

SACRED HEART COLLEGE (AUTONOMOUS)

Department of Botany

BACHELOR OF SCIENCE IN Botany

Course plan

Academic Year 2018-19

Semester 6

COURSE PLAN: 2019-20

PROGRAMME	B.Sc. BOTANY	SEMESTER	6
COURSE CODE AND TITLE	15U6CRBOT09: PLANT PHYSIOLOGY AND BIOCHEMISTRY	CREDIT	Theory 2; Practical 2
HOURS/WEEK	4	HOURS/SEM	Theory: 54 hrs; Practical: 45 hrs
FACULTY NAME	PRINCY MOL A. P.		

COURSE OBJECTIVES
Understand the relationship of plant with its habitat through plant water relations and plant responses to environment.
Understand the mechanism of mineral nutrition, photosynthesis and respiration.
Understand the physiology of growth and development in plants
Understand the transport mechanisms in plants.
Understand the biochemical nature of molecules in plant cell.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Plant Physiology (Theory 36: hours; Practical: 33 hours)				
Module I - Water relations				
1	a) Physical aspects of water absorption – imbibition, diffusion and osmosis.	PPT/ Chalk and Board	e- resource	
2	OP, DPD, TP, WP	PPT/Lecture		
3	Concept of Water potential, matrix potential, pressure potential.	PPT/Lecture		
4	b) Absorption of water-active & passive	PPT/Lecture		
5	Ascent of sap-cohesion adhesion theory	PPT/Lecture		
6	Transpiration-types-mechanism-theories-(starch-sugar, proton-K ⁺ ion exchange) -significance – antitranspirants, Guttation.	PPT/Lecture		
Module II - Mineral Nutrition and mechanism of absorption				
7	Essential and non essential elements -macro& micro- role	PPT/Lecture		
8	Deficiency symptoms.	PPT/Lecture		
9	Absorption of minerals– active & passive-ion exchange, carrier concept.	PPT/Lecture	e-resource	

Module III - Photosynthesis				
10	History - Photosynthetic pigments	PPT/Lecture		
11	Photo excitation- Fluorescence, Phosphorescence	PPT/Lecture		
12	Absorbtion and action spectra	PPT/Lecture	Q & Ans Session	
13	Red drop and Emerson enhancement effect			
14	Concept of photo systems			
15	Cyclic & Non Cyclic photophosphorylation	PPT/Lecture		
16		PPT/Lecture		
17	Carbon assimilation pathways- C3	PPT/Lecture		
18	C4	PPT/Lecture		
19	CAM- Photorespiration –factors affecting photosynthesis.	PPT/Lecture		
Module IV - Translocation of solutes				
20	Pathway-phloem transport-mechanism-pressure flow	PPT/Lecture		
21	Phloem loading and unloading	PPT/Lecture		
CIA-1				
Module V - Respiration				
22	Aerobic and Anaerobic Glycolysis	PPT/Lecture		
23		PPT/Lecture		
24		PPT/Lecture	e resource	
25	Krebs cycle	PPT/Lecture		
26		PPT/Lecture		
27	Electron Transport System & Oxidative phosphorylations	PPT/Lecture	video	
28	ATPases - chemi osmotic hypothesis-RQ – significance	PPT/Lecture	Quiz	
29	Factors affecting respiration.	PPT/Lecture		
Module VI - Plant responses to environment				
30	Allelochemicals- herbivory	PPT/Lecture		
Module VII - Physiology of growth and development				
31	A. Physiological effects and practical application of hormones- Auxins, Giberillins	PPT/Lecture	E- resource	
32	Cytokinins, ABA, ethylene.	PPT/Lecture		
33	B. Physiology of flowering–phytochrome	PPT/Lecture		
34	Photoperiodism-vernalisation	PPT/Lecture		
Module VIII - Stress physiology				
35	Abiotic - concept of plant responses to water	PPT/Lecture		
36	Salt and temperature stresses; Biotic- pathogens	Lecture		
Biochemistry (Theory 18: hours; Practical: 12 hours)				
Module I - Water, Solutions & pH				
37	Physical and chemical properties of water, Acid and bases, pH definition, significance, measurement	Lecture		
38	pH indicators, buffer action, pH and lif	PPT/Lecture		
Module II - Chemistry of biological molecules				
39	Carbohydrates- structure and role of mono-di & poly-saccharides-	PPT/Lecture		

40	Common sugars seen in plants	PPT/Lecture		
41	Proteins-peptide bond-essential and non essential amino acids	PPT/Lecture	video	
42				
43	Primary structure-physiologically important proteins.	PPT/Lecture		
44		PPT/Lecture		
45	Lipids - general features and their roles	PPT/Lecture	Group Discussion	
46	Fatty acid types and structure - fatty acid derivatives	PPT/Lecture		
47		PPT/Lecture	Video	
48	Fats and oils, structure and functions - compound lipids	PPT/Lecture		
CIA II				
PRACTICAL Physiology (33 hours)				
Core Experiments				
49	1. Determination of osmotic pressure of plant cell sap by plasmolytic method.	Lab work		
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54	2. Compare the stomatal indices of hydrophytes, xerophytes and mesophytes.	Lab work		
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58	3. Separation of plant pigments by thin layer chromatography (TLC) and paper chromatography.	Lab work		
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68	4. Measurement of photosynthesis by Willmott's bubbler/ any suitable method.	Lab work		
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72	5. Estimation of plant pigments by colorimeter.	Lab work		
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79	1. Papaya petiole osmoscope. 2. Demonstration of tissue tension. 3. Relation between transpiration and absorption.	Demonstration		
80	4. Necessity of chlorophyll, light and in photosynthesis. 5. Simple respiroscope			
81	6. Respirometer and measurement of R.Q. 7. Fermentation. 8. Measurement of transpiration rate using Ganong's photometer/ Farmer's Potometer.			
PRACTICAL Biochemistry (12 hours)				
82	General test for carbohydrates- Molisch's test, Benedicts's tests, Fehling's test.	Lab work		
83				
84	Colour test for starch – Iodine test.	Lab work		
85				
86	Colour tests for proteins in solution. Biuret test, Million's test, Ninhydrin test.	Lab work		
87				
88	Detect the presence of any three major organic compounds in the given food stuff/material viz. reducing /non-reducing sugar/fat proteins/starch.sucrose.	Lab work		
89				
90	Action of various enzymes in plant tissues: peroxides, dehydrogenase.	Lab work		
91				
92	Estimation of protein using colorimeter.	Lab work		
93				

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details

	Date of completion	Topic of Assignment & Nature of assignment (Individual – Written/Presentation – Graded)
1	12/12/2018	Stages in light reaction
2	12/12/2018	Stages in respiration

References

1. Datta, S.C.1989. *Plant Physiology*, Central Book Depot, Allahabad.
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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 .

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9. Leopald, A.C. and Kriedemann, P.E. *Plant Growth and Development*. Tata McGraw Hill, New Delhi.
10. Malik, P.C. 1980. *Plant Physiology*, Kalyani Publishers, New Delhi.
11. Nelson, D.L. and Cox, M.M. 1993. *Principles of Biochemistry*. MacMillan Worth Publications.
12. Pandey, S. N. and Sinha, B. K. 1986. *Plant Physiology*. Vikas Publishing house Pvt. Ltd.
13. Plummer D.T. 1988. *An Introduction to Practical Biochemistry*, Tata Mc Graw- Hill Publishing Company, New Delhi.
14. Sadasivam.S & Manickam, A. 1996. *Biochemical Methods*. New Age International (P) Ltd. New Delhi.
15. Salisbury, F.B. & Ross, C.W. 1985. *Plant Physiology*, CBS Publishers and Distributers, Delhi. (should be compulsorily introduced to students)
16. Srivastava H.S. 2005. *Plant Physiology*. Rastogi Publications, Meerut.
17. Taiz, L. and Zeiger, E. 2003. *Plant Physiology* (3rd Edition). Panima Publishing Corporation, New Dlehi.

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE BOTANY	SEMESTER	6
COURSE CODE AND TITLE	15U6CRBOT10 Perspectives of Science, Methodology and General Informatics	CREDIT	4
HOURS/WEEK	6	HOURS/SEM	90
FACULTY NAME	Dr. Fr. JOSE JOHN, KIRAN GEORGE KOSHY, ANTO JOSEPH		

COURSE OBJECTIVES
Introduce the perspective of science
Understands the steps in scientific methods
Understand the steps in research in plant science
Understand the uses and applications of general informatics
Understand the basis of computer in education
Understand and perform chromatography and other techniques in botany
Understand the statistical terms and its relevance in plant science

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module 1 Introduction to science and scientific methods				
1	Introduction to science	PPT	video	
2	Steps in scientific methods - observation and thoughts - formulation of a hypothesis	PPT/Lecture		
3	designing of experiments - testing of hypothesis	PPT/Lecture		
4	formulation of theories	PPT/Lecture		
Module 2 Experimentation in science				
5	Selection of a problem - Searching the literature	PPT/Lecture		
6	Selection of variables, study area, and a suitable design - Necessity of units and dimensions - Units of length, volume, area, concentration, temperature, pressure	PPT/Lecture		
7	Setting of hypothesis, Null- hypothesis and alternative hypothesis- Need of control, treatments and replication	Lecture		
8	Analysis, presentation and interpretation of data	PPT/Lecture	Discussion	
9	Testing of hypothesis, need of statistical tools	PPT/Lecture		
10	Examples of great experiments in life sciences - Contributions and the great experiments of Louis Pasteur, and Robert Koch	Lecture		
11	An example of moving from a question to hypothesis	PPT/Lecture		

	and then to an experimental design			
12	Ethics in science	PPT/Lecture		
Methodologies of Plant Science Module 1 Microtechnique				
13	Introduction - Microscopy:- simple, compound, phase contrast, fluorescent, confocal and electron microscopes (working principle and application only)	PPT/Lecture		
14	Microtome:- rotary, sledge, cryotome (application only) - Sectioning:- Hand sections, microtomy	PPT/Lecture	Video	
15	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	PPT/Lecture	Video	
16	Mounting and Mounting Media, Purpose of mounting media , Glycerin, DPX, Canada balsam	Lecture	Video	
17	Use of permanent whole mounts, permanent sections	Lecture	Video	
18	Maceration - Smear and squash preparation	Lecture		
Module 2 Biophysics				
19	Principles and applications of colorimeter, spectrophotometer and centrifuge	Lecture		
20	Beer-Lambert's Law	PPT/Lecture		
21	Separation methods :- chromatography; thin layer, paper, column	PPT/Lecture		
22	electrophoresis; PAGE, Agarose gel electrophoresis	PPT/Lecture		
23	pH:- concept of pH, methods to measure pH ; pH paper and pH meter	PPT/Lecture		
24	Buffers:- definition	Lecture		
25	functions of buffers in biological systems, use of buffers in biological research	Lecture	Video	
26	examples of commonly used buffers	PPT/Lecture	Group discussion	
CIA-1				
Module 3 Biostatistics				
27	Introduction, statistical terms and symbols	PPT/Lecture		
28	Sample:- concept of sample, sampling methods	PPT/Lecture		
29	Collection and representation of data, graphic representation of data(Line graph, bar diagram, Pie diagram & Histogram)	PPT/Lecture		
30	Collection and representation of data, graphic representation of data(Line graph, bar diagram, Pie diagram & Histogram)	PPT/Lecture		
31	Measures of central tendency:- mean, mode, median	PPT/Lecture		
32	Measures of dispersion:- standard deviation, standard	PPT/Lecture		

	error			
33	Distribution patterns:- normal distribution, binomial distribution	PPT/Lecture		
34	t-test :- introduction, uses, procedure - chi-square test:- introduction, uses, procedure	PPT/Lecture		
Module 4 Research Methodology				
35	Need for research - Types of research - Scientific literature, Books, Research Journals, Reputed National and International journals in life sciences, Research paper - INSDOC services	PPT/Lecture		
36	Laboratory Etiquette - Laboratory Hygiene	PPT/Lecture		
General Informatics, Module 1 Overview of the information technology				
37	Features of the modern personal computers and peripherals.	PPT/Lecture		
38	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)	PPT/Lecture		
39	Introduction to the use of information technology in teaching and learning	PPT/Lecture		
Module 2. Use of computers				
40	DOS – The basic concept of operating systems	PPT/Lecture		
41	DOS – The basic concept of operating systems	PPT/Lecture		
42	MS-WINDOWS:- logging to windows, organizing files and folders,	PPT/Lecture		
43	copying, moving, deleting and saving documents, installing software, installing hardware	PPT/Lecture		
44	copying, moving, deleting and saving documents, installing software, installing hardware	PPT/Lecture		
45	editing tools (cut , copy, paste,) formatting tools (font, paragraph)	PPT/Lecture		
46	use of spell check, inserting tables (draw), inserting graphs and pictures	PPT/Lecture		
47	MS-EXCEL:- Creating a worksheet, data entry	PPT/Lecture		
48	sorting (ascending and descending), use of statistical tools in EXCEL (SUM, MEAN, MODE, MEDIAN),	PPT/Lecture		
49	sorting (ascending and descending), use of statistical tools in EXCEL (SUM, MEAN, MODE, MEDIAN),	PPT/Lecture		
50	preparation of graphs (bar diagram, pie chart and line graph)	PPT/Lecture		
51	MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides	PPT/Lecture		
52	MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides	PPT/Lecture		
53	MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides	PPT/Lecture		
54	Use of animation tools	PPT/Lecture		

CIA – II

Practical

55		Hands on session		,2,4,6,7
56	1. Prepare CuSO ₄ . H ₂ O solution of different molarity using a stock solution			
57	2. Determination of the area of different types of leaves using graph paper.			
58				
59				
60	Maceration and identification of tracheary elements			
61				
62	1. Preparation of 0.1M sodium phosphate buffer (pH 6 and 7)			
63	2. Measurement of pH using pH meter			
64	3. Paper chromatography of plant pigments (demonstration)			
65	4. Electrophoresis of nucleic acids (demonstration)			
66	5. Column chromatography of plant pigments (demonstration)			
67	6. Determination of the concentration of a given solution of CuSO ₄ using colorimetry			
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71	1. Collect numerical data and find out the central tendencies and prepare different types of graph mentioned in the syllabus			
72				
73	2. Familiarize with situations requiring t-test, chi-square test			
74				
75				
76	1. Gather information and pictures on a given topic using the internet. Make a list of the sites visited for the purpose			
77				
78	2. Prepare a project report using MS-WORD based on the information and pictures gathered from the internet.			
79				
80	3. Prepare a worksheet using a set of data collected and find out the SUM, MEAN, MEDIAN and MODE using EXCEL			
81				
82	4. Prepare suitable tables/ charts/graphs based on the data using EXCEL 5. Prepare a powerpoint presentation based on the 1 & 2 exercises			
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INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	23/03/2019	Applications of modern personal computers
2	30/02/2019	Preparation of double stained specimens

References

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.
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18. Norman T.J Bailey, 2008. *Statistical Methods in Biology*, Cambridge.
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21. Prasad M.K & Krishna Prasad M,1986. *Outlines of Micro Technique*, Emkay Publishers, New Delhi.
22. Prasad S. 2003. *Elements of Biostatistics*. Rastogi Publications, Meerut.
23. Prithipalsingh, 2007. An Introduction to Biodiversity, Ane Books India
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25. Ray Spangenburg and Diane K Moser, 1999. *The history of science in the eighteenth century*. Universities Press
26. Ray Spangenburg and Diane K Moser, 1999. *The history of science from the ancient Greek to the scientific revolution*. Universities Press.
27. Schrodinger, AH1992. *What is life? The physical aspects of living cell with mind and matter*. University Press Cambridge.

28. Sharma O.P,2002. *Experiments in Techniques Microbiology, Plant Pathology, Ecology and Soil Science, Pollution Biochemistry and Plant Physiology*, Pragati Prakasam ,Merut
29. Sobti RC and Sharm V.L,2008. *Essentials of Modern Biology*. Ane Books Pvt. Ltd.
30. Varantha Pallabhi & Gautham. N, 2005. *Biophysics* Norosa Publishing House New Delhi.

COURSE PLAN

PROGRAMME	BACHELOR OF BOTANY	SEMESTER	6
COURSE CODE AND TITLE	15U6CRBOT11: BIOTECHNOLOGY AND BIOINFORMATICS	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	99
FACULTY NAME	KIRAN GEORGE KOSHY		

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
BIOTECHNOLOGY: MODULE I				
1	1. Introduction: Defenition of biotechnology, land marks, definition of tissue culture.	PPT	video	,
2		PPT/Lecture		,
3	2. Principles of tissue culture: Cellular totipotency, callus induction, organogenesis and somatic embryogenesis	PPT/Lecture		,
4		PPT/Lecture	e-resource	,
5	3. Tissue culture medium: Basic components in tissue culture medium, MS medium, Preparation medium	PPT/Lecture		,
6		PPT/Lecture		,
7	4. Aseptic techniques in tissue culture: sterilization of instruments and glass wares, medium, explants; working principle of laminar air flow and autoclave.	Lecture		,
8		Lecture		,
9		Lecture		,
10	5. Micropropagation: definition, different stages of micropropagation, advantages and disadvantages.	Lecture		,
11		PPT/Lecture		,
12	6. Somaclonal variation: Reasons, advantages and disadvantages, applications	PPT/Lecture		,
13		PPT/Lecture		,
14				,
15	7. Applications of tissue culture: Shoot tip and meristem culture, Synthetic seed production, embryo rescue culture, Protoplast culture, Somatic cell hybridization, in vitro secondary metabolite production, in vitro production of haploids – androgenesis and gynogenesis, triploid plant production, Cryopreservation.	PPT/Lecture		,
16		Lecture		,
17		Lecture		,
18		Lecture		,
19		Lecture		,
20		PPT/Lecture		,
MODULE 2				
21	1. Recombinant DNA Technology	PPT/Lecture		,
22	2. Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids pBR322, bacteriophage based vectors, Ti plasmids. Restriction	PPT/Lecture		,
23		PPT/Lecture		,
24		Lecture		,

25	endonucleases and ligases – Ligation techniques, transformation and selection of transformants – using antibiotic resistances markers, southern blotting; PCR	Lecture		,
26	CIA-1			
27	Different methods of gene transfer – chemically	Lecture		,
28	stimulated DNA uptake by protoplast, transduction, electroporation, microinjection, microprojectiles, Agrobacterium mediated gene transfer gene library, gene banks.	Lecture		,
MODULE 3				
29	1. Important achievements in Biotechnology:	PPT/Lecture	Quiz	,
30	2. Production of human insulin, Bt Brinjal and Bt cotton, Golden rice, Flavr Savr tomato, Shikonin pigments	PPT/Lecture		,
31	3. Current trends in Biotechnology:	PPT/Lecture		,
32	4. Tissue Engineering, Stem cell culture, Nanobiotechnology			,
33	5. Strategic Applications of Biotechnology:	PPT/Lecture		,
34	6. Production of disease/ stress resistant plants, Gene therapy, DNA fingerprinting	PPT/Lecture		,
MODULE 4				
35	Social and ethical issues, biosafety, biowar, patenting	PPT/Lecture		,
36	and IPR issues.	Lecture		,
BIOINFORMATICS: MODULE 1				
37	1. Introduction to Bioinformatics, scope and	Lecture	Q & Ans	,
38	relevance, genome, transcriptome, proteome.	PPT/Lecture	Session	,
39	2. Biological data bases –	PPT/Lecture		,
40	Nucleotide sequence database – EMBL, Gen Bank,	PPT/Lecture		,
41	DDBJ.	PPT/Lecture		,
	Protein sequence database – PDB, SWISS PROT	Lecture		,
42	Organismal database – Saccharomyces genome database Biodiversity database – Species 2000			,
43	3. Information retrieval from Biological database, sequence alignment types and tools: pair wise sequence alignment multiple sequence alignment, use of BLAST, FASTA.	PPT/Lecture		,
MODULE 2				
44	1. Genomics : DNA sequencing Sangers procedure-	PPT/Lecture		,
45	automation of DNA sequencing, genome sequence	PPT/Lecture		,
	assembly, Genome projects – Major findings of the	PPT/Lecture		,
46	following genome projects – Human, Arabidopsis thaliana, Rice, Haemophilus influenza, Application of genome projects			,
47	2. Proteomics : Protein sequencing- Edman	PPT/Lecture		,
48	degradation method, automation of sequencing,	PPT/Lecture		,
49	protein structure prediction and modelling (Brief account only)	PPT/Lecture		,
MODULE 3				
50	A brief account on	PPT/Lecture	Video	,
51	1. Molecular phylogeny and phylogenetic trees.	PPT/Lecture		,

52	2. Molecular visualization – use of Rasmol.	PPT/Lecture		,
53	3. Molecular docking and computer aided drug design.	PPT/Lecture		,
54		PPT/Lecture		,
PRACTICALS				
55	1. Preparation of nutrient medium – Murashige and Skoog medium, sterilization, preparation of explants, inoculation.	LAB WORK		
56		LAB WORK		
57	2. Extraction of DNA from plant tissue.	LAB WORK		
58		LAB WORK		
59	3. Immobilization of whole cells or tissues in sodium alginate.	LAB WORK		
60		LAB WORK		
61	4. Determination of appropriate flower bud containing uninucleate pollen for anther culture using cytological techniques	LAB WORK		
62		LAB WORK		
CIA - II				
63	5. Study of genetic engineering tools and techniques using photographs/diagram (Southern blotting, DNA finger printing, PCR)	LAB WORK		
64		LAB WORK		
65	6. Visit a well-equipped biotechnology lab and submit a report along with the practical record.	LAB WORK		
66		LAB WORK		
67		LAB WORK		
68		LAB WORK		
69	1. Familiarizing with the different data bank mentioned in the syllabus.	LAB WORK		
70		LAB WORK		
71	2. Molecular visualization using Rasmol. 3. Blast search	LAB WORK		
72		LAB WORK		
73		LAB WORK		
74		LAB WORK		
75		LAB WORK		
76		LAB WORK		
77		LAB WORK		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	12/1/2019	Recombinant DNA Technology
2	12/2/2019	Biological Data bases

References

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. Bhojwani and 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.
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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.
13. Rastogi SC, Mendiratta M and Rastogi P. 2004. Bioinformatics: concepts, Skills and Application CBS.

COURSE PLAN

PROGRAMME	BACHELOR OF BOTANY	SEMESTER	6
COURSE CODE AND TITLE	15U6CRBOT12 HORTICULTURE, NURSERY MANAGEMENT, EMBRYOLOGY AND REPRODUCTIVE BIOLOGY	CREDIT	2
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Dr. Ima Neerakkal		

COURSE OBJECTIVES
Understand Horticulture
Understand the importance of horticulture in human welfare.
understand the basics in embryology.
Analyse the development of fruit and seed.
Apply Nursery Management Techniques

1.	SESSION	Topic	LEARNING RESOURCES	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	General account and interdisciplinary relevance of embryology, embryology in relation to taxonomy; experimental embryology.	Presentation/Chalk and Board	
14	Session 14			
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	Presentation/Chalk and	

24	Session 24	and pollination syndromes (with examples for each syndrome) in angiosperms	Board	
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;	Presentation/Chalk and Board	
28	Session 28	Poly-embryony; Development and general structure of fruits (dry and fleshy) and seed		
29	Session 29	Any Indian example from a reputed journal to study the pollination mechanisms and methods (eg. Adathodavasica, Strobilantheskunthianus	Presentation/Chalk and Board/Assignment	
30	Session 30			
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	Presentation/Chalk and Board	
37	Session 37			

		dung, poultry waste, oil cakes, organic mixtures and compost		
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. Organic farming of fruit crops – Packing and Transporting of fruits.	Presentation/Chalk and Board	
42	Session 42			
43	Session 43			
44	Session 44			
45	Session 45	Induction of flowering and weed control. Cultivation of Medicinal and Aromatic plants of common use and great demand. Traditional production techniques and Post-harvest techniques		
46	Session 46			
47	Session 47			
48	Session 48	Problems and prospects of Floriculture in Kerala. Scope of growing Anthurium, Orchids and Jasmine in Kerala. Common cut flowers – Rose, Gerbera, Gladiolus, Aster,		
49	Session 49			
50	Session 50			
51	Session 51			

52	Session 52	Chrysanthemum, Daisys, Carnation, Golden rod, Anthurium, Orchids, Liliium and Limolium. Common leaves used in flower arrangement – Cyprus, Podocarpus, Asparagus, Palms, Cycads, Ferns and Eucalyptus. Floral arrangement: Types - Western, Eastern (Japanese/Ikebana) and Modern. Wases, Flower Holders and Floral Foam. Wase life of flowers and leaves. After care of flower arrangements – Bouquets. Packing and Maintenance of flowers and leaves.		
53	Session 53			
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64	Session 64			
PRACTICALS				
65	Session 65	Tongue grafting, budding ('T' and patch), air layering 2. Identification of different garden tools and their uses 3. List out the garden components in the photograph of the garden given 4. Preparation of potting mixture in the given proportion.	Laboratory/Demonstration	
66	Session 66			
67	Session 67			

68	Session 68	1. Identification of C.S. of anther, embryo sac and embryo.	Laboratory/Demonstration	
69	Session 69			
70	Session 70	2. Identification of various anther types-monothealous, dithealous 3. Identification of placentation types. 4. Observation of pollen and locating pollen pore 5. Pollen germination study		
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)		

Basic Reference

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