

UNIVERSITY OF CALICUT

(Abstract)

Scheme and Syllabus of M.Sc.Botany (1st Semester) of affiliated colleges under Credit Semester System (CUCSS-PG-2010) implemented with effect from 2010 admission-orders issued.

GENERAL & ACADEMIC BRANCH-IV 'J' SECTION

No. GA IV/J1/4765/2006

Dated, Calicut University PO, 30.07.2010.

Read: 1. U.O.No.GAIV/J1/1373/08 dated 23.07.2010.

2. Minutes of the meeting of the Board of Studies in Botany (PG) of 19.06.2010.

3. Orders of the Vice-Chancellor, in the file of even number dated 29.07.2010.

ORDER

As per paper read as (1) above, Credit Semester System at Post Graduate level in affiliated colleges (CUCSS-PG-2010) has been implemented from the Academic year 2010 onwards.

The Board of Studies at its meeting, vide paper read as (2) above, discussed the scheme and syllabus of Botany (PG) of affiliated colleges and has forwarded the scheme and syllabus of 1st Semester to the University.

The Vice-Chancellor, in view of exigency, has approved the minutes of the meeting of the Board, subject to ratification by the Academic Council vide paper read as 3 above.

Sanction has therefore been accorded to implement the scheme and syllabus of M.Sc.Botany (1st Semester) of affiliated colleges under Credit Semester System with effect from 2010 admission.

Orders are issued accordingly. Scheme and Syllabus appended.

Sd/-

DEPUTY REGISTRAR(G&A IV)

For REGISTRAR

To

1. The Principals of affiliated Colleges.
Colleges offering M.Sc.Botany.
2. Self financing centers of the University of Calicut offering Botany (PG)

Copy to:

PS to VC/PA to Registrar/CE/Digital wing (with a request to upload in the University website)/Enquiry/Information centers/DR III Exams/EG I/DR PG/Tabulation Section/GA I 'F' 'G' sections/GAII/GAIII / DDLFA/SF/FC

Forwarded/By Order

Sd/-

SECTION OFFICER.

UNIVERSITY OF CALICUT
M.Sc. BOTANY PROGRAMME (CSS)

Admission:

The norms of admission as per the existing university regulations will be followed.

Duration of the Course:

Four semesters (2 years)

Number of courses and credits required:

Ist, IInd and IIIrd semesters with four core courses (three theory and one practical), each with 4 credits (total 16 credits per semester) and IV semester with four elective courses (two theory and two practical) each with 4 credits, one dissertation with 4 credits and one viva voce with 4 credits (total 24 credits in the semester). Total credits required for the completion of the programme is $16 \times 3 + 1 \times 24 = 72$.

Selection of subject for dissertation:

A subject is to be selected by each student for dissertation based on the facilities available and the specializations of the supervising teachers.

Evaluation:

Evaluation is to be carried out both by internal continuous evaluation and external terminal evaluation. Out of the total weightage for each course, 25% is to be given for internal continuous evaluation and 75% for external terminal evaluation.

1. Internal continuous evaluation:

Internal continuous evaluation should have five components of equal weightage as shown below. Internal evaluation will be carried out by the teacher/ teachers offering the course. The marks should be displayed on the notice board of the department and the students shall be given a chance to redress grievances if any.

a. Theory courses:

Attendance	Assignments	Test paper (1)	Seminar	Test paper (2)
90%: full weightage	A: full weightage	A: Full weightage	A: full weightage	A: full weightage
80%: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage
75%: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage
Below 75%: no weightage	D: no weightage	D: no weightage	D: no weightage	D: no weightage

b. Practical courses:

Attendance	Practical skill	Test paper (1)	Drawing skill and regularity	Test paper (2)
90%: full weightage	A: full weightage	A: full weightage	A: full weightage	A: full weightage
80%: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage
75%: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage
Below 75%: no weightage	D: no weightage	D: no weightage	D: no weightage	D: no weightage

c. Dissertation:

Regularity	Involvement/ level of knowledge	Literature collection	Presentation (1)	Presentation (2) (model)
90%: full weightage	A: full weightage	A: full weightage	A: full weightage	A: full weightage
80%: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ credits	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage	B: $\frac{3}{4}$ weightage
75%: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ credits	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage	C: $\frac{1}{2}$ weightage
Below 75%: no weightage	D: no credits	D: no weightage	D: no weightage	D: no weightage

2. External terminal evaluation:

At the end of each semester, there will be external evaluation for each course. The pattern of theory question paper will be as per the general regulations of CSS. The pattern of practical question papers will be finalized by the concerned board of examiners. The answer scripts of each theory course will be valued by one member of the board of examiners constituted by the university for the purpose. There will be

provision for revaluation after the declaration of results. The practical examination will be conducted by two members each of the board of examiners constituted by the university. Each dissertation will be valued by two examiners. Maximum number of dissertations to be valued by a set of examiners on a particular day will be 5. The examiners will value the dissertations in the FN of the day. The candidates will be presenting the salient features of their work and dissertation by way of power point presentation in the AN. The teachers and students of the department may form the audience but they will be simple listeners. However, academic deliberations may be permitted based on the decision of the board of examiners. The board of viva voce will also constitute of two examiners appointed by the university. One improvement chance will be given to the candidate in the case of each course. There will be no limit for supplementary chances. The candidates will have to appear for the improvement and supplementary chances along with the junior batches. Theory examinations will be of 3 hours duration and practical examination of 6 hours duration with a break in between. The practical question paper is to be set with two sections, one for the FN and the other for the AN. The students will have to submit their tour reports and practical records on the day of the practical examination.

Pass and overall grade:

Pass and overall grade will be as per the general regulation of CSS.

Grievance redressal:

Grievance redressal should be carried out as per the general guidelines issued by the university from time to time.

Distribution of weightage of marks:

1. Theory:

Essay questions: 40%; Paragraph questions: 30%; Short answer questions: 30%.

2. Practicals:

Practical work: 75%; Practical records: 15%; Submissions and tour report: 10%.

3. Dissertation:

Written account: 80%; Presentation: 10%; Discussion: 10%.

4. Viva voce:

Viva voce at the end of the IVth semester based on the entire syllabus with 100% external evaluation.

Distribution of work based on credits:

1 credit = 1.5 hours of teaching per week.

(I Semester to III Semester: 16 credits = 24 teaching hours per week. 1 hour per week for seminar; IV Semester: 16 credits for elective courses = 24 teaching hours. 1 hour for CE of Dissertation.)

UNIVERSITY OF CALICUT				
M.Sc. Programme in Botany (CSS)				
Programme, structure of courses and distribution of credits				
Course	Title	Credits		
		Internal	External	Total credits
Semester I				
BO01CT01	Phycology, Bryology, Pteridology and Gymnosperms	25%	75%	4
BO01CT02	Mycology and Lichenology, Microbiology and Plant Pathology	25%	75%	4

BO01CT03	Angiosperm Anatomy, Embryology, Palynology and Lab Techniques	25%	75%	4
BO01CP04	Practicals of Phycology, Bryology, Pteridology, Gymnosperms, Mycology and Lichenology, Microbiology, Plant Pathology, Angiosperm anatomy, Embryology, Palynology and Lab Techniques.	25%	75%	4
Semester II				
BO02CT05	Cell Biology, Molecular Biology and Biophysics	25%	75%	4
BO02CT06	Cytogenetics, Genetics, Biostatistics, Plant Breeding and Evolution	25%	75%	4
BO02CT07	Plant Ecology, Conservation Biology, Phytogeography and Forest Botany	25%	75%	4
BO02CP08	Practicals of Cell Biology, Molecular Biology, Biophysics, Cytogenetics, Genetics, Biostatistics, Plant Breeding, Plant Ecology, Conservation Biology, Phytogeography and Forest Botany	25%	75%	4
Semester III				
BO03CT09	Plant Physiology, Metabolism and Biochemistry	25%	75%	4
BO03CT10	Angiosperm Morphology and Taxonomy and Plant Resources	25%	75%	4
BO03CT11	Biotechnology and Bioinformatics	25%	75%	4
BO03CP12	Practicals of Plant Physiology, Metabolism, Biochemistry, Angiosperm Morphology, Taxonomy, Plant Resources, Biotechnology and Bioinformatics	25%	75%	4
Semester IV				
BO04ET13	Elective I	25%	75%	4
BO04ET14	Elective II	25%	75%	4
BO04EP15	Practicals of Elective I	25%	75%	4
BO04EP16	Practicals of Elective II	25%	75%	4
BO04DN17	Dissertation	25%	75%	4
BO04VV18	Viva voce	0%	100%	4
Total				72 credits

CT01. PHYCOLOGY, BRYOLOGY, PTERIDOLOGY AND GYMNOSPERMS (1.5+1+2+1.5 = 6 hours per week)

Phycology

1. Classification of Algae-comparative Survey of important systems - Fritsch-Smith-Round. Criteria for algal classification-Phylogenetic considerations.
2. Biological importance of Planktons.
3. Algal cytology-Basic ideas of cell features-Electron microscopic studies of algal cell, cell wall, flagella, chloroplast, pyrenoid, eye-spot- their importance in classification.
4. Reproduction-Different types of life cycles in algae.
5. General account of energy sources and pigments in algae.
6. Economic importance of algae-Roll of algae in soil fertility, algae in industry-Biological importance of phytoplanktons and water blooms.
7. General account of thallus structure, cell ultra-structure, reproduction, relationships and evolutionary trends in the following groups: Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta, Rhodophyta.

References :

1. Fritsch, F.E. 1945. The structure and Reproduction of Algae.
2. Smith, G.M. 1950. Manual of Phycology
3. Round, F.E, 1965. The Biology of Algae.
4. Pold and Wyane. 1978. Introduction of Algae.

Bryology

1. General characters and systems of classifications of Bryophytes
2. General account of the anatomy, reproduction, life history and phylogeny of Sphaerocarpales, Marchantiales, Jungermanniales, Calobryales, Anthocerotales, Sphagnales, Andreales, Funariales and Polytrichales
3. Origin and evolution of Bryophytes- gametophytic and sporophytic.
4. A general account of fossil Bryophytes and their affinities.
5. Economic importance of Bryophytes.

References

1. Watson E.V. The structure and life of Bryophytes. Hutchinson Univ. Press, London.
2. Cavers F. The interrelationship of Bryophytes. New Phytologist.
3. Kashyap S.R., The Liverworts of Western Himalaya and the Punjab Plains, Vol.I&II. Chronica Botanica
4. Smith G.M. Cryptogamic Botany. McGraw Hill Book Co., N.Y.
5. Parihar N.S. An introduction of Embryophyta: Bryophyta. General Book House, Allahabad.
6. Verdoon, F.M. Mannual of Bryology. Ashor & Co., Amsterdam.
7. Shaw, J. and Goffinet, B. 2000. Bryophyte Biology. Cambridge University Press.
8. Manju C. Nair, K.P. Rajesh and Madhusoodanan P.V., 2005. Bryophytes of Wayanad in Western Ghats. Malabar Natural History Society, Kozhikode.

Pteridology

1. General characters and life history of Pteridophytes.
2. Cytology of Pteridophytes- Chromosome number and polyploidy.
3. Structure and evolution of stele in Pteridophytes.
4. Origin and evolution of Sporangium.
5. Heterospory and seed habit.
6. Development and evolutionary trends in the Gametophytes of Pteridophytes.
7. Apogamy, Apospory and Parthenogenesis.
8. Classification of Pteridophytes: Holttum, Pichi-Sermolli.
9. Comparative morphology, ecology and phylogeny of the following:
 - a) Psilopsida : Rhyniales, Psilophytales and Psilotales
 - b) Lycopside: Lycopodiales and Isoetales
 - c) Sphenopsida: Hyeniales, Pseudobomiales, Sphenophyllales, Calamitales and Equisetales.
 - d) Filicopsida: General account: Primofilicales, Ophioglossales, Marattiales, Osmundales, Schizaeales, Cyatheales, Gleicheniales, Marsileales and Salviniiales.
10. Economic importance of Pteridophytes-Medícal, Horticulture, Biofertilizer, weeds.
11. General account of the contribution of Indian pteridologists.

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Referncnes

1. Bierhost, D.W. 1971 . Morphology of Vascular Plants. Mac Miilan Co., New York.
2. Dyer, A.C. 1979. The Experimenial Biology of Ferns. Academic Press, London.
3. Jermy, A.C.1973 (Ed.): The phylogeny and Classification of Ferns.
4. Kramer, K.U. and Green, P.S. 1991. The Families and Genera of Vascular Plants. Narosa, New Delhi.
5. Nampy, S. and Madhusoodanan, P.V.1998. Fern Flora of South India-Taxonomic Revision of Polypodioid Ferns. Daya Publishing House, New Delhi.
6. Aböul Hameed C., Rajesh K.P. and Madhusoodanan P.V. 2003. Filmy Ferns of South India. Penta Book Publishers & Distributors, Calicut.
7. Azeez K., Venugopalakrishna Kurup V. and P.V. Madhusoodanan, 2008. Spleenworts (Aspleniaceae) of South India. Malabar Natural History Society, Calicut.
8. Venugopalakrishna Kurup V., Azeez K. and P.V. Madhusoodanan, 2008. Primitive Ferns of South India. 'V'Publishers, Kottayam.

Gymnosperms

1. Geological time scale and correlated predominant Gymnosperm flora.
Classification of Gymnosperms- Chamberlain's system.
2. Geological horizons. Distribution, morphology, anatomy, reproduction and interrelationship of the following orders (Study of families and types not required)
 - a. Pteridospermales; b. Glossopteridales; c. Caytoniales; d. Cycadaeoidales; e. Pentoxylales; f. Cycadales, g. Ginkgoales; h. Cordaitales; i. Coniferales; j. Taxales; k. Ephedrales; l. Welwitschiales; m. Gnetales
3. Phylogenetic relationship of Gymnosperms.
4. Economic importance of Gymnosperms

References

1. Andrews, H.N. 1961. Studies in Paleobotany, Wiley, N.Y.
2. Banks, H.P. 1970. Evolution and plants of the past. Wadsworth.
3. Bierhost, D.W. 1971. Morphology of Vascular Plants. Macmillan.
4. Bower, F.O. 1935. Primitive Plants. Macmillan.
5. Chamberlain, C.J. 1935. Gymnosperms- Structure and Evolution. Univ. of Chicago Press.
6. Foster, A.S. & E.M. Gifford. 1974. Comparative morphology of vascular plants. Freeman.
7. Maheshwari, P & V. Vasil. Gnetum. CSIR, New Delhi.
8. Ramanujam, C.G.K. 197b. Indian Gymnosperms in time and space. Today & Tomorrow, Dehra Dun.
9. Sewart, W.N. 1983. Paleobotany and the Evolution of Plants. Cambridge Univ. Press.
10. Stockey, R.S. 1981. Some comments on the origin and evolution of conifers. Canadian J. Bot. 59: 75-82.
11. Taylor, T.N. 1982. Reproductive biology in early seed plants. Bioscience 32:23-28.
12. Walton, 1951. An Introduction to the Study of Fossil plants.

CT02: MYCOLOGY & LICHENOLOGY, MICROBIOLOGY AND PLANT PATHOLOGY (2.5+2.5+1= 6 hours per week)

Mycology

1. General characters of Fungi: cell-ultra structure, unicellular and multicellular organization, hyphal growth, cell wall composition, nutrition (saprobic, biotrophic, symbiotic, predacious) reproduction (vegetative, asexual, sexual), heterothallism, parasexuality.
2. Classification of fungi by Ainsworth & Bisby (1983), Alexopoulos et al. (1996)- Phylogeny of fungi- Characters used in classification.
3. General account of Myxomycota, Mastigomycota, Zygomycota, Ascomycota, Basidiomycota and mitosporic fungi. Different kinds of spores and their dispersal.
4. Fungi as saprophytes: details of the fungal decomposition of organic matter, coprophilous fungi, lignin degrading fungi, role of fungi in degradation of pesticides.
5. Fungi as symbionts: Mycorrhiza – ectotrophic, orchidaceous and Ericoid mycorrhiza, Vesicular Arbuscular Mycorrhiza - their distribution and significance. Endophytes.
6. Lichenology: General account and systematics of lichens, thallus structure, reproductive bodies, ecological significance and economic importance of lichens.

References:

- Alexopoulos C.J., Mims, C.W. & Blackwell, M. (1996). Introductory Mycology. 4th edition. John Wiley & Sons Inc.
- Ainsworth, G.C., Sparrow, K.F. & Sussman, A.S. (Eds.) (1973). The Fungi - An Advanced Treatise. Vol 1-4. Academic Press.
- Burnett, J.H. (1970). Fundamentals of Mycology. Edward Arnold.
- Cariile, M. J. & Watkinson S.C. (1994). The Fungi. Academic Press.
- Deacon, J.W. (1988). Introduction to Modern Mycology. Blackwell.
- Dubey, H.C. (1990). An Introduction to Fungi. 2nd Edition. Vikas Publishers, New Delhi.
- Hale Mason, E. (1983). The Biology of Lichens. 3rd Ed. Edward Arnold, London.
- Jennings, D.H. & Lysek, G. (1999). Fungal Biology. Bios Scientific Publishers.
- Mehrotra, R.S. & Aneja, K.R. (1990). An Introduction to Mycology. New Age International Publishers.
- Landecker, Elizabeth Moore. (1996). Fundamentals of Fungi. 4th Ed. Prentice Hall.
- Nair, M.C. & Balakrishnan, S. (1986). Beneficial fungi and their utilization. Scientific Publishers, Jodhpur.
- Nash, T.H. (1996). Lichen Biology. Cambridge University Press.
- Webster, John (1980). Introduction to Fungi. Cambridge University Press.

Microbiology

1. Introduction - main groups of microorganisms and their characteristics -prions, viroids, viruses, bacteria, mycoplasmas and actinomycetes.
2. Bacteria - classification based on Bergey's Manuel. Archaeobacteria and Eubacteria. Morphology, ultra-structure,. nutrition, genetics
3. Plasmids and their characterization.
4. Cyanobacteria- salient features, morphology, ultrastructure, classification and economic importance
5. Viruses- General account of plant and animal viruses, bacteriophages and their classification. Isolation, purification, infection, replication and transmissiion of plant virüses. Detailed study of TMV and T4Phage.
6. Microbial ecology- microbiology of rhizosphere and phylloplane. Sewage disposal, bioremediation and. water purification. Detection of microbes in air and water.
7. Agricultural microbiology - management of agricultural soils, biofertilizers, biopesticides.
8. Food Microbiology - .Food spoilage and preservation methods. Microbiology of fermented food - dairy products, bread and other fermented plant products. Microorganisms as source of food- single cell protein.
9. Industrial Microbiology - Production of alcohol, vinegar, antibiotics, vitamins, steroids, vaccines, organic acids, amino acids.

References:

- Adams, M R & Moss, M.O. (1996). Food Microbiology. New Age International Publishing Ltd., New Delhi.
- Brock, T. D. (1996). Biology of Microorganisms. Prentice Hall.
- Campbell, R. (1987). Microbiology. ELBS-Edward Arnold, London.
- Carpemter, P.L. (1967). Microbiology. W.B. Saunders & Company, Philadelphia.
- Dubey, R.C. & Maheswari, D.K.(2000) A text book of Microbiology. S. Chand.
- Desikachary. Cyanophyta- Monograph
- Goodfellow, M. et.al. (1993). The Biology of Actinomycetes. Academic press.
- Kumar, H.D. & Swati Kumar (1998). Modern Concepts of Microbiology.
- Mathew, R.E.F. (1981). Plant Virology, Academic press.
- Pelozar, M.J., Chan, E.C.S. & Krieg, N.R. (1986). Microbiology. Tata Mc Graw Hill.
- Sharma, P.D. (1999). Microbiology & Plant Pathology. Rastogi Publishers, Meerut.

Plant Pathology

1. Principles of Plant Pathology- Causal agents of plant diseases - Biotic causes (fungi, bacteria, virus, mycoplasma, nematodes, angiospermic parasites. Abiotic causes (nutrient and mineral deficiencies, effect of pollution). Koch's postulates. Latrogenic diseases. Seed pathology.
2. Details of different symptoms of plant diseases.
3. Process of infection- mechanical, physiological and enzymatic action. Penetration and entry of pathogens in to host tissue.
4. Host- parasite interaction. Enzymes and toxins in pathogenesis. Defense mechanisms in plants (structural and biochemical).
5. Details of different ways of spread and transmission of plant diseases- wind and water-mediated, seed borne and vector borne.
6. Plant disease management- exclusion, eradication and protection. Different pesticides and fungicides and their application. Biocides in plant protection.
7. Study of the following diseases with reference to the symptoms, causal organisms, disease cycle and control measures:
Bunchy top of banana, Bacterial blight of paddy, Bud rot of coconut, Mahali of Arecanut, Powdery mildew of rubber, Abnormal leaf fall of rubber, tikka disease of Ground nut, Late blight of potato, Blister blight of tea, wheat rust, coffee rust, grey leaf spot of coconut, Phytophthora foot rot of pepper, rhizome rot of ginger and turmeric, angiospermic parasites-Viscum, Dendrophthoe.

References

- Agrios, G.N. (1997). Plant pathology. 4th Ed., Academic Press.
- Bilgrami, K.H. & Dube, H C. A Text Book of Modern Plant Pathology. Vikas Publishers, New Delhi.
- Chaube, H.S. & Ramji Singh (2001). Introductory Plant Pathology. International Book Distributing Co., Lucknow.
- Gareth-Jones, D. (1983). Plant Pathology: Principles and Practice. Open University Press.
- Horsfall J.G. & Cowling E. B. (Ed.) (1978). Plant Disease: An Advanced Treatise. Academic Press.
- Lucas, J. A.. (1998). Plant Pathology and Plant pathogens. Blackwell.
- Manners, J.G. (1993) Principles of Plant Pathology. Cambridge Univ Press.
- Mehrotra, R.S. (1980). Plant Pathology. Tata Mc Graw Hill.

- Pandey, B. P. (1999). Plant Pathology -pathogen and plant disease. S. Chand & Co.
- Pathak, V.N., Khatri, N.K. & Pathak, M. (2000). Fundamentals of Plant Pathology. Agro-bios India.
- Rangaswami, G. (1999). Diseases of Crop Plants of India. Prentice Hall India.
- Tarr, S.A. J. (1972). The Principles of Plant Pathology. Winchester Press.
- Wheeler, H. (1975). Plant Pathogenesis. Springer Verlag.
- Wood, R.K.S. (1978). Physiological Plant Pathology. Blackwell

CT03. ANGIOSPERM ANATOMY, ANGIOSPERM EMBRYOLOGY, PALYNOLOGY & LAB TECHNIQUES (2+2+1+1= 6 hours per week)

Angiosperm Anatomy

1. Cell wall and its development. Chemistry of cell wall- cellulose, hemicellulose, polysaccharides, cell wall proteins, water.
Organisation of primary wall. Cytokinesis and growth. Plasmodesmata. Secondary wall chemical Constituents- lignin, suberin, callose; organisation of secondary wall.
2. Node - nodal patterns:
Unilacunar, trilacunar, multilacunar and split lateral. .Phylogenetic considerations.
Leaf trace and branch trace- origin, departure; effect on stele and pith.
Secondary growth in leaf traces.
3. Cambium:
Development of vascular cambium.and.cork cambium in root and stem; cell types in vascular cambium, infected vascular cambia, seasonal variations in cambial activity; role of cambium in wound healing and grafting. Conversion of fusiform initials in to ray initials; cambium in arborescent monocotyledons (Liliflorae).
4. Development and differentiation:
The structure of specialized cells. Vascular differentiation (procambium, residual meristem, interfascicular and intrafascicular cambia); acropetal and basipetal differentiation in leaves, stem and roots. Sieve tube differentiation. Control of phloem differentiation. Tracheary elements differentiation. Ultra structure of phloem and xylem, brief account of transfer cells. Secondary wall thickening, cytoplasmic changes and autolysis. Control of differentiation.
Genetic aspects- Induction of vessel elements. Induction of secondary xylem structure in relation to function in water conduction.
5. Anomalous secondary growth:
Concepts; modification of the common type of vascular cambium, unequal activity of the vascular cambium. Successive cambia. Anomalous placement of vascular cambium. Discontinuous, unidirectional and bidirectional activity of cambium. Anomalous secondary growth in storage roots (Beet root, sweet potato).
6. Seedling anatomy:
Concepts: anatomy of cotyledons, hypocotyl, seedling root, mesocotyl differentiation
7. Leaf anatomy:
Unifacial, bifacial and centric leaf (onion); structure of epidermis, stomatal types; foriar sclerieds; oil cells; crystal idioblasts.
8. Anatomy in relation to taxonomy.
9. Wood anatomy- general account.

References

1. Easu, K- 1983. Plant Anatomy - Wiley Eastern Limited.
2. Fahn, A. 1977 – Plant Anatomy. Pergamon Press.
3. Cutter, E.G. & Edward, E., 1978. Plant Anatomy : Experiment and Interpretations Part I and II.
4. Mauseth, J.D. 1988. Plant Anatomy - The Nenjamin Cumming Publishing Co.
5. Forester,A.S. 1960. Practical Plant Anatomy. D. Van Nostrand Company Inc.
6. Roberts, L.W. 1976. Cytodifferentiation in Plants - Cambridge University Press, Cambridge.

Angiosperm Embryology

1. Introduction to angiosperm embryology - structure of dithecous and monothealous anther.
2. Microsporogenesis: Structure and function of wall layers, role of tapetum in pollen development
3. Male gametophyte: Pollen mitosis, division of generative cells, heterospory.
4. Megasporesogenesis: Megaspore triad, dyad, coenomegaspore.
5. Embryo sac - different types- ultra-structure of components- synergid and antipodal.
embryo sac theories of the morphological nature of embryo sac
6. Pollination -Artificial pollination - ultra-structural and dis-ultrastructural and histo-chemical sigma. significance of pollen - pistil interaction. Role of pollen wall proteins and stigma.

In vitro pollination and fertilization.

7. Fertilization: Role of synergids - filiform apparatus, heterospermy and triple fusion.

8. Structure and development of typical dicot and monocot embryos- structure and function of suspensor.

9. Endosperm: classification and type- ruminate endosperm- mosaic endosperm- endosperm haustoria - physiology and cytology of endosperm.

10. Polyembryony - classification – practical value.

11. Apomixis - general account, genetics of apomixis.

12. Parthenocarpy -seedless fruits

13. Experimental embryology-embryo culture, anther culture, ovule culture.

14. Embryology in relation to taxonomy.

References:

Bouman F., 1978. Ovule initiation, ovule development and seed coat structure in angiosperms. Today and Tomorrow Publishers, New Delhi.

Bhojwani S.S. and Bhatnagar S.S., 1974. The embryology of Angiosperms. Vikas Publication, New Delhi.

Davis C.L., 1965. Systematic embryology of Angiosperms. John Wiley.

Eames A.J., 1960. Morphology of Angiosperms. Mc Graw Hill.

Johanson D., 1950. Plant Embryology. Waltham, Massachusetts.

John B.D. (Ed.), 1984. Embryology of Angiosperms. Springer Verlag.

Maheswari P., 1950. An introduction to the Embryology of Angiosperms. Mc Graw Hill.

Raghavan V., 1976. Experimental embryogenesis in plants. Academic Press.

Wardlaw C.W., 1976. Embryogenesis in Plants. Methuen, London.

Palynology

1. Introduction- contributions of Erdtman and P K K Nair.

2. Development and structure of pollen wall. Pollen morphology and its application. Pollen evolution

3. Aero-palynology- methods of aerospore survey and analysis

4. Melittopalynology- nutritional and medical value of honey- unifloral and multifloral honey.

5. Recent advances in palynological studies- forensic-pollen allergy-oil exploration-paleopalynology.

6. Palynology in relation to taxonomy- eurypalynous and stenopalynous taxa.

References:

1. Sripad N. Agashe. Palynology and its Application.

2. Kahinath Bhattacharya et. al. A Text Book of Palynology.

Laboratory Techniques

1. Study of the following instruments - their uses and principles:

a. Microscope: microscopic measurements - camera lucida, micrometry.

b. Microtomes- Sledge, Rocking, Rotary.

2. Killing, fixing and staining of plant tissues:

a. Important reagents and chemicals used in the preparation of fixatives and their properties.

b. Fixatives - FAA, Carnoy's fluid, chrome acetic, Nawaschins fluid, Craff, Flemings- composition, preparation and specific uses.

c. Dehydrating agents, clearing agents, mounting media. Examples and brief description.

d. Stains - classification, composition and specific uses - safranin, crystal violet, cotton blue, fast green, Orange - G, hematoxylin, carmine.

e. Brief account of vital staining.

f. Staining techniques - Double staining.

i. Safranin - Fast green

ii. Crystal violet - Orange G

iii. Methods of embedding plant materials in paraffin wax - TBA method; embedding for Electron microscopy.

iv. Sectioning of embedded paraffin wax materials using Rotary Microtome.

v. Double staining of microtome serial sections embedding in paraffin wax - Safranin - fast green; Crystal violet - Orange G / Erythrosin.

vi. Whole mounts - general account

vii. Maceration, smears

viii. Histochemical tests –

(1) PAS Test - insoluble polysaccharides.

(2) Sudan black -lipids

(3) Fuelgen reaction - Nucleic Acids.

References:

1. Peter Gray. Hand book of Basic microtechnique. Mcgraw – Hill.
2. John E. Sass. Botanical Microtechnique, Oxford & IBH Publishing Co.
3. John R. Baker. Principles of Biological Microtechnique –
4. A guide book to microscopical methods. A. V. Grimstone and R.J. Saker, Cambridge Univ. press.
5. K.V. Krishnamurthy. Methods in Plant Histochemistry.

CP04. PRACTICALS OF PHYCOLOGY, BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS, MYCOLOGY AND LICHENOLOGY, MICROBIOLOGY, PLANT PATHOLOGY, ANGIOSPERM TAXONOMY, ANGIOSPERM EMBRYOLOGY, PALYNOLOGY AND LAB TECHNIQUES.
(0.5x10+1for lab techniques = 6 hours)

Phycology

1. Collection, preservation and preparation of algal herbarium (5 numbers).
2. Collection and study of the types mentioned below and their identification up to generic level using algal monographs:

Chlorophyta: Pediastrum, Scenidesmus, Hydrodictyon, Ulva, Cladophora, Pithophora, Bulbochaeta, Cephaleuros, Draparnaldiopsis, Bryopsis, Codium, Caulerpa, Halimeda, Desmids (Closterium, Cosmarium), Nitella.

Xanthophyta: Botrydium.

Bacillariophyta: Biddulphia, Coscinodiscus, Cymbella.

Phaeophyta: Ectocarpus, Dictyota, Padina, Turbinaria.

Rhodophyta: Batrachospermum, Gracilaria, Champia..

Bryology

Morphological and structural study of representative members of the following groups using whole mount preparations, dissections and transactions:

Asterella, Targionia, Cyathodium, Lunularia, Pallavicinia, Dumortiera, Porella,

Anthoceros, Sphagnum and Bryum.

Pteridology

Study of vegetative and reproductive features of Lycopodium, Ophioglossum, Angiopteris, Osmunda, Lygodium, Ceratopteris, Pteris, Asplenium, Blechnum, Cyathea, Gleichenia, Trichomanes, Salvinia and Azolla.

Study of the following fossils: Rhynia, Lepidodendron, Sphenophyllum, Calamites, Calamostachys, Zygopteris and Anachoropteris.

Spore germination and development of prothallus in Knop's Agar medium.

A study of Pteridophytes in their natural habitats.

Gymnosperms

Identification of petrifications, compressions, impressions: Lyginopteris, Heterangium, Medullosa, Trignocarpus, Glossopteris, Caytonia, Pentaxylon and Cordaites.

Study of vegetative and reproductive structures of Zamia, Ginkgo, Pinus, Cryptomeria, Cupressus, Araucaria, Agathis, Podocarpus, Cephalotaxus, Ephedra and Gnetum.

Mycology

Critical study of the following types with the help of fresh/preserved materials by making suitable micropreparations giving emphasis on systematic position, details of vegetative and reproductive structures:

Stemonitis, Saprolegnia, Phytophthora, Albugo, Mucor, Pilobolus, Saccharomyces, Xylaria, Chaetomium, Peziza, Puccinia, Auricularia, Polyporus, Ganoderma, Lycoperdon, Dictyophora, Geastrum, Cyathus, Aspergillus, Curvularia, Alternaria, Fusarium, Colletotrichum, Parmelia, Usnea.

Microbiology

Test for the presence of coliform bacteria in contaminated water.

Isolation of Eubacteria and Cyanobacteria from soil by dilution plate method.

Isolation of pure bacterial culture by streak plate method.

Staining of bacteria (negative staining, Gram staining and spore staining).

Demonstration of bacterial motility by hanging drop method.

Morphological studies on Scytonema, Aphanocapsa, Spirulina, Oscillatoria, Anabaena.

Plant Pathology

Detailed lab study of the following diseases:

Bunchy top of banana, Bacterial blight of paddy, Bud rot of coconut, Mahali of Arecanut, Powdery mildew of rubber, Abnormal leaf fall of rubber, tikka disease of Ground nut, Late blight of potato, Blister blight of tea, wheat rust, coffee rust, grey leaf spot of coconut, Phytophthora foot rot of pepper, rhizome rot of ginger and turmeric, angiospermic parasites- Viscum and Dendrophoe.

Technique of isolation and pure culture of pathogens.

Angiosperm Anatomy

Study of anomalous secondary growth in roots and stems of Aristolochia, Strychnos, Amaranthaceae, Nyctaginaceae, Bignoniaceae and Agavaceae.

Nodal anatomy of different types.

Leaf anatomy: epidermal peels and TS of lamina.

Embryology

1. Study of anther development of Datura.
2. Preparation of dissected whole mounts of microsporangium.
3. Study of megaspore mother cell, megaspore and embryo sac.
4. Study of the receptivity of stigma and in situ germination of pollen.
5. Dissection of stages in the development of embryo and endosperm.
6. Pollen germination using hanging drop technique.
7. Demonstration of intra ovarian pollination.

Palynology

1. Analysis of honey for microscopic examination of pollen.
2. Calculation of percentage of viable pollen by using T Z test.
3. Study of pollen wall by acetolysis.

Lab Techniques

1. Measurement of microscopic objects - Micrometry.
2. Camera lucida drawing - calculation of magnification
3. Double stained permanent sections - free hand section, Microtome serial sections.
4. Preparation of whole mounts, macerations and smears.
5. Submission of 10 permanent slides - which should include microtome serial sections, free hand sections, macerations, whole mounts and smears.

Practical records:

Submission of certified record of practicals at the time of terminal evaluation.

Field work:

3 days of field work for the in situ study of the types of the above areas of study and submission of a field report.

