

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON**

SYLLABUS

**M.Sc. Part I and II Botany
(w.e.f. June, 1997)**

Skeleton of M.Sc. (Part I & II) Botany syllabus to be implemented from June 1997.

Semesterwise distribution course structure M.Sc. (Botany)

SEMESTER-I

Course No.	Course Code No	Titles
1.	Bot.1.1	Angiosperm: taxonomy
2.	Bot.1.2	Molecular Biology, Cytogenetics & Plantbreeding
3.	Bot.1.3	Environmental Botany & Biostatistics
4.	Bot.1.4	Practical (I) on Bot.1.1
5.	Bot.1.5	Practical (II) on Bot.1,2 & Bot.1.3

SEMESTER-II

6.	Bot.2.1	Algae and Fungi
7.	Bot.2.2	Bryophytes and Pteridophytes
8.	Bot.2.3	Gymnosperms and Paleobotany
9.	Bot.2.4	Practical I (Algae, Fungi and Bryophytes)
10.	Bot.2.5	Practical II (Pteridophytes, Gymnosperms & Paleobotany)

- NOTE :
- 1) Botanical excursions are compulsory for Practical courses of each semester.
 - 2) Each theory course consists of 60 lectures.
 - 3) Each theory course requires 5 lectures and 1 tutorial per week.
 - 4) Each practical course requires two practicals per week and each practical requires 4 hours duration.
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NORTH MAHARASHTRA UNIVERSITY, JALGAON
Syllabus for M.Sc. Botany Part-I & II
(w.e. From June 1997
Bot 1.1 Angiosperm Taxonomy

(60 Lectures)

- I. Introduction :
1. Taxonomy and systematics - synonyms or independent branches
 2. Aims and objectives
 3. Principles of Taxonomy.
 4. Diversity in angiosperms with respect to :
 - i) Form, structure and function.
 - ii) Evolutionary status of angiosperms. (5)
- II. Classifications.
1. Review of pre-Darwinian classifications.
 2. Review of post-Darwinian classifications.
 3. Recent modifications. (8)
- III. 1. Discussion of orders as defined in Engler's system with reference to :
- i) Taxonomy
 - ii) Range of floral variation.
 - iii) Inter relationships of the families in the order Helobiae, Liliflorae, Glumiflorae, Scitaminae, Microspermae, Malvales, Rosales, Contortae Tubiflorae, Centrospermae. (12)
2. Discussion of the following families with respect to their salient features and points of biological importance - Cuscutaceae, Lentibulariaceae, Droseraceae, Nepenthaceae, Sarraciniaceae, Orobanchaceae, Balanophoraceae, Rafflesiaceae, Santalaceae, Loranthaceae, Podostemaceae, Rhizophoraceae, Cactaceae and Orchidaceae. (10)
- IV : Discussion of the following with respect to :
- i) Ranales - a group of most primitive dicotyledons, evolutionary trends.
 - ii) Amentiferae - A heterogeneous assemblage of moderately advanced dicotyledons, Evolutionary trends. (6)
 - iii) Sympetatae - Heptaphyletic in origin, evolutionary trends.
- V : Modern trends in taxonomy
- i) External morphology in relation to taxonomy.
 - ii) Anatomy in relation to taxonomy.
 - iii) Embryology in relation to taxonomy.
 - iv) Palynology in relation to taxonomy.
 - v) Chemotaxonomy
 - vi) Cytotaxonomy. (8)
- VI Botanical Nomenclature :
- i) Common and Scientific names.
 - ii) International code of Botanical Nomenclature (ICBN)
 - iii) Codes of Nomenclature - Paris code, Rochester code, Vienna code, American code.
 - iv) Principles of the code - I to V.
 - v) Type method.
 - vi) Author citation.
 - vii) Effective and valid publication.
 - viii) Rejection and retention of names. (6)
- VII General Evolutionary trends in Angiosperm.
- i) Habitat and Growth habit.
 - ii) Leaf structure simple and compound phyllotaxy.
 - iii) Phyllode theory.
 - iv) Evolution of inflorescence.
 - v) Primitive stamen and carpel.
 - vi) Nature of inferior ovary.
 - vii) Evolution of floral nectaries.
 - viii) Evolution of Gynoecium. (5)

M.Sc. I
Semester I (Botany)
Bot. 1.2 : Molecular Biology, Cytogenetic and Plant Breeding.
(60 Lectures)

Molecular Biology (24)

1. Genome organization in prokaryotes and eukaryotes. (6)
 - i) Organization of prokaryotic DNA
 - ii) Organization of eukaryotic DNA, nucleosome, chromosome structure.
 - iii) Specialized chromosomes - polytene, lampbrush and Supernumerary chromosomes.
2. DNA Structure and replication. (5)
 - i) Structure and types of DNA
Viral, Bacterial, Plastid, Mitochondrial, A, B, C, D & Z - DNA
 - ii) Replication of closed circular and linear DNA.
 - iii) DNA damage and repair mechanism.
3. R N A Structure and Synthesis. (5)
 - i) Transcription
 - ii) Processing of R N A - capping, Polyadenylation, Splicing, introns and exons.
 - iii) Types of R N A : t - R N A, m - R N A, r - R N A.
 - iv) R N A, structure and function of R N A.
4. Gene structure and regulation of gene expression. (5)
 - i) Comparison of prokaryotic and eukaryotic genes - RNA gene.
 - ii) Regulation in prokaryotes by inducible and repressible operons with suitable examples.
 - iii) Regulation in eukaryotes at DNA level, transcriptional and post transcriptional level, translational level.
 - iv) Britten and Davidson's model.
5. DNA Sequences in prokaryotic and eukaryotic genome. (3)

Crytogenetics (24)

6. Linkage, recombination and genetic mapping in Fungi. (4)
 - i) Genetic markers.
 - ii) Tetrad analysis in Neurospora and yeast.
 - iii) Recombination mapping in Neurospora and yeast.
 - iv) Molecular mechanism of genetic crossing over.
7. Linkage, recombination and genetic mapping in bacteria. (4)
 - i) Genetic markers.
 - ii) Recombination and mapping of bacterial genes by transformation and conjugation.
8. Linkage, recombination and genetic mapping in bacteriophages. (3)
 - i) Genetic markers.
 - ii) Recombination and mapping.
 - iii) Circular permutation of genomes.
 - iv) Fine structure of r-II locus.

9. Cytogenetics of euploids and aneuploids. (3)
 - i) Origin, classification and cytological behaviour of haploids, autopolyploids and allopolyploids.
 - ii) Origin, classification and cytological behaviour of monosomics, nullisomics and trisomics.
10. Cytogenetic behaviour of deletions, duplications, inversions and translocations. (3)
11. Cell Cycles. (3)
 - i) Mitosis and meiosis.
 - ii) Molecular events in the cell cycle.
 - iii) Spindle apparatus and movement of chromosomes.
12. Population genetics. (2)
 - i) Effects of selection, mutation, migration and genetic drift of gene frequencies in population.
13. Genetic Engineering. (2)
 - i) Principles and methods of genetic engineering, gene targeting.
 - ii) Application in agriculture, health, medicine and industry, Hybridoma technology.

Plant breeding (12)

14. Nature and goal of plant breeding, definition aims, Objective scope and importance. (3)
15. Important conventional methods of breeding, Self and cross pollinated and Vegetatively propagated crops. (4)
16. Importance of non-conventional methods of breeding, polyploidy, genetic Variability. (3)
17. Plant diseases and defensive mechanisms. (2)

Reference Books

1. Biochemistry of Nucleic acid -
By Adams, Knowler and Leader Chapman and Hall NY. 1986
2. Molecular biology of the gene by J. Watson, Hopkins, Roberts, Steitz and Weiner. The Benjamin Cummings Publishing Co. Inc. USA, 1987.
3. D N A - Protein interactions by
Travers, A. Chapman & Hall NY. 1993.
4. Plant molecular biology by Greirson and Covey, Chapman & Hall, N.Y. 1985
5. Molecular biology of cell - Alports B. Bray D., Lewis J. Raff M, Roberts K. Watson J.D.
6. Genetics - Stickberger M.W. IIIrd Edition.

7. Burnham C.R. Discussion in Cytogenetics Burgeress publishing Co.
8. Chromosome Techniques Theory and Practice. Butter worth London
Sharma A and A.Sharma.
9. Cell and Molecular Biology - Dr.Robertis, D.D.M. and E.M.F.
- Dr.Robertis.
10. Genetics - Good enough Ursula. Hold Sounder Inteds.
11. Gene - Lewin B. Wilely Eastern Ltd.
12. Gene Expression Vol.1 II, III ~ Wilely Interscience publish
13. Cytogenetics - Swanson O.P. merz and Young Prentice Hall.
14. Modern Genetics Vol. I,II & III ~ Academic Press London and N.Y.
15. Principles of plant breeding - R.W.Allard.
16. Elementary Principles of Plant breeding By H.K.Choudhary.

Semester - I

Bot. 1.3 Environmental Botany and Biostatistics (60 Lectures)

Environmental Botany (48 Lectures)

1. Environmental science as interdisciplinary subject, its scope and necessity. (4)
2. Environmental complex and organism - (6)
 - i) Concept of stress and strain.
 - ii) Adaptations and Concept of limiting factors.
 - iii) Concept of Habitat and Niche.
 - iv) Scope and necessity.
3. Population ecology and biological control - (6)
 - i) Concept of population and population attributes.
 - ii) Concept of carrying capacity and environmental resistance.
 - iii) Population growth forms.
 - iv) Population interactions : Competition, co-habitation, Co-existence and allelopathy.
 - v) Human population growth.
4. Community ecology : (6)
 - i) Concept of community and basic return.
 - ii) Community - Structure, Organization and functions.
 - iii) Phyto-sociological aspects of community.
 - iv) Methods of studying communities.
 - v) Ecotypes and Ecophenes.
5. Environments monitoring : (4)
 - i) Biological monitoring
 - ii) Bioindicators and environmental monitoring.

6. Energy and its sources : (4)
- i) Conventional and exhaustible energy sources.
 - ii) Non-Conventional and inexhaustible energy sources.
 - iii) Conservation of energy.
7. Wastes : Ecological and Economic considerations. (6)
- i) Waste management-Mechano-chemical treatment.
 - ii) Biodeterioration of wastes.
 - iii) Recycling of wastes in production process.
8. Resource management : (6)
- i) Importance, depletion and management of Grassland forest and Soil.
9. Environmental pollution ; (6)
- i) Concept, definition, types and sources.
 - ii) Water pollution : eutrophication, bioaccumulation biomagnification, hazards, remedial measures.
 - iii) Air pollution Sources, effect on human beings and higher plants biodeterioration, depletion of ozone layer, green house effect, acid rain and invisible threat, measures of control.

Biostatistics : (12 Lectures)

1. Statistical population, Sampling.
2. Mean and Use of contrast, like mean, mode, median and standard deviation.
3. Probability and hypothesis testing.
4. Distribution - Binomial, Poisson and normal tests of significance F & T and X² test, Analysis of variance.
5. Correlation and linear regression, design of experiments and field plot techniques (brief outline)

**Bot.- 1.4 Practical - I (on Bot.1.1 Angiosperm Taxonomy)
(24 Practicals)**

(1-15) :- Study of following families with respect to morphological characters using botanical terms, floral formula, floral diagram and Classification giving reasons as per Bentham and Hooker's system:-
(Any 30 families)

Menispermaceae, Nymphaeaceae, Papaveraceae, capparidaceae,
polygallaceae, Portulacaceae, Malvaceae, sterculiaceae,
Zygophyllaceae, Geraniaceae, Rutaceae, meliaceae, Celastraceae,
Rhamnaceae, Vitaceae, Sapindaceae, Moringaceae, Papilionaceae,
Cesalpiniaceae, Mimosaceae, Combretaceae, Myrtaceae, Lythraceae,
passifloraceae, Cucurbitaceae, Molluginaceae, Aizoaceae, Umbelliferae,
Rubiaceae, Compositae, Sapotaceae, Oleaceae, Boraginaceae,
Convolvulaceae, Schrophulariaceae, Bignoniaceae, Acanthaceae,
Verbenaceae, Labiatae, Nyctaginaceae, Amaranthaceae, Polygonaceae,
Euphorbiaceae, Hydrocharitaceae, Scitamineae, Amaryllidaceae,
Liliaceae, Commelinaceae, Typhaceae, Cyperaceae, Gramineae.

(16-19) :- Identification of genus and species with the help of flora of the plant material from the families mentioned above.

(20-22) :- Preparation of artificial bracketed/Indented dichotomous keys based on Vegetative and reproductive characters.

(23-24) :- Study of morphological/biological peculiarities of the following :-

- i) Prosera, Utricularia, Nepenthes,
- ii) Striga, Cuscuta, Loranthus, viscum,
- iii) Lemma, Wolffia, Vallisneria, Limnophila, Ottelia.
- iv) Inflorescence / Flower of :-
Tropae, Orchid, Spadix, Cyathium, Catkin, Cleistogamous flowers.

- Note:-
- 1) Submission of 30 herbarium sheets duly identified and certified, is compulsory.
 - 2) Botanical excursion and submission of excursion report is compulsory.

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**M.SC. I Sem.I Bot.1.5 - Practical - II (24 Practicals)
(On Bot. 1.2 & Bot. 1.3)**

Pract. No.1 and pract. No.2 :-

- i) Pretreatments of Root tips by 8-Hydroxyquinolene, Para dichlorobenzene, colchicine.
- ii) Preparation of stains - Acetocarmine, Crystal violet, Heidenhain's Haematoxylene, Leuco basic fuschin.
- iii) Fixatives - Cornoy's fluid, fixatives for algal, Fungal, Materials - (see A.K.Sharma) (chromosome techniques)

Practical No.3 :-

- i) Seed treatments for different concentrations of colchicine for different durations sowing the seed to obtain future plants - Induction of polyploidy.

Practical No.4 :-

- i) Plant hybridization techniques and visit to agriculture college.

Practical No.5 :-

- i) Microtomy of Root-tips - Aloe, Rhoec, -Buds - Use of Crystal violet Schedule. Use of Haematoxylene.

Practical No.6 :-

- i) D N A Isolation Extraction.

Practical No.7 and Practical No.8 :-

- i) Root tip-squash Technique.
- ii) Making cytological preparations permanent by Alcohol - Xylol Canadabalsam n-Butanol - Acetic acid - Euperal method.
- iii) Study of mitosis with the help of permanent slides.
- iv) Chromosomal aberrations - Translocation ring Inversion bridges.

Practical No.9 :-

- i) Meiosis - Anther smear technique.
- ii) Meiosis - Anther squashes.

Practical No.10 :-

- i) Chironomus larvae - polytene chromosome.

Practical No.11 & Practical No.12 :-

- i) Preparation of ideogram from onion root tip chromosome.
 - a) Preparation of Semipermanent/Permanent slides.
 - b) Camera lucida sketching of chromosome.
 - c) measurement of length of the chromosomes.

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Bot. 1.5 Practical - II (24 Practicals)

13-15 Practical on study of vegetation by using following methods.

- a) List count quadrats.
- b) Belt transect.
- c) Line transect.
- d) Chart method.

16. Estimation of basal area.

17. Estimation of biomass.

18-19 Soil analysis for i) ph ii) moisture holding capacity iii) Conductivity iv) Nitrogen test.

20. Studies on ecological instruments. (at least any Six)

21-22 Studies on pond ecosystem (polluted & Unpolluted sites)

Analysis of plants and water of the pond.

Parameters -

- i) Dissolved CO_2
- ii) free CO_2
- iii) Carbonate
- iv) bicarbonate
- v) Total alkalinity
- vi) hardness viii) Chlorides
(any four)

23-24 Biostatistics

Examples based on biological data

- a) Estimation of probability.
- b) Estimation of Standard deviation.
- c) Test of Significance (χ^2 & T test)
- d) Normal distribution.

Semester - II

Bot. 2.1 - Algae and Fungi (60 Lectures)

A: Algae :-

- 1) Study of the following selected groups of algae in detail with reference to :-
 - i) Classification upto orders according to G.M. Smith.
 - ii) Occurrence and distribution.
 - iii) Structure.
 - iv) Reproduction.
 - v) Life cycle pattern.
 - vi) Phylogeny & interrelationships.

Algal groups :- (10)

1. Chlorophyta :-
 - i) Chlorophyceae.
 - ii) Charophyceae.
2. Chrysophyta :- (4)
 - i) Chrysophyceae.
 - ii) Xanthophyceae.
 - iii) Bacillariophyceae.
3. Phaeophyta :- (4)
 - i) Isogeneratae.
 - ii) Heterogeneratae.
 - iii) Cyclosporae.
4. Rhodophyta :- (4)
 - i) Rhodophyceae.
5. Cyanophyta :- (6)
 - A 2) Economic importance of algae. (2)

Fungi :-

1. General - History, scope & importance. (2)
Five kingdom system.
2. Outline classification according to :- (4)
 - i) Ainsworth G.E. (1973).
 - ii) Alexopoulos. T & C.W. nims (1979)
3. General account of following groups with respect to-16
 - i) Characters.
 - ii) Reproduction.
 - iii) Life cycle pattern.
 - iv) Phylogeny & interrelationships.
 - v) Economic importance.

- Groups :-
- a) Myxomycota.
 - b) Mastigomycotina.
 - c) Zygomycotina.
 - d) Ascomycotina.
 - e) Basidiomycotina.
 - f) Deuteromycotina.

4. Study of following fungal diseases with respect to - (8)
- i) Causal Organization.
 - ii) Symptomis.
 - iii) Disease cycle.
 - iv) Control measures.
 - v) Defensive mechanism.

- Diseases :-
- a) Club rot of crucifiers.
 - b) Tikka disease of groundnut.
 - c) Late blight of potato.
 - d) Downy mildew.
 - e) Powdery mildew.
 - f) Ergot.
 - g) Rust.
 - h) Smut.

BO. 2.2 Bryophyta and pteridophyta (60 Lectures).
Bryophyta (30 Lectures)

- A)
- 1) Classification of Bryophytes proposed by G.M. Smith in details upto Orders. (3)
 - 2) Evolution of gametophyte and sporophytes of Bryophyta. (3)
 - 3) Distribution of Bryophytes in India and their micro-Climate. (3)
 - 4) Contribution of Indian Bryologists Kashyap R. Pande, Mehara, RamUdar. (2)
 - 5) Fossil Bryopytes. (1)
- B) Distinguishing features, interrelationships, phylogeny and evolutionary tendencies of the following orders with their affinities.
- 1) Hepaticae - Sphero carpales (1)
 - Marchantiales (3)
 - Jungermanniales (3)
 - Takaiiales (1)
 - Calobryales (1)
 - 2) Anthocerotae - Anthocerotales (3)
 - 3) Musci - Sphagnales. (2)
 - Andreales. (2)
 - Polytricales. (2)

Pteridophyta (30 Lectures)

- C) Classification of Pteridophytes proposed by Reimers and Distribution of pteridophytes in India.. (3)
- D) Morphology, anatomy, and comparative discussion of sporophytes, gametophytes, interrelationship, evolutionary tendencies, and phylogeny of living orders.
- 1) Psilotales. (1)
 - 2) Lycopodiales. (1)
 - 3) Isoetales. (1)
 - 4) Selaginellales. (2)
 - 5) Equisetales. (2)
 - 6) Marattiales. (1)
 - 7) Ophioglossales. (2)
 - 8) osmundales. (2)
 - 9) Filicales. (2)
 - 10) Marsileales. (2)
 - 11) Salviniales. (1)
- Contribution of Indian Pteridologists, Rashida, S.S.Bir. (1)

- E) 1) Economic importance of Pteridophytes. (1)
 2) Stele theory and evolution. (2)
 3) Heterospory and seeds habit. (1)
 pre-requisites of seed habit.
 4) Solar evolution. (1)

Recommended Books for Course 2.2

- 1) Cryptogamic Botany Volume. II by G.M.Smith.
- 2) Bryophytes by N.S.Parihar.
- 3) Liverworts of western Himalya By - Kashyap S.R.
- 4) Bryophytes Morphology, Growth & Differentiation.
- 5) Bryophytes By Pande, Mishra and Trivedi.
- 6) Morphology of Pteridophytes by N.S.Paihar.
- 7) Comparative morphology of vascular plants.
 by Foster A.S. - G. ford E.M.
- 8) An Introduction to pteridophytes by Rashid A.
- 9) Bryophytes - By - Vasistha.
- 10) Pteridophytes - By - Vashistha.

Bot.2.3 Gymnosperms and Palaeobotany (60 Lectures)

Gymnosperms (30 Lectures)

1. Outline of systems of classification of Gymnosperms Sporne's system of classification. (3)
2. General characters, distribution, morphology, anatomy, sporogenesis, gametogenesis, embryology, their affinities, evolutionary trend and phylogeny of following living orders- (24)
 i) Cycadales.
 ii) Ginkgoales.
 iii) Coniferales.
 iv) Taxales.
 v) Gnetales.

3. Economic importance of Gymnosperms. (3)

Palaeobotany (30 Lectures).

1. Classification, morphology, affinities and evolutionary trends in (20)
 i) Psilophytales.
 ii) Lepidodendrales.
 iii) Calamitales and Sphenophyllales.
 iv) Coenopteridales.
 v) Marattials, Filicales.
 vi) Pteridospermales.
 vii) Glossopteridales.
 viii) Pentoxiales.
 ix) Bennettitales.
 x) Cycadales.
 xi) Ginkgoales.
 xii) Cordiatales.
2. Fossil Angiosperms. (2)
3. Geological time scale. (2)
4. Palaeobotanical techniques. (2)
5. Types of preservation. (2)
6. Contribution of Birbal Sahni, K.R.Surange, D.D. Pant & T.S.mahabale. (2)

Semester - II.

Bot. 2.4 Practical - I (Algae, Fungi & Bryophytes.)

Total - 24 Practicals.

Algae :- (8 Practicals.)

Pract. 1 - 3 - Chlorophyta :-

Chlamydomonas, Gonium, Pandorina, Eudorina, Volvox, Chlorella, Pediculus, Scenedesmus, Hydrodictyon, Ulothrix, Cylirocapsa, Schizomeria, Ulva, Enteromorpha, Cladophora, Rhizoclonium, Pithophora, Chaetophora, Draparnaldia, Draparnaldionia, Eritrichia, Spirogyra, Zygnema, Stigeoclonium, Coleochaetae, Cylirocystis, Staurastrum, Sirogonium, Closterium, Cosmarium, Caulerpa, Helinoda, Codium, Oedogonium, Bulbochaetae. (Any 24 Forms).

Pract. 4 - Charophyceae - Chara, Nitella.

Pract. 5 - Chrysophyta.

- i) Xanthophyceae - Vaucheria, Botrydium.
- ii) Bacillariophyceae - Navicula, Pinnularia, Fragillaria, Nitschia, Cymbella, Cyclotella, Pleurosigma, Gyrosigma. (Any 4 Forms.)

Pract. 6 - Phaeophyta :-

Ectocarpus, Dictyota, Padina, Lyngbya, Gelidium, Sargassum.

Pract. 7 - Rhodophyta :-

Comanodon, Batrachospermum, Gracilaria, Polysiphonia.

Pract. 8 - Cyanophyta :-

Chroococcus, Oscillatoria, Dismidium, Lyngbya, Anabaena, Nostoc, Sextonema, Rivularia.

Pract. 9 - Myxomycota :-

Stemonites, Arcyria, Physarum, Plasmodiophora, Diderma, Fuligo.

Pract. 10 - Mastigomycotina -

Synchytrium, Physoderma, Saprolegnia, Achlya, Plasmopara, Peronospora, Sclerospora, Pythium, Phytophthora, Albugo, Allomyces. (Any 8).

Pract. 11 - Zygomycotina -

Mucor, Rhizopus, Zygorhynchus, Entomophthora, Pilobolus.

Pract. 12 & 13 - Ascomycotina -

Urena, Peziza, Morchella, Xylaria, Hypoxylon, Claviceps, Phialophora, Chaetomium, Erysiphe, Phyllactinia, Uncinula, Eurotium, Elsinoe, Taphrina, Parodiella. (Any 12)

Pract. 14 & 15 - Basidiomycotina -

Puccinia, Uromyces, Hapliphia, Gaiopsis, Ravendia, Melampsora, Dasturella, Nasseella, Ustilago, Sphaerolotheca, Urocystis, Doassansia, Clavaria, Agaricus, Pleurotus, Polyporus, Hexagonia, Coprinus, Phyllus, Cyathus, Lycoperdon, Geaster (Any 12)

Pract. 16 - Deuteromycotina -

Cereospora, Fusarium, Alternaria, Helminthosporium, Curularia,
Beltrania, Aspegillus, Penicillium. (Any 6)

Practical Course of Bryophyta.

Bryophyta - Total 8 Practicals 17 to 24.
Morphological, anatomical and reproductive.
Studies of the following orders.

Pract. 17 to 19 - 1) marchantiales :- Plagiochasma,
Targionia,
Asterella,
Conoccephalum,
Dumortiera.

Pract. 20 & 21- 2) Jungermanniales :- Pellia,
Pallavicinia,
Fossombronia,
Leigunia,
Frullania.

Pract. 22 & 23 - 3) Anthocerotales:- Anthoceros,
Pheoceros,
Notothylus.

Pract. 24 - 4) Musci. :- Sphagnum,
Polytrichum,
Pogonatum.

Note:- Botanical excursion are compulsory for collection of Algae
Fungi & Bryophytes.

1. Ainsworth, et al. (eds) 1973- The Fungi : An Advanced Treatise
Vol. IV A and IV B. Academic Press, London.
2. Alexopoulos and Mims (1979) Introductory mycology. Wiley Eastern
Ltd.
3. Bessey, E.A. (1950) Morphology & taxonomy of Fungi.
4. Dube, H.C. (1996) An introduction to Fungi.
5. Hawker, L.E. (1974) Fungi.
6. Mehrotra and Aneja (1991) An Introduction to Mycology.
7. Vaidya, J.G. (1995) Biology of the Fungi.
8. Webster, J. (19-) Introduction to the Fungi Cambridge Uni.
Press.
9. Sarbhoy, A.K. (1983) Advanced Mycology. Today and Tomorro's
Pub. New, Delhi.
10. Kamat, M.N. - (1959) Hand book of Mycology. Vol. I & II Prakash Pub.
Hon. Pune.
11. Agrios, G.N. (1969) Plant Pathology, Academic Press. New York.
12. Butler, E.J. (1918) Fungi and diseases in Plants.
13. Bilgrami and Dlabé (1976) Text book of Modern Pathology. Vikas
Publication, New Delhi.
14. Kamat, M.N. (1957) Introductory Plant Pathology.
Prakash Pub. House - Pune.
15. Mukerji and J. Bhasin (1906) Plant Diseases of India.
Tata Mac - Graw Hill, New Delhi.
16. Mehrotra (1991) Plant Pathology, International Publ. House. New
Delhi.
17. Mundkar. B.B. (1953) Fungi and Plant diseases.
18. Singh. R.S. (1995) Plant diseases. Ox-food & IBH. Pub. New Delhi.

19. Singh R.S. (1993) Introduction to principles of Plant Pathology
Ibid.
20. Tarr, S.J.J. (1972) The Principles of Plant Pathology. Mac -
Millan, London.
21. Ghia. O.H. (1990) Mycology, Wiley East Ltd., New Delhi.
22. Ghia, O.H. (1990) Plant pathology, Wiley East Ltd., New Delhi.

Bot 2.5

Bot. 2.5 Practical - II

Pteridophytes, Gymnosperms & Paleobotany.

Pteridophyta - 1 - 8.

Morphological, anatomical & reproductive - Studies of following members.

- Pract. 1) Pailotum, Lycopodium.
 Pract. 2) Isoetes, Selaginella.
 Pract. 3) Ophioglossum, Botrychium, Angiopteris, Marattia, Osmunda. (Any Two)
 Pract. 4 to 6 - Lygodium, Gleichenia, Cyathia, Hymenophyllum, Pteris, Pleoletis, Blachum, Adiantum, Asplenium, Cheilanthus (Any Six)
 Pract. 7) Marsilea.
 Pract. 8) Salvinia, Azolla.

Gymnosperms - 9 to 16.

Pract. 9 to 11 - Cycadales.

- a) External morphology of vegetative parts - Cycas & Zamia.
- b) Megasporophyll / megasporangiate Strobili - Cycas, Zamia.
- c) Microsperangiate strobili - Cycas, Zamia.
- d) Gametophyte - embryogeny - Cycas = embryo.
Zamia = Archegonia, Proembryo.
- e) Anatomy - T.S. of rachis & pinna of Cycas & Zamia.

Pract. 12 to 14 - Coniferales & Taxales.

Pinus, Cupressus / Thuja, Araucaria, Agathis.
Podocarpus, Taxodium.

- a) Double stained permanent preparation of stem any two genera.
- b) T.S., T.L.S. & R.L.S. of wood any two genera.
- c) Study of male Cone - microsporophyll, mounting of microspores - any two genera.
- d) Female cones & ovuliferous scales any two genera.
- e) Gametophyte & embryogeny of Pinus.

Pract. 15 & 16 - Gnetales - Ephedra & Gnetum.

- a) External morphology.
- b) Morphology of reproductive parts.
- c) Gametophytes & embryogeny - female gametophyte.
- d) Anatomy - i) T.S. of stem.
ii) T.S., T.L.S. & R.L.S. of wood.

Palaeobotany - (8 Practicals).

External Morphological and anatomical study of the following.

Pract. 17 & 18 - Pailopsida :-

Pailophytas Princeps, Rhynia (Stem T.S.)
Lycopsida -

Stem genera - Lepidodendron vasculare.
Lepidodendron Sclerotium.

Leaf Cushions - Lepidodendron, Sigillaria.
Root - Stigmaria.

Fructification - Lepidostrobus, Lepidocarpon.

Pract. 19 - Sphenopsida :-

Stem genera - Sphenophyllum, Annularis.
Fructification - Calamostachys.

Pract. 20 - Maraltiales & Filicales -

Psaronius, Scoleopteris, Rodeites.

Pract. 21 - Pteridosperms. -

Foliage - Pecopteris, Sphenopteris, Alethopteris,
Neuropteris, Glossopteris.
Stem genera - Lyginopteris Medullosa, Vertebraria.

Fructification - Doleriotheca formosa.

Pract. 22 & 23 -

Cordaitales, Ginkgoales, Pentoxylales, & Bennettitales = Foliage =
Cordaites, Ptilonophyllum, Ginkgo, Digitata Nipaniophyllum.
Stem genera - Cordaites, Pentaxylon.
Fructification - Cardiocarpon, Carnoconites.

Pract. 24 - Angiospermes :-

Monocotyledons = Palmoxylon, Rhizonaloxylon, Cyclanthodendron,
Tricocoites.

Dicotyledons :- Dicotstem, Dicot Leaf impression,
Enigmocarpon.
Sahnianthus.
Sahnipushpan.

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JBB/WS/SYLL/MSCBOT