill, a. F. 1937. *Economic botany: a textbook of useful plants and plant products,* mcgraw-hill book company, inc. New york and london 1937
2. Trease G.E. and Evans. W.C. (2002) Pharmacognosy ELBS 15th Edition


## Department of Undergraduate Botany

B.Sc. – Botany Programme (CBCS)

(With effect from June 2015)

| Sem. | Part | Course | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|

| | | **No.** | | | | |
|---|---|---|---|---|---|---|
| 1 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1201 | Conversational Skills | 3 | 2 | 30 |
| | IIIC | BOT1531 | Ecology | 5 | 5 | 75 |
| | IIIC | BOT1433 | Learning Basic Skills In Biology(LBSB) | 4 | 4 | 60 |
| | IIIC | BOT1435 | LAB I (Ecology and LBSB) | 4 | 4 | 60 |
| | IIIS | CHE14XX | Chemistry for Botanists -1 | 3+2L | 3+1 | 45+15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -1 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | - | |
| | | | **Total** | **30** | **25** | |
| 2 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1202 | Reading and Writing Skills | 3 | 2 | 30 |
| | IIIC | BOT1532 | Economic Botany | 5 | 5 | 75 |
| | IIIC | BOT1434 | Horticulture Practices and Post-Harvest Technology (HPPHT) | 4 | 4 | 60 |
| | IIIC | BOT1436 | LAB II (Economic Botany and HPPHT) | 4 | 4 | 60 |
| | IIIS | CHE14XX | Chemistry for Botanists - 2 | 3+2L | 3+1 | 45+15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -2 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **25+1** | |
| 3 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2201 | Study Skills | 3 | 2 | 30 |
| | IIIC | BOT2531 | Microbiology and Phycology | 5 | 5 | 75 |
| | IIIC | BOT2533 | Archegoniatae | 5 | 5 | 75 |
| | IIIC | BOT2335 | Genetics and Plant Breeding | 3 | 3 | 45 |
| | IIIC | BOT2637 | LAB III (Micro+Arche +Genetics) | 2+2+2 | 6 | 90 |
| | IIIS | ZOO24XX | General Zoology-I | 3+2L | 3+1 | 45+15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | | |
| | | | **Total** | **30** | **27** | |
| 4 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2202 | Career Skills | 3 | 2 | 30 |
| | IIIC | BOT2552 | Mycology and Pathology | 5 | 5 | 75 |
| | IIIC | BOT2444 | Cell Biology | 4 | 4 | 60 |
| | IIIC | BOT2436 | Anatomy and Reproductive Biology of Angiosperms (ARBA) | 4 | 4 | 60 |
| | IIIC | BOT2638 | LAB IV (Myco+Cellbio+ARBA | 6 | 6 | 90 |
| | IIIS | ZOO24XX | General Zoology II | 3+2L | 3+1 | 45+15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **27+1** | |

| Sem. | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 5 | IIIC | BOT 3631 | Plant Systematics | 6 | 6 | 90 |
| | IIIC | BOT3633 | Biochemistry | 6 | 6 | 90 |
| | IIIC | BOT3535 | Analytical Techniques and Research Methodology | 5 | 5 | 75 |
| | IIIC | BOT3637 | LAB – V (Systematics + Biochem) | 3+3 | 6 | 90 |
| | IVLS | ***32XX | Life Skill - 3 | 3 | 2 | 30 |
| | IVEVS | BOT 3200 | Environmental Studies | 4 | 2 | 30 |
| | | | | **30** | **27** | |
| 6 | IIIC | BOT3832 | Plant Biotechnology (Lab cum Theory) | 5+3L | 8 | 75+45 |
| | IIIC | BOT3434 | Entrepreneurial Botany | 4 | 4 | 60 |
| | IIIC | BOT3536 | Bioresource Management | 5 | 5 | 75 |
| | | BOT3538 | Botany Project | | | |
| | IIIC | BOT3642 | Plant Physiology (Lab cum Theory) | 4+2L | 6 | 60+30 |
| | IVLS | *** 32XX | Life Skill IV | 3 | 2 | 30 |
| | IVVE | VAL32XX | Value Education | 4 | 2 | 30 |
| | | | **Total** | **30** | **27** | |
| | | | | | | |

**Supportive Courses (Lab Cum Theory Courses)**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IIIS | BOT1437 | Plant Biology I | 3+2L | 4 | 45+15 |
| 2 | IIIS | BOT1438 | Plant Biology II | 3+2L | 4 | 45+15 |
| 3 | IIIS | BOT2439 | Botany for Chemists-I | 3+2L | 4 | 45+15 |
| 4 | IIIS | BOT2440 | Botany for Chemists-II | 3+2L | 4 | 45+15 |

**Life Skill Courses**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IVLS | BOT1231 | Mushroom Culture Technology | 3 | 2 | 30 |
| 2 | IVLS | BOT1236 | Nursery and Gardening | 3 | 2 | 30 |
| 5 | IVLS | BOT3239 | Medicinal Botany | 3 | 2 | 30 |
| 6 | IVLS | BOT3240 | Biofertilizers and Biopesticides | 3 | 2 | 30 |

**Non Major Courses**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | IVE | BOT1233 | Food and Nutrition | 3 | 2 | 30 |
| 2 | IVE | BOT1238 | Plant Wonders | 3 | 2 | 30 |

**BOT 3631 PLANT SYSTEMATICS 6 Hr /6Cr**

**Preamble**: This course is designed to give an introduction on plant systematics to the young minds who study the subject for the first time. The morphology and the history of classification will be an eye opener to the students. Further the on hand study of locally available flora can give them the basic knowledge of plants. This study will further helping the young students to appreciate and enjoy the nature and also lead them towards conservation of plants. After the successful completion of the course, the student will be able to understand and explain the principles of systematics, distinctive features of selected families, recall the economic value of the plants in the cited families.

**Objectives**

To appreciate the scientific approach diversity of plants with reference to the morphological characters

To enrich the students knowledge on plants by hands on study of various classes of plants.

To observe the plants in their habitat and to appreciate the evolution of plant diversity.

**UNIT 1. Morphology of plants & History of classification:**

Morphology of root, stem, leaf, inflorescence, flower and fruit – History of classification ( Theophrastus, Linnaeus, Bentham and Hooker, and Engler and Prantle.)

**UNIT 2. Principles of plant taxonomy:**

Principles of Taxonomy – Minor and Major categories, rules and recommendations – ICBN and ICN – principles of ICN – active principles (priority of publication, typification and effective publication) author citation – naming of plants – rejection of names – dichotomous key – phytography – herbarium techniques – numerical taxonomy – Chemotaxonomy.

**UNIT 3. Study of the locally available *Polypetalae* flora:**

Annonaceae, Leguminosae (Fabaceae, Caesalpiniaceae, Mimosaceae), Rosaceae and Cucurbitaceae with their economic importance and phylogeny.

**UNIT 4. Study of the locally available *Gamopetalae* flora:**

Asteraceae, Sapotaceae, Apocynaceae, Rubiaceae and Lamiaceae with their economic importance and phylogeny.

**UNIT 5. Study of the locally available *Monochlamydae* and Monocot flora**:

Amaranthaceae, Euphorbiaceae, Orchidaceae , Arecaceae and Poaceae with their economic importance and phylogeny.

**TEXT BOOKS**

Singh, G., 2012. Plant systematics, Third edition. Oxibh publishers, New Delhi. ISBN: 978-8120417632.

Pandey, S. N. and Misra, S. P., 2008. Taxonomy of angiosperms. Ane books India, New Delhi. ISBN: 978-8180521768.

Verma, B.K., 2011. Introduction to taxonomy of angiosperms, PHI learning private limited, New Delhi. ISBN: 978-8120341142.

Lawrence, G.H.M., 1965. Taxonomy of vascular plants. The Macmilan co, New York. ISBN: 978-0023681905.

Pandey, B. P., 2001. Taxonomy of angiosperms, S. Chand and co limited. New Delhi. ISBN: 978-8121909327.

**REFERENCE BOOKS**

Gamble, J.S and Fischer, C.E.C., 1957. Flora of the presidency of madras, I – III, W. C. Adlard and son limited, London. ISBN: 978-1152544420.

Jeffrey, C., 1982. An introduction to plant taxonomy. Allied publishers private limited, New Delhi. ISBN: 978-0521287753.

Jones Jr, S. B. and Luchsinger, A. E., 1987. Plant systematics. Mcgraw hill book company, New Delhi. ISBN: 978-0070327962.

Sambamurty, A. V. S. S., 2005. Taxonomy of angiosperms. I. K. International private limited, New Delhi. ISBN: 978-8188237166.

Singh, H.B. and Subramanian, B., 2008. National institute of science communication and information resources, New Delhi. ISBN: 978-8172363307.

**BOT 3633 BIOCHEMISTRY 6Hr/6Cr**

**Preamble:** A cognitive and pedagogical exposure of biochemistry is useful for a concrete understanding of biology. The course work envisaged endeavors to provide students a broad based training to look at life as an outcome of interlocked events of simple biochemical reactions, biosynthetic pathways and metabolism which eventually gets expressed as physical and physiological changes. In addition to the theoretical knowledge imparted on the basic rules, emphasis will be placed on the applications and forefront areas of experimental biochemistry. A multidisciplinary approach will provide the learner a good leverage for better comprehension of integrated metabolism.

**Objectives:**

To relate the basic structure and properties of biomolecules to their function in living organisms.

To comprehend the carbohydrates, lipids, proteins and nucleic acids as important macromolecules.

To visualize the cell as self contained bio-entities in terms of energy generations and supporting biochemical processes.

To help students to appreciate the biochemical basis of life for pursuing further studies.

**Unit 1. Introduction:**

An overview of the cell structure and brief survey of major bioconstituents ( Atoms – molecules – bonds and bonding – functional groups) – basic principles of thermodynamics – Gibbs free energy – entropy and enthalpy – redox reaction – electron transfer and its significance.

**Unit 2. Carbohydrates:**

Sources of various carbohydrates – classification – physio-chemical and optical properties of monosaccharides – structural and functional significance of sucrose, starch and cellulose.

**Unit 3. Lipids:**

Triglycerides – saturated and unsaturated fatty acids – brief outline on lipid metabolism – β-oxidation and lipid peroxidation – dietary value of lipids and vitamins

**Unit 4. Nucleic acids, Amino acids and Proteins:**

Types of nucleic acids – components – synthesis of purines and pyrimidines in outline – properties, classification and precursors for amino acid biosynthesis – structure and conformation of proteins – significance of Ramachandran plot – acid-base solubility – properties of proteins.

**Unit 5. Enzymes:**

Enzymes as quaternary proteins – properties –classification and nomenclature – mechanism of action – significance of Km – Michaelis and Menton concept– Enzyme catalysis – coenzymes and cofactors – competitive and non competitive inhibition – allosteric regulation – isoenzymes.

**REFERENCE BOOKS**

Berg, J.M. Tymoczko, J.L. and Stryer, L., 2002. Biochemistry, Fourth edition. W. H Freeman and company, New York. ISBN: 07 1674 9548.

Gasser, R.P.H. and Richards, W.G., 1986. Entrophy and energy levels. Oxford university publication, London. ISBN: 10- 0194424111.

Lehninger, A.L., Nelson, D.L. and Cox, M.M., 2000. Principles of biochemistry, Fifth edition. CBS publishers and distributors, New Delhi. ISBN: 10: 0716743396.

Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Weil, P.A., 2009. Harper's illustrated biochemistry, Twenty-eighth edition. Mcgraw hill education, New York. ISBN: 978-0-07-162591-3.

Voet, D. and Voet, J.G., 2004. Biochemistry, Third edition. John wiley and sons, New Jersey, United States. ISBN: 10: 047119350X.

Zubay, G.L., 1998. Biochemistry, Fourth edition. Brown publishers, Chicago. ISBN: 0-697-21900-3.

**BOT3535 ANALYTICAL TECHNIQUES AND RESEARCH METHODOLOGY 5Hr/5Cr**

**Preamble**: This course imparts knowledge on principles of various instruments and gadgets employed in scientific enquiry. Students will learn various qualitative and quantitative techniques. Further students will gain skills to design scientific experiments, data mining, analysis and scientific paper writing.

**Objectives:**

To impart Good Laboratory Practices

To acquire knowledge about lab instrument and their working principles

To understand the fundamentals of biological research work

To learn standard procedures in planning, executing research work and interpretation of results

**UNIT 1. Basic principles:**

Units of measurement, expression of solutions concentration (molarity, molality, normality, percentage, parts per thousand, and ppm) – pH metry (working principle, components and buffers) – electromagnetic spectrum – gravitational force – Good Laboratory Practices (GLP)

**UNIT 2. Analytical techniques:**

Instrumentation for environmental analysis (sonometer, clinometer, altimeter, barometer, hygrometer, anemometer, lux meter, thermometer, rain gauge and smart phone Apps.)

colorimetry and spectrophotometry (working principle, components and applications) – Spectroscopy, UV visible and Mass spectrometry (working principle, components and applications.)

**UNIT 3. Separation techniques and their application:**

Centrifugation ( principle, types of centrifuge and applications) – Chromatography (principle of paper and thin layer) – applications of HPLC, GC–MS, FTIR, NMR – electrophoresis – (principle, agarose and Poly Acrylamide Gel Electrophoresis) – applications of Southern and Northern blotting.

**UNIT 4. Data collection and analysis:**

Collection of primary and secondary data – population and sample – sampling methods (random and non–random sampling) – questionnaire – survey – field note – photo documentation.

Biostatistics (mean, mode, frequency distribution, standard deviations, standard error) – data processing softwares – Model biological organisms (*Escherichia coli* and *Arabidopsis thaliana* )

**UNIT 5. Scientific report writing:**

Scientific observations – critical thinking – research aptitude – research problem, hypothesis testing and experimental design – review of literature (journal references, on line resources.)

thesis writing – format of report, abstract, data presentation (tabulations, graphic representation) – interpretation of results – acknowledgements – MS-word, excel and power point – oral presentation – plagiarism.

**REFERENCE BOOKS**

Jeyaraman, J., 2011. Laboratory manual in biochemistry, Second edition. New age international private limited, New Delhi. ISBN: 9788122430493.

Kothari, C.K., 1985. Research methodology – methods and techniques. Wishwa prakashan publications, New Delhi. ISBN: 81 224 0002 7.

Palanivelu, P., 2009. Analytical biochemistry and separation techniques – A laboratory manual, Fourth edition. Twenty first century publications. India. ISBN: 978–8190848909.

Plummer, D.T., 1975. An introduction to practical biochemistry, Tata mcgraw hill publishing company limited. New Delhi. ISBN: 9780070994874.

Rastogi, V.B., 2011. Fundamentals of biostatistics. Ane books private limited, New Delhi. ISBN: 978 81 8052 2550.

Wallwork, A., 2011. English for writing research papers. Springer science publications, New York. ISBN: 9781441979216.

Wilson, K. and Walker, J., 2006. Principles and techniques of biochemistry and molecular biology, Sixth edition. Cambridge university press, New York. ISBN: 10 0 521 69180.

**BOT 3637 LAB V (PLANT SYSTEMATICS AND BIOCHEMISTRY) 6hr/6cr**

**Plant systematic** **3h/wk**

The lab course is aimed at giving on hand experience to the students. The students will be encouraged to observe and understand the various vegetative and reproductive structures of the plant.

Introduction: Various plant parts

Morphology of vegetative parts

Morphology of flowers and fruits

Phytography (description of plants)

Key construction (Indented and bracketed key)

Identification of plants up to family level using dichotomous keys used in the floras

Polypetalae I Annonaceae, Leguminosae (Fabaceae, Caesalpiniaceae, Mimosaceae),

Polypetalae II Rosaceae & Cucurbitaceae

Gamopetalae I Asteraceae, Asclepiadaceae,

Gamopetalae II (Convolvulaceae, Acanthaceae & Lamiaceae)

Monochlamydeae (Amaranthaceae, Euphorbiaceae.)

Monocots : Orchidaceae, Arecaceae, & Poaceae

Economic botany

Taxonomic problems

Further students are encouraged to participate in Field trips arranged by the Course Teacher to nearby botanically rich areas to study plants in their natural habitat.

**Suggested places for field study**:

Alagar Hills, Karungalakudi, Sathuragiri, Kodaikanal, Kuttupatti, Sirumalai .

## REFERENCE BOOKS

Gamble, J.S. and Fischer, C.E.C., 1957. Flora of the presidency of madras, I – III, W. C. Adlard and son limited, London. ISBN : 978-1152544420.

Lawrence, G.H.M., 1965. Taxonomy of vascular plants. The macmilan co, New York. ISBN: 978-0023681905.

Matthew, K. M., 1995. An excursion flora of central tamilnadu, Oxford press, New Delhi. ISBN: 978-905410286.

**Biochemistry** **3h/wk**

This laboratory session is to train the student to quantitatively and qualitatively analyze biomolecules and metabolites besides providing knowledge about the principles and knowhow of using various instruments**.**

pH metry

Colorimetry - Verification of Beer – Lambert's law

Spectrophotometer- Determination of λ-max.

Qualitative test for carbohydrates

Quantitative estimation of carbohydrates by Anthrone's method

Qualitative test for proteins and amino acids

Quantitative estimation of protein by Lowry's method

Qualitative test for lipids and estimation of oil in seeds

Separation of amino acids using paper chromatography.

Separation of pigments using thin layer chromatography.

Enzyme activity (Catalase / Peroxidase)

Isolation of chloroplast for electron transport studies.

Estimation of PS II activity (DCPIP reduction method)

## REFERENCE BOOKS

Cooper, T.G., 1991. The tools of biochemistry. John wiley and sons, New York. ISBN: 0-471 17116-6.

Jeyaraman, J., 1998. Laboratory manual in biochemistry. New age international publishers limited, New Delhi. ISBN: 0852264283.

Plummer, D.T., 2003. An introduction to practical biochemistry, Third edition. Tata Mcgraw hill publishing company limited, New Delhi. ISBN: 0-07-0994870

**BOT 3239 MEDICINAL BOTANY 3Hr/2Cr**

**Preamble:** This course will provide knowledge on botanical and therapeutic value of selected locally available and easily cultivable herbs. The students will be introduced to a few systems of medicines such as Siddha, Ayurveda, Unani and Homeopathy. Students will learn domestic usage of medicinal plants and be apprised about scope for documentation of folk medicinal knowledge, collection, marketing and sustainable utilization of medicinal plants.

**Objectives:**

To document folk knowledge and home remedies
To develop entrepreneurial skills in promoting herbal based products.

**UNIT 1. Introduction to medical practices in India:**
History – Literatures and physicians of ancient period. – Ayurvedha – Siddha – Unani-Homeopathy – Allopathy.

**UNIT 2. Ethnobotany and Folk lore medical practices:**
Ethnic communities in Tamil Nadu and their medicinal plant usage – patented products (Kani Tribe) – popular folklore medicines – methods of documenting the ethnobotanical knowledge – AICRPE.

**UNIT 3. An overview of selected medicinal plants:**
Morphology, family, vernacular and botanical name, useful part and active principles phytotherapeutics.
**I. Root (** *Asparagus racemosus & Gloriosa superba)*
**Leaf (** *Aloe vera, Azadirachta indica)*
**III. Bulb(** *Allium cepa, Allim sativum)*
**IV. Rhizome(** *Zingiber officianale, Curcuma longa)*
**V.Fruit (** *Solanum nigrum, Solanum xanthocarpum)*
**VI. Seed(***Trigonella foenum graceum.Cuminum cyminum)*
**VII. Oil seed (***Cocus nucifera, Ricinus communis)*

**UNIT 4. Cultivation and processing of medicinal plants:**
Propagules (Seed, leaf, stem, root, rhizome and bulbs) – cultivation methods – harvesting – processing – packaging – storage.

**UNIT 5. Good Manufacturing Practices:**
Choornam – legiyam – thailam – parpum– kasayam– herbal concoction – Processing of medicinal plants – medicinal plants in commercial products – list of commercial outlets.

**REFERENCE BOOKS**

Akerele, O., Heywood, V. and Synge, H., 1991. The conservation of medicinal plants. Cambridge university press. Cambridge. ISBN: 0521112028.

Chevallier, A., 1996. The encyclopedia of medicinal plants. D.K publishing, Michigan. ISBN: 0-789-41067-2.

Cunningham, A.B., 2001. Applied ethnobotany- people, wild plant use and conservation. Earth scan publications limited, London. ISBN: 1853836974.

Singh, M., 2009. Medicinal plants of india. New central book agency, New Delhi. ISBN: 8173815933.

Mathur, N., 2010. Medicinal plants of india. RBSA publishers, New Delhi. ISBN: 8-176114995.

Wallis, T.E., 1997. Textbook of pharmacognosy, Fifth edition. CBS publishers, New Delhi. ISBN: 0700012915

**BOT 3200 ENVIRONMENTAL STUDIES 4Hr/2Cr**

**Preamble:** The course presents an overview on the components of environment. Students will learn about the fragility and delicate balance between the interactive variables of habitat. Various causes of pollution with special reference to anthropogenic influences will be investigated. Learners will have an opportunity to get sensitized about local and global environmental issues and strategies to manage them.

**Objectives:**

To inform dynamic nature of planet earth.

To investigate the threats that are imminent.

To explore alternate resources for sustainability.

To bring awareness on policies that governs environmental management.

**Unit 1. Living Earth**:

Elements of Nature – Biotic, abiotic and climatic factors – lithosphere – atmosphere – hydrosphere – biosphere – renewable and nonrenewable energy resources (types – utilization – generation – solar – wind – hydro – wave – nuclear – biomass –fossil fuel.)

**Unit 2. Ecosystem, Community and Population ecology:**

Structure – **t**ypes – pyramids–food web – food chain – succession (hydrosere) – Clement's classification of community – attributes of population.

**Unit 3. Pollution**:

Pollution and its types – sources – effect – control (air –noise – space – water – land – thermal – biomedical and e-waste) – treatment of pollutants (reduce/ reuse/ recycle techniques) – episodes of concern (Ennore oil slick, Bhopal gas tragedy, Pacific gyre, Fukushima nuclear plant disaster)

**Unit 4. Climate change and natural disasters**:

Factors affecting global climate (green house effect, ozone depletion, acid rain) – disasters (occurrence – reasons – types – measurement – monitoring –management strategy) – participatory management – earthquake – volcanic eruption – floods – cyclones – tsunami – forest fire.

**Unit 5. Environmental policies:**

Future energy – environmental movements – national environmental issues – Indian environment policies – environment education – phytoremediation – aforestation and reforestation – social and agroforestry.

**REFERENCE BOOKS**

Chauhan, B.S., 2015. Environmental studies, Second edition. Laxmi publications, New Delhi. ISBN: 8-131-80328-7.

Cunningham, W. P., Cunningham, M.A. and Saigo, B. W., 2006. Environmental sciences, Nineth edition. Mcgraw-hill higher education, United States. ISBN: 978-0073218816.

Odum, E.P., 1971. Fundamentals of ecology, Third edition. W.B. Saunders company, Philadelphia. ISBN: 0-7216-6941-7.

Rai, G.D., 2011. Non conventional energy resources. Khanna publishers, New Delhi. ISBN: 1-364-63010-1.

Rao, C.S., 2006. Environment pollution control engineering, Second edition. New age international publishers, New Delhi. ISBN: 812241835X.

Sharma, P.D., 1999. Ecology and environment. Rastogi publications. Meerut. ISBN: 81-713381-43.

Subramanyam, N.S. and Sambamurthy, A.V., 2000. Ecology. Narosa publishing house, New Delhi. ISBN: 81-7319-289-8.

**BOT3832 PLANT BIOTECHNOLOGY (LAB CUM THEORY) 5T+3L**

**Preamble:** This course opens up the vistas of molecular biology and its application in genetic engineering. Students will learn the purpose and the art of tissue culture for propagation and genetic transformation of plants. Students will analyze the wet lab data at dry lab. They will explore the practical issues involving fermentation industries and nitty-gritty of making marketable plant based products. On completion of the course students will appreciate the art of fermenting foods and beverages.

**Objectives:**

To introduce students the emerging technologies in plant sciences
To learn the application of rDNA technology
To familiarize *in-vitro techniques* in rearing plants and microbes
To introduce *in-silico* methods

**Unit 1. Tissue culture as a tool for plant biotechnology**:

Objectives and goals – historical perspective – laboratory design and equipments – MS Media composition and supplementation – explants selection, sterilization, inoculation –induction of callus – organogenesis – somatic embryogenesis and hardening – micro propagation – artificial seeds – protoplast isolation, culture and fusion – haploid plants.

**UNIT 2. Basics of rDNA technology** :

Central Dogma – DNA structure, variations and organization – replication – transcription, translation and protein synthesis – mutations – principles of recombinant DNA technology – pGEMT vector – restriction mediated and PCR based cloning – *Agrobacterium* mediated gene transfer.

**Unit 3. Elements of bioinformatics**:

*In silico* assistance in sequencing biomolecules – online nucleotide and protein databases (EBI and NCBI) and tools ( BLAST,FASTA ,ClustalW and PHYLIP)

**Unit 4 : Fundamentals of Fermentation Technology**:

Potential microorganisms – culture and characterization – strain development – batch and continuous culture – media formulation – growth kinetics – fermented products – food (curd, yoghurt, dhokla, miso, sauerkrauts , sausages , vinegar and cheese) – beverages (wine, beer) – types of fermenters – design – control and scale-up – upstream and downstream processing – introduction to bioreactors.

**UNIT 5. Marketable products and bio-applications:**

Secondary metabolites production – immobilisation – Single Cell Protein(SCP) – enzymes – planticcines – biofuels – GM crops – terminator seed technology – bioremediation – bioethics and biosafety.

**TEXT BOOKS**

Demain, A.L. and Davis, J.E., 2004. Industrial microbiology and biotechnology, American society for microbiology press. ISBN: 9781555811280.

Brown, T.A., 2010. Gene cloning and DNA analysis: an introduction, Sixth edition. Wiley-blackwell, United States. ISBN: 9781405181730.

Dubey, R.C., 2006. Textbook of biotechnology, Fourth revised edition. S.Chand and company, New Delhi. ISBN: 8-219-2608-4.

Dubey, R.C., 2014. Advanced biotechnology. S. Chand and company, New Delhi. ISBN: 81-219-4290-X.

Stansbury, P.F., 2009. Principles of fermentation technology, Second edition, Butterworth-heinemann publisher- Elsevier, United Kingdom.ISBN: 9780080999531.

Razdan, M.K., 2003. Introduction to plant tissue culture. Oxford and IBH publishing, New Delhi. ISBN: 81-210-41571-X.

Stansbury, P.F., Whitaker, A. and Hall, S.J., 1997. Principles of fermentation technology, Butterworth-heinemann publisher-Elsevier, United Kingdom. ISBN: 978-0750645010.

**REFERENCE BOOKS**:

Peterson, C.S., 1971. Microbiology of food fermentations, Second revised edition. AVI publishing company, Connecticut. ISBN: 978-0870552779.

Joshi, V.K., 2009. Biotechnology: Food fermentation-Volume I. Educational publishers and distributors, Kerala. ISBN: 978-8187198048

**Lab in Plant Biotechnology 3L**

Sterilization

Media preparation

Callus culture

DNA Extraction and agarose gel electrophoresis

DNA Quantification

Restriction Digestion of DNA

Introduction to databases

Usage of tools-BLAST, ClustalW analysis

Growth curve of *Escherichia coli*

Production of primary metabolites-catalase, amylase

Wine/Beer production

Production of acetic acid and lactic acid

Biodiesel production-*Jatropha*

**BOT 3434 ENTREPRENEURIAL BOTANY 4Hr/4Cr**

**Preamble:** This course is designed to help students gain the know-how on contemporary opportunities in business situations and develop skills needed to successfully convert them into entrepreneurial ventures. The basics of entrepreneurship as a concept and the fundamentals training they may require to meet their livelihoods will be explored. On completion learners will be able to develop ideas that will lead them to start their own business and enable them to be professionally competent.

**Objectives:**

To provide an understanding the essentials of entrepreneurship.
To introduce organizations and agencies that can backup entrepreneurial initiatives .

To expose students to various business opportunities emerging around the study of plants.
To encourage students to built proposals and projects to become an entrepreneur.

**Unit 1. Introduction:**

Need – definition and concept – Types and characterization – entrepreneurial values – motivation and barriers – entrepreneurship as innovation, risk assessment and solutions.

**Unit 2. Bioventure:**

Industry – overview of *Spirulina, Pleurotus sajor-caju*, *Ganoderma*, *Lentinus edodes*, drumstick and coconut – Straight Vegetable Oil (SVO) and Pure Plant Oil (PPO) - methods and marketing – fresh and dry flowers for aesthetics.

**Unit 3. Value added products:**

Canning of fruits – process and equipment – fruit and vegetable based products (squash) – ready to serve (RTS) (syrup, pulp, paste, ketchup, soup, vegetable sauces, jam and jellies) –bio-fuel production – Bamboo and cane based products – virgin coconut oil, jasmine oil production – nutraceuticals – standards and quality management.

**Unit 4. Organizations and agencies:**

TIIC, DIC, NABARD, MICROSTAT, DBT – case study – sarvodaya – SIDCO – Micro Small and Medium Enterprises – support structure for promoting entrepreneurship – various government schemes.

**Unit 5. Entrepreneurial opportunities:**

Understanding a market and assessment – selection of an enterprise – business planning –mobilization of resources – Break Even Analysis – project proposal (guidelines, collection of information and preparation of project report) – steps in filing patents – trademarks and copyright – Intellectual Property Rights – export and import license.

**REFERENCE BOOKS**


Taneja, S. and Gupta, S.L., 2015. Entrepreneurship development, New venture creation, Galgeha publication company, New Delhi. ISSN: 2321-8916.

Desai, V., 2015. Entrepreneurship development, First edition. Himalaya publication house, Mumbai. ISBN: 9789350973837.

Khanna, S.S., 2016. Entrepreneurial development. S.Chand company limited, New Delhi. ISBN: 9788121918015.

Manohar, D., 1989. Entrepreneurship of small scale industries, vol.III. Deep and deep publication, New Delhi. ISSN: 09735925.

Lal, G., Siddhapa, G.S. and Tandon, G.L., 1988. Preservation of fruits and vegetables. Indian Council of Agricultural Research (ICAR). ISSN: 0101-2061.

Ranganna, S., 2001. Hand book of analysis and quality control of fruits and vegetable products, Second edition, Tata mcgraw hill, New Delhi. ISBN: 9780074518519.

Cruses, W.V. and Fellows, P.J., 2000. Commercial fruits and vegetable processing. CRC press, United States. ISBN: 9780849308871.


**BOT3536 BIO-RESOURCE MANAGEMENT 5Hr/5Cr**

**Preamble**: This course is framed to cater the need of non major students about the Bioresources and its conservation of Indian subcontinent. Current status of our country's wealth is given a greater emphasis. *In situ* and *ex situ* methods of conservation are being taught to create a holistic approach in natural resources management. The course is designed to create leadership abilities among students and transform them as stewards of our natural resource.

**Objectives:**

To achieve an in-depth knowledge of classifying landscapes and waterscapes of India using geological and geographical inputs.
To appreciate forest as one of the life support systems of human and other living organisms.
To related the quality of soil with the productivity of agricultural crops.

**UNIT 1. Geology of India:**

Introduction of Geology – types of rocks – geographical position and boundaries – soil types in India – pedology – soil as natural capital – ecosystem services of soil – mineral sources – mining and its impact – depletion of minerals – conservation strategies.

**UNIT 2. Water, Wetlands and Marine resources:**

Watershed management – raining pattern – harvesting and storage – indigenous and remote sensing techniques – fresh water and wetland ecosystems located in India – global and national statistics of water resources – an overview of ecosystem services of wetlands – types of marine ecosystems – marine resources ( production, status, dependence, issues and challenges for resource supply, threats and prospects.)

**UNIT 3. Phytogeography**:

Mega diversity countries – biodiversity hotspots- endemism biogeographical realms – flora and fauna – forest types (Champion and Seth 1968) – Eastern and Western Ghats (physiography, distribution maps, diversity of plants and animals.) – desert ecosystem.

**UNIT 4. Food, Agriculture and Forestry:**

Native seeds and agricultural implements – land use patterns – ancient and modern agriculture –Food ( sources,sustainable usage, shortage and management,food storage methods merits and demerits.) Public distribution system (FAO, IBPGR, NBPGR.) – timber and Non timber forest produce (NTFP).

**UNIT 5. Conservation and Management:**

Heritage sites of UNESCO – Man and Biosphere Reserve (MAB) program – national parks – wildlife sanctuaries – botanical gardens – field gene bank – cryopreservation – reintroduction – silviculture.

**REFERENCES**

Sharma, P. D., 2015. Ecology and environment. Rastogi publications, New Delhi. ISBN: 978-93-5078-068-8.
Rana, S.V.S., 2012. Environmental studies. Rastogi publications, New Delhi. ISBN: 81-7133-728-7.
Sharma, P. D., 2013. Environmental biology and toxicology. Rastogi publications, New Delhi. ISBN: 978-81-7133-964-8.
Sharma, P. D., 2013. Ecology and utilization of plants. Rastogi publications, New Delhi. ISBN: 81-7133-861-5.
Bawa, K.S., Primack, R.B. and Oommen, M.A., 2012. Conservation biology. Universities press, New Delhi. ISBN: 9788173717246

**BOT 3538 Botany Project 5Cr./5hr.**

**PREAMBLE :** Botany Project work is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation or difficult problem. A project work may be given in lieu of an elective paper (Bio-resource Management). Interested students will get an opportunity to carryout research project at the department laboratories. Every year, based on the faculty availability a few areas will be identified and informed well in advance. Eligible students will be asked to make a list of three areas according to his/ her ranked choice. According to his/ her ranked choice of the area, project will be allotted. In the case of competition for a specific project the cumulative credential of first four semesters would be considered for project allotment. At the end of the research work students will be encouraged to create fact sheets and posters to report their findings.

**Objective:**

To promote research interest among students utilizing locally available resources.
To help students to develop research proposals of their own and develop unique problem solving methodologies.
To systematically document research experiences of every student and inculcate research aptitude among them.
To create self-explanatory fact sheets and posters (prescribed format) to report his/her findings.

**BOT 3642 Plant Physiology (Theory Cum Lab) 4+2L Hr/6C**

**Preamble:** This course explores the knowledge on life processes exclusive to plants. Students learn intricate details on water transport, transpiration and the uptake of nutrients of plants. It also facilitates them to have a deeper insight on energy generation and utilization mechanisms. Eventually learners understand the music of 'plant growth' from the notations of 'chemical regulators'.

**Objectives:**

To learn the overall dynamics of plants as autotrophs.
To understand the plant- environment relationship.
To explore the uptake and transport mechanisms that support plant metabolism.
To gain an understanding on the synthesis and utilization of metabolites.
To conceive the idea on the complexity and significance of various growth processes.

**Unit 1. Plant-Water relations:**

Characteristics of water molecule – Diffusion, osmosis, Imbibition– diffusion pressure deficit–guttation– ascent of sap– transpiration–factors affecting transpiration –translocation and descent of sap – components of phloem– girdle experiment– pressure flow hypothesis–flag leaf physiology.

**Unit 2. Mineral nutrition:**

Essential elements – macro and micronutrients – transport of ions across membrane – active and passive transport – deficiency symptoms and toxicity– nitrogen metabolism and phosphate solubilization.

**Unit 3. Photosynthesis:**

Photosynthetic pigments – PS I and PS II– reaction centres –antenna pigments – light dependent and independent reactions (C3, C4 and CAM) – C2 cycle – factors affecting photosynthesis.

**Unit 4. Respiration:**

Glycolysis – Krebs cycle-electron transport system – oxidative phosphorylation– pentose phosphate pathway–respiratory quotient.

**Unit 5. Growth Physiology:**

Introduction to plant growth – germination – physiological role and assays of auxins, gibberellins, cytokinin, abscissic acid, ethylene – photoperiodism and vernalization – photo morphogenesis – phytochromes – LDP, SDP and day neutral plants – Biorhythms and plant movements –senescence –plant re sponse to abiotic stresses.

**TEXT BOOKS**

Sinha, R. K., 2004. Modern plant physiology. Narosa publishing house, New Delhi. ISBN: 81-7319-333-9.

**REFERENCE BOOKS**

1. Bidwell, R. G. S., 1975. Plant physiology. Macmillan publishing co. inc., New York. ISBN: 0-02-309430-3.
Salisbury, F. B. and Ross, C.W., 1992. Plant physiology, Fourth edition. Eastern press, Bangalore. ISBN: 981-243-853.
Srivastava, H. S., 2005. Plant physiology. Rastogi publications, Meerut. ISBN: 81-7133-785-6.
Williams, M. B., 1984. Advanced plant physiology. Pitman publishing, New Zealand. ISBN: 0-273-02306-3.
Ghosh, M. S., 1996. Plant physiology, First central edition. New central book agency private limited, New Delhi. ISBN: 81-7381-478-3

## PLANT PHYSIOLOGY (LAB)

Determination of water potential.
Influence of temperature over permeability of membrane.
Transpiration measurement by potometer.
Cobalt chloride Experiment for transpiration.
Calculation of stomatal index and frequency of mesophytes and xerophytes.
Oxygen evolution in photosynthesis (Thistle funnel experiment).
Demonstration of light by DCPIP.
Characterization of C3 and C4 plants.
Demonstration of respiration using Ganong's respiroscope.
Comparison of rate of respiration of two plants using respirometer.
Auxin bioassay
Demonstration of Ethylene triple response.
Phototropic movements in plants.

**REFERENCES**

William, G H., 2009. Introduction to plant physiology. John wiley, New Jersey, United States. ISBN: 9780123741431.

Nobel, P.S., 1990. Physiochemical environmental plant physiology. Academic press, United States. ASIN: B0043KK4KY.

Taiz, L., 2015. Plant physiology, Sixth edition. Sinauer associates, United States. ISBN: 978- 1-60535-255-8.

Bajracharya, D., 1999. Experiments in plant physiology. Narosa publishing house, New Delhi. ISBN-13: 978-8173193101, ISBN-10: 817319310X

**BOT3240 BIOFERTILIZERS AND BIOPESTICIDES 3H/2CR**

**Preamble:**Through this course the non biology students will come to know the importance of eco-friendly approaches in agriculture. By enrolling in this course students will primarily know about the common agriculture practices and will able to appreciate the use of natural methods of providing nutrition and controlling pests and herbs. They will further learn about the regulations governing the organic farming.

**Objectives:**

To encourage students to learn the relevance of using plants and organic inputs in agriculture.

To enable students to gain a general understanding on eco–friendly, pollution free approaches that can replace the use of anthropogenic supplements.

To provide students hands on experience in preparing bioproducts this can be used for growing crops.

To introduce the concept of kitchen and terrace garden that can be practiced in urban situation.

**Unit 1. Introduction to Agriculture**:

Domestication of plants – early agricultural practices – shifting cultivation – settled cultivation– major cultivated crops in India (rice, wheat, soya, maize and brinjal) – industrialization and consequences– green revolution – indiscriminate use of agrochemicals.

**Unit 2. Organic farming:**

Principles and practices of organic farming – organic matter management in agricultural fields – crop rotation – plant health – sustainable agriculture– supplementation of NPK as bioresource – vermicomposting – green manure – terrace and kitchen garden– value addition in organic products – government policies.

**Unit 3. Biofertilizers:**

Scope, application, types – mass cultivation of Biological nitrogen fixers – Blue green algae – *Rhizobium, Azolla* – Phosphate solubilizing bacteria (*Pseudomonas fluorescens)* – Mycorrhiza – cost-benefit analysis.

**Unit 4. Biopesticides:**

History – comparative study of bio and synthetic pesticides – mass production and economics of microbial biopesticides (case study on *Trichoderma, Pseudomonas fluorescens, Bacillus thuringiensis (Bt)* – plant pesticides ( a case study on Neem.)

**Unit 5. Commercial formulation:**

Types of formulation – dry and liquid product – shelf-life, Stabilization, Methods of field application, certification – Bureau of Indian Standards (BIS) –biopesticide regulations (national and international with special emphasis on European Union.)

**REFERENCE BOOKS**

Dubey, R.C., 2014. A textbook of biotechnology. S. Chand and co private limited, New Delhi. ISBN: 81–219–2608–4.

Lakshmana, H.C. and Channabasava, A., 2014. Biofertilizers and biopesticides. Pointer publishers, Jaipur. ISBN: 8171327753.

Himadri, P. and Dharamvir, H., 2007. Biofertilizers and organic farming. Gene–tech books, New Delhi. ISBN: 978–8189729202.

Hegazi, N. I., Fayez, M. and Hamza, M., 2013. Biofertilizers for organic farming. Academic publishing, Egypt. ISBN: 978–3659336157.

Dilip, N., 2016. Organic farming for sustainable agriculture. Springer publishing, New Delhi. ISBN: 978–3319268019.

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 1 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1201 | Conversational Skills | 3 | 2 | 30 |
| | **IIIC** | **BOT1551** | **Ethnoecology** | **5** | **5** | **75** |
| | **IIIC** | **BOT1453** | **Learning Basic Skills In Biology(LBSB)** | **4** | **4** | **60** |
| | **IIIC** | **BOT1455** | **LAB I (Ethnoecology and LBSB)** | **4** | **4** | **60** |
| | IIIS | CHE13XX | Chemistry for Botanist -1(theory) | 3 | 3 | 45 |
| | IIIS | CHE11XX | Chemistry for Botanist -1(lab) | 2 | 1 | 15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/ Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -1 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | - | |
| | | | **Total** | **30** | **25** | |
| 2 | I | ***12XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG1202 | Reading and Writing Skills | 3 | 2 | 30 |
| | **IIIC** | **BOT1552** | **Genetics and Plant Breeding** | **5** | **5** | **75** |
| | **IIIC** | **BOT1454** | **Evolution & Phycology** | **4** | **4** | **60** |
| | **IIIC** | **BOT1456** | **LAB II (Phycology &Genetics)** | **4** | **4** | **60** |
| | IIIS | CHE13XX | Chemistry for Botanist – 2(theory) | 3 | 3 | 45 |
| | IIIS | CHE11XX | Chemistry for Botanist – 2 (lab) | 2 | 1 | 15 |
| | IVE | ***12XX | Basic Tamil/Adv.Tamil/Non-Major | 3 | 2 | 30 |
| | IVLS | ***12XX | Life Skill -2 | 3 | 2 | 30 |
| | V | ***11XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **25+1** | |
| 3 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2201 | Study Skills | 3 | 2 | 30 |
| | IIIC | BOT2551 | **Microbiology** | 5 | 5 | 75 |
| | IIIC | BOT2553 | **Archegoniatae** | 4 | 5 | 75 |
| | IIIC | BOT2355 | **Horticulture** | 4 | 3 | 45 |
| | IIIC | BOT2657 | LAB III (Micro+Arche +Horticulture) | 2+2+2 | 6 | 90 |
| | IIIS | ZOO2349 | General Zoology-I | 3 | 3 | 45 |
| | IIIS | ZOO2151 | Lab in General Zoology-I | 2 | 1 | 15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | | |
| | | | **Total** | **30** | **27** | |

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| 4 | I | ***22XX | TAM/HIN/FRE | 3 | 2 | 30 |
| | II | ENG2202 | Career Skills | 3 | 2 | 30 |
| | IIIC | BOT2552 | **Mycology and Pathology** | 5 | 5 | 75 |
| | IIIC | BOT2454 | **Cell Biology** | 4 | 4 | 60 |
| | IIIC | BOT2456 | **Anatomy and Reproductive Biology of Angiosperms (ARBA)** | 4 | 4 | 60 |
| | IIIC | BOT2658 | LAB IV (Myco+Cellbio+ARBA) | 6 | 6 | 90 |
| | IIIS | ZOO2350 | General Zoology II | 3 | 3 | 45 |
| | IIIS | ZOO2152 | Lab in General Zoology II | 2 | 1 | 15 |
| | V | ***21XX | NCA/NCN/NSS/PED/SLP | | 1 | |
| | | | **Total** | **30** | **27+1** | |
| 5 | IIIC | BOT 3651 | **Plant Systematics** | 6 | 6 | 90 |
| | IIIC | BOT3653 | **Biochemistry** | 6 | 6 | 90 |
| | IIIC | BOT3555 | **Analytical Techniques and Research Methodology** | 5 | 5 | 75 |
| | IIIC | BOT3657 | LAB – V (Pt Systematics + Biochem) | 3+3 | 6 | 90 |
| | IVEVS | BOT 3259 | Environmental Studies | 4 | 2 | 30 |
| | IVLS | ***32XX | Life Skill – 3 | 3 | 2 | 30 |
| | | | | **30** | **27** | |
| 6 | IIIC | BOT3852 | **Plant Biotechnology (Lab cum Theory)** | 4+3L | 8 | 75+45 |
| | IIIC | BOT3454 | **Entrepreneurial Botany** | 4 | 4 | 60 |
| | IIIC | BOT3656 | **Plant Physiology (Lab cum Theory)** | 5+2L | 6 | 60+30 |
| | IIIC | BOT3558 | **Botany Project** | 5 | 5 | 75 |
| | IVLS | ***32XX | Life Skill IV | 3 | 2 | 30 |
| | IVVE | VAL32XX | Value Education | 4 | 2 | 30 |
| | | | **Total** | **30** | **27** | |
| | | | | | | |

*Supportive Courses*

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| **1** | **IIIS** | **BOT1357** | **Plant Biology I (theory)** | **3** | **3** | **45** |
| **1** | **IIIS** | **BOT1159** | **Plant Biology I (lab)** | **2** | **1** | **15** |
| **2** | **IIIS** | **BOT1358** | **Plant Biology II (theory)** | **3** | **3** | **45** |
| **2** | **IIIS** | **BOT1160** | **Plant Biology II (lab)** | **2** | **1** | **15** |
| 3 | IIIS | BOT2359 | Botany for Chemists- I (theory) | 3 | 3 | 45 |
| 3 | IIIS | BOT2161 | Botany for Chemists – I (lab) | 2 | 1 | 15 |
| 4 | IIIS | BOT2360 | Botany for Chemists- II(theory) | 3 | 3 | 45 |
| 4 | IIIS | BOT2162 | Botany for Chemists – II (lab) | 2 | 1 | 15 |

**Life Skill Courses*

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| **1** | **IVLS** | **BOT1251** | **Mushroom Culture Technology** | **3** | **2** | **30** |
| **2** | **IVLS** | **BOT1252** | **Nursery and Gardening** | **3** | **2** | **30** |
| 5 | IVLS | BOT3251 | Medicinal Botany | 3 | 2 | 30 |
| 6 | IVLS | BOT3252 | Biofertilizers and Biopesticides | 3 | 2 | 30 |

***Non Major Courses**

| Semester | Part | Course No. | Course Title | Hr. | Cr. | Marks |
|---|---|---|---|---|---|---|
| **1** | **IVE** | **BOT1253** | **Food and Nutrition** | **3** | **2** | **30** |
| **2** | **IVE** | **BOT1254** | **Plant Wonders** | **3** | **2** | **30** |

**Value Added Courses**

| Semester | Course No. | Course Title | Hr. | Cr. |
|---|---|---|---|---|
| **1** | BOT121V | Edible Mushrooms | 2 | 2 |
| **2** | BOT122V | Gardening Techniques | 2 | 2 |
| 3 | BOT221V | Plant propagation | 2 | 2 |
| 4 | BOT222V | Organic farming | 2 | 2 |
| 5 | BOT321V | Plantation crops | 2 | 2 |
| 6 | BOT322V | Skills in Biology | 2 | 2 |

* All Job oriented courses

*Programme Specific Outcomes (PSOs) for Undergraduates*

1. Identify the diversity of nature to pursue his own career opportunity without disturbing the ecological balances.

2. Subscribe to the idea of climate conscious approaches while dealing with development activities

3. Probe new avenues in plant biology and pursue research

4. Explore suitable biotechnological approaches to develop the bio-entrepreneurship

5. Employ themselves in bio-based industries that offer Green jobs.

6. Evaluate and manage bioresources without bias and profiteering motives

7. Get back to the community as leaders and do such things that will appreciate the diverseness and togetherness in harmony with nature.

8. Draw from biotic associations in nature insights on to manoeuvre positive and negative influences that are essential for communal co living and societal interferences.

9. Learn from plants the idea of adaptations and acclimatization to entrain themselves to remain steadfast rather than running away from difficult situations.

10. Translate the idea of grand unification of life to draw lessons of pluralism and inclusivity.

*BOT1551* *Ethnoecology* *5 Hr./5 Cr.*

**Preamble:** This course is designed for the fresher as an introduction to the ecology of their own community and landscape. The study material is prepared to introduce the basics of ethnoecology and its components with reference to Madurai. The course is aimed at giving proper explanation for the better understanding of their surroundings. Further to understand the local knowledge on agriculture, natural resources management and traditional practices of the local community in their day to day life. After the completion of this course the student will be able to understand and appreciate the evolution of mankind and their tradition.

At the end of the course, students will be able to

i. understand the climatological changes and apply his knowledge in taking suitable initiatives to protect and conserve life support systems
ii. analyse the origin of human race and learn their habitat, cultural practices and occupation and identify the invasive and native plant species.
iii. relate sangam literature and landscapes and learn about the importance of sacred groves.
iv. assess the extent of environmental degradation in urban Madurai and join the initiatives of city administration in developing and ensuring a clean and green Madurai.
v. quantify the natural wealth and resources by using appropriate field methods to maintain the environmental serenity and take efforts to enhance the ecological elegance.

*Unit 1: Climate and Geography (15 hr)*

Global, regional and local climatic conditions (overview) -Altitudinal Zonation and forest types of Tamilnadu- Significance of Forests and Grasslands- Climate Change.

*Unit 2: Human Ecology (15 hr)*

Origin of human race ethnic communities of the world – Migration of human population – Occupation and culture - Local ethnic communities - Population explosion - Impact on Animal and Plant population; Native, exotic, and invasive species of plants - Vaviloviancentres of Origin.

*Unit 3: Ecological History (15 hr)*

Sangam Literature and landscapes - Sacred Groves, Nandavanam - Plants and Animals of socio-religious importance –Geography of Western Ghats & Eastern Ghats - Cultural ecology of Madurai .

*Unit 4: Urban Madurai (15 hr)*

Urbanization and Tourism- Sources of water – Vaigai - Irrigation practices- Land use- ecological conflicts- Agrobiodiversity - Monoculture - Waste management - Smart city.

*Unit 5: Vegetation and Floristic Elements (15 hr)*

Analysis of local species diversity - Field ecology: Quadrat ( frequency, density and abundance) Transect (belt and line)- Study of air microflora.

*Textbooks:*

**1.** Pushpendra K. Karhana 2004. Agriculture Science " A complete study package" Arihant Publishers (ISBN- 13 ; 978-8183482875)

**2.** Krishnamurthy, K.V. 2003. A text Book on Biodiversity (principles and Practice), Science Publishers, USA. (ISBN 1578083257, 9781578083251)

*References*

1. Anonymous, 2011. Handbook of Agriculture, Indian council of Agricultural Research Krishi Anusandhan Bhavan -I Pusa, New Delhi- 110012 ( ISBN NO: 81-7164-050-8)

2. Prathipal Singh, 2010. Introduction to biodiversity. Ane books Pvt. Ltd. New Delhi. (ISBN 978-1-8052-185-0)

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO 1 | 5 | 5 | 4 | 5 | 5 | 5 |
| CO 2 | 5 | 5 | 4 | 5 | 3 | 3 |
| CO 3 | 5 | 5 | 4 | 4 | 3 | 3 |
| CO 4 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO 5 | 5 | 5 | 5 | 5 | 5 | 5 |

Mean: 3.9

*BOT 1453* *Learning Basic Skills in Biology* *4 Hr. /4Cr.*

*Preamble:*
This is a unique course which aims to equip students to develop a basic understanding in biology and self-learning skills to comprehend and communicate with clarity and authenticity. It will also teach soft skill to the fresher in Botany who will be mostly from semi urban background of Madurai and give them the confidence to maneuver their linguistic and cognitive limitation. The course will also provide a gateway to the students and open their thinking and sensitivities to learn and appreciate in science and help to harbour and nurture innovative ideas in day to day life.

At the end of the semester, students will be able to

i. see the growth of botanical studies from an exploratory standpoint that they shall be entrained to appreciate the idea of conceptualizing a botanical thought that no less sooner they will acquire skills to build their own cognitive capabilities by resorting to perform appropriate and suitable experiments

ii. acquaint themselves with the contours of communications and equip themselves adequately with the reading writing, listening skills and master the ability to make graphical and pictorial presentations of their ideas to get groomed as a budding botanist

iii. familiarize themselves with the scientific conventions of making scientific measurements, data collections and data interpretations that a professional training needed to initiate original scientific discoveries and pursue career in leading scientific discourses later in life.

iv. find themselves nurtured with personality development and leadership traits to set proper goals, develop problem solving abilities, plan and schedule events that they may eventually emerge as mangers and custodians of nature.

v. turnconfident in hiring the services of the emerging frontiers of computational technology and ICT tools to emerge as an updated, informed, tech-savvy, skilled learner and a technician that he shall be vested with a competitive edge to compete with his peers in effectively realizing their dreams and ambitions of life

*Unit 1. History of Natural Sciences (10hr)*
Insights on botanical edifice - Contributions of Indian Botanists- S.R. Kashyap (Bryology) – Birbal Sahni (Paleobotany) – P.Maheswari (Embryology) M.S. Swaminathan (Plant Breeding) – Jagadish Chandra Bose (Biophysics).Contributions of Naturalists of International Acclaims – Charles Darwin (Evolution) GJ Mendel (Genetics) Louis Pasteur (Microbiology) Watson and Crick (Cell Biology).

*Unit 2. Communication in Biology (20 hr)*
Observational Skills: Inputs from Class lectures- Seminars- Field Visits; Serendipity in science (Penicillin Invention, Newton Law); Communication and Presentation skills- Verbal and nonverbal - use of scientific words- photographs- cartoons- tables and graphs – common barriers and impediments in communication. Reading and Comprehension skills: Academic reading tips, making notes while reading.

Writing Skills : Purpose of writing ( Class room, Examination, Scientific Publication)- logical sequence- botanical terms, interpretation of results and inferences- experimental records - Mnemonics.

*Unit 3: Quantitative Biology (10 hr)*

Units and measurement - International system of Units (SI)- Seven basic units - Distance ( Meter)- Mass (Kilogram)- Time (seconds)- Electric Current (Ampere)- Temperature (Kelvin) Quantity (Mole) - Luminous intensity ( Candela). Fundamental measurement- Volumetric and gravimetric Measurements- Tool and Techniques- Constants and standards- Principles of Calibration and Minimizing error – Collection, Processing and preservation of data.

*Unit 4 : Soft Skills (10 hr)*

Personality and Leadership Traits- Intra personal skills- self confidence- Goal setting- Problem solving abilities- Reflective thinking and strategic planning- Time management and effective planning.

*Unit 5: Computer in Biology(10hr)*

Basic Computing and Arithmetic logic skill – Computer - Software & Hardware - Exploring MS office - Basics of networking and Internet applications - Smartphone and its application in biology.

*Textbooks:*

1. Sanjay Kumar, Pushp Lata (2015) Communication skills 2nd edition. Oxford University Press. India. ISBN: 978-0199457069
2. DineshMaidasani(2008) Learning computer fundamentals, MS office and Internet and Web technology. Laxmi Publication. India. ISBN: 8131804062

*References:*

1. Adir J, (1997) Effective communication, Pan Book. U.K. ISBN 0330347861
2. Ghosh (2012) Managing soft skills for personality development, Mc Graw Hills India ISBN 978-0-07-107813-9
3. Jones A., Reed R & Weyers (2012), J. Practical skills in Biology, Pearsons review. ISBN 978- 1408245477.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 3 | 2 | 1 |
| CO2 | 5 | 5 | 5 | 5 | 4 | 4 |
| CO3 | 5 | 5 | 5 | 5 | 5 | 3 |
| CO4 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO5 | 5 | 5 | 5 | 5 | 5 | 5 |

Mean: 4.5

*BOT 1455* *4Hr./4Cr.*

## Ethnoecology and Learning Basic Skills in Biology- Lab 1

**Preamble:**

This is a basic course for those who have freshly joined in the field oriented biology courses. The primary objective of this course is to inculcate quantitative thinking and critical analysis among students. It is designed to promote systematic observation skills to promote documentation of the facts that are observed in the field. While studying the basic field ecology concepts students will be given a chance catalog the field information and data with precision and accuracy. At the end of this course students will know to enumerate, tabulate, rank, measure, estimate both qualitative and quantitative information collected aat the study area. They will be also trained to present given information with clarity and accuracy to their class and any other relevant forums.

At the end of the semester, students will be able to

i.learn and appreciate the college campus diversity.
ii. observe various ecological spots.
iii. experiment the use of measuring instruments and landscaping.
iv. acquire hands on training with the use of computer softwares.
v. visit agricultural fields to appreciate ecology of irrigation field.

*Learning Basic skills in Biology*

Visual documentaries:

1. National scientists.
2. International scientists.

Skill Assessment:

3. Observational and Interpretation Skills
4. Oral Presentation skills (Group wise presentation)
5. Report writing
6. Personality development
7. Time Management – 80:20 Rule

Fundamental Measurement:

8. Physical measurements
9. Volumetric apparatus & Gravimetric apparatus

Exploring with computers:

10. MS Word & Excel, Power Point Presentation
11. Data mining – Scientific web sites
12. Use of Smart phones in Biology.

*Ethnoecology*

1. Enumeration of trees at the American college campus.
2. Observation of structural modifications and ecological adaptations of plants.
3. Raunkier's biological spectrum.
4. Floristic elements in temples and parks.
5. Vegetation mapping (quadrat study 1mx1m).
6. Sacred groves in Madurai (any one site)
7. Importance of irrigation and traditional water management in Madurai
8. Survey of traditional crops and native foods in Madurai.

9. Visit to archeological site and remains excavated(Keezhadi)
10.Madurai smart city project.
11. Basic Landscape Mapping (application of GPS and GIS)
12. Waste management & Recycling.

*References:*

1. Bendre, A.M.Kumar (2006) A text book of Practical Botany. (Vol I and II).Rastogi publication New Delhi. ISBN 81-7133-852-6
2. Jones A., Reed R & Weyers (2012) J. of Practical skills in biology, Pearsons Review. ISBN 978-1408254477.
3.Sundararajan, S. (2000) Practical manual of Angiosperm Taxonomy. Anmol publication. New Delhi. (ISBN 81-261-0687-5)

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 3 | 2 | 1 |
| CO2 | 5 | 5 | 5 | 5 | 4 | 4 |
| CO3 | 5 | 5 | 5 | 5 | 5 | 3 |
| CO4 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO5 | 5 | 5 | 5 | 5 | 5 | 5 |

Mean: 4.5

*BOT 1357* *Plant Biology I* *3Hr./3Cr.*

*Preamble:*
This course is designed for zoology major students as a supportive course to enable them to understand the world of plants. It gives an overall view on diversity in structure, organization and evolutionary trend in the plant kingdom. Plants are broadly divided into non-vascular and vascular plants and from each group a plant will be taken for a detailed study. The course also has a lab component, in which students will experiment and learn more about the type specimens. At the end of the course the students would have accomplished the basic understanding of the plant kingdom.

At the end of the course, the students will be able to

i. look at plants on earth with a geological and geographical perspective and recognize their placing in the five kingdom classification, an arrangement in which algae can be shown as the progenitor of the plant world with a special emphasis on its own ecological and economic potential
ii. describe the general characters of bryophytes, classify liverworts, hornworts and mosses as the structure and reproduction of *Riccia* and
iii. the alternation of generation in mosses are scrutinized in the process of highlighting the ecological and economic importance of the group
iv. present pteridophytes as first land plants and explain their general character and life cycle with morphology and reproduction of *Pteris* asa case study to illustrate the nifty-gritty and diversity of ferns and explore their ecology and evolutionary significance
v. describe and characterize gymnosperms as the constituents of the early forests of planet earth keeping a closer watch on *Pinus,* explaining its external and internal morphology, reproduction and seed formation and use the study to find the feasibility of cashing on industrial and domestic utilities
vi. trace the origin of flowering plants, defining a flower and a fruit and gain an overview on the Bentham and Hooker's classification to deal with floral biology and study the significance of fruits and seeds.

**UNIT 1: Introduction:**(9 hr)
Geological timescale -Five kingdom classification – evolution of plants -co-evolution-biological diversity.

**UNIT 2: Non – vascular plants**: (9 hr)
General characters of algae **–** occurrence, and structure of alga (*Caulerpa*) - economic importance of algae- General characters of Bryophytes and morphology of *Riccia*-economic importance of Bryophytes.

*UNIT 3: Lower Vascular plants:(6 hr)*
Non-flowering plants – General characters of Pteridophytes – morphology of ferns (*Pteridium aquilinum*)- economic importance of ferns

*UNIT 4: Primitive seed plants: (6 hr).*
General characters of Gymnosperms–morphology and reproductive structures of*Pinus* – economic importance of gymnosperms

**UNIT 5: Flowering plants**: (15 hr)

Bentham and Hookers classification (up to series level) -Diagnostic characters of Malvaceae (Polypetalae)-Solanaceae (Gamopetalae)- Euphorbiaceae (Monochalamydeae) - Poaceae (Monocotyledons) with a species from each family as an example.

*Textbooks:*

1. Pandey, B. P. 2005. *College Botany*, Vol I. (5th ed.) S. Chand & Company New Delhi. ISBN 81-219-0593-1
2. Pandey, B. P. 2009. *College Botany*, Vol II. (7th ed.) S. Chand & Company New Delhi.ISBN 81-219-0601-6

*References:*

1. Vashishta, P. C. 2001. *Pteridophyta* (Vascular Cryptogams). S. Chand & Company, New Delhi. ISBN 81-219-0828-0
2. Vashishta,P. C. 2009. *Gymnosperms*. S. Chand & Company, New Delhi. ISBN 81-219-2618-1
3.Vashishta, B.R., A. K. Sinha & A. Kumar 2005. *Bryophyta*. S. Chand & Company, New Delhi.ISBN 81-219-0463-3
4. Bhattacharyya, B. 2005. *Systematic Botany*. Narosa Publishing House, Chennai. ISBN 81-7319-542-0

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 4 | 5 | 5 | 3 | 2 | 1 |
| CO2 | 4 | 5 | 5 | 3 | 2 | 1 |
| CO3 | 4 | 5 | 3 | 3 | 2 | 1 |
| CO4 | 4 | 5 | 4 | 3 | 2 | 1 |
| CO5 | 3 | 4 | 5 | 4 | 4 | 2 |

Mean: 3.3

*BOT 1159* *Plant Biology- I* *(Lab)* *2Hr./1Cr.*

*Course Outcome:*

At the end of the lab course, the students will be able to

i. identify the diverseness of various plant forms in their own habitats in day to day life and do comparative study of structure and reproduction of thallus forms to higher plants.
ii. to distinguish species in a selective ecosystem with the knowledge he acquired about the anatomical variations among the lower plant forms which differentiates terrestrial plants from aquatic habitats.
iii. categorize the tissue organization in thallophytes, pteridophytes and gymnosperms.
iv. classify the flowering plants by investigating the floral structures of the given plant and identify the family to which the particular plant belongs to.
v. describe the economic importance of plants with specific attention to the plant produces from which he is benefited in life.

1. Algae – *Caulerpa* as example vegetative and reproductive structure
2. Bryophytes – Riccia (gametophyte and sporophyte structure)
3. Pteridophytes – morphological and anatomical structure of sporophyte and sorus organization
4. Gymnosperms – Morphological features of *Pinus* (Stem, needle and cones)
5. Gymnosperms – Anatomical features of *Pinus* (male and female cones)
6. Angiosperms – Morphology of vegetative and reproductive structure of Malvaceae *(Hibiscus rosa-sinensis* as example)
7. Morphology of vegetative and reproductive structure of Solanaceae (*Datura metel* as example)
8. Morphology of vegetative and reproductive structure of Euphorbiaceae (*Euphorbia cyathophora* as example)
9. Morphology of vegetative and reproductive structure of Poaceae (*Oryza sativa* as example)
10. Economic botany – plants used as food and medicine
11. Field trip to nearby areas such as Alagar Hills orSirumalai

*References:*

1. Sundararajan, S. 2003. Practical manual of plant morphology. Anmol publication New Delhi. (ISBN 81-261-1403-7)
2. Bendre, A. M., A. Kumar, 2006. A text book of practical botany. Vol I. Rastogi Publication New Delhi. (ISBN 81-7133-809-7)
3. Bendre, A. M., A. Kumar, 2006. A text book of practical botany. (Vol I and II) Rastogi Publication New Delhi. (ISBN 81-7133-852-6)
4. Sundararajan, S. 2000. Practical manual of Angiosperm Taxonomy. Anmol publication New Delhi. (ISBN 81-261-0687-5)

*BOT 1251 Mushroom Culture Technology (Life skill) 3Hr. /2Cr.*

*Preamble:*

As a two credit course offered to the first year student of any major, it will be taught as life skill course. Skill development is being recognized as the priority of higher education in any said branch of science. This course is designed to motivate fresh students to learn the science of cultivating mushrooms. It is an introductory level course and designed to help the students to grow mushrooms in simple and cheap substrates like hay and organic debris and other locally available substratum. The nutritive and economic potential of mushrooms will be taught with illustration. Demonstration and field visit components may help the students to get hands on experience. At the end of the course the students will develop skills in commercial cultivation, harvest and marketing. It is taught as a lab cum theory course which will span 4 hours per week. This course is also designed to carter to the need of young entrepreneurs who would like to start a food based industry.

At the end of the course, the students will be able to

i. list different varieties of mushroom, distinguish between edible and non edible, and classify them.
ii. characterize, compare the cultivating mushroom and trace the lifecycle.
iii. experiment the cultivation procedure, design new culture technique, analyze the pest and factors affecting growth of mushroom.
iv. develop technologies for harvesting, packaging and acquire knowledge to avail loan from banks
v. summarize uses of mushroom and create new recipes for marketing.

*Unit 1. Introduction (9 hr)*

Mushroom a type of fungi –Characteristics features of fungi – Differences between fungi and other organisms. mushroom classification – History of mushroom cultivation – Naming of mushroom – Popular mushroom – Edible and poisonous mushrooms – Institutes cultivating mushroom – Varieties available in Tamilnadu.

*Unit 2. Morphology and Taxonomy of Mushroom: (9 hr)*

Morphological characters and taxonomical position of Agaricus - Pleurotus – Volvariella – Shiitake – life cycle of any one species – Spore collection – fruiting body.

*Unit 3. Cultivation of Mushroom: (9 hr)*

Tray method for large cultivation – Packet method for small scale cultivation – outdoor mushroom cultivation Pure culture of spores – compost making – spawn types and spawning – casing of soil – Time interval for water sprinkling – Pest identification and control – environmental control.

*Unit 4. Harvesting and Packaging :(9 hr)*

Manual harvesting method – Asepsis –Packing – Labeling –Marketing –Shelf life of mushrooms – Budget.

*Unit 5. Uses of Mushroom: (9 hr)*

Economic value of various mushrooms – Food and Dietary Component –Medicinal value – Mushroom recipes.

*Textbooks:*

1. Tripathy D.P 2005. Mushroom cultivation. Oxford and IBH publishing co. pvt.Ltd.New Delhi. ISBN 8120416449
2. Nita Bahl. 2000. Handbook on mushrooms, Oxford &IBH publishing pvt. Ltd. India. ISBN 9788120413993

*References:*

1. Kaul T.N. 2002. Biology and conservation of mushrooms.Oxford and IBH publishing co.pvt.Ltd. New Delhi. ISBN 81-204-1513-2.
2. Stamets P and Chilton J. S 1985. The mushroom cultivator, Richmond publishing company. U.K. ISBN096-1079-80-0.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 5 | 4 | 1 |
| CO2 | 5 | 5 | 4 | 4 | 4 | 4 |
| CO3 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO4 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO5 | 5 | 5 | 5 | 3 | 3 | 5 |

Mean : 4.7

*BOT 1253* *Food And Nutrition (NME)* *3Hr./ 2Cr.*

*Preamble:*

Human perspective towards food keeps changing, taking advantage of this; global marketers introduce food varieties in the market every year. In general, a food preferred by consumers is determined by the media and the advertisement agencies. Hence, Today's youth and children are attached towards a variety of packaged, preserved fast food. Enough cautions are posed by health advisors about these junk foods, but still awareness id poor about healthy foods among the educated too. There is a need for a scientific analysis of the food colorants and preservatives. They would be able to choose healthy foods and avoid junk foods and further they would be able to carry this knowledge to their family and friends.

At the end of the course, the students will be able to

i. Comprehend the idea of defining food as a concept, classify foods, identify palatable nutritious meal, traditional and ethnic food and get idea on dealing with food security and hunger
ii. Identify the carbohydrate, protein, fat, mineral and vitamin source of food.
iii. Gain a knowledge on the types of food preservative -significance of sweeteners, emulsifiers and probiotics -methods of coloring it with suitable colorants, adding flavor
iv. Adulteration, know the methods of checking food quality in the light of legal implications and food laws that the flipside of consuming low quality food on human health is realized
v. Acquire the needed skills from the dietary point of view to classify food, define balanced diet, and do BMI calculations for carrying out comparative analysis of food types for securing gainful employment in food industry.

*Unit 1: Food facts:(9 hr)*

Concept of food- Brief history of food and agriculture- Cuisines and culture- Classification of foods-(Western foods, Indian food, continental foods, Ethnic foods, Junk foods, Fast foods)- Famous food recipes of Madurai

*Unit 2:Nutrientprofile:(9 hr)*

Carbohydrates -Protein – Fats - Vitamins – Minerals- Fibres – water – Nutritional deficiency diseases - Nutraceuticals.

*Unit 3: Food preservatives and additives: (9 hr)*

Food preservatives- types- expiry date- Artificial sweeteners-Emulsifiers –Probiotics- Enzymes- Microbes in food industry. Food colorants- Types- Food flavors- Types- advantages and limitations of food additives and preservatives

*Unit 4: Food Adulteration:(9 hr)*

Adulterants- types of adulteration- simple tests in identifying adulteration in food stuffs- Impact on health- case study. Food policies and laws.

*Unit 5: Know your food:(9 hr)*

Balance diet and choice of food – BMI calculation – Nutritional requirements based on age, body mass and gender- role of dieticians- Master Health Checkup Programs - Comparative analysis of Cooked food Vs Raw food-vegetarian food Vs non vegetarian food- prevention of loss of nutrients.

*Textbooks:*

1. Srilakshmi, B. 2006. Nutrition science.2nd edition New age international publishers, ISBN 81-224-1633-0
2. Sumathi R.M 2007. Fundamentals of food, Nutrition and Diet therapy, New age International Publication ISBN 81-22419828

*References:*

1. Anita Tull 1996. Food and Nutrition Oxford University press,U.K. ISBN: 01-98327668
2. Annie Fredrick 2006. Text book of Food and Nutrition, Lotus Press ISBN: 8193820735
3. Sanjeev R. 2014. Ayurvedic science of Food and Nutrition, Springer Publication ISBN: 978-1-9627-408245477.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 5 | 2 | 2 |
| CO2 | 5 | 5 | 5 | 5 | 5 | 2 |
| CO3 | 5 | 5 | 4 | 3 | 2 | 1 |
| CO4 | 5 | 5 | 5 | 3 | 3 | 2 |
| CO5 | 5 | 5 | 5 | 5 | 3 | 3 |

*Mean: 4*

*BOT 1552* *Genetics and Plant breeding* *5Hr./5Cr.*

*Preamble:*

The course introduces the basics of genetics dealing with inheritance of characters, about principles pertaining to plant breeding and crop improvement. Starting from the basic rules drawn from Mendel's experiments, the idea of chromosomal theory of inheritance will be introduced that will lay foundations and students will be able to study applied studies, with real time examples. It will help them to understand DNA as the genetic material. The unit on population genetics will brief about the mutations, genetic drift and chances for speciation. Basics of plant breeding and traditional methods in crop improvement will be discussed citing regional examples. Discussion on plant breeding and crop improvement will not be exhaustive, but the content would suffice the learner to apprentice the need for breeding, conservation and management of genomes of useful plant stocks. Students should be able to understand the science of inheritance of characters and reasons behind the variations noticed in the population. He should be able to appreciate the importance of plant resources, need to develop hybrid varieties and conserve them for the future generation.

At the end of the course, the students will be able to

i. conceptualize the laws governing our inheritance, compare and contrast the allelic and genic and polygenic interaction.
ii. acquire knowledge about chromosome organization and recognize sex and sex linked inheritance.
iii. formulate hardy Weinberg law, assess the effect of mutagens and appreciate the traits in humans.
iv. distinguish between qualitative and quantitative traits, expertise in various methods of breeding.
v. represent the right of farmer and breeder, adapt strategies to develop resistant varieties and gain knowledge and practical experience in the activities of breeding and conservation centres.

*Unit 1: Fundamentals of Genetics (15 hr)*

Mendel's history and experiment- laws of inheritance- Allelic interaction -Gene interactions- (Duplicate dominant,epistatis, complementary gene)- multiple allele inheritance ( human blood group)- polygenic inheritance (ear length in Maize)- Sex linked inheritance (color blindness).

*Unit 2: Chromosomal Structure and Inheritance(15 hr)*

Chromosome organization – types of chromosomes, sex chromosome- Sex determination in human, animals and plants (*Melandrium*)- sex linked inheritance- chromosomal aberration-, linkage and mechanism of crossing over.

*Unit 3: Population Genetics (15 hr)*

Hardy-Weinberg Law- penetrance and expressivity- spontaneous and induced mutation, mutagens- genetic drift and erosion- Introduction to speciation- human traits-Pedigree and family tree.

*Unit 4: Plant Breeding (15 hr)*

Objectives – Qualitative and quantitative characters- Conventional methods of selection -Self pollinated crops - Cross pollinated crops - Hybridization types - Procedure of hybridization - hybrid vigour.

*Unit 5: Crop ImprovementProgram(15 hr)*

Crop improvement for resistant, tolerant and high yielding varieties. Traditional breeding programmes in Rice- Plant genetic resources of India- Germplasm centres -Sugarcane breeding institute (Coimbatore) - Tamil Nadu Rice Research Institute (Aduthurai) - Coconut Research Station (Sholavandan) - Institute of Forest Genetics and Tree Breeding (Coimbatore) - National Research Centre for Banana (Tiruchirappalli).

*Textbooks:*

1. Ahluwalia,K.B. (2009). Genetics, 2edn. New Age International Publishers. ISBN 978-81- 224-2390-7
2. Chahal, G.C and Gosal,S.S (2002) Principles and Procedures of Plant Breeding. Narosa Publishing House. ISBN 81-7319-374-6

*References:*

1. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition. ISBN 0470388250
2. Klug, W.S., Cummings, M.R., Spencer, C.A. (2007). Concepts of Genetics. Pearson Education. 7 th edition. ISBN 813170811X
3. Sinnott,E.W., Dunn,L.C. and Dobzhansky,T. (2004).Principles of Genetics. Tata Mc Graw Hill. ISBN : 0-07-099-413-7.
4. Hayward,M.D, Bosemark,N.O, Romagosa,T(eds) Plant Breeding Principles and prospects Springer publication. ISBN 9780412433900
5. George Acquaah, (2012) Principles of plant genetics and breeding.2 ndedition.Wiley Blackwell Publishers. ISBN 9781118313695

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 4 | 4 | 4 | 4 |
| CO2 | 5 | 5 | 4 | 4 | 4 | 4 |
| CO3 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO4 | 4 | 4 | 5 | 5 | 3 | 5 |
| CO5 | 5 | 5 | 4 | 3 | 5 | 3 |

Mean: 4.4

*BOT 1454* *Evolution and Phycology* *4Hrs./4Cr.*

*Preamble:*
The course provides an overview of formation and conditions of early earth, emergence of life forms and evolution process. Students will be inducted into the plant kingdom starting from algae as the simplest autotrophs and evolutionary trends. They will be able to comprehend the characteristics features of the major groups of algae, and their economic importance will be assessed.

At the end of the course, the students will be able to

i. understand formation of earth and explain the earliest environmentconditions..
ii. analyze emergence of life and general theories on evolution.
iii. illustrate the evolutionary links from algae to vascular plants.
iv. formulate the characteristic features, life cycle patterns of major classes of algae.
v. assessthe applications and economic potential of algae

*Unit 1: Genesis of Life(12 hr)*
Earth formation – Geological time scale – emergence of life - Miller and Urey experiment – basic theories on evolution – Origin of Species – contributions of Darwin and Lamarck – tree of life – evolution of human.

*Unit 2: Origin of Plants: (12 hr)*
Life forms – Five kingdom classification – evolutionary history of plants – fossils – Stromatolites – oxygenic photosynthesis - prokaryotic algae – endosymbiosis – chloroplast and membranes – vascularization – evolutionary trends from algae to land plants.

*Unit 3: Salient Features and Classification ofAlgae: (12 hr)*
Characterization and classification of Algae: pigments, storage reserves, cell wall, flagella, eyespot and pyrenoids - thallus construction – reproduction – Outline of classification (Smith, 1955) – Salient features of Cyanophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae – Contributions of Indian algologists.

*Unit 4: Type Studies: (12 hr)*
Cyanophyceae (*Anabaena*) – Chlorophyceae(*Chara*, *Oedogonium*) – Phaeophyceae (*Sargassum*) – Rhodophyceae (*Gracilaria*).

*Unit 5: Applied Phycology: (12 hr)*
Mass cultivation: SCP (*Spirulina*) –marine algae Mariculture (*Kapphaphycus* ) - diatomaceous earth – algae as food, Agar agar (*Gracilliaria, Gelidiella*), Carrageenans, Alginates - biofertilizers, biofuel – Docosahexaenoic acid (DHA), Seaweed Liquid Fertilizer
– algal blooms – symbiotic association (*Azolla*, Lichens).

*Textbooks:*
1. Kumar, H.D.(1988). Introductory Phycology. East West Press. India. ISBN: 81-859-3896-2
2. Sharma,O.P. (2007). Textbook of algae. Tata McGraw Hill, India. ISBN 0-07-451928.

*References:*

1. Bold, H.C and Wyne. M.J. (1978). Introduction to the algae: Structure and reproduction. Prentice-Hall. ISBN 0134777867
2. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. ISBN: 9780521141444
3. Morris, I. (1971). An Introduction to Algae. Hutchinson University Library. ISBN: 0-090-80713-8
4. Raven, P.H., Evert, R.F and Eichhorn, S.E. (2013). Biology of plants. 8th Ed. W.H. Freeman
Publishers, ISBN: 1464113513.
5. Smith, G.M. (1971). Cryptogamic Botany Vol.1. Algae and Fungi. Tata McGraw – Hill book
company. 2nd Edn. ISBN :0070995761.
6. Stewart, W.N and Rothwell G.W. (2010). Paleobotany and the Evolution of Plants. Cambridge University Press. 2nd Edn. ISBN 10:0521126088
7. Willis,K.J and McElwain.J.C (2002). The Evolution of Plants. Oxford University Press.ISBN: 0198500653

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 5 | 4 | 1 |
| CO2 | 5 | 5 | 5 | 5 | 5 | 1 |
| CO3 | 5 | 5 | 5 | 3 | 2 | 1 |
| CO4 | 5 | 5 | 4 | 3 | 2 | 1 |
| CO5 | 5 | 5 | 5 | 4 | 4 | 4 |

Mean: 4

*BOT 1456 Botany Lab-II (Genetics and Evolution & Phycology) 2Hr/2 Cr. Course*

*Outcome:*

Thestudents will be able to

i. verify mendel's laws, test the purity of gametes, identify the interaction between alleles and distinguish various gene interaction, identify different blood group in human, familiarize with polygenes which influences quantitative traits, determine sex of animals, categorize human traits as dominant and recessive and perform probability test for gene inheritance.

ii. test viability of seed, experiment with emasculation techniques and familiarize with different hybridization techniques by visiting plant breeding stations.

iii. interpret the formation of earth, emergence of life and theories on evolution process.

iv. investigate the habitat and diversity of cyanobacteria and higher algal forms during the field study and draw a comparative analysis of thallus structure and life cycle patterns of important forms.

v. identify the different types of lichens and preserve algal specimens

*Genetics and Plant Breeding*

1. Verification of Mendel's law – I ( Monohybrid ,test and back crosses)
2. Verification of Mendel's law - II (Dihybrid cross)
3. Gene interactions – problem solving
4. Study of Mendelian traits in human
5. Barr bodies & Giant chromosome - Chironema
6. Blood grouping- multiple alleles
7. Probability test – beads/coin/dice
8. Chromosome mapping
9. Drosophila experiment
10. Collection and submission of local rice / vegetable cultivars
11. Determination of seed viability
12. Method of emasculation – pollen dusting and bagging
13. Visits - Cotton, millet, sugarcane research centres (Coimbatore), Banana Research Centre (Trichy), National facilities - NBPGR, ICRISAT.

*References:*

1. Gardner,E.J.,Simmon,M.J and Snustad .D.P. (1991) . Principles of Genetics. John Willey and Son (Asian) Ltd. Singapore. ISBN:0-471-50487-4
2. Stansfield,W.D. (1991). Theory and problems of Genetics. 3rd ed. McGraw Hill Inc. ISBN 0-07-060877-6
3. Chahal,G.C and Gosal,S.S (2002) Principles and procedures of Plant breeding. NarosaPubli. House. ISBN 81-7319-374-6

*Evolution and Phycology:*

1. Formation of earth - documentary & discussion
2. Darwinism: Galapagos Island – documentary & discussion
3. Fossils – Stromatolites and Diatoms

Morphology and reproductive structures of

4. *Cyanophyceae – Nostoc*, *Anabaena* and *Oscillatoria* movement
5. *Chlorophyceae – Chlamydomonas, Volvox*
6. *Chlorophyceae - Oedogonium, Caulerpa, Chara*
7. *Phaeophyceae– Sargassum, Dictyota*
8. *Rhodophyceae – Batrachospermum, Gracilaria*
9. Algal cultivation Race way (*Spirulina)* – Demo
10. Marine algal cultivation (Mariculture) – Demo
11. Lichens – types and uses
12. Collection and preservation of algae

*References:*

1. Bendre, A. M., A. Kumar, 2006. A text book of practical botany. Vol I. Rastogi Publication New Delhi. (ISBN 81-7133-809-7)
2. Pandey, B. P. 2005. *College Botany*, Vol I. (5th ed.) S. Chand & Company New Delhi. ISBN 81-219-0593-1

*BOT 1358* *Plant Biology II* *3Hr./3Cr.*

*Preamble:*
This course gives an overview of life process happening inside plants and this will broaden the understanding of the students on various functional events including water and mineral uptake, transport of photosynthates, growth & development and nitrogen fixation. The course also has a lab component to have a hand on experience of verifying the theory under natural setting. At the end of the course students will be able to appreciate the plant as the only system, which is equipped to capture light energy and convert it into chemical energy.

At the end of the course, the students will be able to

i. look at plant as a functionally self-contained entity and use the understanding on mechanics and structures for water and mineral uptake, transport and utilization in their cells and tissues as model system to create and fabricate machines, filters and devices of human utility modeled on the inputs they have received from this course
ii. understand the translocation of food and sap, regulation water and food transport , ventilating mechanism with a role for stomatal apparatus, and process of liquid loss from hydathodes and lenticels that the heat release and hydraulic components of plant function can be analyzed for adoption in designing relevant production and processing units required for industrial and environmental applications
iii. look at chloroplast as photovoltaic battery involved in thermodynamic functions that the light trapping, transfer and transduction processes are elucidated as functions initiated by chlorophyll form from the biophysical viewpoint and the role of phytochromes and cryotochromes are interpreted as environmentally regulated switches with precision ad sensitivity.
iv. critically look at the paradox of nitrogen as a common as well as scarce resource to plants and evaluate the nitrogen cycle and the prokaryotic process nitrogen fixation that serves as source of nitrogenous input and look at nitrate reduction and amino acid synthesis that form the hub of nitrogen metabolism.
v. gain an overview of plant growth & development in outline, study plant growth promotion and regulation by auxins, gibberellins and cytokinins besides ABA and ethylene that they may acquire the prowess of commercially manipulating plant development to their own advantage.

*Unit 1: Water Relations: (9 hr)*
Pipeline systems in plants- Water potential- Guttation- Imbibition- Osmosis-Tissue organization of xylem and phloem – role in conduction.

*Unit 2:TransportSystems: (9 hr)*
Transport-Water - Mineral –Photosynthates– Stomatal mechanism- Evapotranspiration.

*Unit 3: Photobiology: (9 hr)*
Photosynthetic pigments- Photosynthetic electron transport- Path of carbon in photosynthesis –photoperiodism – phytochrome- cryptochromes – photomorphogenesis.

*Unit 4: Nitrogen Metabolism: (9 hr)*
Nitrogen sources – Nitrogen cycle - symbiotic and asymbioticNitrogen fixation - Biofertilizers.

*Unit 5: Growth hormones: (9 hr)*
Growth and measurement - Plant hormones - growth promoters- (auxin, gibberellin, cytokinins) – growth inhibitors(ethylene, ABA) - Plant Movements (nastic and tactic) –.

*Textbooks:*

1. Srivastava. H. S. 2005. *Plant physiology.* Rastogi Publications, Meerut. ISBN 81-7133-785-6
2. Ghosh. M. S. 1996. *Plant physiology*. (Ist Central Edition) New Central Book Agency (P) Ltd. ISBN 81-7381-478-3.

*References:*

1. Bidwell. R. G. S. 1975. *Plant physiology*. Macmillan Publishing Co. INC. New York. ISBN-0-02-309430-3
2. Williams. M. B. 1984. *Advanced Plant Physiology*. Pitman Publishing New Zealands Ltd. Wellington.ISBN-0-273-02306-3
3. Salisbury. F. B. & Ross C.W. 1992. *Plant Physiology*. Fourth Edition. Eastern Press. Bangalore. ISBN-981-243-853
4. Sinha. R. K. 2004. *Modernplant physiology*. Narosa Publishing house New Delhi. ISBN 81-7319-333-9

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 4 | 5 | 4 | 3 | 2 | 1 |
| CO2 | 4 | 5 | 3 | 3 | 1 | 1 |
| CO3 | 4 | 4 | 4 | 5 | 3 | 2 |
| CO4 | 4 | 4 | 4 | 5 | 3 | 1 |
| CO5 | 4 | 4 | 4 | 5 | 5 | 2 |

Mean: 3.4

*BOT 1160* *Plant Biology II (LAB)* *2Hr./1Cr.*

*Course Outcome:*

At the end of the course, the students will be able to

i. investigate the movement of food and water through the specialized tissues ,intercellular translocation in plants with the influence of environmental factors.

**ii.** analyse the external factors which brings changes in the physiology of plants through live experiments**.**

iii. **e**quip himself to calculate the duration, rate of reaction and measurements of various physiological reactions.

iv. explore the movements in plants with response to different stimuli and analyse the role of microbes in fixing atmospheric nitrogen which the plants cannot able to do.

v. apply the knowledge of growing plants in soilless environment with the supplement of mineral nutrients.

1. Osmosis using potato osmoscope
2. Plasmolysis using Onion peel &*Tradescantia* leaf.
3. Measurement of (DPD) Diffusion Pressure Deficit using potato tubers.
4. Ascent of sap (Ringing and Girdling experiment)
5. Transpiration using potted plant & bell jar, cobalt chloride method to compare the transpirational rates
6. Evolution of $O_2$ during photosynthesis using Wilmott bubbler counter.
7. Effect of different wavelength of light during photosynthesis
8. Measurement of growth using auxanometer
9. Phototropism & Gravitropism using potted plants
10. Use of biofertilizer to promote root nodule
11. Methods of studying plant nutrition – Hydroponics
12. Symbiotic nitrogen fixation – legume root nodule

*References:*

1. Kumar B. 2006. *A Text book of practical botany.* Rastogi Publication. Meerut. ISBN 81-7133-809-7
2. Santra. S.C..Chatterjee.T. P.& Das A. P. 2005. *College Botany-Practical.* Vol-I. New Central Book Agency (P) Ltd. India ISBN-81-7381-357-4.

*BOT 1252* *Nursery and Gardening (LS)* *3 Hr./2Cr.*

*Preamble:*
This course is designed for students who have passion for collecting plants and adopting them at safe and protected areas. The course is envisaged in such a way to develop fine skills in planning for various types of gardens with specific theme ad purpose. Landscaping is also added in order to enhance the scope of the course. At the end of this course student will use the given space in an intelligent manner and transform it as a thematic garden.

At the end of the course, the students will be able to

i. Identify the varieties of plants maintained in a nursery, forecast the risk of climatic factors affecting nursery plants, create facilities of his own.
ii. Develop seed storage strategies, track the pest and evolve the right method to control them.
iii. Specialize himself in cultivation technique and manage the nursery.
iv. Categorize the plants, select right choice of the plant for different gardens and develop himself as a entrepreneur
v. Recognize the various types of parks and gardens in his locality, appreciate the role of parks in society thereby conserving it.

*Unit 1: Nursery Development (9 hr)*
Definition –Objectives and Scope for nursery –role of nursery curator– Facilities needed( land –soil - water- climate-special growing structure-manure/fertilizer – pesticide – pots – polybags - labour-transport)-steps in raising nursery - factors affecting nursery plants- varieties of plants sold in nursery and trade.

*Unit 2:Propagation by Seeds: (9 hr)*
Storage - viability – treatment methods -sowing – germination and seedling stage- soil mixture –transplanting – watering – control of pest in nursery.

*Unit 3:VegetativePropagation and Maintenance: (9 hr)*
Cutting- layering –budding –grafting –collecting season – planting methods – treatments for propagating materials – propagules – growing in special structures – hardening – pruning – cleaning – fertilizing.

*Unit 4:NurseryPlants: (9 hr)*
Ornamental plants (flowering) - Crotons - medicinal plants – arboreal – climbers – fencing plants – Ornamental palms – Orchids – Gymnosperms – ferns – Cacti – Bonsai.

*Unit 5:Gardens and Parks: (9 hr)*
Definition - Objectives and scope – Types of garden – landscape gardening –- water garden-ornamental gardening in homes – Kitchen garden - Components of garden/ parks – choice of the plants for garden components – Rockery – Role of gardener - Benefits of garden – Popular parks and gardens –Role of parks in well being of human and environment.

*Textbooks:*

1. Kumar, N., 2017, Introduction to Horticulture, Med tech publishers, India.ISBN 9386479834
2. Sadhu, M.K., 1989, Plant propagation, New Age International publishers. India. ISBN 8122400655

*References:*

1. Agarwal, P.K.1993, Hand Book of Seed Technology, Dept. Of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.ISBN 8120409949
2. Bose T.K. Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.ISBN 9788120402294
3. Edmond Musser, Andrews. 1997. Fundamentals of Horticulture, McGrawHill Book Co., New Delhi.ISBN 9780070189782
4. Janick Jules. 1979. Horticultural Science. (3rd Ed), W.H.Freeman and Co., San Francisco, USA.ISBN 0716717425

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 4 | 4 | 4 | 4 |
| CO2 | 3 | 3 | 3 | 4 | 4 | 4 |
| CO3 | 4 | 4 | 4 | 4 | 4 | 4 |
| CO4 | 4 | 4 | 4 | 4 | 4 | 4 |
| CO5 | 5 | 4 | 4 | 4 | 4 | 5 |

Mean: 3.9

*BOT 1254* *Plant Wonders(NME)* *3 Hr./2Cr.*

*Preamble:*
This course is aimed to impart knowledge on plants to non science students. It introduces the microscopic to giant Angiosperms of the plant kingdom. Students will learn about different groups of plant, basic plant processes and their contributions to the human being. Uniqueness of plants in terms of size, shape, habitat and their associations will be highlighted. They will develop a desire to further explore the plant kingdom and also to conserve plants.

At the end of the course, the students will be able to

i. relate plants and civilization, identify plants as source of food, fuel, energy.
ii. acquire knowledge about various life forms of plant, able to benefit from the uses of plants
iii. describe the amazing plants, utilize plants as fertilizer
iv. rank the plants according to their magnitude, identify the indicators of pollution and minerals
v. discover plants in various extreme environment, discuss the plant's adaptation.

*Unit 1: Plant as Resource: (9 hr)*
Plants and civilization: Difference between plants and animals – Plants and man-Plants as source of food, energy, fuel and medicine - Plants in protection of environment.

*Unit 2: Plant Groups: (9 hr)*
Unique characters and Importance of - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

*Unit 3:Plants of Curiosity: (9 hr)*
Sensitive plants (*Mimosa pudica*)- Aromatic plants(*Tagetus*)- fertilizing plants(*Tephrosia purpurea*) –camaouflage plants (*Corydalis hemidicentra*) – stinky plants(*Titan arum*)Biolumenscing plants – model plants- dancing plants- seed dispersing plants

*Unit 4:Amazing Plants: (9 hr)*
Tallest, largest, oldest and smallest plant -magnitudes in size, flowers, leaves and fruits – Epiphytes(*Vanda*) – Parasites(*Cuscuta*) – Orchids(*Bulbophyllum*) – Insectivores*(Nepenthes*) pollution indicators-mineral indicators

*Unit 5: Extreme Plants and Their Adaptation: (9 hr)*
Plants thriving inspace (*chlorella*) – volcanoes(hawaiian*argyroxiphium*)- ocean(-sea weed) – swamps(mangroves -*Avicennia*) –desert (*Saguaro cactusti*) – alpine (Junipers) – tundra (arctic lichen) .

*References:*
1. Pandey B.P. 2005 Collage Botany : Vol I, 5th edn. S.Chand&Company LTD. New Delhi. ISBN -81-219-0593-1
2. Raven PH Evert RF and Eichhorn SE 2013. Biology of plants. VIIIth Ed. W.H. Freeman Publishers, 1464113513.
3. Santna, S.C..Chatterjee, T.P and A.P. Das 2004 Collage Botany Practical (Vol II) New Central Book Agency (P) Kolkatta. ISBN -81-7381-320-5
4. Starr,C. 2007. Biology : concepts and applications. VI edn. ISBN 81-315-0284-8.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 4 | 5 | 5 | 3 | 3 | 4 |
| CO2 | 5 | 5 | 5 | 5 | 3 | 2 |
| CO3 | 5 | 5 | 5 | 3 | 2 | 2 |
| CO4 | 5 | 5 | 3 | 3 | 2 | 2 |
| CO5 | 5 | 5 | 5 | 2 | 2 | 2 |

Mean: 3.7

*Value Added course*

**BOT 121V** **Edible Mushrooms** **2 Hr./ 2 Cr.**

**Preamble:**
As a two credit course offered to the first year student of any major, it will be taught as life skill course. Skill development is being recognized as the priority of higher education in any said branch of science. This course is designed to motivate freshers to learn the science of cultivating mushrooms. It is an introductory level course and designed to help the students to grow mushrooms in simple and cheap substrates like hay and organic debris and other locally available substratum. The nutritive and economic potential of mushrooms will be taught with illustration. students will develop skills in commercial cultivation, harvest and marketing. This course is also designed to carter to the need of young entrepreneurs who would like to start a food based industry.

At the end of the course, the students will be able to

i. List different varieties of mushroom, distinguish between edible and non edible, and classify them.
ii. Characterize, compare the cultivating mushroom.
iii. Experiment the cultivation procedure, design new culture technique, analyze the pest and factors affecting growth of mushroom.
iv. Summarize uses of mushroom and create new recipes for marketing.
v. Obtain training from agricultural institutes

*Unit 1: Introduction: (6 hr)*
Characteristics –history of mushroom cultivation – Nomenclature – Popular, edible and poisonous.

*Unit 2:Edible Mushrooms(6 hr)*
Morphological characters and taxonomical position of *Agaricus* - *Pleurotus* – *Volvariella* – *Calocybe*– Shiitake.

*Unit 3: Cultivation of Mushroom: (6 hr)*
Tray method for large cultivation – Packet method for small scale cultivation – facilities required – cultivation procedures - Budget

*Unit 4: Harvesting and Processing:*
Harvesting and packaging -– Food and Dietary value –Medicinal value – Mushroom recipes.

*Unit 5:Research Institutes: (6 hr)*
Institutes cultivating mushroom –collection of spawn- Varieties available in Tamilnadu – Mushroom culture training –TNAU (Coimbatore) – Mushroom cultivation training Institute (Dehradun).

*Textbooks:*
1. Tripathy D.P 2005. Mushroom cultivation. Oxford and IBH publishing co. pvt.Ltd.New Delhi. ISBN 8120416449
2. Nita Bahl. 2000. Handbook on mushrooms, Oxford &IBH publishing pvt. Ltd. India. ISBN 9788120413993

*References:*

1. Kaul T.N. 2002. Biology and conservation of mushrooms.Oxford and IBH publishing co.pvt.Ltd. New Delhi. ISBN 81-204-1513-2.
2. Stamets P and Chilton J. S 1985. The mushroom cultivator, Richmond publishing company. U.K. ISBN 096-1079-80-0.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 5 | 5 | 5 | 5 | 4 | 1 |
| CO2 | 5 | 5 | 4 | 4 | 4 | 4 |
| CO3 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO4 | 5 | 5 | 5 | 5 | 5 | 5 |
| CO5 | 5 | 5 | 5 | 3 | 3 | 5 |

Mean :3.7

*BOT 122V* *Gardening Techniques* *2 Hr./2Cr.*

*Preamble:*
This course is designed for students who have passion for collecting plants and adopting them at safe and protected areas. The course is envisaged in such a way to develop fine skills in planning for various types of gardens with specific theme ad purpose. Landscaping is also added in order to enhance the scope of the course. It is a course where there is no need any perquisites except love and passion for plants and intelligent special perception. At the end of this course student is expected to use the given space in an intelligent manner and transform it as a thematic garden.

At the end of the course, the students will be able to

i. identify and distinguish various gardens of the world.
ii. classify various gardens of Indian styles.
iii. create different types of garden and planning the design of garden .
iv. perform the different propagation techniques for garden plant cultivation.
v. categorize the various plant varieties planted in a garden

*Unit 1: Introduction to Gardens: (6 hr)*

Definition - Objectives and scope – Types of garden – formal garden- informal garden – British garden - Mughal garden- French garden –Japanese garden - Hanging garden- Vertical garden – medicinal garden.

*Unit 2: Gardens in India: (6 hr)*

Landscape garden (Mysore) –Rock garden (Chandigarh) - Water garden (Kolkatta) - ornamental garden (Lal Bagh) - Botanical garden (Ooty) – Kitchen garden –Terrace garden – Popular Indian Gardens (JNTBGRI, RBG).

*Unit 3: Establishment of Garden: (6 hr)*

Components – choice of plants –Facilities required –Planting -Role of gardener – Benefits.

*Unit 4: Gardening Practices (6 hr)*

Cutting- layering –budding –grafting –seasonal attributes – planting methods – treatments for propagating materials – Propagules – growing in special structures – hardening – pruning – cleaning – fertilizing - irrigation.

*Unit 5: Garden plants: (6 hr)*

Ornamental (flowering) - Crotons - medicinal – arboreal – climbers – ornamental palms – Orchids – Gymnosperms – ferns – Cacti – Bonsai –biofencing – edges & hedges.

*Textbooks:*

1. Kumar, N., 2017, Introduction to Horticulture, Med tech publishers, India. ISBN 9386479834
2. Sadhu, M.K., 1989, Plant propagation, New Age International publishers. India. ISBN 8122400655

*References:*

1. Agarwal, P.K.1993, Hand Book of Seed Technology, Dept. Of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi. ISBN 8120409949
2. Bose T.K. Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi. ISBN 9788120402294
3. Edmond Musser, Andrews. 1997. Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.ISBN 9780070189782
4. Janick Jules. 1979. Horticultural Science. (3rd Ed), W.H.Freeman and Co., San Francisco, USA.ISBN 0716717425

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 Recall | K2 Understand | K3 Apply | K4 Analyze | K5 Evaluate | K6 Create |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 4 | 4 | 4 | 4 |
| CO2 | 3 | 3 | 3 | 4 | 4 | 4 |
| CO3 | 4 | 4 | 4 | 4 | 4 | 4 |
| CO4 | 4 | 4 | 4 | 4 | 4 | 4 |
| CO5 | 5 | 4 | 4 | 4 | 4 | 5 |

Mean: 3.9

*BOT221V* *Plant Propagation* *2Hrs./2Cr.*

*PREABMBLE:*

The course provides an overview of plant propagation that include methods of propagating by seeds, bulbs, divisions, layers, cuttings, budding, grafting, and micropropagation. The knowledge and information on timing, technique, and material for making cuttings, environmental conditions, and media requirements for rooting cuttings of ornamental plants, fruit trees, shrubs, and flowering plants will be gained. Various propagation structures, soils, and fertilizer requirements will be considered.

| At the end of the course, the students will be able to | **Unit** | **Hrs P/S** |
|---|---|---|
| **CO1** : acquire knowledge of plant propagation technique and its application | 1 | 6 |
| **CO2**: get vast information on various plant growing structures | 2 | 5 |
| **CO3**: create skills in the art of plant propagation by vegetative cuttings. | 3 | 7 |
| **CO4**: create skills in the art of plant propagation by seeds | 4 | 5 |
| **CO5**: update the technique of plant propagation using micropropagation tool. | 5 | 7 |

**Unit I Basics of plant propagation:** Scope and importance - government schemes for developing of nurseries – Role of NGO - establishment of nursery - site selection - tools and implements - preparation of nursery beds, transplanting techniques - plant propagation material.

**Unit II Plant growing structures**: Shade net - Mist chamber - greenhouse - glasshouse - polyhouse - cold frames - hot beds – nursery beds – soil media – pot mixture and containers - manures and manuring – crop health management.

**Unit III Vegetative propagation** : Stock-scion relationship – Cutting (stem, root, leaves) - Layering (Air, Mound, Ground) – Budding (T- Budding, Patch, Chip budding) – Grafting (tongue, cleft, Approach, side, Veneer) - Raising clonal nursery - factors influencing rooting of cuttings - root stock influences - hardening – Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils – Indoor plants – Anthuriam, Adenium.

**Unit IV Seed propagation:** Seed selection- seed viability – sowing - germination - dormancy –seed treatments -– seed dressing – raising seed beds – seedling vigour – measures for pest and disease control during storage and godown sanitation- Seed Certification and Quality Control – Seed production of medicinal plants- Aromatic plants - Hybrid seed Production.

**Unit V Micro propagation:** Micro propagation – protocol - media composition - sterilization techniques - explants - shoot multiplication - root formation - acclimatization and hardening - constraints and problems - packing, transport and marketing - establishment of commercial tissue culture units - status of micro propagation in India and globe - nursery certification – marketing of propagative plant materials.

*Text books*

Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth – Heinemam, Oxford University Press.

Bansil. P.C. 2008. Horticulture in India. CBS Publishers and Distributors, New Delhi.

Hartmann & Kester's Plant Propagation: Principles and Practices, 9th Edition. 2018. F. Davies, R. Geneve and S.B. Wilson. (Required, ISBN-13: 978-0134480893).

Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.

*Reference books*

Beyl, C.A. and R.N. Trigiano. 2015. Plant Propagation Concepts and Laboratory Exercises, 2nd edition.

CRC Press, Boca Raton, FL. Dirr, M.A. and C.W. Heuser, Jr. 2006. The Reference Manual of Woody Plant PropagationFrom Seed to Tissue Culture, 2nd edition. Timber Press, Inc., Portland, OR. Kyte, L.,

Bhattacharjee.S.K. 2006. Amenity Horticulture, Biotechnology and Post harvest technology. Pointer publishers. Jaipur

Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.

Chandra, R. and M. Mishra. 2003. Micropropagation of horticultural crops. International Book Distributing Co., Lucknow.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 4 | 4 | 4 | 5 |
| CO2 | 3 | 3 | 5 | 4 | 4 | 4 |
| CO3 | 4 | 3 | 4 | 4 | 3 | 5 |
| CO4 | 4 | 4 | 4 | 4 | 3 | 4 |
| CO5 | 4 | 4 | 5 | 4 | 5 | 5 |

Mean :3.9

*BOT321V* *PLANTATION CROPS* *2Hr/2Cr*

*PREAMBLE*

This add-on course is designed as an topping to UG curriculum offered in the college to Botany majoring and other department students as an optional will help students to understand and appreciate the high-value attached with commercial crops which in turn serve earning foreign exchange to the country and at the same time provide the livelihood for sizable population of rural poor and masses at the semi urban back drop. This course is aimed to inculcate the know-how of growing and cultivating economically important crops that are intertwining in our daily life. It will kindle in young minds the inquisitiveness towards probe the wealth of nature in lesser known context. After completing this course the students will beable get a holistic picture of plantation crops.

At the end of the certificatecourse, the students will be able to

**CO1:** recognize the important plantation crops that contribute to the commercial side of the agricultural economy.

**CO2:** appreciate how these crops help to conserve and foster ecological balance and at the same time offer the livelihood to the rural masses.

**CO3:** develop a comprehensive idea to rear plantation crops in India at diverse agro-climatic profile.

**CO4:**analyse and develop strong market intelligence and harness the potential to provide a competitive edge to the Indian farmers.

**CO5:**familiarise themselves and put into practice the knowledge gained using the produce harvested/gathered from plantation crops that they may eventually take entrepreneurial venturesadvocating and promoting value added products

**Unit I: Plantation Crops:** Importance – plantation crops vs major agricultural, horticultural and fruit crops – plantation crops status in India – Topographical data – scope and economic value – research potential.

**Unit II: Tea:** Origin and distribution– area and production – soil – climate – varieties – vegetative propagation –establishment– pruning – manuring – harvesting (plucking) – processing and manufacturing of tea –classification, grading – packing – marketing.

**Unit III: Coffee and Cocoa:**Coffee–origin and distribution- soil and climate requirement- varieties– establishment – planting – pruning – manuring– plant protection – processing – grading and packing. Cocoa – origin and distribution – climate and soil – varieties – propagation – plantation establishment – manuring and irrigation – pruning – plant protection
– harvesting, processing (fermentation) and yield.

**Unit IV: Arecanut, Coconut and Palmyra:** Arecanut:Importance–climate and soil, cultivars selection and raising of – varieties – seedling index – establishment – manuring- irrigation – plant protection – harvesting, processing and yield. Coconut: origin and distribution – composition and uses of coconut – climate and soil – cultivars and hybrids–establishment of coconut plantation – manuring – irrigation – plant protection – harvest and yield – post harvest processing – value addition. Palmyra: origin and distribution – soil and climate requirement –economic importance – varieties – propagation and planting–irrigation – leaf pruning and ablation – plant protection – diseases and disorders – harvesting, processing and yield – edible and commercial products.

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**Unit V: Cashewnut andRubber**: Origin and distribution –importance– climate and soil– varieties and propagation– seed, clonal and budding – establishment and management – irrigation– manuring–plant protection– harvesting, yield, processing and grading.Rubber: origin and distribution – climate and soil – propagation – polyclonal seedlings – planting and after care – manuring – plant protection – harvesting (tapping, marking and bark renewal) – yield – processing of latex- commercial products.

*Textbooks*

1. Dashora, L. K., Abhay, D., &Lakhawat, S. S. (2006). *Production technology of plantation crops, spices, aromatic and medicinal plants*. Agrotech Publishing Academy.
2. Kumar, N. J. B. M. (2006). *Introduction to spices, plantation crops, medicinal and aromatic plants.* Oxford and IBH Publishing.
*3.* Shanmugavelu, K. G., & Madhava Rao, V. N. (1979). Spices and plantation crops. *Spices and plantation crops.*
4. Shanmugavelu, K. G., Kumar, N., & Peter, K. V. (2002). *Production technology of spices and plantation crops.* Agrobios.

*References*

1. Carr, M. K. (2012). *Advances in irrigation agronomy: plantation crops*. Cambridge University Press.
2. Chakraverty, A., Mujumdar, A. S., & Ramaswamy, H. S. (Eds.). (2003). *Handbook of postharvest technology: cereals, fruits, vegetables, tea, and spices* (Vol. 93). CRC press.
3. Dhillon, B. S., & Tyagi, R. K. (Eds.). (2005). *Plant genetic resources: horticultural crops*. Alpha Science Int'l Ltd..
4. Kulkarni, S., & Hedge, Y. R. (2002). *Diseases of plantation crops and their management*. Agrotech Pub. Academy.

**Mapping of Course Outcomes with Bloom's Taxonomy**

| | K1 | K2 | K3 | K4 | K5 | K6 |
|---|---|---|---|---|---|---|
| CO 1 | 4 | 5 | 5 | 5 | 5 | 5 |
| CO 2 | 3 | 5 | 5 | 5 | 5 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CO 3 | 4 | 5 | 5 | 5 | 5 | 5 |
| CO 4 | 4 | 5 | 5 | 5 | 5 | 5 |
| CO 5 | 5 | 5 | 5 | 5 | 5 | 5 |

Mean : 4.8