

SACRED HEART COLLEGE (AUTONOMOUS)

Department of Botany

BSc Botany

Course plan

Academic Year 2015 – 16

Semester 5

COURSE PLAN
ANGIOSPERM SYSTEMATICS, FLORAL MORPHOLOGY AND ECONOMIC BOTANY

COURSE OBJECTIVES:

- The students will have a through basic understanding about plant taxonomy.
- Students would be able to identify plant families included in the course.
- Students would be able to develop deductive reasoning ability.
- Students would be able to identify economic importance of different angiosperms.

Basic Reference

1. Ashok Bendra and Ashok Kumar ,1980. *Economic botany.*: Rastogi publications, Meerut.
2. Cornquist A. ,1968. *The evolution and Classification of FloweringPlants.*
3. Davis P.H and Heywood V.H. 1967 *Principles of Angiosperm Taxonomy.* Edinburgh: Oliver and Boyl.
4. Eames A.J. 1961 *Morphology of Angiosperms.* New York: Mc Graw Hill.
5. Foaster A.S. and Giffad E.M. 1962 *Comparative Morphology of Vascular Plants.* Allied Pacific Pvt. Ltd. Bombay.
6. Henry and Chandra Bose 2001 *An Aid to the International Code of Botanical Nomenclature.* Botanical Survey of India. Coimbatore.
7. Heywood V.H. 1967. *Plant Taxonomy.* London: Edward Arnold.
8. Hill A.F. 1982. *Economic Botany.*: Mc Graw Hill ,New York.
9. Jain S. K. 1981. *Glimpses of Indian Ethnobotany.*: Oxford and IBH. New Delhi
10. Jain S. K. 1987. *A Manual of Ethnobotany.* Jodhpur Scientific Publishers.

No	Sessions	Topic	Method	Remarks
ANGIOSPERM SYSTEMATICS AND FLORAL MORPHOLOGY				
1	2	Types of flower – Hypogyny, Perigyny and Epigyny, Symmetry of flowers.	Presentation/Chalk and Board	
2.	2	Aestivation types; Placentation types	Presentation/Chalk and Board	
3	2	Floral Diagram and Floral Formula with examples for actinomorphic, zygomorphic, Monochlamydeae and Monocot flowers	Presentation/Chalk and Board	
4	2	Aim, Scope and Significance, identification, field inventory, Monographs	Presentation/Chalk and Board	
5	2	Types of Classification- Artificial (Brief account)	Presentation/Chalk and Board	
6	2	Natural – Bentham and Hooker (Detailed account) and Phylogenetic (Brief account)	Presentation/Chalk and Board	
7	2	Binomial Nomenclature, ICBN- Brief account	Presentation/Chalk and Board	
8	2	Interdisciplinary approach in Taxonomy- Cytotaxonomy and Chemotaxonomy	Presentation/Chalk and Board	
9	2	Palynology, Phylogeny and Molecular Systematic	Presentation/Chalk and Board	
10	2	Herbarium technique- Preparation of herbarium, their preservation.	Assignment	
11	2	Important herbaria, Botanical Garden and BSI	Assignment	
12	2	Concept of eflora and other online groups that enumerate plant diversity	Presentation/Chalk and Board	
13	2	Important flora works of India	Presentation/Chalk and Board	
14	2	Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Annonaceae, Nymphaeaceae, Malvaceae, Sterculiaceae, Rutaceae, Meliaceae, Anacardiaceae	Presentation/Chalk and Board	

15	2	Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Leguminosae (Mimosaceae, Caesalpiaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Apiaceae, Rubiaceae	Presentation/Chalk and Board	
16	2	Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Compositae (Asteraceae), Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae	Presentation/Chalk and Board	
17	2	Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Acanthaceae, Verbenaceae, Lamiaceae (Labiatae), Amaranthaceae, Euphorbiaceae	Presentation/Chalk and Board	
18	2	Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Orchidaceae, Liliaceae, Arecaceae, Graminae (Poaceae)	Presentation/Chalk and Board	
PRACTICALS				
19	2	Preparation of floral formula from floral description. Identification of aestivation and placentation types.	Laboratory Demonstration	
20	2	Identify the families mentioned in the syllabus by noting their key, vegetative and floral characters. Students must describe the floral parts, draw the L.S., floral diagram and write the floral	Laboratory Demonstration	

		formula of at least one flower from each family.		
21	2	Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family. Prepare herbarium of 25 plants with field notes.	Laboratory Demonstration	
22	2	Conduct field work for a minimum of 5 days under the guidance of a teacher Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.	Laboratory Demonstration	
ECONOMIC BOTANY				
23	2	Study of the following groups of plants based on their uses with special reference to the botanical name, family and morphology of the useful part Cereals- Rice, Wheat Millets- Ragi Pulses- Green gram, Bengal gram, Black gram Sugar yielding plants – Sugarcane Fruits:- Apple, Pineapple, Orange, Mango and Banana Vegetables:- Bittergourd, Ladies finger, Carrot and Cabbage. Timber yielding plants:- Teak wood and Jack wood Beverages- Tea, Coffee	Presentation/Chalk and Board	
24	2	Study of the following groups of plants based on their uses with special reference to the botanical name, family and morphology of the useful part Fibre yielding plants- Coir, Jute, Cotton Oil yielding plants- Ground nut, Gingelly	Presentation/Chalk and Board	

		Rubber yielding plants- Para rubber Gums and Resins- White damer, Gum Arabic, Asafoetida Spices – Cardamom, Pepper, Cloves , Ginger Insecticide yielding Plants- Tobacco and Neem		
25	2	Study of the following plants used in daily life by tribals and village folks for Food, Shelter and Medicine Food :- <i>Artocarpus, Corypha, Phoenix</i> Shelter - <i>Bambusa, Ochlandra and Calamus</i>	Presentation/Chalk and Board	
26	2	Study of the following plants used in daily life by tribals and village folks for Food, Shelter and Medicine Medicine - <i>Curcuma, Trichopus zeylanicus and Alpinia galanga</i>	Presentation/Chalk and Board	
27	2	Revision		

COURSE PLAN

ENVIRONMENTAL SCIENCE AND ECOTOURISM

COURSE OBJECTIVES:

- Students will develop an insight in the significance of environmental science.
- This course will help create responsible citizens with values inculcate on conservation of natural resources and prevention of pollution.
- Students will develop an ability to design novel mechanism for the sustainable utilization of natural resources.
- A thorough understanding of the nature and interactions of populations in the ecosystem.
- Students will have a thorough knowledge on structure and function of the ecosystems, various movements in the protection of nature and natural resources and extent of the total biodiversity and their conservation.
- They will have acquaintance with various environmental laws in India.
- They develop ability to assess the positive and negative impacts of Ecotourism and its role in the sustainable utilization of resources for tourism.

Basic Reference

1. Ahmedullah, M. & Nayar, M.P 1987. *Endemic Plants of the Indian Region*. Botanical Survey of India, Calcutta.
2. AK Bhattacharya, 2005. *Ecotourism and Livelihoods*. Concept Publishing Co. New Delhi
3. Amal Raj S. *Introduction to Environmental Science & Technology*; Laxmi Publications Pvt. Ltd., New Delhi.
4. Asthana D.K. & Meera Asthana. 2006. *A Text Book of Environmental Studies* S. Chand.
5. Basha S.C. 1991.. *Indian forester*. 117: 439-448. The Distribution of Mangroves in Kerala
6. Bharucha, Erach 2003. *The Biodiversity of India*. Mapin Publishing Co., New Delhi
7. Ceballos-Lascurian, Hector, 1996. *Tourism, Ecotourism and Protected areas*. IUCN, Cambridge UK.
8. Champion, H. G. 1936. *A Preliminary Survey of Forests of India and Burma*. Ind. For. Rec. (n.s.) 1: 1-236.

No	Date	Topic	Method	Remarks
ENVIRONMENTAL SCIENCE				
1	Session 1	Introduction, relevance and scope, public awareness	Presentation/Chalk and Board	
2.	Session 2	Types of resources-renewable and non renewable Forest resources: Timber extraction, mining, dams, over exploitation, deforestation, MFP (minor Forest products), Joint Forest Management (JFM), Rights of Tribals to forests.	Presentation/Chalk and Board	
3	Session3	Water resources: surface and ground water, drinking water, dams-benefits and problems, conflict over water, Rain water harvesting, Water shed conversation, importance of hills and mountains in water conservation	Presentation/Chalk and Board	
4	Session 4	Food resources: major food crops in India. Causes of food shortage. Food security, world food problems.	Presentation/Chalk and Board	
5	Session 5	Energy resources: Energy plantation, - Jatropha, Wind energy and Solar energy Land resources: Land use, land degradation, desertification, EFL(Ecologically Fragile Land), Ecological sensitive area	Presentation/Chalk and Board	
6	Session 6	Conservation of Biodiversity, ecological footprints, umbrella species and keystone species conservation.	Presentation/Chalk and Board	
7	Session 7	Structure and function of ecosystem	Presentation/Chalk and Board	
8	Session 8	Ecosystem components- abiotic and biotic	Presentation/Chalk and Board	
9	Session 9	Productivity – primary and secondary-gross and net productivity	Presentation/Chalk and Board	
10	Session 10	Decomposition in nature, homeostasis in ecosystem	Presentation/Chalk and Board	
11	Session 11	Ecological energetics: energy flow, trophic levels, food chain and food web, ecological pyramids	Assignment	
12	Session 12	Nutrient cycles: Biogeochemical cycles of C, N and S.	Presentation/Chalk and Board	
13	Session 13	Population: size, density, natality, mortality.	Presentation/Chalk and Board	
14	Session 14	Community characteristics: Species diversity and species richness, dominance, growth forms and structure, trophic structure	Presentation/Chalk and Board	

15	Session 15	Association of communities: plant association, ecotypes, ecotone, edge effect, ecological indicators.	Presentation/Chalk and Board	
16	Session 16	Ecological succession: types of succession, process – migration, ecesis, colonization, stabilization and climax community; hydrosere, xerosere, lithosere	Presentation/Chalk and Board	
17	Session 17	Ecological complexes and factors affecting plants growth and response: Climatic factors: temperature and pressure; water - precipitation, humidity, soil water holding capacity; light - global radiation	Presentation/Chalk and Board	
18	Session 18	Topographic factors: altitude and aspects	Presentation/Chalk and Board	
19	Session 19	Edaphic factors - profile and physical and chemical properties of soil Biotic factors: interactions – positive and negative.	Presentation/Chalk and Board	
20	Session 20	Species – ecosystem interaction: Habitat, ecological niche, microclimate	Assignment	
21	Session 21	Adaptation of plants to environment: To Water-Xerophytes, Hydrophytes; Temperature – thermo periodicity, vernalization; light – photoperiodism, heliophytes, sciophytes; salinity – halophytes, mangroves	Presentation/Chalk and Board	
22	Session 22	Definition and general introduction	Presentation/Chalk and Board	
23	Session 23	Air pollution: Causes and sources, types of pollutants-particulates-aerosol, mist, dust, smoke, fume, plume, fog, smog. Effect of air pollution on plants and animals, Bhopal Gas Tragedy.	Assignment	
24	Session 24	Water pollution: Sources and types of pollutants. Water quality standards, water quality assessment. Ground water pollution-blue baby syndrome. Cycling of heavy metals, hydrocarbons. Eutrophication, BOD, Minamata disease.	Assignment	
25	Session 25	Soil pollution: Causes and sources-waste dumps, municipal wastes, agrochemicals, mining, solid waste management-vermi composting.	Presentation/Chalk and Board	
26	Session 26	Noise pollution: Sources, standards and measurements, effect on health, control techniques. Thermal pollution: Sources and effects, management	Presentation/Chalk and Board	

27	Session 27	Nuclear hazards: Sources and impacts, management, Chernobyl incident EIA: Environmental Impact Assessment in polluted areas	Presentation/Chalk and Board	
28	Session 28	Climate change, global warming and green house gases, IPCC, Acid rain	Presentation/Chalk and Board	
29	Session 29	Ozone layer depletion, nuclear accidents and nuclear holocaust	Presentation/Chalk and Board	
30	Session 30	Environment (protection) Act, 1986, (2) Air (Prevention and control of pollution) Act, 1981, (3) Water (Prevention and control of pollution) Act, 1974, (4) Wildlife (protection) Act, 1972, (5) Forest (Conservation) Act, 1980 (briefly)	Presentation/Chalk and Board	
31	Session 31	Endemism: Definition-types-factors. Hotspot of endemism-hotspots in India. IUCN-threat categories. Red data book., Western Ghats as the hottest spot and its conservations.	Presentation/Chalk and Board	
32	Session 32	Biodiversity loss: Causes and rate of biodiversity loss, extinction-causes. Alien species, negative and positive impacts	Presentation/Chalk and Board	
33	Session 33	Conservation efforts: Rio Earth Summit, Agenda 21, Kyoto protocol, COP 15(15th Conference of the Parties under the U N Framework Convention on Climate Change), IPCC (Inter Governmental Panel for Climate Change) and its contribution	Presentation/Chalk and Board	
34	Session 34	Conservation strategies and efforts in India and Kerala, In situ and ex situ conservation methods. Role of NGOs in biological conservation	Presentation/Chalk and Board	
35	Session 35	Organizations: BNHS, WWF, CSE, NEERI, , MoEF, Green Peace, Chipko	Presentation/Chalk and Board	
36	Session 36	Famous contributors of Ecology in India: Salim Ali, M.S. Swaminathan, Madhav Gadgil, M.C. Mehta, Anil Agarwal, Medha patkar, John C. Jacob, Sunderlal Bahuguna	Presentation/Chalk and Board	
37	Session 37	Definition, concept, introduction, history, relevance and scope.	Presentation/Chalk and Board	
38	Session 38	Components of ecotourism: Forms and types of ecotourism in India and Kerala	Presentation/Chalk and Board	
39	Session 39	Ecotourism resources- biological, historical, cultural, and geographical.	Presentation/Chalk and Board	
40	Session 40	Ecotourism centers in Kerala. Positive and negative impacts of ecotourism	Presentation/Chalk and Board	

PRACTICALS

41	Session 41	Estimation of CO ₂ , Cl, and salinity of water samples (Titremetry) Determination of pH of soil and water Assessment of diversity, abundance, and frequency of plant species by quadrat method (Grasslands, forests)	Laboratory Demonstration	
42	Session 42	Study of the most probable number (MPN) of coliform bacteria in water samples EIA studies in degraded areas (Sampling – line transect, Quadrat) Visit to any forests types including grasslands and preparation of the list of Rare and threatened (R&T) plants (no collection of specimens)	Laboratory Demonstration	
43	Session 43	Collection, identification and preparation of the list of exotic species in the locality. Identification of pollutant to respective pollution types. Study of anatomical, morphological, physiological adaptation of plants to the environment (Xerophytic, Hydrophytic, Epiphytic, Halophytic). Collection and recording of rain data by using simple rain gauge.	Laboratory Demonstration	
44	44 – 48	Seminar		
45	49 – 54	Revision		

COURSE PLAN

GENETICS AND PLANT BREEDING

COURSE OBJECTIVES:

- This enables the student a detailed basic understanding about genetics.
- Students will be able to understand inheritance pattern of nuclear and extra nuclear genes.
- It also enables the student to understand the basics in plant breeding.
- They will be equipped with different methods of crop improvement.

Basic Reference

1. Gardner, E.J. and Snustad D.P. (1984) *Principles of Genetics*. John Wiley, New York.
2. Gerald Karp 1985. *Cell Biology*. Mc Graw Hill co.
3. Gupta P.K ,1994. *Genetics* Rastogi Pub.
4. John Ringo, 2004. *Fundamental Genetics*. Cambridge University Press India Pvt. Ltd.
5. Sadhu M.K. 1996. *Plant propagation*. New age international publishers, N. Delhi.
6. Schilletter J.C., Richey H.W. 1999. *Text Book of General Horticulture*. Biotech Books, New Delhi.
7. Shukla R.S., Chandel P.S. 2004. *Cytogenetics Evolution and Plant breeding*. S. Chand&Co.Ltd New Delhi.
8. Swanson C.P. 1957. *Cytology and Genetics*. Englewood cliffs, New York.
9. Peter Sunstard & Michael. J. Simmons 2003, *Principles of Genetics* (3rd edition) John Wiley & Sonc, Inc.
10. Singh B.D., 1983, *Plant breeding*. Kalyani Publishers, Ludhiana.

No	Date	Topic	Method	Remarks
GENETICS				
1	Session 1	Origin of a new branch of Biology- Genetics- A short life sketch of Gregor Mendel	Presentation/Chalk and Board	
2.	Session 2	Basic laws governing genetics, Mendelian ratios	Assignment	
3	Session3	Growth of Genetics- post Mendelian period- modified Mendelian ratios	Presentation/Chalk and Board	
4	Session 4	Incomplete dominance-flower color in <i>Mirabilis</i> : Interaction of genes- comb pattern in poultry (9:3:3:1)	Assignment	
5	Session 5	Epistasis- recessive- coat color in mice (9:3:4)	Presentation/Chalk and Board	
6	Session 6	Dominant epistasis- fruit color in summer squash (12:3:1)	Assignment	
7	Session 7	Complementary genes- flower color in <i>Lathyrus</i> (9:7)	Presentation/Chalk and Board	
8	Session 8	Multiple alleles- general account: ABO blood groups in man	Presentation/Chalk and Board	
9	Session 9	Co dominance; self sterility in <i>Nicotiana</i>	Presentation/Chalk and Board	
10	Session 10	Quantitative characters- polygenic inheritance	Presentation/Chalk and Board	
11	Session 11	Continuous variation- skin colour inheritance in man; ear size in maize	Presentation/Chalk and Board	
12	Session 12	Linkage and crossing over- importance of linkage, linkage and independent assortment.	Presentation/Chalk and Board	
13	Session 13	Complete and incomplete linkage	Presentation/Chalk and Board	
14	Session 14	Crossing over- general account, cytological basis of crossing over- two point test cross; determination of gene sequences	Presentation/Chalk and Board	
15	Session 15	Interference and coincidence; mapping of chromosomes.	Presentation/Chalk and Board	
16	Session 16	Sex determination- sex chromosomes and autosomes- chromosomal basis of sex determination; XX-XY, XX-XO mechanism; genic balance theory of sex determination in <i>Drosophila</i>	Presentation/Chalk and Board	
17	Session 17	hormonal theory of sex determination; sex chromosomal abnormalities in man- Down's syndrome, Klinefelter's syndrome, Turner's syndrome	Presentation/Chalk and Board	

18	Session 18	Sex linked inheritance- eye color in Drosophila	Presentation/Chalk and Board	
19	Session 19	Haemophilia in man; Y-linked inheritance	Presentation/Chalk and Board	
20	Session 20	Extra nuclear inheritance- general account- maternal influence		
21	Session 21	Plastid inheritance in Mirabilis, kappa particle in Paramecium	Presentation/Chalk and Board	
22	Session 22	Population genetics-Hardy Weinberg law	Presentation/Chalk and Board	
PRACTICALS				
23	Session 23	Students are expected to work out and record the problems in: 1. Monohybrid, dihybrid cross and back crosses. 2. All types of modified Mendelian ratios mentioned in the syllabus.	Chalk and Board	
PLANT BREEDING				
24	Session 24	An Introduction to and objectives of plant breeding	Presentation/Chalk and Board	
25	Session 25	Plant introduction- procedure of plant introduction, quarantine regulations, acclimatization- agencies of plant introduction in India, major achievements.	Assignment	
26	Session 26	Selection- mass, pureline, clonal- genetic basis of selection- some achievements	Presentation/Chalk and Board	
27	Session 27	Semi dwarf wheat and Rice	Presentation/Chalk and Board	
28	Session 28	Hybridization- Introduction, history, objectives and procedure- choice of parents, evaluation of parents, emasculation procedures such as hand method, succession method, hot water method, alcohol method and cold treatment methods	Presentation/Chalk and Board	
29	Session 29	Intergeneric, interspecific and intervarietal hybridization with examples- composite and synthetic varieties- heterosis in plant breeding	Presentation/Chalk and Board	
30	Session 30	Inbreeding depression; genetics of heterosis and inbreeding depression	Presentation/Chalk and Board	
31	Session 31	Single cross, pedigree method, bulk population method, multiple cross, back cross, polyploidy breeding, male sterility in plant breeding	Presentation/Chalk and Board	

32	Session 32	Use of apomixis in plant breeding	Presentation/Chalk and Board	
33	Session 33	Mutation breeding- methods- achievements in India	Assignment	
34	Session 34	Breeding for pest, disease and stress resistance	Presentation/Chalk and Board	
35	Session 35	Modern tools for plant breeding	Presentation/Chalk and Board	
36	Session 36	Genetic Engineering and products of genetically modified crops	Presentation/Chalk and Board	
PRACTICALS				
37	Session 37	Emasculation and bagging 2. Comparison of percentage of seed germination and the effect of any one chemical on the rate of elongation of radicle in any three crop seeds	Laboratory Demonstration	
38	38 – 46	Seminar		
39	47 – 54	Revision		

COURSE PLAN
CELL MOLECULAR BIOLOGY AND EVOLUTION

COURSE OBJECTIVES:

- This course enables the student to understand the ultrastructure in submicroscopic and molecular level.
- Students will have a better understanding about the origin, concept of continuity and complexity of life activities.
- It also enables the student to understand different cytological aspects of growth and development.
- They would know that the DNA is the basis of heredity and variation.
- Students will be able develop their understanding around the concept of evolution as the basis of biodiversity.

Basic Reference

1. Aggarwal SK, 2009. Foundation Course in Biology, 2nd Edition, Ane Books Pvt. Ltd.
2. Avinash & Kakoli Upadhyay 2005. *Basic Molecular Biology*. Himalaya Publishing House, Mumbai.
3. Cohn, N.S.,1964. *Elements of Cytology*. Brace and World Inc., New Delhi.
4. Darlington, C.D, 1965. *Cytology*, Churchill, London.
5. Darnel, J. Lodish, Hand Baltimore, D, 1991. *Cell and molecular biology*. Lea and Fibiger, Washington.
6. De Robertis, E.D.P. and Robertis, E.M.P ,1991. *Cell and molecular biology* Scientific American books.
7. Dobzhansky, B, 1961. *Genetic and origin of species*, Columbia university Press New York.
8. Gardner, E.J. and Snustad, D.P. 1984, *Principles of Genetics*. John wiley, New York.
9. Gerald Karp, 1985. *Cell Biology*,2006. Mc Graw Hill company.
10. Gupta, P.K. *Genetics*, Rastogi Publications.
11. Jha AP 1993 *Genes and evolution* Macmillan, India Ltd.
12. Lewin, B, 1999. *Genes*, Oxford University Press, New York
13. Lewis,W.H, 1980. *Polyploidy*. Plenum Press, New York
14. Paul Ames Moody 2002- *Introduction to Evolution* , Kalyani Publishers , New Delhi

No	Sessions	Topic	Method	Remarks
CELL BIOLOGY				
1	2	Historical account of cell Biology, Cell theory, Protoplasm theory	Assignment	
2.	2	The physio-chemical nature of plasma membrane and cytoplasm Eukaryotic, Prokaryotic cell.	Assignment	
3	2	The ultra-structure of plant cell with brief description and function of the following organelles: Endoplasmic reticulum, Plastids, Mitochondria, Ribosomes, Dictyosome	Presentation/Chalk and Board	
4	2	The ultra-structure of plant cell with brief description and function of the following organelles: Microbodies, lysosomes. Vacuole and cell sap	Presentation/Chalk and Board	
5	2	The ultra-structure of plant cell with brief description and function of the following organelles: Nucleus - ultra structure, nucleolus structure and function.	Presentation/Chalk and Board	
6	2	Morphology - fine structure Dupraw model - Nucleosome model – chemical organization of nucleosome – nucleoproteins, karyotype and idiogram	Assignment	
7	2	Special type of chromosomes - salivary gland, Lampbrush and B chromosome	Presentation/Chalk and Board	
8	2	Cell cycle, mitosis, meiosis: significance of mitosis and meiosis. Change in number of chromosomes - Aneuploidy and Euploidy	Presentation/Chalk and Board	
9	2	Change in the structure of chromosomes - Chromosomal aberrations deletion, duplication, inversions and translocations.	Presentation/Chalk and Board	
10	2	Meiotic behaviour of chromosomes. Lagging of chromosomes and Chromosome Bridge	Presentation/Chalk and Board	
11	2	Spontaneous and induced. Mutagens- Physical and Chemical mutagens.	Presentation/Chalk and Board	
12	2	Chromosomal and point mutations. Molecular mechanism of mutation - Transition, Transvesion and Substitution.	Presentation/Chalk and Board	
13	2	Stem cells; definition, sources and applications	Presentation/Chalk and Board	
PRACTICALS				
14	2	1. Make acetocarmine squash preparation of onion root tip to identify mitotic stages. 2. Study the Mitotic Index of onion root tip cells 3. Study of meioses in any flower bud by smear preparation of PMC's	Laboratory Demonstration	

15	2	4. Identification of Barr body 5. Identification of salivary gland chromosome. 6. Identify and study photographs and diagrams of cell division anomalies like lagging chromosomes, chr. bridge, aneuploidy, polyploidy. study the chromosomal patterns/ Karyotype in auto-, allo-, and aneuploids	Laboratory Demonstration	
MOLECULAR BIOLOGY				
16	2	Nucleic acids - structure of DNA and RNA - basic features, alternate forms of DNA - types and structure of RNA	Presentation/Chalk and Board	
17	2	Replication of DNA - Meselson-Stahl experiment - details of semiconservative replication of DNA	Presentation/Chalk and Board	
18	2	Gene expression - concept of gene, definitions - the central dogma	Assignment	
19	2	Details of transcription in prokaryotes and eukaryotes	Presentation/Chalk and Board	
20	2	RNA processing. details of translation - genetic code features		
21	2	Control of gene expression - positive and negative control - operon model - lac operon	Presentation/Chalk and Board	
22	2	trp operon -attenuation	Presentation/Chalk and Board	
23	2	Genetic basis of cancer - oncogenes - tumor suppressor genes - metastasis	Chalk and Board	
EVOLUTION				
24	2	Problems based on DNA, RNA and Proteins	Presentation/Chalk and Board	
25	2	Introduction, Origin of life – biochemical origins of life, Progressive, Retrogressive, Parallel and Convergent evolution	Assignment	
26	2	Theories of evolution - Lamarck's, Darwin's, Weismann's and De Vries.	Presentation/Chalk and Board	
27	2	Reproductive isolation, Mutation, Genetic drift, Speciation	Presentation/Chalk and Board	
28	2	Variation and evolution, hybridization and evolution, Polyploidy and evolution	Presentation/Chalk and Board	
29	2	Mutation and evolution	Presentation/Chalk and Board	

COURSE PLAN
AGRIBASED ENTERPRISES OPEN COURSE

COURSE OBJECTIVES:

- This course enables the student to understand business opportunities in plant sciences.

- Students from other disciplines would generate a basic knowledge on agriculture and farming.

- Students will develop a genuine interest in ornamental gardening, nursery management, floriculture and mushroom cultivation.

Basic Reference

1. Chandha.,K.L (2003) Handbook of Horticulture. ICAR. New Delhi.
2. George Acquciah. (2004) Horticulture – Principles and Practices. II Edn. Prentice Hall. India.
3. Gopal Chandha De. (2002) Fundamentals of Agronomy. Oxford and IBH Publishing House.
4. Hudson. T., Hartmann., Dale E. Kester. (2001) Plant Propagation, Principles and Practices. 6th Edn. Prentice Hall. India.
5. John J. (2012) Elements of Agribased Microenterprises, Bulbul Scientific Publishers, Kottayam.
6. Kalian Kumar De. (1996) Plant Tissue Culture. New Central Book Agency (P) Ltd.
7. Kaul, T.N. Biology and Conservation of Mushroom (2002) Oxford and IBH Publishing Co.
8. Kunte, Kawthalkar and Yawalker.(1997) Principles of Horticulture and Fruit Growing. Agri –Horticulture Co.
9. Neshamani, S. (2003) Pazhangal, Pazhavibhavangal (Malayalam). Kerala Bhasha Institute.
10. Pandey, R.K and S.K. Ghosh. (1996) A Hand Book on Mushroom Cultivation. Emkey Publications.

No	Sessions	Topic	Method	Remarks
CELL BIOLOGY				
1	2	Organic manures and fertilizers.	Assignment	
2.	2	Composition of fertilizers – NPK content of various fertilizers	Assignment	
3	2	Common organic manures – bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost.	Presentation/Chalk and Board	
4	2	Preparation of compost –aerobic and anaerobic- advantages of both	Presentation/Chalk and Board	
5	2	Vermicompost – preparation, vermiwash	Presentation/Chalk and Board	
6	2	Biofertilizers – definition, types – Trichoderma, Rhizobium, PGPR	Assignment	
7	2	Biopesticides – Tobacco and Neem decoction.	Presentation/Chalk and Board	
8	2	Biological control. Sustainable agriculture	Presentation/Chalk and Board	
9	2	Soil components. Preparation of potting mixture. Common Garden tools and implements. Methods of plant propagation – by seeds – advantages and disadvantages. Vegetative propagation – advantages and disadvantages. Natural methods of vegetative propagation.	Presentation/Chalk and Board	
10	2	Artificial methods – cutting, grafting, budding and layering. Use of growth regulators for rooting. Micropropagation by tissue culture. Gardening – Types of garden – ornamental, indoor garden, kitchen garden, vegetable garden for marketing.	Presentation/Chalk and Board	
11	2	Rockery and artificial ponds. Ornamental garden designing – garden components – flower beds, borders, hedges, edges, drives and paths, garden adornments. Lawn - preparation by seeds, by transplanting seedling and by turfing.	Presentation/Chalk and Board	
12	2	Bonsai preparation. Pruning of plants. Types of Nurseries – Management aspects and Maintenance. Irrigation Methods: surface, drip and mist chamber.	Presentation/Chalk and Board	
13	2	Plant growth structures – advantages of green house, polyshed, fernery and orchidarium. Packaging of fruits, vegetables, nursery products and flowers.	Presentation/Chalk and Board	
14	2	Prospects and problems of floriculture in Kerala, Scope of floriculture, especially anthurium, orchids and jasmine in Kerala	Presentation/Chalk and Board	

15	3	Common cut flowers- Rose, Gerbera, Gladiolus, Aster, Chrysanthemum, Carnation, Anthurium, Liliun	Presentation/Chalk and Board	
16	3	Orchids; Common leaves in flower arrangement – Cyprus, Podocarpus, Asparagus, palms, cycads, ferns	Presentation/Chalk and Board	
17	3	Flower arrangement types – western, eastern (Japanese), modern, wases, flower holders, floral foam, dry flower arrangement	Presentation/Chalk and Board	
18	3	Significance of Mushrooms, General outline of life cycle. Types of mushrooms - button mushroom, oyster mushroom and milky mushroom, poisonous mushroom	Assignment	
19	3	Methods of identification. Spawn – isolation and preparation. Cultivation of oyster and milky mushrooms – using paddy straw and saw dust by polybag.	Presentation/Chalk and Board	
20	3	Farm design and control of pests and diseases. Value added products from mushroom – pickles, candies, dried mushrooms		
21	3	Protoplasm- basic structure and function of plant cell concept of totipotency- differentiation and dedifferentiation.	Presentation/Chalk and Board	
22	3	Infra structure of a tissue culture laboratory. Solid and liquid media- composition and preparation.	Presentation/Chalk and Board	
23	3	Sterilization- dry, wet and filter sterilization.	Chalk and Board	
24	3	Explant- inoculation and incubation techniques. Callus induction- organogenesis and embryogenesis	Presentation/Chalk and Board	
25	3	Transplanting, hardening, package and transportation of tissue cultured plantlets.	Assignment	
26	3	Funding Agencies and self employment schemes	Presentation/Chalk and Board	
27	3	Procedure to get financial support, special scheme for women empowerment	Presentation/Chalk and Board	
28	3	<ol style="list-style-type: none"> 1. Prepare a chart showing the NPK composition of minimum 6 manures and fertilizers. 2. Identification and familiarization of the following organic manures- cow dung (Dry), Coconut cake, Vermicompost, neem cake, Organic mixture, Bone meal. 3. Preparation of potting mixture. 4. Make a Vermicompost pit /pot in the campus/ house of the student. 5. Familiarization of common garden tools and implements. 6. Estimation of germination percentage of seeds 	Laboratory/Demonstration	

		7. Demonstrate the effect of a rooting hormone on stem cutting.		
29	3	8. Demonstration of T budding, epicotyle grafting and air layering on live plants 9. Familiarization of garden components from photographs 10. Familiarization of different mushrooms and preparation of a polybag of Pleurotus using straw/sawdust 11. Visit to a well established tissue culture lab, nursery and mushroom cultivation unit. 12. Familiarization of common cut flowers in Kerala 13. Fresh cut flower arrangement 14. Preparation and arrangement of dry flowers 15. Interaction with funding agencies	Laboratory/Demonstration	