

SACRED HEART COLLEGE (AUTONOMOUS)

Department of Botany

BSc Botany

Course plan

Academic Year 2015 – 16

Semester 6

COURSE PLAN
PLANT PHYSIOLOGY AND BIOCHEMISTRY

COURSE OBJECTIVES:

- This course will create knowledge and understanding of basic mechanisms of various physiological processes related to plant life.
- Insight in to the water relationships and effect of stress in plants.
- A thorough understanding of most vital plant physiological functions like photosynthesis and respiration.
- Ability to critical thinking and logical reasoning of various plant physiological mechanisms in real life situations.
- Knowledge on both theory and practical aspects of plant growth regulators.
- Acquaintance with basic skills and techniques related to plant physiology.
- Perception on structure and importance of the bio molecules associated with plant life.

Basic Reference

1. Datta, S.C.1989. Plant Physiology, Central Book Depot, Allahabad.
2. Dayananda, B. (1999). Experiments in Plant Physiology, Narosa Publishing House, New Delhi.
3. De Robertis, E.D.P. and De Robertis, E.M.F.Jr. 2002. Cell and Molecular Biology, Lipponcott Williams and Wilkins. USA.
4. Hopkins, W.G. 1999. Introduction to Plant Physiology. John Wiley and sons, New York.
5. Jain J.L. Sanjay Jain & Nitin Jain 2005. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
6. Jain,V. K. 1996. Fundamentals of Plant Physiology, S Chand and Company, Delhi .
7. Kochar, P.L. 1964. A Text Book of Plant Physiology, Atmaram & Sons, Delhi.
8. Lehninger A.L.1961. Biochemistry, Lalyan Publishers, Ludhiana.
9. Leopald, A.C. and Kriedemann, P.E. Plant Growth and Development. Tata McGraw Hill, New Delhi.
- 10.Malik, P.C. 1680. Plant Physiology, Kalyani Publishers, New Delhi.

| No | Sessions | Topic | Method | Remarks/Reference |
|----|------------|---|---|-------------------|
| 1 | Session 1 | Physical aspects of absorption- Diffusion, imbibition, osmosis, OP, DPD, TP, WP, Concept of Water potential, matrix potential, pressure potential. | Presentation/Chalk and Board Assignment | |
| 2. | Session 2 | | | |
| 3 | Session 3 | | | |
| 4 | Session 4 | Absorption of water-active & passive, Ascent of sap- cohesion adhesion theory, Transpiration-types- mechanism-theories-(starch- sugar, proton-K+ion exchange)-significance – antitranspirants, Guttation | Presentation/Chalk and Board | |
| 5 | Session 5 | | | |
| 6 | Session 6 | | | |
| 7 | Session 7 | Essential and non-essential elements- macro& micro- role- deficiency symptoms. Absorption of minerals– active & passive-ion exchange, carrier concept. | Presentation/Chalk and Board | |
| 8 | Session 8 | | | |
| 9 | Session 9 | | | |
| 10 | Session 10 | History - Photosynthetic pigments, photo excitation- Fluorescence, Phosphorescence - Absorbtion and action spectra, Red drop and Emerson enhancement effect | Presentation/Chalk and Board | |
| 11 | Session 11 | | | |
| 12 | Session 12 | Concept of photo systems, Cyclic & Non-Cyclic photophosphorylation | Presentation/Chalk and Board | |
| 13 | Session 13 | | | |
| 14 | Session 14 | | | |

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| 15 | Session 15 | Carbon assimilation pathways- C3, C4, CAM- Photorespiration –factors affecting photosynthesis. | | |
| 16 | Session 16 | Pathway-phloem transport- mechanism-pressure flow- phloem loading and unloading. | Presentation/Chalk and Board | |
| 17 | Session 17 | | | |
| 18 | Session 18 | Aerobic and Anaerobic, Glycolysis, Krebs cycle, Electron transport system & Oxidative phosphorylations, ATPases - chemi osmotic hypothesis-RQ –significance- factors affecting respiration. | Presentation/Chalk and Board | |
| 19 | Session 19 | | | |
| 20 | Session 20 | | | |
| 21 | Session 21 | | | |
| 22 | Session 22 | ATPases - chemi osmotic hypothesis-RQ –significance- factors affecting respiration. | Presentation/Chalk and Board | |
| 23 | Session 23 | | | |
| 24 | Session 24 | | | |
| 25 | Session 25 | | | |
| 26 | Session 26 | Allelochemicals- herbivory | Assignment | |
| 27 | Session 27 | Physiological effects and practical application of hormones-Auxins, Giberillins, Cytokinins, ABA, ethylene. | | |
| 28 | Session 28 | Physiology of flowering– phytochrome- photoperiodism- vernalisation | Presentation/Chalk and Board | |
| 29 | Session 29 | Abiotic - concept of plant responses to water, salt and temperature stresses; Biotic- pathogens | Assignment | |
| 30 | Session 30 | | | |
| 31 | Session 31 | Physical and chemical properties of water, Acid and bases, pH definition, significance, measurement, | Presentation/Chalk and Board/Assignment | |
| 32 | Session 32 | | | |

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| | | pH indicators, buffer action, pH and life | | |
| 33 | Session 33 | Carbohydrates- structure and role of mono-di & poly-saccharides-common sugars seen in plants Proteins-peptide bond-essential and non-essential amino acids-primary structure-physiologically important proteins. | Presentation/Chalk and Board/ Assignment | |
| 34 | Session 34 | | | |
| 35 | Session 35 | | | |
| 36 | Session 36 | | | |
| 37 | Session 37 | | | |
| 38 | Session 38 | Lipids - general features and their roles - fatty acid types and structure - fatty acid derivatives- fats and oils, structure and functions - compound lipids | Presentation/Chalk and Board | |
| 39 | Session 39 | | | |
| 40 | Session 40 | | | |
| 41 | Session 41 | Nomenclature, characteristics mechanism and regulation of enzyme action, enzyme kinetics, factors affecting enzyme action | Presentation/Chalk and Board | |
| 42 | Session 42 | | | |
| 43 | Session 43 | | | |
| 44 | 44 – 49 | Seminar | | |
| 45 | 50 – 54 | Revision | | |

COURSE PAN

Perspectives of Science, Methodology and General Informatics

COURSE OBJECTIVES:

- This enables the student a detailed basic understanding on principles of science and research methodology.
- Students will be able to understand different steps involved in research methodology.
- It also enables the student to understand the basics in general informatics.
- They will be equipped with using different application in computer related to education.
- They will be able to prepare a dissertation using MS office.
- They will be able to prepare power point presentations of research works.

Basic Reference

1. 1. Agarwal SK, 2008, *Foundation course in Biology* , Ane Books Pvt.Ltd., New Delhi.
2. Collins H.and T Pinch 1993 *The Golem: What every one should know about science*, University Press, Cambridge.
3. ColRuxton R, S N. Colegrave.2006. *Experimental Design for the life Science*, Oxford University Press
4. Cotteril R, 2002. *Biophysics an Introduction* .John Wiley and Sons.
5. Dany Spencer Adams, 2004. *Lab Math* I.K. International Pvt. Ltd. New Delhi.
6. David A Micklos, Greg A Freyer 2003. *DNA science: A first course*. Cold Spring Harbor Laboratory Press.
7. Day R.A, 1998. *How to Write and Publish a ScientificPaper*, University Press Cambridge.
8. Dwivedi J .N and R.B Singh (1990) *Essentials of Plant Techniques* – Scientific Publishers, Jodhpur.
9. GW Stout, DJ Taylor,2008. *Biological Sciences*. NPO Green, University Press, Cambridge.
10. Harold C Bold, 1999. *The Plant Kingdom*. Prentice Hall of India Pvt. Ltd.
11. Holmes D Moody P and D.Dine 2006 , *Research Methods for the Biosciences* Oxford University Press
12. Holmes D Moody P and D.Dine 2006, *Research Methods for the Biosciences* Oxford University Press
13. Jeffrey A. Lee 2009; *The Scientific Endeavor Methodology and Perspectives of sciences*, Pearson
14. Johnson DA, 1940. *Plant Microtechnique*, McGraw Hill Co., New York.
15. Judson HF, 1979. *The eighth day of creation*. Simon Schuster, New York.
16. Krishnamurthy K.V (2004) *Advanced text book on biodiversity, principles and practice* IBH Pub Oxford.

| Sessions | Topic | Method | Remarks |
|------------|---|------------------------------|---------|
| Session 1 | Introduction to science | Presentation/Chalk and Board | |
| Session 2 | -Steps in scientific methods <ul style="list-style-type: none"> - observation and thoughts - formulation of a hypothesis - designing of experiments - testing of hypothesis - formulation of theories | | |
| Session 3 | <ul style="list-style-type: none"> - Selection of a problem - Searching the literature - Selection of variables, study area, and a suitable design Necessity of units and dimensions | Presentation/Chalk and Board | |
| Session 4 | | | |
| Session 5 | | | |
| Session 6 | Units of length, volume, area, concentration, temperature, pressure | Presentation/Chalk and Board | |
| Session 7 | <ul style="list-style-type: none"> - Setting of hypothesis, Null-hypothesis and alternative hypothesis - Need of control, treatments and replication - Analysis, presentation and interpretation of data - Testing of hypothesis, need of statistical tools - Examples of great experiments in life sciences | | |
| Session 8 | <ul style="list-style-type: none"> -An example of moving from a question to hypothesis and then to an experimental design -Contributions and the great experiments of Louis Pasteur, and Robert Koch -Ethics in science | | |
| Session 9 | - Introduction | Presentation/Chalk and Board | |
| Session 10 | - Microscopy:- simple, compound, phase contrast, fluorescent, confocal and electron microscopes (working principle and application only) | | |

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| | - Microtome:- rotary, sledge, cryotome (application only) | | |
| Session 11 | - Sectioning:- Hand sections, microtomy | Presentation/Chalk and Board | |
| Session 12 | - Staining technique:- Principle of staining Stains:- Safranin, Hematoxylin, Acetocarmine Vital stains: Purpose, Examples: Neutral red and Evan's blue Mordents : Purpose and examples Single staining and Double staining | | |
| Session 13 | - Mounting and Mounting Media, Purpose of mounting media, Glycerin, DPX, Canada balsam - Use of permanent whole mounts, permanent sections - Maceration - Smear and squash preparation | Presentation/Chalk and Board | |
| Session 14 | | | |
| Session 15 | - Principles and applications of colorimeter, spectrophotometer and centrifuge, Beer-Lambert's Law, | Presentation/Chalk and Board | |
| Session 16 | | | |
| Session 17 | - Separation methods :- chromatography; thin layer, paper, column (principle and applications only), electrophoresis; PAGE, Agarose gel electrophoresis(Principle and applications only) | Presentation/Chalk and Board | |
| Session 18 | | | |
| Session 19 | - pH:- concept of pH, methods to measure pH ; pH paper and pH meter, | Presentation/Chalk and Board | |
| Session 20 | | | |
| Session 21 | - Buffers:- definition, functions of buffers in biological systems, use of buffers in biological research, examples of commonly used buffers | Presentation/Chalk and Board | |
| Session 22 | | | |

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| Session 23 | - Introduction, statistical terms and symbols | Presentation/Chalk and Board | |
| Session 24 | - Sample:- concept of sample, sampling methods | | |
| Session 25 | - Collection and representation of data, graphic representation of data(Line graph, bar diagram, Pie diagram & Histogram) | Presentation/Chalk and Board | |
| Session 26 | - Measures of central tendency:- mean, mode, median | | |
| Session 27 | - Measures of dispersion:- standard deviation, standard error | Presentation/Chalk and Board | |
| Session 28 | - Distribution patterns:- normal distribution, binomial distribution | | |
| Session 29 | - t-test :- introduction, uses, procedure | Presentation/Chalk and Board | |
| Session 30 | - chi-square test:- introduction, uses, procedure | | |
| Session 31 | - Need for research | Presentation/Chalk and Board | |
| Session 32 | - Types of research - Scientific literature, Books, Research Journals, Reputed National and International journals in life sciences, Research paper - INSDOC services - Laboratory Etiquette - Laboratory Hygiene | | |
| Session 33 | Features of the modern personal computers and peripherals. | | |
| Session 34 | -Internet as a knowledge repository, e-mail, search engines (Google,), study of educational sites related to life sciences (DNAi, Scitable) , academic search techniques, (Science direct and INFLIBNET) | | |
| Session 35 | -Introduction to the use of information technology in teaching and learning | | |
| Session 36 | DOS – The basic concept of operating systems (Study of commands not required) | Presentation/Chalk and Board | |
| Session 37 | MS-WINDOWS:- logging to windows, organizing files and folders, copying, moving, deleting and saving documents, installing software, installing hardware | Presentation/Chalk and Board | |

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| Session 38 | MS-WORD:- word processing using WORD, editing tools (cut , copy, paste,) formatting tools (font, paragraph) use of spell check, inserting tables (draw), inserting graphs and pictures | Presentation/Chalk and Board | |
| Session 39 | MS-EXCEL:- Creating a worksheet, data entry, sorting (ascending and descending), use of statistical tools in EXCEL (SUM, MEAN, MODE, MEDIAN), preparation of graphs (bar diagram, pie chart and line graph) | Presentation/Chalk and Board | |
| Session 40 | MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides, Use of animation tools | Presentation/Chalk and Board | |
| 41 – 47 | Seminar | | |
| 48 – 54 | Revision | | |

COURSE PLAN

BIOTECHNOLOGY AND BIOINFORMATICS

COURSE OBJECTIVES:

- This enables the student a detailed basic understanding on the fundamentals of Biotechnology and Bioinformatics.
- Students will be able to understand various developments in biotechnology and potential applications.
- It also enables the student to understand the basics in bioinformatics.
- They will be equipped with use of computer in handling experimental data.

Basic Reference

1. Attwood TK & Parry, Smith DJ. 2003. *Introduction to Bioinformatics*. Pearson Education.
2. Balasubramanian, D. – Bryce CFA , Dharmalingam K. Green J, Kunthala Jayaraman, 2007. *Concepts in Biotechnology* – University Press India Pvt. Ltd.
3. Becker JM, Coldwell GA and Zachgo EA. 2007. *Biotechnology – A Laboratory Course* Academic Press.
4. Bhojwnis abd Razdan Mk 2000 *Plant Tissue Culture – Theory and practice* Elsevier India Pvt. Ltd.
5. Brown T.A. *Gene cloning and DNA analysis*. Black Well publishing.
6. Colin Ratledge and Bjorn Krishansen, 2008. *Basic Biotechnology*, Cambridge University Press.
7. Dixon R.A, 2003. *Plant Cell Culture*, IRC Press
8. Dubey R.C 2006. *A Text Book of Biotechnology* S.Chand and Company, New Delhi
9. Gupta PK. ,2006. *Biotechnology and Genomics*. Rastogi Publications.
10. Jogdand S.N. 1999. *Advances in Biotechnology*, Himalaya Publishers, Mumbai.
11. John E Smith 2006. *Biotechnology*, Cambridge University Press
12. Lewin. B. 2008 *Gene IX*. Jones and Barlett Publications.

| 1. | Date | Topic | Method | Remarks |
|----|------------|---|--|---------|
| 1 | Session 1 | Introduction – The concept of biotechnology, landmarks in biotechnology. | Presentation/Chalk and Board | |
| 2. | Session 2 | | | |
| 3 | Session 3 | Plant tissue culture – Principles and techniques. Cellular totipotency, in vitro differentiation –de differentiation and re-differentiation , callus induction, organogenesis and somatic embryogenesis | Presentation/Chalk and Board | |
| 4 | Session 4 | | | |
| 5 | Session 5 | | | |
| 6 | Session 6 | Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium – suspension culture. Murashige and Skoog medium – composition and preparation. | Presentation/Chalk and Board | |
| 7 | Session 7 | | | |
| 8 | Session 8 | Aseptic techniques in tissue culture – sterilization – different methods – sterilization of instruments and glass wares, medium, explants | Assignment | |
| 9 | Session 9 | 4. Micropropagation - Different methods – axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis. Different phases of micropropagation – hardening, transplantation and field evaluation Advantages and disadvantages of micropropagation. Somaclonal variation | Presentation/Chalk and Board | |
| 10 | Session 10 | | | |
| 11 | Session 11 | | | |
| 12 | Session 12 | | | |
| 13 | Session 13 | | | |
| 14 | Session 14 | | | |
| 15 | Session 15 | 5. Methods and Applications of tissue culture - Shoot tip and meristem culture Synthetic seed production, embryo culture, In vitro mutagenesis, Protoplast isolation culture and regeneration – transformation and transgenics, Somatic cell hybridization- cybrids. In vitro secondary metabolite production — cell immobilization, bioreactors In vitro production of haploids – anther and pollen culture, In vitro preservation of germplasm. | Presentation/Chalk and Board Presentation/Chalk and Board | |
| 16 | Session 16 | | | |
| 17 | Session 17 | | | |
| 18 | Session 18 | | | |

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| 19 | Session 19 | Recombinant DNA Technology | Presentation/Chalk and Board | |
| 20 | Session 20 | Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids pBR322, bacteriophage based vectors, Ti plasmids. Restriction endonucleases and ligases – Ligation techniques, transformation and selection of transformants – using antibiotic resistances markers, southern blotting; PCR. | | |
| 21 | Session 21 | | | |
| 22 | Session 22 | | | |
| 23 | Session 23 | | Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, transduction, electroporation, microinjection, microprojectiles, Agrobacterium mediated gene transfer gene library, gene banks. | Presentation/Chalk and Board |
| 24 | Session 24 | | | |
| 25 | Session 25 | | | |
| 26 | Session 26 | | | |
| 27 | Session 27 | Important achievements in Biotechnology: Production of human insulin, Bt Brinjal and Bt cotton, Golden rice, Flavr Savr tomato, Shikonin pigments | Assignment | |
| 28 | Session 28 | | | |
| 29 | Session 29 | Current trends in Biotechnology: Tissue Engineering, Stem cell culture, Nanobiotechnology | Presentation/Chalk and Board | |
| 30 | Session 30 | | | |
| 31 | Session 31 | Strategic Applications of Biotechnology: Production of disease/ stress resistant plants, Gene therapy, DNA fingerprinting | Presentation/Chalk and Board | |
| 32 | Session 32 | | | |
| 33 | Session 33 | Social and ethical issues, biosafety, biowar, patenting and IPR issues. | Presentation/Chalk and Board | |
| 34 | Session 34 | | | |
| 35 | Session 35 | | | |
| 36 | Session 36 | 1. Introduction to Bioinformatics, scope and relevance, genome, transcriptome, proteome. 2. Biological data bases – Nucleotide sequence database – EMBL, Gen Bank, DDBJ. Protein sequence database – PDB, SWISS PROT | Presentation/Chalk and Board | |
| 37 | Session 37 | | | |
| 38 | Session 38 | | | |

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| 39 | Session 39 | Organismal database – Saccharomyces genome database Biodiversity database – Species 2000 3. Information retrieval from Biological database, sequence alignment types and tools: pair wise sequence alignment multiple sequence alignment, use of BLAST, FASTA. | Presentation/Chalk and Board | |
| 40 | Session 40 | Genomics : DNA sequencing Sangers procedure-automation of DNA sequencing, genome sequence assembly, Genome projects – Major findings of the following genome projects – Human, Arabidopsis thaliana, Rice, Haemophilus influenza, Application of genome projects. | Assignments and Discission | |
| 41 | Session 41 | | | |
| 42 | Session 42 | | | |
| 43 | Session 43 | | | |
| 44 | Session 44 | Proteomics : Protein sequencing- Edman degradation method, automation of sequencing, protein structure prediction and modelling (Brief account only) | Presentation/Chalk and Board | |
| 45 | Session 45 | | | |
| 46 | Session 46 | | | |
| 47 | Session 47 | A brief account on 1. Molecular phylogeny and phylogenetic trees. 2. Molecular visualization – use of Rasmol. 3. Molecular docking and computer aided drug design | Presentation/Chalk and Board | |
| 48 | Session 48 | | | |
| 49 | Session 49 | | | |
| 50 | Session 50 | | | |
| 51 | 51 – 54 | Revision | | |

COURSE PLAN
HORTICULTURE, NURSERY MANAGEMENT, EMBRYOLOGY AND REPRODUCTIVE
BIOLOGY

COURSE OBJECTIVES:

- This enables the student a detailed basic understanding Horticulture and Nursery Management.
- Students will be able to understand the importance of horticulture in human welfare.
- It also enables the student to understand the basics in embryology.
- They will have a clear knowledge on the development of fruit and seed.

Basic Reference

1. Adams C.R., Early M.P. 2004. *Principles of Horticulture*. Elsevier, N. Delhi.
2. Barton West R. 1999. *Practical Gardening in India*. Discovery Pub. House, New Delhi.
3. Edmond J.B., Senn T.L., Andrews F.S., Halfacre P.G. 1975. *Fundamentals of Horticulture*. 4th Edn. TMH N. Delhi.
4. John J. (2012). *Elements of Agribased Microenterprises*. Bulbul Scientific Publishers, Kottayam.
5. John Weathers. 1993. *Encyclopaedia of Horticulture*. Discovery Pub. House. New Delhi
6. Jules Janick. 1979 *Horticultural Science*. Surjeet publications, Delhi
7. Kumar N. 1994. *Introduction to Horticulture*. Rajalakshmi Pub. Nagarcoil
8. Manibhushan Rao K. 1991. *Text Book of Horticulture*. Macmillan India Ltd.
9. Randhawa G.S., Mukhopadhyay A. 1986. *Floriculture in India*. Allied Publishers Pvt. Ltd. Ahamedabad
10. Sadhu M.K. ,1996. *Plant Propagation*. New age International publishers, N. Delhi
11. Schilletter J.C., Richey H.W. 1999. *Text Book of General Horticulture*. Biotech Books, New Delhi.
12. Mazundar B.C. and P.M. Mukhopadhyay 2006, *Principles & Practices of Herbal Garden*. Daya Publishing House – Delhi.

| No. | Date | Topic | Method | Remarks |
|-----|------------|---|---|---------|
| 1 | Session 1 | Introduction to horticulture - definition, history, classification of horticultural plants, disciplines of horticulture; Garden tools and implements. Irrigation methods- surface, sub, drip and spray irrigations, mist chambers - advantages and disadvantages | Presentation/Chalk and Board | |
| 2. | Session 2 | | | |
| 3 | Session 3 | Propagation of horticultural plants- by seeds- Seed viability, seed dormancy, seed testing and certification, seed bed preparation, seedling transplanting, hardening of seedling; advantages and disadvantages of seed propagation. | Presentation/Chalk and Board/Assignment | |
| 4 | Session 4 | | | |
| 5 | Session 5 | | | |
| 6 | Session 6 | Vegetative propagation- organs used in propagation- natural and artificial vegetative propagation; methods- cutting, layering, grafting and budding; | Presentation/Chalk and Board | |
| 7 | Session 7 | | | |
| 8 | Session 8 | Advantages and disadvantages of vegetative propagation. | Assignment | |
| 9 | Session 9 | Gardening- ornamental gardens, indoor gardens, home gardens- terrestrial and aquatic gardens- garden adornments; garden designing- garden components- lawns, preparation of lawns by seeds, seedling, turfing. | Presentation/Chalk and Board | |
| 10 | Session 10 | | | |
| 11 | Session 11 | Shrubs and trees, borders, hedges, edges, walks, drives- famous gardens of India; Landscape architecture- home landscape design, parks. Physical control of plant growth- training and pruning; repotting; disease and pest control selection of plant for bonsai, bonsai containers and method of bonsai formation | Presentation/Chalk and Board | |
| 12 | Session 12 | | | |
| 13 | Session 13 | | | |

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| 14 | Session 14 | General account and interdisciplinary relevance of embryology, embryology in relation to taxonomy; experimental embryology. | Presentation/Chalk and Board | |
| 15 | Session 15 | Structure and development of anther, microsporogenesis, development of male gametophyte, anthesis and anther dehiscence | Presentation/Chalk and Board | |
| 16 | Session 16 | | | |
| 17 | Session 17 | Structure of pollen, pollen germination, pollen tube growth and pollen viability | Presentation/Chalk and Board/Assignment | |
| 18 | Session 18 | | | |
| 19 | Session 19 | Structure and development of ovule, megasporogenesis, embryosacs-monosporic (polygonum type), bisporic (Allium type) and tetrasporic (Peperomia type) | Presentation/Chalk and Board | |
| 20 | Session 20 | | | |
| 21 | Session 21 | Structure of mature embryo sac | Presentation/Chalk and Board | |
| 22 | Session 22 | | | |
| 23 | Session 23 | Breeding/Reproductive systems and pollination syndromes (with examples for each syndrome) in angiosperms | Presentation/Chalk and Board | |
| 24 | Session 24 | | | |
| 25 | Session 25 | Pollen stigma interaction; self-compatibility and incompatibility; syngamy and fusion; apomixis. | Presentation/Chalk and Board | |
| 26 | Session 26 | | | |
| 27 | Session 27 | Development of endosperm and embryo in Dicots and Monocots; Poly-embryony; Development and general structure of fruits (dry and fleshy) and seed | Presentation/Chalk and Board | |
| 28 | Session 28 | | | |
| 29 | Session 29 | Any Indian example from a reputed journal to study the pollination mechanisms and methods (eg. Adathoda vasica, Strobilanthes kunthianus | Presentation/Chalk and Board/Assignment | |
| 30 | Session 30 | | | |

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| 31 | Session 31 | Preparation of potting mixtures, polybags. Plant Growth structures – green houses, shaded houses, polyshed, mist chamber, sprinkling system, drip irrigation. Modern strategies in propagation by root initiation of cutting, layering technique, budding and grafting technique | Presentation/Chalk and Board | |
| 32 | Session 32 | | | |
| 33 | Session 33 | Micropropagation; Planting, Transplanting and Hardening of seedlings, After care of seedlings. Packing and transporting of seedlings | Presentation/Chalk and Board | |
| 34 | Session 34 | | | |
| 35 | Session 35 | | | |
| 36 | Session 36 | Organic manures and fertilizers, Composition of fertilizers. NPK content of various fertilizers and preparation of fertilizer mixtures. Common organic manures – bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost | Presentation/Chalk and Board | |
| 37 | Session 37 | | | |
| 38 | Session 38 | Preparation of compost –aerobic and anaerobic-advantages and limitations. Vermicompost – preparation - Vermiwash. – preparation. Biofertilizers – Definition and preparation of different types – Trichoderma, Rhizobium, PGPR, PSB, mycorrhiza. Application of Biofertilizers. Biopesticides – Tobacco and Neem decoction. | Presentation/Chalk and Board | |
| 39 | Session 39 | | | |
| 40 | Session 40 | Biological control of disease and pests. Organic traps – Natural dyes | Assignment | |
| 41 | Session 41 | Types–Home gardening, Market gardening and Truck gardening. Packing and Transporting of Vegetables. | Presentation/Chalk and Board | |
| 42 | Session 42 | | | |
| 43 | Session 43 | Organic farming of fruit crops – Packing and Transporting of fruits. | | |
| 44 | Session 44 | | | |
| 45 | Session 45 | | | |
| 46 | Session 46 | Induction of flowering and weed control. Cultivation of Medicinal and Aromatic plants of common use and great demand. | | |
| 47 | Session 47 | Traditional production techniques and Post-harvest techniques | | |
| 48 | Session 48 | Problems and prospects of Floriculture in Kerala. | | |
| 49 | Session 49 | | | |

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| 50 | Session 50 | <p>Scope of growing Anthurium, Orchids and Jasmine in Kerala.</p> <p>Common cut flowers – Rose, Gerbera, Gladiolus, Aster, Chrysanthemum, Daisys, Carnation, Golden rod, Anthurium, Orchids, Liliium and Limolium.</p> <p>Common leaves used in flower arrangement – Cyprus, Podocarpus, Asparagus, Palms, Cycads, Ferns and Eucalyptus.</p> <p>Floral arrangement: Types - Western, Eastern (Japanese/ Ikebana) and Modern.</p> <p>Wases, Flower Holders and Floral Foam.</p> <p>Wase life of flowers and leaves.</p> <p>After care of flower arrangements – Bouquets.</p> <p>Packing and Maintenance of flowers and leaves.</p> | | |
| 51 | Session 51 | | | |
| 52 | Session 52 | | | |
| 53 | Session 53 | | | |
| 54 | Session 54 | | | |
| 55 | Session 55 | | | |
| 56 | Session 56 | | | |
| 57 | Session 57 | | | |
| 58 | Session 58 | | | |
| 59 | Session 59 | | | |
| 60 | Session 60 | | | |
| 61 | Session 61 | | | |
| 62 | Session 62 | | | |
| 63 | Session 63 | | | |
| 64 | Session 64 | | | |
| PRACTICALS | | | | |
| 65 | Session 65 | <p>Tongue grafting, budding ('T' and patch), air layering</p> <p>2. Identification of different garden tools and their uses</p> <p>3. List out the garden components in the photograph of the garden given</p> <p>4. Preparation of potting mixture in the given proportion.</p> | Laboratory/Demonstration | |
| 66 | Session 66 | | | |
| 67 | Session 67 | | | |
| 68 | Session 68 | <p>1. Identification of C.S. of anther, embryo sac and embryo.</p> <p>2. Identification of various anther types- monothealous, dithealous</p> <p>3. Identification of placentation types.</p> <p>4. Observation of pollen and locating pollen pore</p> <p>5. Pollen germination study</p> | Laboratory/Demonstration | |
| 69 | Session 69 | | | |
| 70 | Session 70 | | | |

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| 71 | Session 71 | 1. Preparation of potting mixture | Laboratory/Demonstration | |
| 72 | Session 72 | 2. Preparation of Tobacco/ Neem decoction 3. Familiarization of common fertilizers and manures 4. Familiarization of common cut flowers and leaves used in flower arrangements 5. Different flower arrangement types (demonstration) | | |

COURSE PLAN

PHYTOCHEMISTRY AND PHARMACOGNOSY

COURSE OBJECTIVES:

- This enables the student a detailed basic understanding Horticulture and Nursery Management.
- Students will be able to understand the importance of horticulture in human welfare.
- It also enables the student to understand the basics in embryology.
- They will have a clear knowledge on the development of fruit and seed.

Basic Reference

1. Ashutosh Kar, 2006, *Pharmacognosy and Pharmacobiotechnology*, New Age International, New Delhi
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3. Bhattacharjee S K, 2003, *Hand Book of Medicinal Plants*, Pointer Publishers, Jaipur
4. Daniel, M.,1991. , *Methods in Plant Chemistry and Economic Botany*, Kalyani publishers ,New Delhi.
5. *Glossary of Indian Medicinal Plants with Active Principles* Part I & II, 1980. CSIR ,New Delhi.
6. *Indian Medicinal Plants* (5Vols) 1994. Arya Vaidya Sala Kottackal, Orient longoman New Delhi.
7. Irfan Ali Khan, 2008, *Medicinal and Aromatic plants of India*, Ukaaz Publishers, Hyderabad
8. Jain S K 2004, *A Manual Of Ethnobotany*, Scientific Publishers, India
9. Jain S.K. 1981. *Glimpses of Indian Ethnobotany*, Oxford and IBH, New Delhi
10. Khory R N 1999 *Materia Medica of India and their Therapeutics*, Komal Prakashan, Delhi

| No | Date | Topic | Method | Remarks |
|----|------------|---|---|--|
| 1 | Session 1 | Introduction to phytochemical approaches – morphological-organoleptic-microscopic- to study drug and aromatic plants | Presentation/Chalk and Board | |
| 2. | Session 2 | | | |
| 3 | Session 3 | Cold extraction- hot extraction—soxhlet-clevenger apparatus; Solvents - petroleum ether, chloroform, ethanol, water. Separation technique-TLC, Column, HPLC. | Presentation/Chalk and Board/Assignment | |
| 4 | Session 4 | | | |
| 5 | Session 5 | | | Characterization technique-GC/MS, HPTLC, UV Spectra, IR Spectra. |
| 6 | Session 6 | Alkaloids – introduction, properties, occurrence, structure, classification, functions, and pharmacological uses. | Presentation/Chalk and Board | |
| 7 | Session 7 | | | |
| 8 | Session 8 | | Assignment | |
| 9 | Session 9 | B. Triterpenoids. Introduction, properties, occurrence, classification, functions and pharmacological uses. | Presentation/Chalk and Board | |
| 10 | Session 10 | | | |
| 11 | Session 11 | | Presentation/Chalk and Board | |
| 12 | Session 12 | | | |
| 13 | Session 13 | C. Phenolics. Quinines- benzoquinones, naphthoquinones, anthraquinone, and coumarins. | Presentation/Chalk and Board | |
| 14 | Session 14 | | | |
| 15 | Session 15 | Habit, habitat and systematic position and morphology of the useful part. (2) Organoleptic, anatomical and chemical evaluation of the officinal part. (3) Phytochemistry and major pharmacological action of plant drugs. (4) Ayurvedic formulations using the plant <i>Tinospora cordifolia</i> , <i>Papaver somniferum</i> , <i>Aegle marmelos</i> , | Presentation/Chalk and Board | |
| 16 | Session 16 | | | |
| 17 | Session 17 | Habit, habitat and systematic position and morphology of the useful part. (2) Organoleptic, anatomical and chemical evaluation of the officinal part. | Presentation/Chalk and Board/Assignment | |
| 18 | Session 18 | | | |

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| | | <p>(3) Phytochemistry and major pharmacological action of plant drugs.</p> <p>(4) Ayurvedic formulations using the plant</p> <p>Punica granatum, Plumbago rosea, Adhatoda vasica, Withania somnifera,</p> | | |
| 19 | Session 19 | <p>Habit, habitat and systematic position and morphology of the useful part.</p> <p>(2) Organoleptic, anatomical and chemical evaluation of the officinal part.</p> <p>(3) Phytochemistry and major pharmacological action of plant drugs.</p> <p>(4) Ayurvedic formulations using the plant</p> <p>Achyranthes aspera, Asparagus racemosus, Kaempheria galanga, , Sida acuta, Carica papaya,</p> | Presentation/Chalk and Board | |
| 20 | Session 20 | | | |
| 21 | Session 21 | <p>Habit, habitat and systematic position and morphology of the useful part.</p> <p>(2) Organoleptic, anatomical and chemical evaluation of the officinal part.</p> <p>(3) Phytochemistry and major pharmacological action of plant drugs.</p> <p>(4) Ayurvedic formulations using the plant</p> <p>Azadirachta indica, Glycirrhiza glabra, Phyllanthus neruri, Datura stramonium, ,</p> | Presentation/Chalk and Board | |
| 22 | Session 22 | | | |
| 23 | Session 23 | <p>Habit, habitat and systematic position and morphology of the useful part.</p> <p>(2) Organoleptic, anatomical and chemical evaluation of the officinal part.</p> <p>(3) Phytochemistry and major pharmacological action of plant drugs.</p> <p>(4) Ayurvedic formulations using the plant</p> <p>Hemidesmus indicus, Aloe veera, Tylophora indica, Acorus calamus</p> | Presentation/Chalk and Board | |
| 24 | Session 24 | | | |
| 25 | Session 25 | | | |

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|----|------------|--|---|--|
| 26 | Session 26 | Study of the following aromatic plants - volatile oils and methods of extraction Vetiveria zizanoides, Cinnamomum zeylanica,. | Presentation/Chalk and Board | |
| 27 | Session 27 | Study of the following aromatic plants - volatile oils and methods of extraction Sisymbrium aromaticum, Santalum album | Presentation/Chalk and Board | |
| 28 | Session 28 | | | |
| 29 | Session 29 | Study of the following aromatic plants - volatile oils and methods of extraction Eucalyptus, Ocimum basilicum, | Presentation/Chalk and Board/Assignment | |
| 30 | Session 30 | | | |
| 31 | Session 31 | Study of the following aromatic plants - volatile oils and methods of extraction Rosa, Mentha piperita, Cymopogon, Cananga, Pelargonium | Presentation/Chalk and Board | |
| 32 | Session 32 | | | |
| 33 | Session 33 | Introduction, tools for identifying adulteration; methods in pharmacognosy- microscopy, | Presentation/Chalk and Board | |
| 34 | Session 34 | | | |
| 35 | Session 35 | | | |
| 36 | Session 36 | phytochemical methods- study of starch grains of maize, wheat, rice, potato, curcuma | Presentation/Chalk and Board | |
| 37 | Session 37 | | | |
| 38 | Session 38 | Traditional plant medicines as a source of new drugs – The process of modern drug discovery using ethnopharmacology – Taxol, Artemisinin, Galanthamine and Flavopyridole as examples of drug discovery based on ethnopharmacological approach. | Presentation/Chalk and Board | |
| 39 | Session 39 | | | |
| 40 | 41 – 47 | Seminar | | |
| 41 | 48 – 54 | Revision | | |