



UNIVERSITY OF CALICUT

Abstract

Faculty of Science- M.Phil. in Botany- modified syllabus - implemented- with effect from 2018 admissions- Approved- Orders issued.

G & A - IV - J

U.O.No. 10783/2017/Admn

Dated, Calicut University.P.O, 26.08.2017

*Read:-*1.Minutes of the Board of Studies in Botany P.G held on 03.07.2017, item No.5.
2.Minutes of the Faculty of Science held on 10.07.2017 item No.19.
3.Extract of the item No.II.H of the minutes of the meeting of the LXXVI meeting of the Academic Council held on 17.07.2017.
5.Orders of the Vice Chancellor in the file of 191466/GA IV/J1/2013/CU dated 27.07.2017

ORDER

Vide paper read first above, the Board of Studies in Botany P.G has resolved to approve the revised syllabi of M.Phil in Botany.

Vide paper read second above, the Faculty of Science has resolved to approve the Minutes of the Board of Studies in Botany P.G held on 03.07.2017.

Vide paper read third above, the LXXVI meeting of the Academic Council has approved the minutes of the Faculty of Science held on 10-07-2017 and the minutes of the meetings of various Boards of Studies coming under the Faculty.

Vide paper read fourth above, the Vice Chancellor has accorded sanction to implement the resolutions of the Academic Council.

Accordingly orders are issued to implement the modified M.Phil in Botany syllabus with effect from 2018 admissions.

(The revised syllabi of M.Phil in Botany is appended.)

Ajitha P.P

Joint Registrar

To

HoD Department of Botany, Director DoR, Controller of Examinations, EX Branch.

Forwarded / By Order

Section Officer

Department of Botany, University of Calicut

M.PHIL. PROGRAMME IN BOTANY

The M.Phil. Degree course in Botany shall be for a period of 12 Months. The course comprises of Two Semesters. The first semester is devoted to course work and the second semester is devoted to project/research/dissertation work. First semester comprises three theory papers: two methodology papers common to all students and one special paper specific to each student covering the area of his/her specialization. The syllabus for the special papers shall be prepared by the concerned guide for every student every year and shall get approved by the Departmental Council and the Chairman, Board of Studies in Botany.

SYLLABUS FOR COMMON PAPERS

RESEARCH METHODOLOGY PAPER -1

1. General methodology of Scientific Research - Science as a human activity, setting up of objectives of the study and hypotheses to be tested - Experimental designs and Experimental Protocols - Setting up detailed methodologies, sampling methods, Strategies for execution of the protocols – Statistical validation. Ethics in Research.

2. General laboratory rules and techniques: General rules to be observed in a laboratory. General Safety measures. Chemical Hazards. Physical Hazards. Biological Hazards. Spillage and Waste Disposal. Laboratory- acquired infections. First Aid. Safety measures. Safety in Genetic engineering. Safety of Laboratory animals. Working with liquids ~ (i) measurement - auto pipette, burette, volumetry, (ii) handling of liquids (iii) preparation of solution - percent, molar, molal, normal, ppm (iv) Dilution - linear, logarithmic (v) use of SI units and standard abbreviations

3. Scientific Documentation & Report Writing: Literature collection, presentation of Scientific Data. Preparation of manuscripts for publication of research paper, scientific conduct, ethics, authorship issues, plagiarism, citation and acknowledgement. Importance of language and effective communication. Thesis writing, writing a review for a paper, structure and components of scientific reports, abstraction of a research paper. Reference manager software (Mendeley, Zotero, End Note). Presenting a paper in a scientific seminar, oral presentation, planning, preparation, practice, making presentation, uses of visual aids.

4. Experimental Designs and Principles and Applications of Biostatistics – Introduction, observation, Hypothesis and Null Hypothesis. Basic principles of Experiments. Experimental Units and sampling units. Experimental error, Discrimination, Replication, Generalization, Controls, Randomization, Measurement. Classification of Data; Measures of central Tendency; Measures of Dispersion; Tests of Significance; Student T Test; The Chi-Square test; Probability; Correlation; Regression.

5. Bioinformatics: Introduction to Bioinformatics; Applications of Bioinformatics; Techniques in bioinformatics; Bioinformatic Tools; Bioinformatic Databases.

6. Light microscopy: resolving power; numerical aperture; parts of a microscope; lens aberrations and their corrections; sources of contrast: amplitude change and phase shift; Kohler illumination; bright-field microscopy; dark-field microscopy; UV microscopy; fluorescence microscopy and immunofluorescence; polarized-light microscopy; phase-contrast microscopy and interference-contrast microscopy; confocal microscopy; inverted microscopes and stereo microscopes; micrometry.

7. Electron microscopy (TEM and SEM.): parts of an electron microscope, electromagnetic lenses and their aberrations; specimen preparation for TEM: sectioning of biological tissues: fixatives, freeze-drying and freeze-substitution, embedding materials, ultra-thin sectioning, staining; replica preparation; freeze fracturing and freeze-etching; vacuum evaporation of carbon and metals; specimen preparation for SEM: chemical- and cryo-fixation, freeze-drying and critical-point drying, sputtering. Elemental Analysis with SEM.

8. Digital photography: with special emphasis on digital photomicrography and image analysis; important camera controls, functions; the charge coupled Device (CCD); comparison with film; depth of field; analog-digital conversion; digital to analog conversion; photographic reticule; filters for photomicrography.

RESEARCH METHODOLOGY PAPER -II

1. Methods in microbiology: culture media and their preparation, methods of sterilization, isolation of pure cultures, cultivation of anaerobic bacteria, maintenance of microbial cultures, estimation of microbial number and biomass.

2. Plant Biotechnology: In-vitro culture techniques; plasticity and totipotency, culture types – callus, cell suspension culture, protoplast, root culture, shoot tip and meristem culture, embryo culture, somatic embryogenesis, organogenesis; plant growth regulators; haploid plant production; protoplast isolation and fusion; *Agrobacterium*-mediated plant transformations; secondary metabolite production; transgenic plant production.

3. Photometry: Colorimetry: principles and application. Absorption spectrophotometry. Electromagnetic spectrum. Absorption spectrum. Extinction coefficient. Application of absorption spectrophotometry using visible and UV light. Chromatography: principles: adsorption, partition, ion exchange, molecular sieving and affinity. Paper, column, and thin layer chromatography. Gas chromatography and HPLC. Application of chromatographic techniques in biology. Electrophoresis: theory of electrophoresis. Types of electrophoresis-moving boundary, zone and continuous. Paper, starch, polyacrylamide and agarose gel electrophoresis. PAGE: Disc gel and SDS gel electrophoresis. Isoelectric focusing. Applications of electrophoresis in biology. Sedimentation techniques: theory of velocity sedimentation. Instruments: Desk top, high speed and ultracentrifuges. Zonal sedimentation, boundary sedimentation, speed dependent sedimentation. Density gradient sedimentation. Application of centrifugation in biology.

4. Methods of Molecular Biology: Extraction of DNA & RNA: Principles, Methods and Applications; estimation of G+C content; Nucleic Acid Hybridization: In Situ Hybridization, Principles and Methods, ISH, FISH, DIRVISH; Colony Hybridization, Applications; Blotting (Southern, Northern, Western, South-Western & North-Western) and Dot Blotting, Methods

and Applications; Sequencing: Principles and Different Methods; Maxam and Gilbert's Chemical Method, Sanger et al. Dideoxy Method, Shot Gun Method; RNA, Protein & Amino acid Sequencing, Sequanator, Applications; STS, PCR, RAPD, RFLP, DNA- & RNA Fingerprinting, Biochip, Microarray, Genomic Library, cDNA Library & GenBank

5. Methods in Environmental Science: Soil/sediment: Design and methods of sampling, sampling devices, methods in the physical, chemical and biological analysis of soil/ sediment samples. Air quality analysis: sampling methods and devices in air quality analysis, methods in the physical, chemical and biological analysis of air samples. Water quality analysis: Sampling methods and devices, physic-chemical and biological methods in water quality analysis.

6. Histochemical techniques: tissue processing, localization of metabolites such as polysaccharides, proteins, lipids, nucleic acids and enzymes; quantitative histochemistry; Fluorescent dyes for specific applications, Intrinsic fluorescence, Background fluorescence and photobleaching.

7. Localization of molecular targets in tissues: Immunolocalization, Tissue printing to detect proteins and RNA in plant tissue, in situ hybridization, Autoradiography and Detecting incorporated radioactive elements in tissue sections, Whole-mount in situ hybridization, Tyramide signal amplification, TUNEL Assay for detecting DNA degradation and programmed cell death, Fluorescence in situ hybridization. ELISA, RIA, autoradiography, isotopes in biology.

8. Methods of Molecular Taxonomy: Scope; Methods in molecular taxonomy and systematics; Processing molecular data and phylogenetic inference using different methods (Parsimony, Maximum Likelihood, Bayesian); Use of Chloroplast, Nuclear and Mitochondrial DNA sequences in Plant systematics; Phylogenetic trees and concepts; Applications of molecular Phylogenetics.

Model Question Papers:

M.Phil. (BOTANY) 1st SEMESTER EXAMINATION METHODOLOGY PAPER 1

Time: 3hours

Marks: 50

**SECTION A: One 10-mark question to be answered out of two questions
(1 x10 =10 marks)**

1. Compare TEM and SEM based on design, applications, and methods of specimen preparation.
2. With the aid of labeled sketches, give a brief account on different methods of ELISA. How HIV is detected employing ELISA.

**SECTION B: Four 5-mark questions to be answered out of six questions
(4 x 5 =20 marks)**

3. Compare alcohol-xylene series and alcohol-TBA series of dehydration.
4. Describe calibration of microscope for micrometry.
5. Comment on the applications of isotopes in biology
6. Give an account of vital stains.
7. Describe a histochemical staining technique to localize nucleic acids.
8. What is numerical aperture and how is it related to resolving power?

SECTION C: Ten 2-mark questions to be answered out of twelve questions
(10 x 2 =20 marks)

9. Explain the principle of tetrazolium chloride test of viability
10. Write a short note on cryostat.
11. Write a short note on freeze-drying.
12. What is critical-point drying?
13. What are super antigens?
14. What is the principle of immunofluorescence?
15. Differentiate between Metachromasia and Orthochromasia.
16. Write short note on PAS reaction.
17. 20 ml of 0.18 N NAOH is required to titrate 25 ml of a monobasic acid. Calculate the normality of the acid.
18. If the concentration of an aqueous solution of indole acetic acid is given as 100 ppm, what is its concentration expressed as mg/litre?
19. Differentiate between achromatic and apochromatic objectives.
20. Write a short note on Fluorescein diacetate

M.Phil. (BOTANY)
1st SEMESTER EXAMINATION
METHODOLOGY PAPER 2

Time: 3hours

Marks: 50

SECTION A: One 10-mark question to be answered out of two questions
(1 x10 =10 marks)

1. Enumerate the main components of a research article and explain the nature of each component.
2. Describe the various DNA sequencing techniques. Mention their merits & demerits.

SECTION B: Four 5-mark questions to be answered out of six questions
(4 x 5 =20 marks)

3. Describe RFLP. What are its applications?
4. Differentiate random sampling techniques from non-random sampling techniques. Bring out their merits and demerits.

5. Using flow-chart, illustrate a protocol for somatic embryogenesis.
6. Write on the general ethics in research and publication.
7. Write a note on thin layer chromatography and mention the uses and applications.
8. Bring out the concept of test of significance and comment on the most common tests used in biological research.

SECTION C: Ten 2-mark questions to be answered out of twelve questions
(10 x 2 =20 marks)

9. What is isoelectric focussing?
10. Write a short note on ultracentrifuge.
11. What is test of hypothesis? Differentiate null hypothesis from alternate hypothesis.
12. Explain the use of hemocytometer to estimate bacterial number.
13. Explain Rf value and its application
14. What is GenBank?
15. Differentiate measures of central tendency from measures of variation.
16. Name the chemicals used to extract DNA from plants
17. What is serial dilution method for isolation of pure cultures?
18. What are the Information retrieval systems for bioinformatics?
19. What is the importance of HEPA filters?
20. What is molar extinction coefficient?

M.Phil. (BOTANY)
1st SEMESTER EXAMINATION
Special Paper- Fungal Systematics

Time: 3hours

Marks: 50

SECTION A: One 10-mark question to be answered out of two questions
(1 x10 =10 marks)

1. Give an overview of the characters used in the classification of agarics.
2. Discuss in detail the modern techniques available to fungal taxonomists.

SECTION B: Four 5-mark questions to be answered out of six questions
(4 x 5 =20 marks)

3. Describe the different methods of maintaining fungal cultures.
4. Give an account of typification in botanical nomenclature.
5. Give an overview of fungal taxonomic literature.
6. Give an outline of numerical taxonomy.
7. Explain the concept of 'domains' in biological classification.
8. Give an account of the current ideas in fungal phylogeny.

SECTION C: Ten 2-mark questions to be answered out of twelve questions

(10 x 2 =20 marks)

9. Differentiate between dendrogram and phenogram.
10. Differentiate between gene trees and species trees.
11. Differentiate between a monograph and a revision.
12. Differentiate between bracketed keys and indented keys.
13. Differentiate Oomycota from true fungi based on cell-wall chemistry.
14. What is 'Systema Ascomycetum'?
15. What is Rolf Singer's contribution to agaricology?
16. What is an ecotype?
17. What is the most important diagnostic feature of Kingdom Stramenopila?
18. Explain any one chemical spot test used in the identification of agarics.
19. Explain the value of lamellar tramal structure as a taxonomic character.
20. What is *forma specialis*? Give an example.