NORTH MAHARASHTRA UNIVERSITY,
JALGAON

FACULTY OF SCIENCE

SYLLABUS FOR
M.Sc. (PART-I)
IN BOTANY

To Be Implemented From
Academic Year 2014-15
NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus for Theory and Practical Courses for M.Sc. In Botany

M.Sc. Part-I

(w.e.f. Academic Year 2014-2015)

Semester-I

BOT.1.1 Angiosperm Taxonomy
BOT.1.2 Environmental Botany and Biostatistics
BOT.1.3 Cytogenetics, Plant breeding and Molecular Biology
BOT.1.4 Practical –I (Based on BOT.1.1)
BOT.1.5 Practical –II (Based on BOT.1.2 and BOT.1.3)

Semester-II

BOT.2.1 Diversity of Lower Cryptogams
BOT.2.2 Diversity of Higher Cryptogams
BOT.2.3 Plant Physiology and Biochemistry
BOT.2.4 Practical –I (Based on BOT.2.1)
BOT.2.5 Practical –II (Based on BOT.2.2 and BOT.2.3)

Note: i) Each theory course requires 05 lectures of 60 minutes each.

ii) Each practical course requires 02 practical’s per week of 04 hours duration.
Aims and Objectives:

i) To study conceptual development of ‘taxonomy’ vis-à-vis ‘systematics’.

ii) To study general range of variations in the group of angiosperms.

iii) To trace history of development of systems of classification emphasizing angiospermic taxa.

iv) To study characters of biologically important families of angiosperms.

v) To study range of floral variations in angiospermic families, their phylogeny and evolution.

vi) To study various rules, principles and recommendations of plant nomenclature.

vii) To know modern trends in taxonomy.

viii) To study major evolutionary trends in various parts of angiospermic plants.

Chapter I - Introduction: (03 L)

i) Taxonomy and Systematics: Conceptual Development

ii) Aims and Principles

iii) Approaches and importance

iv) Diversity of angiosperms with respect to:
   a) Form, structure and function
   b) Evolutionary status of Angiosperms

Chapter II - Classifications: History of Development: (09 L)

i) Review of Pre-Darwinian classifications

ii) Review of Post-Darwinian classifications

iii) Recent Systems

Chapter III - Discussion of the following families with respect to salient features and points of biological importance: (10 L)

Sarraceniaceae, Lentibulariaceae, Droseraceae, Nepenthaceae, Cuscutaceae, Orobanchaceae, Balanophoraceae, Refflesiaceae, Santalaceae, Loranthaceae, Podostemaceae, Rhizophoraceae, Cactaceae, Orchidaceae, Aristolochiaceae

Chapter IV: Discussion of following families with reference to range of floral variations, taxonomy, phylogeny and evolutionary trends: (12 L)

1) Ranunculaceae, 2) Malvaceae, 3) Rutaceae, 4) Cactaceae, 5) Umbelliferae, 6) Compositae, 7) Asclepiadaceae,

Chapter V: Sources of Taxonomic Information: Role of the following: (10 L)

i) Micromorphology and Ultrastructure
ii) Embryology
iii) Phytochemistry
iv) Reproductive biology
v) Plant geography and Ecology
vi) Genetics and Cytogenetics
vii) Paleobotany

Chapter VI: General Evolutionary Trends In Angiosperms: (08L)

i) Habitat and growth habit
ii) Leaf structure: Simple and compound, phyllotaxy
iii) Phylloide theory
iv) Evolution of inflorescence
v) Primitive stamen
vi) Primitive carpel
vii) Nature of inferior ovary: Foliar (Appendicular) and receptacular (Axial) theories
viii) Evolution of gynoecium
ix) Evolution of floral nectaries
x) Evolution of fruit

Chapter VII: Study of Botanical Nomenclature with respect to: (08 L)

i) Scientific names and Common names
ii) International Code of Botanical Nomenclature (ICBN)
iii) Review of various codes
iv) Principles of the code I-V
v) Type method (Typification) and working of Type method
vi) Author citation
vii) Rejection of names
viii) Retention of names
ix) Conservation of names
x) New Names
xi) Names of cultivated and hybrid plants
REFERENCE BOOKS:


14. Maheshwari, P. (Ed.) Recent Advances in the Embryology of Angiosperms, (International Society of Plant Morphology, University of Delhi, Delhi, India.


Aims and Objectives:
   i) To understand the environmental botany.
   ii) To study the nature and its co-relation with human society.
   iii) To study the impact of human activities on environment.
   iv) To understand global issues concerned with environment.
   v) To understand the sustainable development and care of environment.

(I) Environmental Botany (42 Lectures)

Chapter I - Environmental Botany: (03L)
   i) Introduction, scope and Importance
   ii) Interdisciplinary nature, Physical environment, Biotic environment and Biotic & abiotic interactions.

Chapter II - Ecosystem Ecology: (08L)
   i) Ecosystem – Definition, Concept, Types and Components of Ecosystem.
   ii) Major Ecosystems – Food Chain & Food Web, Aquatic Ecosystem (Fresh water ecosystem, Marine ecosystem and Estuarine ecosystem), Terrestrial Ecosystem (Forest ecosystem and grassland ecosystem)
   iii) Productivity of different ecosystems – Primary productivity and secondary productivity.

Chapter III - Fundamentals of Remote Sensing and GIS: (08L)
   i) Definition, concept and history of remote sensing, Electro-magnetic radiation (EMR), Energy interaction with atmosphere, interaction with Earth’s surface materials.
   ii) GIS: Definition, history and introduction, components of GIS, Concept of data, information, knowledge Data: spatial and non-spatial data, raster and vector data, GIS file formats.
   iii) Applications of RS and GIS in Forestry and Ecology: Introduction - forest density, Forest type mapping, inventory of forests, delineation of degraded forests, damage assessment, Landscape characterization, Biomass assessment, Forest ecosystem management

Chapter IV - Forestry: (05L)
   i) Agro forestry
   ii) Social forestry
   iii) Forest conservation
   iv) Watershed Management
   v) Wetland Management
Chapter V - Solid Wastes: (03 L)

i) Introduction
ii) Types and Sources of Solid Wastes
iii) Solid Waste Management (Collection, Resource & Disposal Recovery and sustainable management)

Chapter VI - Environmental Management: (05 L)

i) Concept, Scope and Procedure of EIA
ii) Environment Management Plan (EMP)
iii) Environmental Auditing
iv) Green Belt
v) Kyoto Protocol

Chapter VII- Environmental Legislation: (06 L)

i) Forest Conservation Act
ii) General account of legislation related to environment
iii) Wildlife Protection Act – 1972
iv) Water Act – 1976
v) Environment Protection Act – 1985
vi) Biodiversity Act (2002)

Chapter VIII - Global Environmental Issues and Conference: (04 L)

i) Global Warming, Green House Effect, Acid Rain, Ozone layer depletion

(II) Biostatistics (18 Lectures)

Chapter IX- Sampling Methods: (02 L)

Chapter X - Measure of Central Tendencies: (02 L)

i) Mean
ii) Mode
iii) Median

Chapter XI - Measure of Dispersion: (03 L)

i) Range
ii) Standard Deviation, Mean Deviation
iii) Coefficient of Variation, Co-efficient of co-relation
iv) Standard Error

Chapter XII - Distribution: (02 L)

Probability and Distribution (Normal)

Chapter XIII- Test of Significance: (04 L)

i) Concept of Significance
ii) Students test
iii) Chi square ($X^2$) test
Chapter XIV - Analysis of Variance (ANOVA)
   i) Introduction and Application in Biology
   ii) ANOVA table and F ratio, least significant difference

Chapter XV : Correlation and Regression

REFERENCE BOOKS:


**Important Web links:**

http://www.geospatialworld.net/Paper/Application/index.aspx


Aims and Objectives:

i) To study structural organization and variation in chromosome as well as karyotype analysis.

ii) To study extra-chromosomal inheritance in plant system.

iii) To study plant breeding system for improvement of economically important plants.

iv) To study molecular biology in relation to genetic material, its inheritance, modification, replication and repair.

v) To study transcription, translation post translation modification and targeting sorting of protein to organelles.

vi) To study gene regulation in prokaryotes and eukaryotes.

(I) Cytogenetics

(25 Lectures)

Chapter I - Organization of genes and chromosomes: (05L)

i) Structure of chromatin and chromosomes

ii) Unique and repetitive DNA, heterochromatin, euchromatin, transposons.

Chapter II- Genetic recombination: (07L)

i) Molecular mechanism of recombination, role of RecA and RecBCD enzymes

ii) Chromosome mapping, linkage group, genetic markers, construction of linkage maps, correlation of genetic and physical maps.

Chapter III - Karyotype analysis: (05L)

i) Chromosome markers, variation in chromosome structure-(Deletion, Duplication, Inversion and Translocation), Variation in chromosome Number (Euploidy, Eneuploidy, methods of inducing Auto and Alloplody).

ii) Banding pattern Q, C, G, and R-bandings, Special types of chromosomes. C-value, C-value paradox.

Chapter IV - Cell Cycle, its Regulation and control: (05L)

i) Mitosis, Meiosis, Check Points, Cyclins and Cyclin dependent Kinases.

ii) Apoptosis and program cell death.

Chapter V - Cytoplasmic inheritance: (03L)

Cytoplasmic inheritance involving Chloroplast (*Mirabilis jalpa*, *Maize*), Mitochondria (Male sterility in higher plant).
(II) Plant Breeding
(10 Lectures)

Chapter VI - Scope, Importance and Objectives. (02L)

Chapter VII - Reproductive Systems in Crop Plants: Sexual, Asexual and Vegetative Reproduction. (02L)

Chapter VIII: Methods of Crop Improvements: (06L)
i) Pure line theory, Pure line selection, Pedigree selection, Bulk methods.
ii) Concept of Heterosis, Hybrid vigour, Inbreeding depression, Dominance and Overdominance hypothesis.
iii) Hybrid Seed Production.

(III) Molecular Biology
(25 Lectures)

Chapter IX: Structure and Properties of Nucleic acid: (03L)
i) Physical and chemical nature of nucleic acid, Cot Curve, cot 1/2 value and its significance.
ii) Unique, moderately repetitive and highly repetitive DNA.

Chapter X: DNA Replication: (02L)
i) Unit of replication, various enzymes involved in replication
ii) replication origin and replication fork.

Chapter XI: Gene Mutation: (03L)
i) Molecular basis of mutation
ii) Mechanism of Spontaneous and induce mutation.

Chapter XII: Gene Repair: (02L)
Direct repair, Excise Repair, Mismatch repair and SOS repair.

Chapter XIII: RNA Synthesis and Processing: (04L)
i) Transcription: RNA polymerases and their role, Transcription apparatus,
ii) Transcription in prokaryotes and eukaryotes, initiation, elongation and termination, RNA processing.

Chapter XIV: Protein Synthesis and Processing: (03L)
i) Initiation, elongation and termination of translation.
ii) Post-translation, modification of protein.

Chapter XV: Protein Sorting and Targeting: (03L)
i) Chloroplast, Vacuoles, Mitochondria, and Peroxisomes.
ii) Protein Traffickin

Chapter XVI: Regulation of gene expression: (05 L)
i) Eukaryotic transcriptional regulation (promoter enhancer and silencer, gene battery) and post transcriptional regulation
ii) Prokaryotic transcriptional regulation (Lac Operon and Trp Operon) and post transcriptional regulation.

REFERENCE BOOKS:

BOT 1.4 Practical –I
(Based on Bot 1.1 Angiosperm Taxonomy)
(Total: 24 Practicals)

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 covering major groups of it (Any 30 families in angiosperms locally available)


Practicals 16-20: Identification of genus and species with the help of flora of the plant materials from the families mentioned above.

Practicals 21-22: Preparation of artificial, bracketed/indented dichotomous keys based on vegetative and reproductive characters.

Practicals 23-24: Study of morphological and biological peculiarities of the following:

i) Insectivorous plants: Drosera, Utricularia, Nepenthes
ii) Parasitic plants: Striga, Cuscuta, Dendrophthoe, Viscum
iii) Aquatic plants: Lemna, Wolffia, Vallenisneria, Limnophila, Ottelia
iv) Inflorescences: Spadix, Cyathium, Catkin
v) Flowers: Typha, Orchid and Cleistogamous flowers.
vi) Phyllode: Australian Acacia
vii) Velamen tissue

Note: i) Botanical excursions and submission of scientific excursion reports from one locally and vegetationally different locality are compulsory.

ii) Duly certified journals are compulsory at the time of practical examination.
Following floras may be consulted for practical purpose:


BOT 1.5 Practical –II

(Based on Bot 1.2 and Bot 1.3)

(Total: 24 Practicals)

**Practicals 1-4:** Practical’s on study of vegetation by using following methods for Estimation of FICC, IVI, frequency, Density, Abundance and Histogram.

a) Quadrate Method:
   i) List count Quadrate
   ii) Chart Quadrate

b) Transect Method
   i) Line Transect
   ii) Belt Transect

c) Physiognomic Method
   i) Biological Spectrum.

**Practical 5:** Estimation of Biomass

**Practical 6:** Instruments used for collection of meteorological data (any six)

**Practical 7:** Studies on pond ecosystem (Polluted and unpolluted sites) any two parameters

   a) Carbonates
   b) Total alkalinity
   c) Hardness
   d) Chlorides

**Practical 8:** Estimation of Phosphatic fertilizers from agricultural soil using colorimeter / spectrophotometer.

**Practical 9:** Element of visual interpretation of aerial photograph and satellite image.

**Practical 10:** Details and use of mirror stereoscope and pochet stereoscope for interpretation.

**Practical 11-12:** Examples based on Biological Data

   a) Measure of Central Tendencies
   b) Measure of Dispersion
   c) Test of significance $X^2$ test and t-test
   d) Normal Distribution

**Practical 13:** Preparation of Cytological fixative (Carnoy’s fluid I,II, Navashin’s fluid etc.)

**Practical 14:** Preparation of stains, Aceto-carmine, Haematoxylene, and Feulgen

**Practical 15-16:** Squash and smear preparations to study Mitosis in onion root tips and Meiosis in Maize or Onion or *Rhoeo* flower buds.
**Practical 17:** Determination of Mitotic index and Metaphase frequency in *Allium cepa* or other plant material.

**Practical 18:** Demonstration of salivary gland chromosome preparations (Chironomous larvae/Drosophila).

**Practical 19:** Estimation of RNA by Orcinol Method.

**Practicals 20-21:** Isolation and estimation of DNA from suitable plant material.

**Practical 22:** Hybridization in plant (selection of male and female flower, emasculation, bagging, tagging, etc)

**Practical 23:** Study of chromosomal aberrations in plant (*Rhoeo*).

**Practical 24:** Isolation and Janus green staining of mitochondria.

**Reference Books for remote sensing practicals**


Semester- II
BOT 2.1 Diversity of Lower Cryptogams
Total 60 Lectures

Aims and Objectives:
i) To study salient features of Algae and Fungi.
ii) To study diversity of lower Cryptogamic plants in nature.
iii) To study the life cycle patterns in lower cryptogams.
iv) To study algae and fungi for human welfare.

Algae (30 Lectures)

Chapter I - Algae - Introduction: (03L)
i) General characters; Definition; Development of Phycology; The Scope of modern Phycology
ii) Structure of algal cell: a) Prokaryotic, ii) Eukaryotic
iii) Algae in human welfare

Chapter II - Classification of algae according to F. E. Fritsch (1945), G.W. Prescott and Parker (1982) up to class and subclass: (04L)
i) Basis of algal classification and nomenclature.
ii) Summary of the principal characteristics of the algal classes, with respect to pigments, reserve food, cell wall, chloroplast and eyespot, flagella.

Chapter III - Range of thallus organization: (04L)
i) Unicellular organization: a) Rhizopodial forms, b) Coccoid form c) Flagellated forms
ii) Colonial organization: a) Palmelloid, Tetrasporal, and Dendriod types b) Coenobia
iii) Filamentous organization: a) simple filaments b) Branched filaments
iv) Parenchymatous organization
v) Pseudoparenchymatous organization
vi) Siphonoceous organization

Chapter IV - Cyanophyceae: (03L)
i) General Characters
ii) Ecology of Blue green algae, thallus Organization,
iii) Ultra structure of Heterocyst, Nitrogen fixation and metabolism
iv) Reproduction

Chapter V - Chlorophyceae (05L)
i) General characteristics
ii) Range of thallus structure
iii) Method of reproduction and life cycle pattern.
Chapter VI - Phaeophyceae
i) General characters
ii) Range of thallus structure
iii) Method of reproduction and life cycle pattern

Chapter VII - Rhodophyceae
i) General characters
ii) Range of thallus structure
iii) Method of reproduction and life cycle pattern

Chapter VIII - General characters of divisions with examples:
  i) Xanthophyta: General characters
  ii) Bacillariophyta: Cell structure; classification, reproduction.
  iv) Euglenophyta: General characters
  v) Algae in human welfare

Fungi (30 Lectures)

Chapter IX - Fungi – Introduction:  
  i) Distinguishing characters
  ii) Thallus- unicellular and multicellular filamentous
  iii) Nutrition
  iv) Hyphal modifications in Fungi
  v) Classification of fungi up to classes as per- Ainsworth et al., system (1973).
  vi) Economic importance- Fungi in biotechnology, fungi as food

Chapter X - Myxomycotina: 
  i) Distinguishing characters
  ii) Structure of thallus and reproductive bodies
  iii) Life cycle pattern.

Chapter XI - Mastigomycotina: 
  i) Distinguishing characters
  ii) Thallus structure and reproduction (Asexual and sexual)
  iii) Life cycle pattern in Chytridiomycetes and Oomycetes.

Chapter XII - Zygomycotina: 
  i) Distinguishing characters
  ii) Thallus structure, Heterothallism
  iii) Sexual reproduction, Evolution of Asexual reproduction
  iv) Life cycle pattern

Chapter XIII - Ascomycotina: 
  i) Distinguishing characters
  ii) Thallus structure, structure of asci, Concept of Hamatheci um and centrum, Fructifications
  iii) Life cycle pattern in Hemiascomycetes and Euascomycetes.

Chapter XIV - Basidiomycotina:  
  i) Distinguishing characters
  ii) Thallus structure, structure of asci, Concept of Hamatheci um and centrum, Fructifications

Chapter XV - Fungi (continued):
  i) Economic importance- Fungi in biotechnology, fungi as food

Chapter XVI - Fungi (conclusion):
  i) Summary of key points
  ii) Future research directions
  iii) Conclusion

Chapter XVII - Fungi in nature:
  i) Fungi in ecosystems
  ii) Fungi in agriculture
  iii) Fungi in medicine

Chapter XVIII - Fungi in human welfare:
  i) Fungi in food production
  ii) Fungi in medicine
  iii) Fungi in biotechnology

Chapter XIX - Fungi in agriculture:
  i) Fungi in crop production
  ii) Fungi in livestock production
  iii) Fungi in aquaculture

Chapter XX - Fungi in medicine:
  i) Fungi as pathogens
  ii) Fungi as symbionts
  iii) Fungi as therapeutics

Chapter XXI - Fungi in biotechnology:
  i) Fungi in bioremediation
  ii) Fungi in biodiesel production
  iii) Fungi in biofuel production

Chapter XXII - Fungi in food production:
  i) Fungi in bread production
  ii) Fungi in cheese production
  iii) Fungi in wine production

Chapter XXIII - Fungi in water treatment:
  i) Fungi in wastewater treatment
  ii) Fungi in water desalination
  iii) Fungi in water purification

Chapter XXIV - Fungi in fuel production:
  i) Fungi in biofuel production
  ii) Fungi in biogas production
  iii) Fungi in biomethane production

Chapter XXV - Fungi in bioremediation:
  i) Fungi in soil remediation
  ii) Fungi in water remediation
  iii) Fungi in air remediation
Chapter XV - Deuteromycotina: (03L)
i) Distinguishing characters
ii) Thallus structure, Types and Structure of Basidia and basidiocarps
iii) Life cycle pattern in Teliomycetes, Hymenomycetes and Gasteromycetes.

Chapter XVI - Lichens: (02L)
i) Types and Classification of lichens, Nature of association
ii) Morphology and anatomy of lichen thallus, reproduction
iii) Economic and Ecological importance.

REFERENCE BOOKS:

Algae:


**Fungi:**


Aims and Objectives:

i) To make students aware of the status of higher cryptogams as a group in plant kingdom.

ii) To study habit and habitat of the higher cryptogams in the field.

iii) To study distinguishing features, interrelationships, phylogeny and evolutionary tendencies of selected orders with their affinities.

iv) To study economic importance of higher cryptogamic plants

BRYOPHYTA (30 Lectures)

Chapter I - Introduction

i. Classification of Bryophytes proposed by G. M. Smith with reasons details up to orders

ii. Distribution of Bryophytes in India and their micro climate

iii. Contribution of Indian bryologists
   - Prof Shiv Ram Kashyap
   - Prof S.K. Pande
   - Prof Ram Udar

Chapter II - Distinguishing features, interrelationships, phylogeny and evolutionary tendencies of the following orders:

(i) Hepaticae:
   - Spherocarpales
   - Marchantiales
   - Jungermanniales
   - Takakiales
   - Calobryales

(ii) Anthocerotae: Anthocerotales

(iii) Musci:
   - Sphagnales
   - Andreales
   - Polytrichales

Chapter III - General Topics:

(i) Evolution of gametophytes and sporophytes of Bryophyta

(ii) Economic importance of Bryophytas
PTERIDOPHYTA (30 Lectures)

Chapter IV - Introduction: (06L)
i) Classification of pteridophytes proposed by Reimers uptorders with reasons

ii) Distribution of Pteridophytes in India

iii) Contribution of Indian Pteridologists
   a) Rashid A
   b) S. S. Bir

Chapter V - Morphology, anatomy, and comparative discussion of sporophytes, gametophytes, interrelationships, evolutionary tendencies and phylogeny of following living orders: (17L)

i) Psilotales

ii) Lycopodiales

iii) Isoetales

iv) Selaginellales

v) Equisetales

vi) Marattiales

vii) Ophioglossales

viii) Osmundales

ix) Filicales (any two families)

x) Marsileales

xi) Salviniales

Chapter VI - General Topics: (07L)

(i) Heterospory and seed habit

(ii) Soral evolution

(iii) Economic importance of Pteridophytes

REFERENCE BOOKS:

BRYOPHYTA


**PTERIDOPHYTA**

BOT.2.3 PLANT PHYSIOLOGY AND BIOCHEMISTRY

(Total 60 Lectures)

Aims and Objectives:

i) To understand plant structures in the context of physiological functions of plants.
ii) To understand plant water relations.
iii) To study the mineral nutrition in plants in and ex flow of nutrients in plants.
iv) To understand the physiological details of photosynthesis and respiration.
v) To understand plant growth and development, and its regulation.

PLANT PHYSIOLOGY (40 Lectures)

Chapter I - Introduction, Scope and Importance (02L)

Chapter II - Growth and Development (06L)

i) Bioassay of Auxins, Gibbrellins, Cytokinins.
ii) Transport and storage of hormones.
iii) Physiological effect of Auxins, Gibbrellins and Cytokinins.

Chapter III - Photosynthesis (10L)

i) Introduction and Definition
ii) Brief account of photosynthetic pigments
iii) Light reaction
iv) Dark reaction
v) Formation of sucrose, starch and fructose
vi) Factors affecting the rate of photosynthesis - Light, temperature, water, O₂ and CO₂.

Chapter IV - Respiration (10L)

i) Introduction and Definition
ii) Respiratory Quotient (RQ)
iii) Formation of Hexose sugars from reserve carbohydrates
iv) Hydrolysis of fructans and sucrose
v) Mechanism: a) Glycolysis b) Kreb’s cycle c) Electron transport system (ETS)
vi) Fermentation:
   a) Alcoholic fermentation
   b) Acetic acid fermentation
   c) Lactic acid fermentation
vii) Factors affecting the rate of respiration

Chapter V - Translocations of Solutes (06L)

i) Introduction
ii) Uptake and translocation of solute & microelements
iii) Mechanisms of loading and unloading of photoassimilates
Chapter VI - Stress Physiology: (04L)
   i) Definition
   ii) Types of Stress
      a) Water stress - Drought, Cold and Salt
      b) Temperature stress - High and Low

Chapter VII - Biological clock: (02L)
   i) Concept of Biological Clock
   ii) Circadian and other Rhythms

**BIOCHEMISTRY (20 Lectures)**

Chapter VIII - Introduction: (03L)
   i) Definition, Scope and Importance
   ii) Hydrogen ion Concentration
   iii) pH and Buffers

Chapter IX - Primary and Secondary Plant Metabolites: (06L)
   i) Brief account of primary plant metabolites
   ii) Brief account of secondary plant metabolites
   iii) Biosynthesis of Terpenes, Phenols and Nitrogenous compounds and their role.

Chapter X - Biological Oxidation and Reduction: (06L)
   i) Introduction
   ii) Oxidation & reduction reactions
   iii) Redox reaction in biological system
   iv) Oxidation-reduction potential and measurement
   v) Biologically important Redox Systems.

Chapter XI - Biosignaling: (05L)
   i) General features of Signal and Transduction
   ii) G-protein mediator, couple receptor
   iii) Receptor Gateway

**REFERENCE BOOKS:**


BOT 2.4 Practical-I
(Based on BOT 2.1  (Total Practical’s – 24)

Algae : (12 Practicals)
Morphological observations, description and classification according to Fritsch with reason of taxa belonging to at least two examples from each order.
Practicals 1- 3: Cyanophyta: Any 10 forms
Practicals 4-7: Chlorophyta: Any 25 forms
Practical 8: Charophyceae- Chara, Nitella
Practicals 9-10: Xanthophyceae – Vaucheria, Botrydium
   Bacillariophyceae- Navicula, Pinnularia, Fragillaria, Synedra, Nitzchia,
   Cymbella, Cyclotella, Pleurosigma, Gyrosigma, Coconeis, (any 4 forms)
Practical 11: Phaeophyta – Any 5 forms
Practical 12: Rhodophyta- Any 4 forms

Fungi: (12 Practicals)
Practical 13: Preparation of cotton blue, Lactophenol and culture medium - PDA
   Representative genera belonging to following subdivisions of fungi with respect to vegetative, reproductive structures and classification with reasons according to Ainsworth et al. (1973).
Practical 14: Myxomycotina -Any three forms
Practical 15: Mastigomycotina - Any five forms
Practical 16: Zygomycotina - Any three forms
Practicals 17-19: Ascomycotina - Any eight forms
Practicals 20-22: Basidiomycotina- Any eight forms
Practical 23: Deuteromycotina - Any five forms
Practical 24: Study of Lichens -Any three forms

Note:
i) Excursion tour is compulsory to observe algae and fungi in nature. Tour report along with photographs must be submitted at the time of practical examination.
ii) Duly certified journals are compulsory at the time of practical examination.
Books/Monograph for identification of Algae:
1) Desikachary, T.V. (1959) Cyanophyta. Indian Council for Agricultural Research, India

Books/Monograph for identification of Fungi:
2) Bhat, D. J. (2010) Fascinating microfungi (Hyphomycetes) of Western Ghats-India, by Broadway Book Centre Publishers & Distributors, Pungim, Goa, India.
9) PandeAlaka (2008) Ascomycetes of Peninsular India, Scientific Publishers (India), Jodhpur, India
BOT 2.5 Practical II (Based on BOT. 2.2 & BOT 2.3)

(Total Practicals -24)

Bryophyta (6 Practicals)

Morphological, Anatomical and Reproductive studies of the following:

Practicals 1 -2: Marchantiales: Plagiochasma, Targionia, Asterella Conocephallum & Dumortiara.

Practicals 3-4: Jungermanniales: Pellia, Fossombronia, Pallavicinia, Porella and Frullania.

Practical 5: Anthocerotales – Anthoceros, Notothylus

Practical 6: Musci: Polytrichum, Pogonatum, Sphagnum

Pteridophyta (6 Practicals)

Morphological, Anatomical and Reproductive studies of the following

Practical 7: Lycopodium

Isoetes

Practical 8: Ophioglossum

Osmunda

Practical 9: Gleichenia, Pteris, Adiantum.

Practical 10: Asplenium, Lygodium.

Practical 11: Pleopeltis, Cheilanthes

Practical 12: Marsilea, Salvinia, Azolla

Note:

i) Excursion tour is compulsory to observe Bryophytes and Pteridophytes in nature. Tour report along with photographs must be submitted at the time of practical examination.

ii) Duly certified journals are compulsory at the time of practical examination.
Plant Physiology and Biochemistry (12 Practicals)

Practical 13: Determine diurnal fluctuations in titrable acid number (TAN) values of CAM succulents (e.g. Aloe, Bryophyllum, Kalanchoe- any one)

Practicals 14-15: Determine the absorption spectrum of chlorophyll pigments and estimate the amount of Chl-a, Chl-b and total Chlorophylls by spectrophotometer method.

Practical 16: Extraction and separation of free amino acid of germinating seed by circular paper chromatography.

Practical 17: Extraction and separation of free sugars from ripe fruits by ascending paper chromatography.

Practical 18: To extract and estimate the amount of Ascorbic acid present in green paper (raw)/ lemon (Fresh).


Practical 21: Estimation of amount of CO2 evolved during respiration (Germinating Pea seeds).

Practical 22: Estimation of ether soluble fat oil of Ricinus/ Arachis seeds by Sohxlet apparatus.

Practical 23: Estimation of total nitrogen in plants.

Practical 24: Estimation of alcohol in fermented grape juice.
Note:

Apart from grooming in basic science of botany, the first year of M.Sc. Botany syllabus included courses with applied avenues as the following:

2. NGO’s writing for environmental concerns
3. NGO’s and Govt. Department concerning hazards of pollutions
4. Industries or companies of Plant Breeding & Crop Improvements
5. Industries or Companies of Plant-based agricultural or horticultural procedures

Some applied courses are included in the syllabus of M.Sc IIInd year. This syllabus is to be framed yet.