M.Sc. PLANT SCIENCE

REGULATIONS AND SYLLABI
(Effective from 2010-2011)
Aim of the Course:

The Degree of Master of Science in Plant Science aims to introduce the students to various aspects of plant biology. At the end of the course, the students are expected to have good working knowledge in the field of Plant Science.

Eligibility for Admission:

Candidates for admission to M.Sc. Plant Science shall be required to have passed B.Sc. in Plant Science/ Botany or Life Sciences/Biological Sciences conducted by the Universities approved by UGC, New Delhi with Chemistry/ zoology as allied subject(s) of study or an examination accepted as equivalent thereto and 40 percentage of marks in Part III (aggregate / Part – III), subject to such conditions as may be prescribed therefore.

Lateral Entry (if applicable)

Candidates who have passed Diploma in _______________ in First Class (10+3 years of Study) are eligible to apply for the lateral entry to the 2nd year of the course subject to availability of seats, but limited to 10% of the sanctioned intake.

Duration of the course:

The Course shall be of two years duration spread over four semesters. The maximum duration to complete the course shall be four years (including completion of arrears, if any).

Eligibility for admission to Examination:

Seventy five(75) percentage of attendance for theory
Seventy five(75) percentage of attendance for Practicals
(i.e., % attendance required prescribed if any)

Medium:

The medium of instruction shall be English

Passing Minimum:

Passing eligibility & classification for the award of the Degree is as follows:

Passing Minimum – 50%; II Class – 50 to 60%; I Class – 60 to 75%;
Distinction – above 75%
## Details of papers and scheme of examination

Effective from the academic year 2010-11

<table>
<thead>
<tr>
<th>Semester</th>
<th>Title of Papers</th>
<th>University Examinations</th>
<th>Internal Assessment</th>
<th>Total Marks</th>
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<tr>
<td>I</td>
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<td>75</td>
<td>25</td>
<td>100</td>
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<tr>
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<td>Paper-II Plant Diversity – II (Pteridophytes, Gymnosperms &amp; Palaeobotany)</td>
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<td>Paper-VI Biostatistics &amp; Computer Applications in Biology</td>
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<td>Paper-XII Project* (Individual)</td>
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<td>Practical IV</td>
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*Project to be valued by both examiners (internal and examiner); Viva voce with Power Point Presentation

### Notes

- **Semester System**: Organized academic year into semesters with specific papers for each semester.
- **Internal Assessment**: Marks for internal assessments are 25% of the total marks for each paper.
- **Total Marks**: The total marks for each semester are 1600, with 1200 for University Examinations and 400 for Practical IV.

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**PONDICHERY UNIVERSITY**

**M.Sc. PLANT SCIENCE – SEMESTER SYSTEM**

Details of papers and scheme of examination

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**PAPER-I PLANT DIVERSITY – I (Algae, Fungi, Lichens & Bryophytes)**

**Objectives:**
1. To learn the diversity, structural organization and reproduction of algae, fungi, lichens and bryophytes.
2. To make the students aware of the economic value of Thallophytes, Bryophytes and their exploitation by humans.

**Unit-I  7Hrs**

**Unit-II  7Hrs**

**Unit-III  8Hrs**
Classification of fungi proposed by Alexopoulos and Mims (1979) [In brief, general characters at class level only]. General characters of the following classes: Myxomycetes, Oomycetes, Zygomycetes, Basidiomycetes and Deuteromycetes - Somatic structure of fungi: mycelial and non mycelial thallus – Reproduction in fungi: Asexual and Sexual. Nutrition in fungi – Fructifications found in Ascomycetes - Patterns of Life cycle in fungi. Economic importance of fungi – Mycotoxins, and mycotoxicoses.

**Unit-IV  6Hrs**

**Unit-V  7Hrs**
Schuter’s classification of Liverworts and Reimer’s classification of mosses [In brief, general characters at class level only]. Origin of Bryophytes including fossil evidence - Morphological variations, Anatomical and Cytological studies of Gametophytes and Sporophytes - Dehiscence of capsule and dispersal of spores. Evolution of gametophytes and sporophytes –Affinities of Bryophytes - Progressive sterilization of the sporogenous tissue – Ecology of bryophytes (Pollution indicators and monitoring) – Economic importance of Bryophytes.
Practicals:

**Algae:** Study of the morphology and internal structure of the algae with particular reference to the following forms.
*Oscillatoria, Spirulina, Nostoc, Anabaena, Microcystis, Scytonema, Tolypothrix, Westiellopsis, Cylindrospermum, Chlorella, Desmids, Ulva, Caulerpa, Halimeda, Diatoms, Padina, Dictyota, Sargassum, Gracilaria.*

**Fungi:** Isolation and identification of fungi from bread, soil, seed & dung. Identification of the following genera – *Rhizopus, Mucor, Pilobolus, Aspergillus, Penicillium, Trichoderma, Fusarium, Curvularia & Alternaria.* Section cutting material – *Agaricus, polyorus & Peziza*

**Lichens:** Usnea, Parmelia thallus and Lichen Apothecium for sectioning.

**Bryophyta:** Morphological and Anatomical studies of the following specimens – *Marchantia, Targionia, Reboulia, Dumortiera, Porella, Anthoceros and Pallavicinia.*

Text books:

Objectives:
1. To learn the diversity, structural organization and reproduction of pteridophytes and Gymnosperms.
2. To learn the preserved vestiges of plant life of the geological past.

Unit-I 6Hrs
Classification (G.M. Smith) of Pteridophytes – General aspects of the Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Origin of Pteridophytes: Telome theory; Origin of Leaves; Origin of sporophylls; Origin of roots; Stelar system in Pteridophytes; Comparative account of the important characters of the Psilotopsida, Eligulopsida and Ligulopsida.

Unit-II 7Hrs

Unit-III 7Hrs

Unit-IV 8Hrs

Unit-V 7Hrs
Palaeontology – Mega and microfossils - Geological time table – Salient features of Paleozoic Pteridospermae and Mesozoic Pteridospermae Affinites of the Cordaitales, Resemblances with Cycads, Ginkgoales and Pteridosperms. A detailed study of external, internal morphology and reproduction in the following fossils – Asteroxylon Mackiei, Lepidocarpon lomaxi, Lyginopteris oldhamia, Ginkgo biloba, and Cordaites.
Practicals:

1. Study of morphology, anatomy and reproductive structures of *Psilotum, Lycopodium, Selaginella, Equisetum, Lygodium, Gleichenia, pteris, Ophioglossum, Isoetes, Ceratopteris Marsilea, Cycas, Ginkgo, Cedurs, Araucaria, Podocarpus, Ephedra, Pinus,* and *Gnetum*

2. Study of important fossil forms from slides and specimens.

Text books:

OBJECTIVES:

* To study the internal morphology of root, stem and leaf of angiosperms.
* To learn the various techniques used in Botanical laboratory.

UNIT-I 6Hrs
Nodal anatomy - types.

UNIT-II 7Hrs

UNIT-III 7Hrs
Microsporogenesis and male gametophyte development. Megasporogenesis and female gametophyte development. Pollen-pistil interaction, sexual incompatibility.

UNIT-IV 7Hrs
Structure and development of different types of Endosperms. Embryo development - Dicot (Capsella bursa - pastoris) monocot (Luzula forsteri) polyembryony, apomixes.

UNIT-V 8Hrs
Practicals:

Anatomy

1. Study of living shoots apices by dissection using aquatic plants such as *Ceratophyllum* and *Hydrilla*.
2. Study of cytohistological zonation in the shoot apical meristem (SAM) in sectioned and doubled stained permanent slides of suitable plant such as *Coleus Kolanchoe*, *Tabacco*.
4. Examination of different types of pits – secondary wall thickening – annular, helical and scalariform and pitted thickening.

Embryology:

1. Study of microsporogenesis in sections of anthers.
2. Study of ultrastructure of male gametophyte with the help of slides and microphotographs.
3. Study of ultrastructure of female gametophyte with the help of slides and microphotographs.
4. Field study of several types of flower with different pollination mechanisms
5. Study of nuclear and cellular endosperm through dissections and staining.
6. Isolation of zygotic globular, heart-shaped, torpedo stage and mature embryos from suitable seeds and polyembryony in Mango, *Citrus* by sections.

Laboratory techniques

1. Study of techniques included in the syllabus.

Text books:

Anatomy

**Embryology**

2. Maheswari P. 1976 An Introduction to Embryology of Angiosperms

**Microtechnique**

PAPER-IV PLANT DIVERSITY III,
(Taxonomy of Angiosperms)

Objectives:
• To study the principles of taxonomy of angiosperms
• To know the local flora
• To get training in the identification of angiospermous taxa

Unit- I 7Hrs

The Species Concept, Taxonomy hierarchy, species, genus, family and other categories; principles used in assessing relationship, delimitation of taxa and attribution of rank. Salient features of ICBN, Typification, Priority, Homonyms and Tautonyms, Conservation and Rejection of names, Author Citation, Effective and Valid publication.

Unit-II 7Hrs

Taxonomic evidences: Morphology, Anatomy, Palynology, Embryology, Cytology, Phyto-chemistry, Genome analysis and nucleic acid hybridization. Taxonomic tools: herbarium, floras, histological, cytological, phyto-chemical, serological, biochemical and molecular techniques; computer and GIS.

Unit – III 8Hrs

System of angiosperm classification: phonetic versus phylogenetic systems; cladistics in taxonomy; relative merits and demerits of major systems of classification; Artificial (Linnaeus), Natural (Bentham and Hooker), Phylogenetic (Hutchinson) and Modern (Cronquist) systems, relevance of taxonomy to conservation.

Unit – IV 6Hrs

Study of the following Polypetalae & Gamopetalae families and their economic importance: Menispermaceae, Portulacaceae, Meliaceae, Sapindaceae, Vitaceae, Combretaceae, Lythraceae, Boraginaceae, Gentianaceae, Bignoniacae, and Acanthaceae.

Unit – V 7Hrs

Study of the following Monochlamideae & Monocotyledonae families and their economic importance Chenopodiaceae, Nyctaginaceae, Loranthaceae, Casuarinaceae, Polygonaceae, Aristolochiaceae, Amaryllidaceae, Orchidaceae, Commelinaceae, Araceae, and Cyperaceae.
Practicals:

1. Description of specimens from representative, locally available families.

2. Description of various species of a genus; location of key characters and preparation of keys to generic level. Location of key characters and use of keys at family level. Training in using floras and herbaria for identification of specimens described in the class.

3. Demonstration of the utility of secondary metabolites in the taxonomy of some appropriate genera.

4. Comparison of different species of a genus and different genera of a family to calculate similarity coefficient and preparations of dendrograms.

5. A study tour under the supervision of lecturers to a place of botanical interest.

Note: The students are required to prepare and submit a brief account of the field survey and 30 herbarium sheets of wild plants.

Text books:


PAPER – V PLANT ECOLOGY, RESOURCE UTILIZATION AND CONSERVATION

Objectives:
1. To understand the concepts of plant Ecology
2. To enhance the knowledge of the students in wide array of plant and their interaction with the environment.

Unit-I 7Hrs

Vegetation organization & Development – Community concepts & their characteristics, ecological succession, nutrient cycling, structure & function of ecosystem, biogeochemical cycle of C, N, P & S, population & the environment, ecads & ecotypes.

Unit-II 7Hrs

Vegetation pattern & Biological diversity – Major biomes & vegetation, soil, concept of biodiversity, IUCN categories of threat, speciation & extinction, inventory, hot spots, endemism, plant introductions, biodiversity & ecosystem, local plant diversity & its socio-economic importance.

Unit-III 7Hrs

Ecological Pollution & Management – Air Pollution, Water Pollution & Soil Pollution (Sources, effects on plants & ecosystem, control measures), Climatic change, Greenhouse effect, Global warming, Ozone layer depletion, UV radiation & their impacts on vegetation, Environmental Impact Assessment, Ecosystem restoration, Sustainable development.

Unit-IV 7Hrs

Plant resources: Plant resources – Global and national scenario (terrestrial and marine), various utility values of plant resources (food, fodder, timber, medicinal, aromatic, oil, ornamental, ethical, aesthetic and option values), Ecosystems in India with rich biological diversity (mangroves, coral reefs, wetlands and sub-tropical forests) and threats to these resources (natural and manmade).

Unit V 7Hrs

Conservation and Management of Biodiversity: Need for conserving the biodiversity, International and National aid, policies and legal assistance, Detailed account on In-situ and Ex-situ conservation methods.
Practicals:

1. To calculate mean, variance, deviation, standard error, students t-test, chi square test for comparing two variables related to ecological data.
2. To find out relationship between two ecological variables using correlation coefficient and regression equation.
3. To determine minimum size of quadrat required for the estimation of biomass in grassland ecosystem
4. To study the community by quadrat method by determining frequency, density, abundance & importance Value Index
5. To determine soil moisture, porosity and bulk density and water holding capacity of soil collected from varying depth at different locations.
6. To estimate chlorophyll content in SO2 fumigated and unfumigated plant leaves.
7. To estimate dissolved oxygen content in water samples collected from different sources.
8. To perform simple test for tannins/alkaloid/oil/Starch /Protin.
9. Primary productivity measurement using Light and Dark Bottle method.
10. Field visit to any of the protected habitat or ecosystem with rich biological diversity to assess and document the values and threats.
11. Scientific visit to institutes which are involved in conserving biological diversity to learn the conservation strategies.

Text books:

4. Ecology and Environment by P.D. Sharma
PAPER VI - Biostatistics and Computer applications in biology

Objectives:

- To learn basic principles of biostatistics
- To make students aware of computer applications in biology

Unit-I (6Hrs)

**Biostatistics:** Introduction to Biostatistics, measures of central tendency and measures of dispersion - Measures of variation.

Unit-II (7Hrs)

**Hypothesis testing:** Student’s t-test, Chi-square test, Annova(one way), Correlation (simple) and regression. Experimental designing, planning of an experiment, replication and randomization.

Unit-III (9Hrs)

**Introduction to computers:** Computer types; basic Computer organization; RAM, ROM, PROM and EPROM, Cache memory; Input-output and storage devices; concepts of different operation systems; details of Networks; internet & email; browsing and designing web pages using HTML. Databases types and its uses; fundamentals of digital imaging, uses of programming languages.

Unit IV (7Hrs)

**Computers and Biology:** botanical softwares and its uses, Introduction to Bioinformatics and its applications, EMBL and GenBank and DDBJ Data libraries, PIR Database, Fundamentals of Geographic Information Systems (GIS) and Remote Sensing and its uses in biology, Information systems – BTIS, ENVIS.

Unit V (7Hrs)

**Softwares used in Biology:** Outline of MS-Office (MS-Word, MS-Excel and MS-Power point), Database softwares – MS access, Image editing softwares (Photoshop), Biological Sequence searching and comparison softwares (Blast), Search engines (Google), GIS Softwares (Google Earth).

Practicals:

1. Use of computer and statistical packages (MS-Excel in built in MS-office or SPSS or Minitab) for computation of mean, standard deviation, correlation and annova
2. Tabulation and graphical representation of scientific data using MS-Excel
3. To plot and import Graphs and charts using biological & statically data in MS-office
4. Search biological information (Texts and images) using internet
5. Biological sequence searching using Blast software
Text books:

1. Pranap Kumar Banarjee, 1887. Introduction to Biostatistics (A text book of Biometry), S.Chand & Co, New Delhi
7. EMBL Nucleotide Sequence Database http://www.ebi.ac.uk/embl.html

1. Introduction to Computer

Its Types and uses, Computer Generations, Hardware, software, Elements of computer system, Number Systems:- Decimal, Binary, Octal, hexadecimal, Storage Devices- primary memory, Secondary Memory, Input and output devices.

2. Operating system

Basic Concepts, Organization, functions, operations and types, Features of DOS, Windows and Unix operating systems. Dos Commands.

3. Data Transmission and Networks


4. Programming

High Level languages, Machine languages, Syntax, semantics, Compiler, Interpreter, Algorithms and Flowchart.

5. Programming Language ‘C’
Data types, Constants, variables, Operators, symbolic constants, input and output, increment and decrement operators. Control Structures: while, do-while, for, if, if-else, and switch statement. Functions, header files, recursion, pointers and arrays, structures.

6. Application software

Word processing, formatting, printing setups, mail merge, Table Handling, picture handling, spreadsheet programs, workbooks/worksheets, formatting of sheets, formulae and functions, graphs, Import and export of files/data. Presentation Packages, Slide designing.

Practicals

Introduction to various components of computer, Use of External & Internal DOS Commands, MS-Office – MS Word, MS, Excel, Powerpoint. A simple documentation preparation & printing. Usage of printer & other components. Simple programs in C.

Books Recommended

2. E. Balaguruseamy: Programming In C, TMH Pub
5. Computer Architecture (Schaum's outline) CARTER, TMH

FUNDAMENTALS OF COMPUTERS AND OPERATING SYSTEMS
PRACTICALS
Evolution of Computers - Organization of Modern Digital Computers-Single user Operating System-
Multitasking OS-GUI
a) Word Processing
b) Data Base Management System
c) Spread Sheet Package
d) Presentation Software
Database Management Systems-Data views-Architecture-Data models-Data Dictionary-Relational Databases.
BLUE PRINT OF QUESTION PAPER FOR M.Sc. PLANT SCIENCE
(Effective from the academic year 2010-11)

Time – 3 hrs
Max. Marks – 75

Section – A
Answer all the questions. Each answer should not exceed 50 words.
Two questions from each unit (10 x 2 = 20 marks)
1. Unit I
2. Unit I
3. Unit II
4. Unit II
5. Unit III
6. Unit III
7. Unit IV
8. Unit IV
9. Unit V
10. Unit V

Section – B
Answer all the questions. Each answer should not exceed 200 words.
Two questions from each unit (5 x 5 = 25 marks)
11 a) Unit I
or
11 b) Unit I
12 a) Unit II
or
12 b) Unit II
13 a) Unit III
or
13 b) Unit III
14 a) Unit IV
or
14 b) Unit IV
15 a) Unit V
or
15 b) Unit V

Section – C
Answer any three questions. Each answer should not exceed 600 words.
One question from each unit (10 x 3 = 30 marks)
16. Unit I
17. Unit II
18. Unit III
19. Unit IV
20. Unit V
PRACTICAL PAPER – I (Covering Theory Papers I,II & III)

Time –4 Hrs.         Max. Marks – 75

1. Make a suitable micro preparations of A,B,C & D. Draw labeled sketches and identify them giving reasons. Leave the slide for valuation. (Slide-2 marks, Identification-1 mark, Sketch-1 mark, Notes-1 mark) 4x5=20 Marks.

2. Make a suitable micro preparation (T.S/L.S) of specimen E. Identify giving reasons. Draw labeled sketches. Leave the slide for valuation. (Slide-2 marks, Identification-1 mark, Sketch-1 mark, Notes-1 mark) 1x5=05 Marks.

3. Make a T.S of anther of the given specimen F. Identify the stages giving reasons. Draw labeled sketches. Leave the slide for valuation. (Slide-2 marks, Identification-1 mark, Sketch-1 mark, Notes-1 mark) 1x5=05 Marks.

4. Identify, draw and write notes on G,H,I & J. (Identification-1 mark, Sketch-1 mark, Notes-1 mark) 4x3=12 Marks.

5. Identify, draw and write notes on K,L,M,N,O & P. (Identification-1 mark, Sketch-2 marks, Notes-2 marks) 5x6=30 Marks.

6. Comment on Q. (Identification-1 mark, Notes-2 marks) 1x3=03 Marks.

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<td>Q</td>
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1. Describe the given specimens A & B in technical terms and assign them to their respective families giving reasons. Draw flower, L.S., & Floral diagram. Write Floral formula. (Identification-1, Technical description-2, Flower, L.S-1, Floral diagram-1, Floral formula-1, Reasons-1) 2x7 = 14 Marks.

2. Using the given plant specimens A, B, C, D & E prepare a taxonomic key for identification. 1x5 = 05 Marks.

3. Determine frequency, abundance and density of the given vegetation in F by using quadrate method. Estimate Importance Value Index. (Frequency-2, abundance-2, density-2, IVI-2) 1x8 = 08 Marks.

4. Performs simple test for tannin/Alkaloid/Oil/Starch/Protein in G. (Procedure 4, setup 2, results 1) 1x7 = 07 Marks.

5. Solve the given problem H 1x10 = 10 Marks

6. Tabulate and graphically represent the given scientific data in I using MS-Excel 1x10 = 10 Marks

7. Identify, draw and write notes on J, K and L (Identification - 1, Diagram -2, notes -2). 3x5 = 15 Marks

8. Submission of herbarium sheets = 06 Marks

KEY

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