॥ अंतरी पेटवू ज्ञानज्योत ॥

उत्तर महाराष्ट्र विद्यापीठ, जळगाव
NORTH MAHARASHTRA UNIVERSITY,
P.B.NO.80, UMAVINAGAR, JALGAON- 425 001 (M.S)
EPABX:(0257)252187-90 Fax No:0257-252183Gram: UTTAMVIDYA

जा.क.: उमवि/१२ /विज्ञान विद्याशाखा /७१७/२००२. दिनांक : २३/०७/२००२

* परिपत्रक क्र. ४९/२००२ *

विषय :- शैक्षणिक वर्ष २००२-२००३ पासून सुधारित अभ्यासक्रम लागू करणेबाबत....

विद्यापीठ अनुदान आयोगाचे निर्देशाप्रमाणे व विद्यापीठ अधिकार मंडळांनी घेतलेल्या निर्णयानुसार शैक्षणिक वर्ष-२००२-२००३ पासून विज्ञान विद्याशाखेतील **एम.एससी. (भाग-१)** रसायनशास्त्र आणि वनस्पतीशास्त्र विषयांचे सुधारित अभ्यासक्रम लागू करण्यात येत आहेत :-

एम.एससी. (भाग-१)

१) रसायनशास्त्र.
२) वनस्पतीशास्त्र.

सहपत्र :- वरीलप्रमाणे अभ्यासक्रमाच्या प्रती.

कुलसचिव.

प्रति,
मा.प्राचार्य,
सर्व संबंधित संलग्नित महाविद्यालये.

प्रतिलिपी :-

१) मा.अधिष्ठाता, विज्ञान विद्याशाखा.
२) मा.प्रा.श्री. _____ अध्यक्ष, _____ अभ्यासमंडळ.
३) मा.परिक्षा नियंत्रक (पाच प्रती)
४) उपकुलसचिव, संलग्नता विभाग, उ.म.वि., जळगाव
५) पध्दती विश्लेषक, संगणक विभाग, उ.म.वि., जळगाव.
६) सहा.कुलसचिव, परीक्षा विभाग, संबंधित विद्याशाखा, उ.म.वि., जळगाव.
७) सभा व दप्तर विभाग, उ.म.वि., जळगाव.
८) मा.कुलगुरू कार्यालय, उ.म.वि., जळगाव.
९) मा.कुलसचिव कार्यालय, उ.म.वि., जळगाव.

॥ अंतरी पेटवू ज्ञानज्योत ॥

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus for M.Sc.

BOTANY (Part-I).

(W.e.f. Acd.Yr. 2002 - 2003)

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

THEORY AND PRACTICAL COURSES FOR M.Sc. IN BOTANY PART-I & II.

Scheme of Courses.

M.Sc. Part-I

(W.e.f. Acd.Yr. 2002-2003).

Semester-I	BOT	1.1	Systematics-I : Angiosperm Taxonomy
	BOT	1.2	Molecular Biology, Cytogenetics and Plant Breeding
	BOT	1.3	Environmental Botany
	BOT	1.4	Practical (I) Based on BOT 1.1
	BOT	1.5	Practical (II) Based on BOT 1.2 & 1.3
Semester-II	BOT	2.1	Systematics-II : Algae and Fungi
	BOT	2.2	Systematics-III : Archegoniatae and Paleobotany
	BOT	2.3	Botanical Techniques and Computer Applications
	BOT	2.4	Practical (I) Based on BOT 2.1 and BOT 2.3
	BOT	2.5	Practical (II) Based on BOT 2.2

M.Sc.Part-II

Semester-III	BOT	3.1	Plant Biotechnology
	BOT	3.2	Plant Physiology and Biochemistry
	BOT	3.31	Algae Special Paper-I
	BOT	3.32	Mycology and Plant Pathology Special Paper-I
	BOT	3.33	Angiosperm Special Paper-I
	BOT	3.34	Plant Physiology Special Paper-I
	BOT	3.4	Practical (I) Based on BOT 3.1 and BOT 3.2
	BOT	3.5	Practical(II) Based on BOT 3.31 or BOT 3.32 or BOT 3.33 or BOT 3.34
Semester-IV	BOT	4.1	Developmental Botany
	BOT	4.21	Algae Special Paper-II
	BOT	4.22	Mycology and Plant Pathology Special Paper-II
	BOT	4.23	Angiosperm Special Paper-II
	BOT	4.24	Plant Physiology Special Paper-II
	BOT	4.31	Algae Special Paper-III
	BOT	4.32	Mycology and Plant Pathology Special Paper-IIII
	BOT	4.33	Angiosperm Special Paper-III
	OT	4.34	Plant Physiology Special Paper-III
	BOT	4.4	Practical (I) Based on BOT 1
	BOT	4.5	Practical (II) Based on BOT 4.21 and BOT 4.31 or BOT 4.22 or BOT 4.32 or BOT 4.23 and BOT 4.33 or BOT 4.24 and BOT 4.34

Note : 1 Botanical excursions are compulsory for practical courses of each semester.
2 Each theory course consists of total 60 lectures of 60 minutes each.
3 Each theory course requires 5 lectures and 1 tutorial per week.
4 Each practical course requires 2 practicals per week and each practical requires 4 hours duration.
5 Duly certified practical journals and tour reports are necessary for appearing all practical examinations.

Cont... 2

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus For M.Sc. Botany (Part-I)

(W.e.f. Acd.Yr 2002-2003).

SEMESTER-I

Bot. 1.1 Systematics I : Anglosperm Taxonomy.

(Total : 60 Lectures)

CHAP.(I) Introduction : (2 L)

i) Taxonomy and systematics-synonyms or independent branches
ii) Aims and Objectives
iii) Principles of Taxonomy
iv) Diversity in anglosperms with respect to :
  a) Form, structure and function
  b) Evolutionary status of Angiosperms

CHAP. (II) Classifications : (8 L)

i) Review of pre-Darwinian Classifications
ii) Review of post-Darwinian Classifications
iii) Recent modifications.

CHAP. (III) Discussion of orders as defined in Engler's system with reference to: (12 L)

i) Taxonomy
ii) Range of floral variation
iii) Interrelationships of the families in the orders: Helobiae, Liliflorae, Glumiflorae, Scitaminae, Microspermae, Malvales,Rosales,Contortae,Tubiflorae,Centrospermae.

CHAP.(IV) Discussion of the following families with respect to : (12 L)

Salient features and points of biological importance : Cuscutaceae, Lentibulariaceae, Droseraceae, Nepenthaceae, Sarraciniaceae,Orobanchaceae, Balanophoraceae, Rafflesiaceae, Santalaceae, Loranthaceae, Podostemaceae, Rhizophoraceae, Cactaceae, Orchidaceae, Aristolochiaceae.

CHAP.(V) Discussion of the following with respect to : (6 L)

i) Ranales : A group of most primitive dicotyledons, evolutionary trends.
ii) Amentiferae : A heterogeneous aasemblage of moderately advanced dicotyledons, evolutionary trends.
iii) Sympetatae : Heptaphyletic in origin, evolutionary trends.

CHAP.(VI) Recent Trends in Taxonomy : (8 L)

i) Embryology in relation to taxonomy.
ii) Anatomy in relation to taxonomy.
iii) Palynology in relation to taxonomy.
iv) Chemotaxonomy
v) Cytotaxonomy.

Cont..3

CHAP.(VII) Botanical Nomenclature : (6 L)

i) Scientific Names
ii) International Code of Botanical Nomenclature (ICBN)
iii) Recent Codes :
  a) St.Louis Code
  b) Tokyo Code
  c) Berlin code
iv) Principles of the code I-V
v) Type method
vi) Author citation
vii) Rejection of names
viii) Retention of names

CHAP.(VIII) General Evolutionary Trends in Angiosperms : (6 L)

i) Habitat and growth habit
ii) Leaf structure : simple and compound, phyllotaxy
iii) Phyllode theory
iv) Evolution of inflorescence
v) Primitive stamen
vi) Primitive carpel
vii) Nature of inferior ovary
viii) Evolution of floral nectaries
ix) Evolution of gynoecium

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Davis, P.H. and V.H. Heywood (1963) Principles of Angiosperm Taxonomy, Oliver and Boyd, Edinburgh.

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Erdtman, G. (1952) Pollen Morphology and Plant Taxonomy, Angiosperms, Almquist & Wicksell, Stockholm.

Gibbs, R.D. (1974) Chemotaxonomy of Flowering Plants, McGill-Queen's University Press, Montreal & London.

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Lawrence, G.H.M. (1951) Taxonomy of Vascular Plants, MacMillan, New York.

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Singh, V. and D.K.Jain (1992) Taxonomy of Angiosperms, Rastogi Publications, Meerut.

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Smith, P.M. (1996) The Chemotaxonomy of Plants, Edward Arnold, London.

Sporne, K.R. (1974) The Morphology of Angiosperms : The Structure and Evolution of Flowering Plants, Hutchinson University Library, London.

Stace, C.A (1980) Plant Taxonomy and Biosystematics, Edward Arnold, London.

Stebbins, G.L. (1974) Flowering Plants : Evolution Above The Species Level, Arnold Press, London.

Swain, T. (Ed.) (1963) Chemical Plant Taxonomy, Academic Press, London.

Cont..5

Bot. 1.2 Molecular Biology, Cytogenetics and Plant Breeding

(Total : 60 Lectures)

Molecular Biology (24 Lectures)

CHAP.(I) Introduction, Molecular organization of chromosome : (6L)

i) Prokaryotic chromosome – Bacterial and Viral chromosomes.

ii) Eukaryotic chromosome – Nucleosome, Solenoid, Loops, Scaffolds

iii) Special types of Chromosomes : Polytene, Lampbrush and Supernumerary Chromosomes.

CHAP.(II) DNA Structure and Replication : (6L)

i) Structure and types of DNA : A, B, Z-DNA, Chloroplast DNA, Mitochondrial –DNA.

ii) Replication in closed circular DNA : θ–mode, σ-mode and D-loop replication.

iii) Replication in Linear DNA-Replication Fork, RNA-Primer, Okazaki Fragment, DNA-Polymerases.

iv) DNA-Damages and Repair Mechanism-Photoreactivation, Excision Repair.

CHAP.(III) DNA-Sequences : Single copy, middle repetitive, highly repetitive and inverted repeat-sequences.

CHAP.(IV) RNA : (2L)

i) Structure and functions of tRNA, mRNA, rRNA. (5L)

ii) Transcription-Role of RNA polymerase I, II and III in Initiation, Elongation and Termination.

iii) Processing of RNA in brief

CHAP.(V) Gene Regulation :

i) Operon Concept. (5L)

ii) Gene regulation in Prokaryotes – Inducible operon (lac-operon), Represible operon (trp-operon)

iii) Transposons, IS elements, Controlling elements in Maize-Ac-Ds System.

Cont...

Cytogenetics (24 Lectures)

CHAP.(VI) Karyotype:Characteristics of karyotype, Applications of karyotype analysis. (2L)

CHAP.(VII) Molecular mechanism of recombination breakage and reunion-heteroduplex-DNA. (3L)

CHAP.(VIII) Linkage, Recombination and Genetic mapping in Neurospora-Tetrad analysis. (3L)

(4L)

CHAP.(IX) **Microbial Genetics :**

i) Conjugation, Transformation and Transduction.

ii) Linkage, Recombination and Genetic mapping by interrupted mating technique in bacterial conjugation.

iii) (3L)

CHAP.(X) **Structural changes in chromosome :**

Deficiency, Duplications, Inversion and Translocation and their evolutionary importance.

(3L)

CHAP.(XI) **Numerical changes in chromosomes :**

i) Euploidy : Origin, classification and evolutionary importance of haploids, autopolyploids and allopolyploids.

ii) Aneuploidy : Origin, classification, and evolutionary importance of monosomics, nullisomics and Trisomics.

(4L)

CHAP.(XII) **Cell Cycle :**

i) Mitosis and Meiosis

ii) Molecular events in cell cycle.

iii) Spindle apparatus and movement of Chromosome.

(2L)

CHAP.(XIII) **Genetic Engineering :**

i) Principles and methods of genetic Engineering.

ii) Applications in Agriculture, health Medicine and Industries.

Plant Breeding (12 Lectures)

CHAP.(XIV) Definition, Aims, objectives, scope and importance of plant breeding, Green revolution in India. (2L)

Cont..7

CHAP.(XV) Plant introduction and acclimatization Vavilov concept of centers of origin of plants. (2L)

CHAP.(XVI) Important conventional methods of breeding in self and cross pollinated and vegetatively propogated crops. (4L)

CHAP.(XVII) Important non-conventional methods of breeding, polyploidy, genetic variability. (4L)

REFERENCE BOOKS

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Dwivedi and Singh (1990) Essentials of Plant techniques, 2nd Ed. Scintific Publisher Maan Bhavan, Jodhpur.

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Zha, A.P. (1993) Genes and Evolution, Macmillan India (Ltd.) New Delhi.

Cont...8

Bot. 1.3 Environmental Botany

(Total : 60 Lectures)

CHAP.(I) **Environmental Science :** (4L)

An interdisciplinary subject, its scope and necessity.

CHAP.(II) **Ecosystem Ecology :** (6L)

i) Introduction, Kinds of Ecosystems, Structure and function of an ecosystem

ii) Major Ecosystems: Pond ecosystem Ocean (Marine) ecosystem, Grass land, Forest, Desert, Cropland ecosystem.

iii) Productivity of different ecosystems and secondary production.

CHAP.(III) **Community Ecology :** (6L)

i) Concept of community and basic terms.

ii) Community : Structure, Organization and Functions.

iii) Phyto-sociological aspects of community.

iv) Methods of Studying Communities.

CHAP.(IV) **Agriculture Ecology :** (6L)

i) Importance of Agriculture.

ii) Cultivable area and classification of land.

iii) Types of soils

iv) Mansoon, rainfall and irrigation.

v) Agricultural operations and cropping pattern

vi) Internal ranking and agricultural inputs.

CHAP.(V) **Human Ecology :** (6L)

i) Introduction, habit and habitat, emergence of man.

ii) Population growth, Reasons for population Explosion and population theories.

iii) Culture of early man, civilization and population control.

iv) Our hungry planet, Green Revolution and New food sources.

v) Pollution and future of man.

CHAP.(VI) **Energy and its sources :** (6L)

i) Conventional and exhaustible energy sources.

ii) Non-conventional and inexhaustible energy sources.

iii) Conservation of energy.

Cont.. 9

CHAP.(VII) Waste : Ecological and Economical Considerations : (6L)

i) Waste Management.

a. Mechano chemical treatment

b. Biodegradation of wastes

c. Recycling and wastes in Production Process.

CHAP.(VIII) Resource Management : (8L)

ii) Importance, diplition and management of

(a) Grassland, (b) Forests and (c) Soil

CHAP.(IX) Ecology and Future of Man : (8L)

ii) Oxygen supply and air quality

iii) Water supplies

iv) World food supplies

v) Space on earth

vi) Distributional inequality

vii) Violence and war

viii) Adaptative capabilities of Man.

CHAP.(X) Earth Summit (Vasundhara Parishad) 1992 : (6L)

i) Rio Declaration of Environment and Development Preambie.

ii) Environment Security – the Road ahead.

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Ambasht, R.S. (1976) "Principles of Ecology", (Ist Ed.) Students Publication, Varanasi.

Arumugam, N. (1996) "Concepts of Ecology" (VIIth Ed.) Saras Puhlication, Kanyakumari.

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i) Ecology Vol.Ist

ii) Environment Vol IInd

iii) Wild Life Vol IIIrd.

iv) Pollution Vol.IVth

v) Basic Environment Laws Vol.Vth

A.P.H. Publishing Corporation, New Delhi-110002.

Cont..11

Bot. 1.4 Practical – I

(Based on Bot.1.1 Angiosperm Taxonomy)

(Total : 24 Practicals)

PRACT (1-16) 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 covering major groups of it. (Any 30 families locally available)

Menispermaceae, Nymphaeaceae, Papaveraceae, Cruciferae, Capparidaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Elatinaceae, Malvaceae, Sterculiaceae, Tiliaceae, Rhamnaceae, Celastraceae, Vitaceae, Sapindaceae, Moringaceae, Papilionaceae, Caesalpiniaceae, Mimosaceae, Combretaceae, Myrtaceae, Lythraceae, Passifloraceae, Cucurbitaceae, Molluginaceae, Aizoaceae, Umbelliferae, Rubiaceae, Compositae, Campanulaceae, Plumbaginaceae, Sapotaceae, Gentianaceae, Apocynaceae, Asclepiadaceae, Oleaceae, Boraginaceae, Convolvulaceae, Scrophulariaceae, Pedaliaceae, Bignoniaceae, Acanthaceae, Verbenaceae, Labiatae, Nyctaginaceae, Amaranthaceae, Polygonaceae, Aristolochiaceae, Loranthaceae, Santalaceae, Euphorbiaceae, Hydrocharitaceae, Scitamineae, Amaryllidaceae, Dioscoeaceae, Liliaceae, Commelinaceae, Typhaceae, Najadaceae, Potamogetonaceae, Eriocaulaceae, Cyperaceae, Gramineae.

Pract. (16-20) Identification of genus and species with the help of flora of the plant materials from the families mentioned above.

Pract. (21-22) Preparation of artificial, bracketed/indented dichotomous keys based on vegetative and reproductive characters.

Pract. (23-24) Study of morphological and biological peculiarities of the following :

i) *Drosera, Utricularia, Nepenthes*

ii) *Striga, Cuscuta, Dendrophithoe, Viscum*

iii) *Lemna, Wolffia, Vallisneria, Limnophila, Ottelia*

iv) Inflorescence : Spadix, Cyathium, Catkin

v) Flowers : *Typha*, Orchid and Cleistogamous flowers.

NOTE :

1) Submission of 30 herbarium sheets at least from 20 different families duly identified should be submitted at the time of practical examination.

2) Botanical excursions and submission of excursion reports from one locally and one vegetationally different locality are compulsory.

3) Rare, endemic and endangered species should be avoided during plant collections.

4) Duly certified journals are compulsory at the time of practical examination.

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BOT 1.5 PRACTICAL-II

(Based on BOT 1.2 & BOT 1.3)

(Total : 24 Practicals)

Pract (1-2) i) Pretreatment of Root tips by 8-hydroxy-quinolene, Para-dichlorobenzene, Phenols and Colchicine.

iii) Preparation of Fixatives-Comoy's Fluid

iv) Preparation of stains : Acetocarmine, Crystal violet, Heidenhain's Haematoxylene, Leuco basic fuschin.

Pract. (3-4) Study of mitosis in pretreated root tips :

i) By Acetocarmine squash preparation.

ii) Root tip squash using Haemotoxylene stain

iii) Using Feulgen Squash method.

iv) Study of mitosis with the help of permanent slides.

Pract. (5-6) Study of Meiosis :

i) Anther smear technique.

ii) Anther squash

iii) Meiosis – with the help of permanent slides.

Pract. (7) Mounting of salivary gland chromosome from chironomous larvae.

Pract. (8) Making cytological preparation permanent by any suitable method.

Pract. (9) Karyotype study :

i) Sketching of metaphase chromosomes with the help of camera lucida.

ii) Preparation of ideogram from onion root tip chromosomes

Pract. (10) Extraction of DNA

Pract. (11) Study of chromosomal aberrations with the help of permanent slides.

Pract. (12) Plant hybridization techniques.

Pract. (13-16) Practicals on study of vegetation by using following method for estimation of FICC, IVI, Frequency, Density, Abundance and histogram.

a) Quadrat Method :

i) List Count Quadrate

ii) Chart Quadrate

b) Transect Method :

i) Line Transect

ii) Belt Transect

c) Physiognomic method

i) Biological Spectrum

Cont...14

Pract. (17) Estimation of Basal Area

Pract. (18) Estimation of biomass

Pract. (19-21) Soil Analysis for :

i) pH,

ii) Water holding capacity

iii) Conductivity

iv) Quantitative estimation of N, P & K

Pract. (22) Instruments used for study of meoterological data. : Any Six.

Pract (23-24) Studies on pond ecosystem (Polluted and unpolluted sites) : Any four parameters.

a) Dissolved O_2

b) Free CO_2

c) Carbonates

d) Total alkalinity

e) Hardness

f) Chlorides

Cont...14

BOT. 2.1 Systematics II : ALGAE AND FUNGI

(Total : 60 Lectures)

Algae (30 Lectures)

CHAP.(I) Introduction of Algae : (3L)

i) Prokaryotic and eukaryotic algae.

ii) Comparative account of algal pigments, food reserves, cell walls, flagellation, chloroplasts and eyespots etc. and their phylogenetic and taxonomic significance.

iii) History of algalogy in India.

CHAP.(II) Classification of Algae according to Fritsch (2L)

CHAP.(III) Cyanophyta : (4L)
Occurrence, ultra cell structure, thallus organization, heterocyst, reproduction, paddy soil algae and their economic role.

CHAP.(IV) Chlorophyta : (6L)
Range of thallus structure, methods of reproduction and alternations of generations in Volvocales, Chlorococcales, Ulotrichales, Chaetophorales, Cladophorales, Siphonales and Charales.

CHAP.(V) Phaeophyta : (4L)
General characters, range of thallus structure, reproduction and alternations of generations with reference to *Ectocarpus*, *Dictyota*, *Laminaria*, *Fucus* and *Sargassum*.

CHAP.(VI) Rhodophyta : (4L)
General characters, range of thallus structure, reproduction and life history with reference to *Porphyridium*, *Porphyra*, *Batrachospermum* and *Polysiphonia*.

CHAP.(VII) General characters of the divisions with examples : (4L)

i) Chrysophyta
ii) Xanthophyta
iii) Bacillariophyta
iv) Dinophyta
v) Cryptophyta
vi) Euglenophyta

CHAP.(VIII) Distribution of algae in soil, freshwater and marine environments. (1L)

CHAP.(IX) Interaction of phytoplankton and phytobenthos with the environment (1L)

CHAP.(X) Algae in relation to human welfare. (1L)

FUNGI (30 Lectures)

CHAP.(XI) Definition, present status of fungi and role of fungi in industries as food material. (2L)

CHAP.(XII) History of Mycology with special reference to Indian work. (1L)

Cont..15

CHAP.(XIII) Outline classification of fungi as per G.C. Ainsworth 1973, Alexopoulos et.al. 1996. (2L)

CHAP.(XIV) Characteristics, thallus structure, reproduction, phylogeny and L.C. of major classes with reference to following orders : (15L)

a. Acrasiomycetes : Dictyosteliales.
b. Myxomycetes : Physarales
c. Chytridiomycetes : Chytridiales
d. Oomycetes : Saprolegniales, Peronosporales
e. Zygomycetes : Mucorales
f. Hemiascomycetes : Taphrinales
g. Plectomycetes : Eurotiales
h. Pyrenomycetes : Erysiphales
i. Discomycetes : Pezizales
j. Loculoascomycetes : Myriangiales
k. Hymenomycetes : Agaricales, Aphyllophorales
l. Teliomycetes : Uredinales, Ustilaginales
m. Gasteromycetes : Lycoperdales, Nidulariales.
n. Hyphomycetes : Moniliales
o. Coelomycetes : Melanconiales

CHAP.(XV) Study of following plant diseases with reference to causal organism, symptoms, disease cycle and control measures. (4L)

a. Club root of crucifers
b. Wart of potato (Black Wart)
c. Downy milew of Grapes
d. Powdery mildew of *Tectona*
e. Ergot of Bajara.
f. Rust of Wheat
g. Smut of Sorghum
h. Tikka disease of Groundnut

CHAP.(XVI) **Lichens :** (3L)

Phycobiont, Mycobiont, External and internal morphology of lichen thallus, reproduction. (Asexual and sexual) and Economic importance.

CHAP.(XVII) Post harvest diseases of Perishebles, common types in local market and diseases caused. (1L)

CHAP.(XVIII) **Fungi of special habitats :** (2L)

a. Fungi in wood decay
b. Mycorrhiza
c. Predacious fungi
d. Dermatophytes

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BOT 2.2 SYSTEMATICS-III : Archegoniatae and Paleobotany

(Total Periods : 60)

(Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

Bryophytes (15 L)

CHAP.(I) i. Concept of Archegoniatae, Classification of Bryophytes proposed by G.M.Smith in details upto orders, Economic importance. (5L)

ii. Evolution of gametophytes and sporophytes of Bryophytes.

CHAP.(II) Distinguishing features phylogeny and evolutionary tendencies of the following orders with their affinities. (10L)

Hepaticae : Marchantiales
Jungermanniales
Metzgeriales
Calabryales

Musci : Polytrichales

Pteridophytes (15 L)

CHAP.(III) i. Classification of Pteridophytes proposed by Reimers, Economic importance. (5L)

ii. Soral Evolution

CHAP.(IV) Distinguishing features morphology, anatomy and comparative discussion on sporophytes an gametophytes. Phylogeny, evolutionary tendencies and affinities of following living orders : (10L)

i. Lycopodiales
ii. Isoetales
iii. Ophioglossales
iv. Osmundales
v. Filicales (at least 3 families)

Gymnosperms (15 L)

CHAP.(V) i. Outline of systems of classification of Gymnosperms. Sporne's system of classification of Gymnosperms. (5L)

ii. Economic importance.

CHAP.VI General characters, morphology, anatomy, sporogenesis, gametogenesis. Embryology, their affinities, evolutionary trends and phylogeny of following living orders : (10L)

i. Coniferales
ii. Taxales
iii. Gnetales (Except *Gnetum*)

Cont..18

Paleobotany (15 L)

CHAP. VII Geological time scale, types of preservations and paleobotanical techniques. (Thin ground and Peel technique). (3L)

CHAP.VIII Classification : Morphology, affinities, evolutionary trends in : (7L)

i) Psilophytales
ii) Lepidodendrales
iii) Calamitales
iv) Coenopteridales
v) Hydropteridinae (Water ferns)
vi) Lyginopteridales, Medullosales, Glossopteridales.
vii) Pentoxylales
viii) Bennittitales (Cycadeolddaceae, Williamsoniaceae)
ix) Cordaitales.

CHAP.IX Fossil Angiosperms : Tertiary Angiosperms : (5L)

Monocots :

i) Palmoxylon
ii) Rhizopalmoxylon
iii) Cyclanthodendron
iv) Tricoccites

Dicots :

i) Sahnipushpam
ii) Sahnienthus
iii) Enigmocarpon

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BOT 2.3 BOTANICAL TECHNIQUES AND COMPUTER APPLICATIONS

Botanical Techniques (30 Lectures)

(Total 60 Lectures)

CHAP. (I) **Microscopy.:** (3L)

Light, Phase contrast and Electron microscopy.

CHAP.(II) **Spectroscopy Techniques :** (4L)

Spetrophotomoter UV & IR NMR Flourimetry.

CHAP.(III) **Centrifugation Techniques :** (2L)

High Speed Centrifugee, rotox, ultracentrifugation, Density gradient centrifugation.

CHAP.(IV) **Chromatographic Techniques :** (4L)

Paper thin layer, and column chromatography. Gas chromatography and HPLC (Introductory)

CHAP.(V) **Electrophoratic Techniques:** (4L)

Supports, electrophoresis under nature, dissociation and denaturing conditions, isoelectric focusing, activity staining.

CHAP.(VI) **Radioactive Techniques :** (2L)

Isotopes and their halflife, autoradiography.

CHAP.(VII) **Immunological Techniques :** (3L)

Antibody specifity, antigen antibody inter-reaction, immunoassays, immunoelectrophoresis, western blotting.

CHAP.(VIII) **Microtomy :** (5L)

Construction and applications. Histochemical techniques preparation of stains (General laboratory stains).

CHAP.(IX) **Whole Mount Preparation :** (3L)

Bacteria, Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

Computer Applications : (30 Lectures)

CHAP.(X) **Introduction To Computers :** (3L)

Block diagra, types of computers, (Micro, Mini, Mainframe and super), Definition of Terms – Software, Hardware, operating system, Applications areas like engineering, educational, email, internet, multimedia, Botanical applications.

CHAP.(XI) **IO Devices And Memories :** (3L)

Printer,types of printer – Dot Matrix Printer, Inkjet Printer, Laser and Line Printer, Display devices - Memories, types of Memories – primary & secondary memories, RAM, ROM, Hard Disk, Floppy disk, Scanner, CD, Mouse.

CHAP.(XII) **Introduction To Windows Operating System :** (4L)

Booting of the computer, what is desktop, welcome to windows, exploring your computer, taskbar and start button, my computer, windows explorer, working with programs, managing files and folders, creating folders, finding files and folders, copying and moving files, shutting down the computer.

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CHAP. (XIII) Introduction To Word : (3L)

Creating a simple document, word basics, undo, Redo, Repeat, Inserting, Replacing, Formatting, Copying text from one word document to another, printing the document.

CHAP.(XIV) Introduction To Powerpoint : (2L)

Terminology, creating a presentation, autocontent wizard, hiding slides, working with text in powerpoint, editing and moving text, clipart gallery.

CHAP. (XV) Introduction To Internet : (3L)

Concepts of www, web page, web site, brauser, search engine, finding the information on internet.

CHAP. (XVI) Introduction To Excel Basics : (2L)

Starting Excel, What is a worksheet, creating and opening workbook, closing and exiting workbook. Entering and editing information, saving a workbook. Data range, formatting cells, changing the height and width of Rows and columns, Ecel Charts.

CHAP.(XVII) Experiments On Population (Using Excel) : (4L)

Problem of defining the population, sample and the properties of population and samples, designing experiments.

CHAP.(XVIII) Comparing Samples : (2L)

Test of significace for proportion, T, F tests.

CHAP. (XIX) Finding significance of observations from population, chi-square. (2L)

CHAP. (XX) Relating Sample Properties. (2L)

Induction, Correlation, Regression.

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Practical I : BOT 2.4 (Based on BOT 2.1 and BOT 2.3)

(Total Practicals-24)

ALGAE - PRACTICALS

Pract.(1–3) Chlorophyta:

Chlamydomonas, Gonium, Pandorina, Eudorina, Volvox, Chlorella, Pediastrum, Scenedesmus, Hydrodictyon, Ulothrix, Cylindrocapsa, Schizomeris, Ulva, Enteromorpha, Cladophora, Rhizoclonium, Pithphora, Chaetophora, Draparnaldia, Draparnaldiopsis, Fritschiella, Spirogyra, Zygnema, Stigeoclonium, Coleochaetae, Cylindrocystis, Staurastrum, Sirogonium, Closterium, Cosmarium, Caulerpa, Halimeda, Codium, Oedogonium, Bulbochaetae (Any 24 Forms)

Pract.(4) Charophceae : *Chara, Nitella*

Pract.(5) Chrysophyta :

i) Xanthophyceae : *Vaucheria, Botrydium*

ii) Bacillariophyceae : *Navicula, Pinnularia, Fragillaria, Synedra, Nitschia, Cymbella, Cyclotella, Pleurosigma, Gyrosigma, Cocconeis* (Any 4 Forms)

Pract.(6) Phacophyta : *Ectocarpus, Dictyota, Padina, Sargassum, Laminaria* (P.S.)

Pract.(7) Rhodophyta : *Comsopogon, Batrachospermum, Gracilaria, Polysiphonia.*

Pract.(8) Cyanophyta : *Chroococus, Oscillatoria, Phormidium, Lyngbya, Anabena, Nostoc, Scytonema, Rivularia* (Any SixForms)

FUNGI : PRACTICALS

Pract.(9&10) Study of the Asexual/Sexual reproductive structures :

Myxomycota (Any Two Forms) :

Physarum, Fuligo, Stemonitis, Plasmodiophora.

Mastigomycotina (Any Six Forms) :

Synchytrium, Physoderma, Saprolegnia, Achlya, Albugo, Peronospora, Plasmopara, Sclerospora.

Zygomycotina (Any Two Forms) :

Rhizopus, Mucor, Pilobolus.

Pract.(11-12) Ascomycotina (Any Twelve Forms) :

Taphrina, Protomyces, Saccharomyces, Eurotium, Erysiphe, Phyllactinia, Uncinula, Meliola, Balansia, Chaetomium, Phyllachora, Xylaria, Daldinia, Peziza, Morchella, Elsinoe, Hysterium, Bagnetiella.

Pract.(13-14) Basidiomycotina (Any Twelve Forms) :

Puccinia, Uromyces, Hapalophragmiopsis, Ravenelia, Melampsora, Dasturella, Ustilago, Sphacelotheca, Tolyposporium, Polyporus, Hexagonia, Daedalea, Ganoderma, Schizophyllum, Pleurotus, Lycoperdon, Geastrum, Cyathus.

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Pract.(15) **Deuteromycotina (Any Six Forms) :**

Cercospora, Alternaria, Ciliochorella, Beltrania. Aspergillus, Penicilium, Curvularia. Helminthosponum, Fusarium, Colletotrichum.

Pract. (16) **Lichens :**

Forms of Lichens, Study of internal structure of homomerous and heteromerous thalli.

Note : Botanical excursions, tour report and submission are compulsory.

Botanical Techniques

Pract. (17) Use of Chromatographic Techniques in the Quantidation/Qualitaton of specific compounds from plant crude extract.

a) Separation of leaf pigments by paper chromatography. or

b) Separation of Antnocyanin Pigments by T.L.C. or

c) Separation of plant pigments by column chromatography.

Pract. (18) Use of spectrophotometric techniques in the Quantidation/Qulitation of different plant extract.

a) Quantitative measurement of chlorophyll a and chlorophyll-6.

b) Quantitative measurement of

c) Quantitative mesuremnt of total Chlorophyll

Pract. (19) Microtomy Techniques.

a) Selection of material

b) Killing and Fixing

c) Dehydration & Clearing.

d) Infiltration and Embedding

1 Cold Infiltration

2 Hot infitration

3 Preparation of blocks

Pract. (20) a. Section cutting and ribbon mounting

b. Staining of slides.

Pract. (21) Starting of windows, using windows :

b. Operating and closing the files

c. Moving, copying and renaming the files

d. Printing the files

Pract. (22) a. Create and format a document using word.

b. Create and format a presentation using powerpoint.

Pract.(23) a. Open a web site using browser.

b Finding information using search engine.

Pract.(24) a. Using Excel, insert and edit the data on a worksheet.

b. Use of Excel for Botanical applications like drawing the type of charts and graphs.

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BOT 2.5 Practicals II (Based on BOT 2.2)

(Total Practicals- 24)

Bryophytes (Practicals 6)

Morphological, Anatomical & Reproductive studies of the following :

Pract (1-2) Marchantiales : *Plagiochiasma, Targionia, Asterella* and *Dumortiera*

Pract. (3,4&5) Jungermaniales : *Pellia, Fossombronia, Pellavicinia and Porella Frullania*

Pract. (6) Musci : *Polytrichum, Pogonatum*

Pteridophytes (Practicals 6)

Morphological, Anaomical and Reproduction studies of the following :

Pract. (7) *Lycopodium*

Pract. (8) *Isoetes*

Pract. (9) *Ophioglossum*

Pract. (10) *Omunda*

Pract. (11) *Gleichenia, Pteris, Adiantum*

Pract. (12) *Asplenium, Lygodium*

Gymnosperms (Practicals 6)

Coniferales, Taxales and Gneteles : *Cryptomeria, Pinus, Cupressus Thuja, Araucaria, Agathis Podocarpus.*

Pract. (13) External morphology of vegetative parts of any two genera from above and *Taxas.*

Prct. (14) Study of reproductive parts –

a) Male cones, microsporophyll, mounting of microspores – Any two genera and *Taxuas*

b) Female cones and ovliferous scales (Any two genera and *Taxus*)

Pract. (15) Double stained permanent preparation of stem of any two genera and *Taxas.*

Pract. (16) T.S., T.L.S and R.L.S. of wood any two genera and *Taxus*

Pract. (17) Gametophyte and Embryogeny of *pinus.*

Pract. (18) Ephedra

a) External morphology

b) Morphology of reproductive parts

c) Anatomy – T.S., T.L.S. and R.L.S. of wood

d) Gametophyte and Embryogeny.

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Palaeobotany (Practicals 6)

Pract. (19) Fossils of Psilophytales and Lepidodendrales :

Psilophytales : *Rhynia major* stem T.S.

Lepidodendrales : *Lepidodendron selaginoides*

Leaf cushion : *Lepidodendron*

Root : *Stigmaria*

Fructification : *Lepidocarpon*

Pract. (20) Study of Sphenopsida

Sphenophylls : Stem, leaf, root

Calamitales : *Calamites*, *Asterophyllon*, *Annularia*

Pract. (21) Study of Pteropsida and Coenopteridales (Petiole genera) Water fern *Rodeites*

Pract. (22) Study of Pteridosperms :

Stem genera : *Lyginopteris oldhamia*, *Medullosa*, *Vertebraria*

Leaf Genera : *Pecopteris*, *Neuropteris*, *Glossopteris*

Fructification : *Lagenostoma*, *Dolerotheca formosa*

Pract. (23) Fossil Gymnosperms

Pentoxylales and Cordaitales : Stem genera *Pentoxylon* and *Cordaites*

Fructification : *Cardiocarpus*

Pract. (24) Fossil Angiosperms :

Monocot : *Cyclanthodendron* (Stem), *Tricoccites* (Fruit)

Dicot : *Sahnianthus*, *Sahnipushpam*, *Enigmocarpon*

NOTE. (i) Botanical Excursions are compulsory for Bryophytes, Pteridophytes, Gymnosperms and paleobotany. One long tour should be arranged along with short local tours.

(ii) Rare, endemic and endangered species should be avoided during plant collections.

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