SACRED HEART COLLEGE (AUTONOMOUS)

Department of Botany

BACHELOR OF SCIENCE IN Botany

Course plan

Academic Year 2018-19

Semester 5

COURSE PLAN:

PROGRAMME	BACHELOR IN BOTANY	SEMESTER	5
COURSE CODE AND TITLE	15U5CRBOT05: ANGIOSPERM SYSTEMATICS, FLORAL MORPHOLOGY AND ECONOMIC BOTANY	CREDIT	Theory -3 Practical -1
HOURS/WEEK	5.5	HOURS/SEM	Theory - 54 Practical - 45
FACULTY NAME	EBIN PJ		

COURSE OBJECTIVES
Define the different systems of angiosperm classification and understand the merits and demerits of the classification systems
Explain the floral morphology of angiosperms
Apply the interdisciplinary knowledge in solving taxonomic problems
Analyze the floral characters and classify the angiosperms into different families
Explain the economically and ethnobotanically important plants.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module 1 Flower as modified shoot (4 hours)				
Session 1	Types of flower – Hypogyny, Perigyny and Epigyny, Symmetry of flowers.	PPT/Lecture	Seminar	
Session 2	Aestivation types	PPT/Lecture		
Session 3	Placentation types	PPT/Lecture		
Session 4	Floral Diagram and Floral Formula with examples for actinomorphic, zygomorphic, Monochlamydeae and Monocot flowers	PPT/Lecture		
Module 2 Systematic Botany (41 hours)				
Session 5	Aim, Scope and Significance, identification, field inventory, Monographs	PPT/Lecture		
Session 6	Types of Classification- Artificial, Natural and Phylogenetic	PPT/Lecture		
Session 7	Bentham and Hookers system	PPT/Lecture	Video	
Session 8	Bentham and Hookers merits and demerits	PPT/Lecture		
Session 9	Binomial Nomenclature, ICBN- Brief account	PPT/Lecture		

Session 10	Cytotaxonomy	PPT/Lecture		
Session 11	Chemotaxonomy	PPT/Lecture		
Session 12	Palynology, Phylogeny and Molecular Systematic	PPT/Lecture		
Session 13	Herbarium technique- Preparation of herbarium, their preservation, Important herbaria	PPT/Lecture	Seminar	
Session 14	Botanical Gardens and BSI	PPT/Lecture	Video	
Session 15	Concept of eflora and other online groups that enumerate plant diversity	PPT/Lecture		
Session 16	Important flora works of India (Flora of British India and Flora of Presidency of Madras)	PPT/Lecture		
Session 17	Annonaceae	PPT/Lecture		
Session 18	Nymphaeaceae	PPT/Lecture		
Session 19	Malvaceae	PPT/Lecture		
Session 20	Sterculiaceae	PPT/Lecture		
Session 21	Rutaceae	PPT/Lecture		
Session 22	Meliaceae	PPT/Lecture		
Session 23	Anacardiaceae	PPT/Lecture		
Session 24	Fabaceae	PPT/Lecture		
Session 25	Caresalpiniaceae	PPT/Lecture		
Session 26	Mimosaceae	PPT/Lecture		
Session 27	Combretaceae	PPT/Lecture		
Session 28	Myrtaceae	PPT/Lecture		
Session 29	Cucurbitaceae	PPT/Lecture		
Session 30	Apiaceae	PPT/Lecture		
Session 31	Rubiaceae	PPT/Lecture		
Session 32	Compositae	PPT/Lecture		
Session 33	Sapotaceae	PPT/Lecture		
Session 34	Apocynaceae	PPT/Lecture		

Session 35	Asclepiadaceae	PPT/Lecture		
Session 36	Solanaceae	PPT/Lecture		
Session 37	Convolvulaceae	PPT/Lecture		
Session 38	Scrophulariaceae	PPT/Lecture		
Session 39	Acanthaceae	PPT/Lecture		
Session 40	Verbenaceae	PPT/Lecture		
Session 41	Lamiaceae	PPT/Lecture		
Session 42	Amaranthaceae	PPT/Lecture		
Session 43	Euphorbiaceae	PPT/Lecture		
Session 44	Orchidaceae	PPT/Lecture		
Session 45	Liliaceae	PPT/Lecture		
Session 46	Arecaceae	PPT/Lecture		
Session 47	Graminae	PPT/Lecture		
Module – 3 Economic Botany (7 hours)				
Session 48	Cereals- Rice, Wheat Millets- Ragi; Pulses- Green gram, Bengal gram, Black gram; Sugar yielding plants – Sugarcane Fruits:- Apple, Pineapple, Orange, Mango and Banana	PPT/Lecture	Seminar	
Session 49	Vegetables:- Bittergourd, Ladies finger, Carrot and Cabbage; Timber yielding plants:- Teak wood and Jack wood;	PPT/Lecture		
Session 50	Beverages- Tea, Coffee Fibre yielding plants- Coir, Jute, Cotton	PPT/Lecture		
Session 51	Oil yielding plants- Ground nut, Gingelly; Rubber yielding plants- Para rubber; Gums and Resins- White damer, Gum Arabic, Asafoetida	PPT/Lecture		
Session 52	Spices – Cardamom, Pepper, Cloves , Ginger; Insecticide yielding Plants- Tobacco and Neem	PPT/Lecture		
Session 53	Food :- Artocarpus, Corypha, Phoenix; Shelter - Bambusa, Ochlandra and Calamus	PPT/Lecture		
Session 54	Medicine - Curcuma, Trichopus zeylanicus and Alpinia galanga	PPT/Lecture		
Practical 45 hours				
Session 55	Floral Morphology	Hands-on		

Session 56		Hands-on		
Session 57		Hands-on		
Session 58		Hands-on		
Session 59	Annonaceae	Hands-on		
Session 60	Nymphaeaceae	Hands-on		
Session 61	Malvaceae	Hands-on		
Session 62	Sterculiaceae	Hands-on		
Session 63	Rutaceae	Hands-on		
Session 64	Meliaceae	Hands-on		
Session 65	Anacardiaceae	Hands-on		
Session 66	Fabaceae	Hands-on		
Session 67	Caresalpiniaceae	Hands-on		
Session 68	Mimosaceae	Hands-on		
Session 69	Combretaceae	Hands-on		
Session 70	Myrtaceae	Hands-on		
Session 71	Cucurbitaceae	Hands-on		
Session 72	Apiaceae	Hands-on		
Session 73	Rubiaceae	Hands-on		
Session 74	Compositae	Hands-on		
Session 75	Sapotaceae	Hands-on		
Session 76	Apocynaceae	Hands-on		
Session 77	Asclepiadaceae	Hands-on		
Session 78	Solanaceae	Hands-on		
Session 79	Convolvulaceae	Hands-on		
Session 80	Scrophulariaceae	Hands-on		
Session 81	Acanthaceae	Hands-on		

Session 82	Verbenaceae	Hands-on		
Session 83	Lamiaceae	Hands-on		
Session 84	Amaranthaceae	Hands-on		
Session 85	Euphorbiaceae	Hands-on		
Session 86	Orchidaceae	Hands-on		
Session 87	Liliaceae	Hands-on		
Session 88	Arecaceae	Hands-on		
Session 89	Graminae	Hands-on		
Session 90	Economic Botany	Hands-on		
Session 91		Hands-on		
Session 92		Hands-on		
Session 93		Hands-on		
Session 94		Hands-on		
Session 95		Hands-on		
Session 96		Hands-on		
Session 97		Hands-on		
Session 98		Hands-on		
Session 99		Hands-on		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	8/6/2018	Bentham and Hookers System
2	13/7/2018	Economic botany – specimen collection

References

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.

11. Jain S.K. and Rao R.R. 1976. A hand book of field and herbarium technique. Today and Tomorrow's Publishers, New Delhi.

12. Jeffery C. (1968) *An Introduction to Plant Taxonomy*, J and A Churchill. London.

13. Maheshwari P. and Umaro Singh. (1965) *Dictionary of Economic Plants in India*, ICAR. New Delhi.

14. Naik V.N. (1984) *Taxonomy of angiosperms*. Tata Mc Graw- Hill Publishing Company, New Delhi.

15. Rendle A.B. (1979) *Classification of flowering plants*. Vikas Publishing House, U.P. Vols. I & II.

16. Sreemali J.L. (1979) *Economic Botany*. Allahabad : Kitab MAhal.

17. Singh V. and Jain D. K. (1989)*Taxonomy of Angiosperms*. Meerut : Rastogi Publication.

18. Sivarajan V.V. (1982) *Introduction to Principles of Taxonomy*, Oxford and IBH Publication. New Delhi

19. Swain T. (1963) *Chemical Plant Taxonomy*. New York: Academic Press.

20. . S.P. Misra S.N. Pandey *Taxonomy of Angiosperms* by

21. Sivarajan V.V. 1991, *Introduction to the Principles of Plant taxonomy*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.

22. Jain S K. 2004, *A Manual Of Ethnobotany*, Scientific Publishers, India

23. Verma V. *Text book of Economic Botany*, Ane Book Pvt. Ltd.

24. Pandey & Misra 2008 *Taxonomy of Angiosperms*. Ane Book Pvt. Ltd.

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE BOTANY	SEMESTER	5
COURSE CODE AND TITLE	15U5CRBOT06 ENVIRONMENTAL SCIENCE AND ECOTOURISM	CREDIT	4
HOURS/WEEK	6.5	HOURS/SEM	99
FACULTY NAME	PRINCYMOL A P, ANTO JOSEPH		

COURSE OBJECTIVES
Understand the significance of environmental science
Create responsible citizens on conservation of nature and natural resources
Design novel mechanism for the sustainable utilization of natural resources
Understand the ecological interactions in various ecosystems
Understand various environmental laws in India
Understand the current environmental issues and its global impacts
Analyze various ecosystems for its impact in human life

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module 1 Environmental science and its multidisciplinary nature				
1	Introduction, relevance and scope, public awareness	PPT	video	
Module 2 Natural Resources				
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.	PPT/Lecture		
3	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	PPT/Lecture		
4	Food resources: major food crops in India. Causes of food shortage. Food security, world food problems.	PPT/Lecture		
5	Energy resources: Energy plantation, - *Jatropha, Wind energy and Solar energy*	PPT/Lecture		
6	Land resources: Land use, land degradation, desertification, EFL(Ecologically Fragile Land), Ecological sensitive area	PPT/Lecture		
7	Conservation of Biodiversity, ecological footprints, umbrella species and keystone species conservation.	Lecture		

Module 3 Ecosystems				
8	Structure and function of ecosystem: Ecosystem components- abiotic and biotic	PPT/Lecture	Discussion	
9	Productivity – primary and secondary-gross and net productivity.	PPT/Lecture		
10	Decomposition in nature, homeostasis in ecosystem	Lecture		
11	Ecological energetics: energy flow, trophic levels	PPT/Lecture		
12	food chain and food web	PPT/Lecture		
13	ecological pyramids	PPT/Lecture		
14	Nutrient cycles: Biogeochemical cycles	PPT/Lecture	Video	
15	Carbon cycle	PPT/Lecture	Video	
16	Nitrogen cycle	Lecture	Video	
17	Sulphur cycle	Lecture	Video	
Module 4 Community ecology				
18	Population: size, density, natality, mortality.	Lecture		
19	Community characteristics: Species diversity and species richness, dominance, growth forms and structure, trophic structure.	Lecture		
20	Association of communities: plant association, ecotypes, ecotone, edge effect, ecological indicators.	PPT/Lecture		
21	Ecological succession: types of succession, process – migration, ecesis, colonization, stabilization and climax community; hydrosere, xerosere, lithosere.	PPT/Lecture		
Module 5 Plants and environment				
22	Ecological complexes and factors affecting plants growth and response: Climatic factors: temperature and pressure; water - precipitation, humidity, soil water holding capacity; light - global radiation.	PPT/Lecture		
23	Topographic factors: altitude and aspects Edaphic factors - profile and physical and chemical properties of soil Biotic factors: interactions – positive and negative.	PPT/Lecture		
24	Species – ecosystem interaction: Habitat, ecological niche, microclimate	Lecture		
25	Adaptation of plants to environment: To Water- Xerophytes, Hydrophytes; Temperature – thermo periodicity, vernalization; light – photoperiodism, heliophytes, sciophytes; salinity – halophytes, mangroves.	Lecture	Video	
	CIA-1			
Module 6 Environmental pollution and Management				
26	Definition and general introduction	PPT/Lecture	Group discussion	
27	Air pollution: Causes and sources, types of pollutants- particulates-aerosol, mist, dust, smoke, fume, plume, fog, smog.	PPT/Lecture		
28	Effect of air pollution on plants and animals, Bhopal Gas Tragedy.	PPT/Lecture		
29	Water pollution: Sources and types of pollutants.	PPT/Lecture		
30	Water quality standards, water quality assessment.	PPT/Lecture		

	Ground water pollution-blue baby syndrome.			
31	Cycling of heavy metals, hydrocarbons. Eutrophication, BOD, Minamata disease.	PPT/Lecture		
32	Soil pollution: Causes and sources-waste dumps, municipal wastes, agrochemicals, mining,	PPT/Lecture		
33	solid waste management-vermi composting.	PPT/Lecture		
34	Noise pollution: Sources, standards and measurements, effect on health, control techniques.	PPT/Lecture		
35	Thermal pollution: Sources and effects, management	PPT/Lecture		
36	Nuclear hazards: Sources and impacts, management, Chernobyl incident	PPT/Lecture		
37	EIA: Environmental Impact Assessment in polluted areas	PPT/Lecture		
Module 7 Social issues and the environment				
38	Climate change, global warming and green house gases, IPCC	PPT/Lecture		
39	Acid rain, Ozone layer depletion, nuclear accidents and nuclear holocaust.	PPT/Lecture		
Module 8 Environmental legislation and law				
40	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)**.**	PPT/Lecture		
Module 9 Biodiversity and Conservation biology				
41	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.	PPT/Lecture		
42	Biodiversity loss: Causes and rate of biodiversity loss, extinction-causes. Alien species, negative and positive impacts	PPT/Lecture		
43	Conservation efforts: Rio Earth Summit, Agenda 21, Kyoto protocol, COP 15(15_{th} Conference of the Parties under the U N Framework Convention on Climate Change)	PPT/Lecture		
44	IPCC (Inter Governmental Panel for Climate Change) and its contribution.	PPT/Lecture		
45	Conservation strategies and efforts in India and Kerala	PPT/Lecture		
46	In situ and ex situ conservation methods. Role of NGOs in biological conservation	PPT/Lecture		
Module 10 Organizations, movements and contributors of Ecological studies				
47	*Organizations*: BNHS, WWF, CSE, NEERI, , MoEF, Green Peace, Chipko	PPT/Lecture		
48	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	PPT/Lecture		
ECOTOURISM:				

49	Definition, concept, introduction, history, relevance and scope.	PPT/Lecture		
50	Components of ecotourism: Forms and types of ecotourism in India and Kerala	PPT/Lecture		
51	Components of ecotourism: Forms and types of ecotourism in India and Kerala	PPT/Lecture		
52	ecotourism resources- biological, historical, cultural, and geographical	PPT/Lecture		
53	Ecotourism centers in Kerala	PPT/Lecture		
54	Positive and negative impacts of ecotourism.	PPT/Lecture		
CIA – II				
Practical				
55	1. Estimation of CO_2, Cl, and salinity of water samples (Titremetry) 2. Determination of pH of soil and water 3. Assessment of diversity, abundance, and frequency of plant species by quadrate method (Grasslands, forests) 4. Study of the most probable number (MPN) of coliform bacteria in water samples 5. EIA studies in degraded areas (Sampling – line transect, Quadrate) 6. Visit to any forests types including grasslands and preparation of the list of Rare and threatened (R&T) plants (no collection of specimens) 7. Collection, identification and preparation of the list of exotic species in the locality. 8. Identification of pollutant to respective pollution types. 9. Study of anatomical, morphological, physiological adaptation of plants to the environment (Xerophytic, Hydrophytic, Epiphytic, Halophytic). 10. Collection and recording of rain data by using simple rain gauge.	Hands on session		
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				

86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	23/08/2018	Submit a detailed report on major environmental problems in your area
2	30/08/2018	Ecosystem interactions

References

1. Ahmedullah, M. &. Nayar, M.P 1987. Endemic Plants of the Indian Region. Botanical Survey of India, Calcutta.
2. AK Bhatacharya, 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, Cambrige UK.
8. Champion, H. G. 1936. A Preliminary Survey of Forests of India and Burma. Ind. For. Rec. (n.s.) 1: 1-236.
9. Champion, H.G. &. Seth, S.K 1968. A Revised Survey of the Forest Types of India. Govt. of India Press, Delhi.
10. Chandrasekharan, C. 1962a. A General note on the Vegetation of Kerala State; Ind. For.88: 440-441.
11. Chandrasekharan, C. 1962b. Ecological Study of the Forests of Kerala State; Ind. For.88: 473-480.
12. Chandrasekharan, C. 1962c. Forest Types of Kerala State. Ind. For. 88: 660-847.
13. Garg M.R. Bansal V.K. Tiwana N.S. 2007. Environmental Pollution and Protection. Deep and Deep Publishers, New Delhi.
14. H.D Kumar 2000, Modern Concepts of Ecology Vikas Publishing House, New Delhi
15. H.Kaur Environmental studies. Pragathi Prakashan Meerut.

16. IUCN, 2000. The IUCN Red list categorie. IUCN. Gland
17. IUCN, 2007. The 2000 IUCN Red list of Threatened Species. IUCN. Gland
18. Jain, S.K. &. Sastry, A.R.K 1984. The Indian Plant Red Data Book. Botanical Survey of India, Calcutta.
19. Khopkar S.M,1995, Environmental Pollution Analysis New Age International (P) Ltd.
20. Kreg Lindberg and Deonal E. Hawkins, 1999. Ecotourism: A guide for planners and managers. Natraj Publishers, Dehradun.
21. Kumar D . 2006,Ecology for Humanity Eco Tourism. Intellectual Book Bureau, Bhopal
22. Kumar, U. and M. Asija 2006. Biodiversity: Principles and conservation. Agrobios India
23. Kurian Joseph & Raghavan, R. 2004. Essentials of environmental studies. Pearson Education Pvt. Ltd. New delhi
24. Mani, M. S. 1974. Ecology and Biogeography in India. W. Junk B.V. Publishers, Netherlands.
25. Misra, D.D. 2008. Fundamental concepts in Environmental Studies. S. Chand & Co. Ltd. New Delhi
26. Myers, N. 1988. The Environmentalist 8: 187-208.
27. Nayar, M.P. & Giri. G. S. 1988. Keywords to the Floristics of India. Vol. 1. Botanic Survey of India. Calcutta.
28. Nayar, M.P. &. Sastry. A.R.K 1987, 1988, 1990. Red Data Book of Indian Plants, Vols. I-III. Botanical Survey of India, Calcutta.
29. Nayar, M.P. 1996. Hot Spots of Endemic Plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Trivandrum.
30. Nayar, M.P. 1997. Biodiversity challenges in Kerala and Science of conservation Biology. In : P. Pushpangadan & K. S. S. Nair (Eds.), Biodiversity of Tropical Forests the Kerala Scenario. STEC, Kerala, Trivandrum.
31. Odum, E.P. 1971. Fundamentals of Ecology WB Sunders.
32. Oza, G. M. 1992. The Earth Summit. Ind. For. 5: 338.
33. Ravindranath NH & Sudha P. 2004. Joint Forest Management: Spread performance and Impact. Universities Press.
34. Richard Wright. 2009. Environmental Science Towards a Sustainable Future Pearson Education.
35. Santhra S.C 2004, Environmental Science New Central Book Agency.
36. Sulekha and Chendel. Plant Ecology and Soil. S. Chand & Co. Ltd. New Delhi
37. Waxena H.M. 2006. Environmental Studies ,Rawat Publications, New Delhi.
38. Wood, Ronald. 1974. The Geography of the Flowering Plants. Longman Group Ltd., London.

COURSE PLAN

PROGRAMME	BACHELOR OF BOTANY	SEMESTER	5
COURSE CODE AND TITLE	**15U5CRBOT7 GENETICS AND PLANT BREEDING**	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Fr.Jose John, Mrs. I'ma Neerackal		

COURSE OBJECTIVES
Understand the science of inheritance and variation of genetic characters
Compare various intra allelic and inter allelic interactions in plants
Assess various techniques for the production of new superior crop varieties
Appreciate the modern strategies applied in genetics and plant breeding for human welfare
Identify various human genetic disorders and predict occurrence of such traits in future generations

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
1	Origin of a new branch of Biology- Genetics- A short life sketch of Gregor Mendel	PPT	video	
2	Basic laws governing genetics, Mendelian ratios	Assignment		
3	Growth of Genetics- post Mendelian period- modified Mendelian ratios	Presentation/Chalk and Board		
4	Incomplete dominance-flower color in *Mirabilis*: Interaction of genes- comb pattern in poultry (9:3:3:1)	Assignment		
5	Epistasis- recessive- coat color in mice (9:3:4)	Presentation/Chalk and Board		
6	Dominant epistasis- fruit color in summer squash (12:3:1)	Assignment		
7	Complementary genes- flower color in *Lathyrus* (9:7)	Presentation/Chalk and Board		
8	Multiple alleles- general account: ABO blood groups in man	Presentation/Chalk and Board		
9	Co dominance; self sterility in *Nicotiana*	Presentation/Chalk and Board		
10	Quantitative characters- polygenic inheritance	Presentation/Chalk and Board		
11	Continuous variation- skin colour inheritance in man; ear size in maize	Presentation/Chalk and Board		
12	Linkage and crossing over- importance of linkage,	Presentation/Chalk		

	linkage and independent assortment.	and Board		
13	Complete and incomplete linkage	Presentation/Chalk and Board		
14	Crossing over- general account, cytological basis of crossing over- two point test cross; determination of gene sequences	Presentation/Chalk and Board		
15	Interference and coincidence; mapping of chromosomes.	Presentation/Chalk and Board		
16-22	Sex determination- sex chromosomes and autosomes- chromosomal basis of sex determination; XX-XY, XX-XO mechanism; genic balance theory of sex determination in Drosophila; hormonal theory of sex determination; sex chromosomal abnormalities in man- Down's syndrome, Klinefelter's syndrome, Turner's syndrome	Presentation/Chalk and Board		
23-30	Sex linked inheritance- eye color in Drosophila Haemophilia in man; Y-linked inheritance Extra nuclear inheritance- general account- maternal influence Plastid inheritance in Mirabilis, kappa particle in Paramecium Population genetics-Hardy Weinberg law	Presentation/Chalk and Board		
PRACTICAL				
31-45	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/ Lab		
PLANT BREEDING				
46	An Introduction to and objectives of plant breeding	PPT/Lecture		
47	Plant introduction- procedure of plant introduction, quarantine regulations, acclimatization- agencies of plant introduction in India, major achievements.	PPT/Lecture		
48	Selection- mass, pureline, clonal- genetic basis of selection- some achievements - Semi dwarf wheat and Rice	PPT/Lecture		
49	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	PPT/Lecture		
50		PPT/Lecture		
51	Intergeneric, interspecific and intervarietal hybridization with examples- composite and synthetic varieties- heterosis in plant breeding	Lecture		
52	Inbreeding depression; genetics of heterosis and	Lecture		

53	inbreeding depression; Single cross, pedigree method, bulk population method, multiple cross, back cross, polyploidy breeding, male sterility in plant breeding	PPT/Lecture		
54	Use of apomixis in plant breeding	PPT/Lecture		
55-60	Mutation breeding- methods- achievements in India: Breeding for pest, disease and stress resistance Modern tools for plant breeding Genetic Engineering and products of genetically modified crops.	PPT/Lecture		
PRACTICAL				
61-65	Emasculation and bagging 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		

References

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. *Genetic*s 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
8. Swanson C.P. 1957. *Cytology and Genetics. Englewood cliffs*, New York.
9. Peter Sunstard & Michael. J. Simmons 2003, *Principles of Genetics.* John Wiley & Sonc., Inc.
10. Singh B.D., 1983, *Plant breeding*. Kalyani Publishers, Ludhiana.

COURSE PLAN

PROGRAMME	BACHELOR OF BOTANY	SEMESTER	5
COURSE CODE AND TITLE	15U5CRBOT8: CELL AND MOLECULAR BIOLOGY AND EVOLUTION	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	90
FACULTY NAME	KIRAN GEORGE KOSHY		

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 as the basis of heredity and variation.
Students will be able develop their understanding around the concept of evolution as the basis of biodiversity.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I				
1	Historical account of cell Biology, Cell theory, Protoplasm theory	PPT		
2	The physio-chemical nature of plasma membrane and cytoplasm Eukaryotic, Prokaryotic cell. The ultra-structure of plant cell with brief description and function of the following organelles- Endoplasmic reticulum, Plastids, Mitochondria, Ribosomes, Dictyosome, Microbodies, lysosomes. Vacuole and cell sap, Nucleus - ultra structure, nucleolus structure and function.	PPT/Lecture		
3		PPT/Lecture		
4		PPT/Lecture		
5		PPT/Lecture		
6		PPT/Lecture		
7		PPT/Lecture		
8		PPT/Lecture		
9		PPT/Lecture		
10	Morphology - fine structure Dupraw model - Nucleosome model – chemical organization of nucleosome – nucleoproteins, karyotype and idiogram; Special type of chromosomes - salivary gland, Lampbrush and B chromosome. Cell cycle, mitosis, meiosis: significance of mitosis and meiosis. Change in number of chromosomes -Aneuploidy and Euploidy Change in the structure of chromosomes - Chromosomal aberrations deletion, duplication,	PPT/Lecture		
11		PPT/Lecture		
12		PPT/Lecture		
13		PPT/Lecture		
14				
15		PPT/Lecture		
16		PPT/Lecture		
17		PPT/Lecture		
18		PPT/Lecture		

19	inversions and translocations. Meiotic behaviour of chromosomes. Lagging of chromosomes and Chromosome Bridge	PPT/Lecture		
20		PPT/Lecture		
21		PPT/Lecture		
22		PPT/Lecture		
23		PPT/Lecture		
24		PPT/Lecture		
25		PPT/Lecture		
	CIA-1			
26	Spontaneous and induced. Mutagens- Physical and Chemical mutagens. Chromosomal and point mutations. Molecular mechanism of mutation - Transition, Transversion and Substitution.	PPT/Lecture		
27		PPT/Lecture		
28	Stem cells; definition, sources and applications	PPT/Lecture	Quiz	
29		PPT/Lecture		
MODULE II				
30	Nucleic acids - structure of DNA and RNA - basic features, alternate forms of DNA - types and structure of RNA	PPT/Lecture		
31		PPT/Lecture		
32		PPT/Lecture		
33	Replication of DNA - Meselson-Stahl experiment - details of semiconservative replication of DNA	PPT/Lecture		
34		PPT/Lecture		
35		PPT/Lecture		
36	Gene expression - concept of gene, definitions - the central dogma - details of transcription in procaryotes and eucaryotes -	Lecture		
37		Lecture	Q & Ans Session	
38		PPT/Lecture		
39	RNA processing. details of translation - genetic cod features	PPT/Lecture		
40		PPT/Lecture		
41		PPT/Lecture		
42	Control of gene expression - positive and negative control - operon model - lac operon, trp operon - attenuation	Lecture		
43		PPT/Lecture		
44		PPT/Lecture		
45	Genetic basis of cancer - oncogenes - tumor suppressor genes - metastasis	PPT/Lecture	Group Discussion	
46		PPT/Lecture		
MODULE III				
47	Introduction, Origin of life – biochemical origin of life, Progressive, Retrogressive, Parallel and Convergent evolution. Theories of evolution - Lamark's, Darwin's, Weisman's and De Vries.	PPT/Lecture	Video	
48		PPT/Lecture		
49		PPT/Lecture		
50		PPT/Lecture		
51		PPT/Lecture		
52		PPT/Lecture		
53	Reproductive isolation, Mutation, Genetic drift, Speciation. Variation and evolution, hybridization and evolution, Polyploidy and evolution. Mutation and evolution	PPT/Lecture		
54		PPT/Lecture		
55				
56		Lecture		
57		PPT/Lecture		

58	Revision			
59				
60				
PRACTICALS				
61	Problems based on DNA, RNA and Proteins 9	Chalk and Board		
62		Chalk and Board		
CIA - II				
63	Make acetocarmine squash preparation of onion root tip to identify mitotic stages. Study the Mitotic Index of onion root tip cells	Demonstration		
64		Demonstration		
65		Demonstration		
66		Demonstration		
67	Study of meioses in any flower bud by smear preparation of PMC's Identification of Barr body Identification of salivary gland chromosome.	Demonstration		
68		Demonstration		
69		Demonstration		
70		Demonstration		
71		Demonstration		
72		Demonstration		
73		Demonstration		
74		Demonstration		
75		Demonstration		
76	Identify and study photographs and diagrams of cell division anomalies like lagging chromosomes, chromosome bridge, aneuploidy, polyploidy. Study the chromosomal patterns/ Karyotype in auto-, allo-, and aneuploids	Demonstration		
77		Demonstration		
78		Demonstration		
79		Demonstration		
80		Demonstration		
81		Demonstration		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	12/7/2018	Ultra-Structure of cell
2	12/8/2018	Process of Gene expression

References

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

15. Peter Volpe E,1989 Understanding of Evolution, Universal Book Stall NewDelhi

16. Roy S.C. and Kalayan Kumar De, 1997. Cell bilogy. New central Boos Calcutta

17. Sandhya Mitra, 1998 Elements of Molecular biology. Macmillan, India Ltd.

18. Sharma, A.K. and Sharma a 1980 Chromosome technique Theory and practice, Aditya Books, New York.

19. Stebbins G.L 1965. Variations and Evolution in Plants Oxford Book Co. New Delhi

20. Swanson, C.P. 1957 Cytology and Genetics, Englewood cliffs, New York.

21. Twymann, R.M. 1998 Advanced molecular biology Viva books New Delhi.

22. Veer Bala Rastogi, 2008. Fundamentals of Molecular Biology Ane Books Pvt. Ltd.

23. Wayne M. Beecker Lewwis J, Klein smith and Jeffharden 2004 . The World of Cell. Pearson Education.

Websites

http://www.plantphysiol.org/contents-by-date.0.shtml

http://4e.plantphys.net/

http://www.rsc.org/education/teachers/learnnet/cfb/Photosynthesis.htm

http://www.plantstress.com/

http://bioenergy.asu.edu/photosyn/education/learn.html

http://www.biologie.uni-hamburg.de/lehre/bza/eanfang.htm

http://www.ab.ipw.agrl.ethz.ch/~yfracheb/flex.htm

http://www.life.illinois.edu/govindjee/photoweb/subjects.html#ps

http://www.plant-hormones.