Shivaji University, Kohapur
M.Sc. T & D. (Botany)
Revised Syllabus
To be Implemented from June, 2013
Total Marks 1600

A) THEORY

M.Sc. Part – I

Total Theory Papers 1 to 8 (Eight)

Each paper of 100 marks

Total Theory marks 8 x 100 = 800 marks

M.Sc. Part – II

Total Theory Papers 9 to 16 (Eight)

Each paper of 100 marks

Total Theory marks 8 x 100 = 800 marks

Total Theory papers for M.Sc. I and II = 16

Total theory marks = 1600 marks

Each Theory paper includes two sections and each section carries 50 marks

B) SEMINARS

There will be four seminars, each of 50 marks two seminars will be

conducted per year.

Total Marks for seminar will be 200

C) DISSERTATION – 500 Marks

D) VIVA-VOCE – 100 MARKS

M.Sc. Part – I (Theory)	800 Marks
M.Sc. Part – II (Theory)	800 Marks

Dissertation	500 Marks
Viva	100 Marks
Seminar	200 Marks
Grand Total	**2400 Marks**

M.Sc. (T. D.) Botany
Theory papers

Theory of M.Sc. (TD.) Botany is similar as theory of Regular M.Sc.

In M.Sc. (Botany) TD sixteen papers are there.

M.Sc. I

Paper 1 : Prerequisite Course

(Regular M.Sc. B O Paper 1.1)

Paper 2 : Biology and Diversity of Algae, Fungi and Bryophytes

(Regular M.Sc. B O Paper 1.2)

Paper 3 : Plant Ecology (Regular M.Sc. Paper B. O. 1.3)

Paper 4 : Biology and Diversity of Pteridophytes and Gymnosperms (Living and Fossils) (Regular M.Sc.B. O. Paper 1.4)

Paper 5 : Cell and Molecular Biology (Regular M.Sc.Paper B.O 2.1)

Paper 6 : Angiosperm Systematics (Regular M.Sc. Paper B.O. 2.2)

Paper 7 : Pant Pathology (Regular M.Sc. Paper B.O. 2.3)

Paper 8 : Plant Structure, Development & Reproduction

(Regular M.Sc. Paper B.O. 2.4)

Paper – I (BO 1.1)
Pre – requisite course

Total Lectures: 60

Unit: I

- **Microscopy:** Introduction, The light microscope, Compound microscope, Stereomicroscope, Phase contrast microscope, Fluorescence microscope, TEM, SEM, Confocal microscope, Principles and working. (**05)**
- **Biochemistry Laboratory:** Laboratory disciplines, safety and care, experimental report, SI units, pH and Buffers. (**02)**
- **Biostatics:** Measures of dispersion and variability, the variance and coefficient of variation. (**03)**
- **Computers in Biology:** Modern computers, its use in Biological science, Internet. (**02)**
- **Bioinformatics:** Definitions, (Analysing information using bioinformatics), data base. (**03)**

Unit: II

- **Separation Techniques:** Centrifugation: Basic principles of centrifugation, types, care and safety aspects of centrifugues, preparative and analytical centrifugation. (**04)**
- **Chromatographic Techniques:** principles, paper, thin layer (TLC), Column, HPTLC, HPLC, GC, Affinity and ion exchange. (**06)**
- **Electrophoretic Techniques:** General principles, support media, electrophoresis of proteins and nucleic acids, capillary, microchip electrophoresis. (**05)**

Unit: III

- **Spectroscopic Techniques:** Introduction, principles and applications in UV-Vis, fluorescence and AAS, Infrared and Raman, NMR, X-ray defraction. (**09)**
- **Radioisotope Techniques:** Introduction, nature of radio activity, atomic structure, stability, radiation, types of radioactive decay, half life, units of radio activity, properties of radioisotopes commonly used in biological sciences. Detection and measurement of radioactivity, autoradiography counters, safety aspects. (**06)**

Unit: IV

- **Culture Techniques:** Principles, types (Bacterial, fungal, algal, plant), media preparation, sterilization, inoculation. (**07)**
- **Equipments:** Laminar air flow, autoclaves, thermobath, shaker, stirrers, oven, incubators. (**02)**
- **Paleobotanical Techniques:** Peel technique, Paleopalynological techniques. (**02)**
- **Collection and preservation of plant material, cryopreservation.** (**04)**

List of Books:

1. Practical cytology, applied genetics and Bio-statistics Goswami H. K. and R. Goswami, Himalayan Publ. House, Bombay (1993)
2. Methods in plant molecular biology – M. A. Schwer and Zeclinskin publ. Academic Press New York (1989)
3. Plant histochemistry – Jensen.
4. Photosynthesis and production in a changing environment. A field and laboratory manual- Hall, Scurlik, BolharNordenkampt, Leagood and Long Chapman and Hall Publ. (1993)
5. Experimental plant physiology – J. Ardittiand Dunn, Publ. Academic Press (1970).
6. Techniques in Bioproductivity and photosynthesis by – Coombs, Hall, Long and Sourlock, Pergamon press Oxford (1985)
7. Methods in enzymology- Colowick and Kaplan Academic Press.
8. Handbook of field and herbarium techniques S. K. Jain and R. R. Rao.

9. Practical Biochemistry: Principles and Techniques. Ed. E. Wilson and J. Walker (2000) Cambridge Publ.
10. Studies in Paleobotany-Andrews, H. N. (1961)
11. Modern Experimental Biochemistry-Boyer, R.(2005). Pearsa, Education, Singapore.
12. Methods in Experimental Biology.-Ralph, R. (1975). Blakie, London
13. An Introduction to Biometry- Mungikar, A. M. (1997), Saraswati Printing Press Aurangabad.
14. Methods in Cell Research- Ruthmann August
15. Analytical quantitative methods in microscopy – G. A. Meek and H. Y. Elder
16. Microscope photometry – Horst Piller
17. Biological Ultrastructure – A. Engstrom and J. B. Finean
18. Techniques in Photomicrography – Brain and Ten Cate
19. Photomicrography: A comprehensive treatise – Roger P. Loveland.
20. Laboratory techniques in Botany – M. J. Purvis and D. C. Collier and D. Wallis.

Paper – II (BO 1.2)
Biology and Diversity of Fungi, Algae and Bryophytes

Total Lectures: 60

Fungi

UNIT: I

(a) General characters of Fungi. (1)
(b) Classification of Fungi by Alexopolous, Mims and Blackwell (2002). (1)
(c) Biodiversity and Taxonomy of following phyla up to the level of order. (13)

Phyla	Order
Chytridiomycota	Chytridiales

Zygomycota	Glomales
Ascomycota	Xylariales, Pezizales, Phallales, Nidulariales
Basidiomycota	Aphyllophorales, Uredinales, Ustilaginales

Unit: II

Biodiversity and Taxonomy of following phyla up to the level of order (13)

Oomycota, Saproligniales, Perenosporales, Hypochytridiomycota, Hypochytriales Labyrinthulomycota, Labyrinthulales,Hemiascomycetes,Taphrinales, Plasmodiophoromycota, Plasmodiophoromycetales, Dictyostelliomycota, Dictyostelliales, Myxomycota,Stemonitales

Algae

Unit: III

- Classification in Algae (2)
- Culture, Cultivation and methods of preservation. (2)
- Role of Algae in human welfare (2)
- Structure, Reproduction, Phylogeny and interrelationship of following classes(9)

  Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae, Rhodophyceae.

Bryophytes

Unit: IV

- Classification of Bryophytes (2)
- Origin of Bryophytes (2)
- Distribution, habit, morphology, reproduction, phylogeny, and inter relationship of following orders (8)

  Sphaerocarpales, Takakiales, Jungermanniales,Sphagnales, Buxbaumiales
- Economic importance of Bryophytes. (2)
- Bryophytes as indicators of pollution. (1)

Reference Books and Journals.

Algae

1. Kumar, H.D. and H. N. Singh (1971) Textbook of Algae
2. Sharma, O.P. (1986) Textbook of Algae
3. Pandey, B. P. (1994) Textbook of Botany – Algae
4. Vashista, B. R. (1995) Botany for degree students-Algae
5. Gangulee, H.C. and A. K. Kar (1992) College Botany Vol. III
6. Desikachary, T.V. (1972) Taxonomy and Biology of Blue -green algae
7. Fritsch, F. E. (1965) Structure and Reproduction of Algae
8. Venkataraman et al. (1974) Algae-Form and Function
9. Chapman, V.J. and D. J. Chapman (1965) The Algae

Journals

1. Phykos.
2. Phycologia
3. Seaweed Research.
4. Mahasagar

5. Indian Journal of Marine Biology

Fungi.

1. Alexopoulos, C.J. and C. W. Mims (1979) : Introductory Mycology
2. Sharma, O.O. (1989) : Textbook of Fungi
3. Ainsworth, G. G. and A.S. Sussman : The Fungi Vols. I, II, III, IV- A and IV-B
4. Bessey, E. A. (1967) : Morphology and Taxonomy of Fungi
5. Gangulee, H.S. and A. K. Kar (1992) : College Botany Vol. I
6. Thind K. S. (1977) : The Myxomycetes of India
7. Subramanan, C. V. (1971) :Hyphomycetes
8. Mundkur B.B. and M.J.Trimukchar (1952) :Ustihlaginales of India
9. Sparrdo F.K. (1960) : Aquatic phycomycetes
10. Dayal (1995) : Aquatic Fungi of India

Bryophytes

1. Cavers, R. (1964) : Inter-relationship of Bryophytes
2. Kashyap, S. R. (1929) : Liverworts of Western Himalayas and the Punjab Plains Part I and II
3. Parihar, N. S. (1959) : An introduction to Embryophyta. Bol. I –Bryophyta
4. Ram Udar (1976) : Bryology in India
5. Smith, G. M. (1955) :Cryptogamic Botany Bol. II
6. Watson, E.V, (1964) : The Structure and life of Bryopytes
7. Watson, E.V, (1963) : British Mosses and Liverworts
8. Vashista, B.R. (1996) : Botany for degree students -Brtophyta
9. Chopra, R. N. and P. K. Kumra (1988) : Biology of Bryophytes.

Paper – III (B O 1.3)

Plant Ecology

Total Lectures: 60

UNIT: I

Major ecosystemsof the world

Biomes: Concept, biomes of world, biome distribution, Biomes of North America: Tundra, Boreal coniferous forest (5)

Temperate deciduous forest, Grassland, Eastern pine-oak biome, Sub-tropical biome, Broad-sclerophyll biome, Tropical biomes: Tropical rain forest, Tropical savannah, Temperate deciduous forest biome, Biomass & biomes. (5)

Aquatic Ecosystems:

Fresh water ecosystems: Lotic and Lentic ecosystems.

Marine Ecosystems:Oceans, seas, estuaries (5)

UNIT: II

Population Ecology:

Properties of Population: Population density, biomass, trophic relationship, methods of estimating population density, natality, mortality, survivorship curves, population age distribution. (5)

Basic concepts of Rate: Birth rate, percentage growth rate, instantaneous rate.

Intrinsic rate of natural increase: Specific growth rate, biotic potential.

Concepts of carrying capacity: J-shaped growth form, S-shaped growth form, Maximum carrying capacity. (5)

Population fluctuations and cyclic oscillations: Seasonal changes, annual fluctuations, various examples of population cycles, extrinsic theories, intrinsic theories.

Density independent and density dependent mechanisms of population regulation

Patterns of Dispersion: Basic patterns of dispersion of individuals within a population.

The Allee Principle of Aggregation and Refuging (5)

Meta population Dynamics: Concept, Meta population distribution.

Energy partitioning and Optimization: *r*&*k* selection, A general model for *r*&*k* selection.Population genetics: Gene frequency, genotypes.

Life History Traits and Tactics: Four life history traits and predictive theories

UNIT: III:

Community Ecology: (5)

Types of interaction between two species,Co-evolution,Evolution of Co-operation

Inter specific competition and Co-existence, Positive / Negative interactions: Predation, Herbivory, Parasitism and Allelopathy (4)
Positive interactions: Commensalism, co-operation, mutualism.
Concept of Habitat: Ecological niche, Guild, Biodiversity & stability, Biodiversity &productivity.Paleoecology: Community structure in past ages. (6)

UNIT: IV

Phytogeographical regions of India:
North-west Himalayas, Western Himalayas, Central Himalayas, Eastern Himalayas, Indus Plains, Gangetic plain, Assam Region, Central India & Deccan Plateau, Malbar Region west coast, Andaman Region. (5)
Succession: Allogenic, Autogenic, Climatic climax, Regulation of Communities and Role of species diversity, Role of predators, Models of succession, Temporal and Spatial aspects. (5)
Environmental Education Programmes: Role of NGO's, Institute involved in various ecological activities like NIE, UNESCO, MAB, Biosphere Reserve, UNEP, WWF etc. (5)

List of Books:

- Plant Ecology. Ambasht R. S. (1990)
- Ecology: The experimental analysis of distribution and abundance. C. J. Krens, Horper and Row (1978).
- Patterns of primary production in the biosphere. H.F.W. Lieth (1978).
- Fundamentals of Ecology. Agarwal S. K. (1992).
- The Biosphere. Bradbury I. K. (1990)
- Handbook of Limnology and water pollution with practical methodology Das S. M. (1989).
- Environment and Plant Ecology. Etherington J. R. (1975).
- Deterministic mathematical models in population ecology. Freedman H. I.(1980).
- Quantitative Plant Ecology. Greig Smith P. (1983).
- Comparative Plant Ecology. Grisms J. P. *et .al* (1988).
- Quantitative and dynamic ecology. Kershaw K. S. (1964).
- Concept of ecology. Kormondy E. J. (1966).
- Ecology. Krebs C. J. (1978).
- Manual of plant Ecology. Misra K. C. (1989).
- Proceedings of the school of plant ecology. Misra R. and Das R. R. (1971).
- Ecology. Odum E. P. (1971).
- Fundamentals of Ecology. Odum E. P. (3^{rd} ed. 1996).
- Fundamentals of Ecology. Odum E. P. and Gary W. Barrett (6^{th} ed. 2010).
- Principles of Environment Sciences. Pandeya S. C. *eta .l* (1963).

Paper – IV (B O 1.4)

Biology and Diversity of Pteridophytes and Gymnosperms (Living and fossils)

Total Lectures: 60

UNIT: I

1) Brief outline of Classification of Pteridophytes (Extant) (**01)**

2) Morphology, reproduction, phylogeny and interrelationship of following orderswith reference to the forms mentioned against each.(Extant) (**12)**
Psilotales- *Tmesipteris*, Lycopodiales- *Lycopodium*, Isoetales- *Isoetes,* Filicales- *Microsorium*, Marattiales- *Angiopteris*, Salviniales- *Salvinia.*

3) Current trends of research in Pteridophytes (**02)**

UNIT: II

- Morphology, anatomy and evolutionary trends of extinct groups- Lepidodendrales,Sphenophyllales, Psilophytales, Marattiales, Filicales. (**10)**
- Evolution in reproductive structures of Cycadales (Extant) **(03)**
- Woods of Coniferales (Extant) **(02)**

UNIT: III

- Classification of Gymnosperms (Latest system) (**03)**
- Study of morphology, anatomy, reproductive organs and affinities of extant members of following orders. Ginkgoales, Taxales, Ephedrales, Welwitschiales (**10)**

- Applied aspects of Gymnosperms (**02)**

UNIT: IV

- Morphology, anatomy and evolutionary trends of following extinct groups. Pteridospermales, Bennettitales, Cordiaitales, Cycadales (**08)**
- Indian fossil flora – Glossopteris flora, Rajamahal Hill flora , Deccan Intertrappean flora (**05)**
- Techniques used in the study of diffèrent fossil types- Pétrification, Impression, compression. (**02)**

Reference Books :

Trivedi, A. N. (2002) - Advances in Pteridology
Bierhorst, D.W.(1971) - Morphology of Vascular plants
Eames, A. J. and E. M. Giffard (1950) - Comparative morphology of vascular plants
Rashid, A. (1978) - An introduction otPeridophytes
Spome, K.R. (1966) - Morphology of Ptseridophytes
Bower, F. O. (1963) - The Ferns
Jermy, A. G. (1973) - The Phylogeny and Classification of ferns.
Vashishta, B.R. (1996) - Botany for degree students – Pteridophytes
Parihar, N.S. (1959) - An Introduction to Pteridophyta
Arnold, C.A. (1972) - An introduction to paleobotany
Darroh, W.C. (1968) - Principles of paleobotany
Surange, K.R. (1968) - Indian Fossil Pteridophytes

Journals –

American Fern Journal
International Journal of plant sciences.
Bierhorst, D.W. (1971) – Morphology of vascular plants
Chamberlein, C.J. (1966) - Gymnosperms, Structure and Evolution
Coulter and Chumberlein, J. M. - Morphology of Gymnosperms
Foster, A. S. and Gifford, E. M. (1959)- Comparative morphology of vascular plants
Ramanujan, C.G.K. (1979) - Indian Gymnosperms in Time and Space
Spome, K.R. (1967) - Morphology of Gymosperms
Vashistha, P.C. (1976) - The Gymnosperms
Bhatnagar, S.P. and MoitraAlok (1996)- The Gymnosperms.
Arnold, C. A. (1972) - An Introduction to Pateobotany
Andrews, H.N. (1961) - Studies in Pateobotany
Darroh, W.C. (1960) - Principles of Paleobotany
Surange, K. R. (1968) - Indian Fossil Pteridophyles
Shukla, A.C. and Mishra, S.D. (1975)-Essentiales of Paleobotany
Bhatnagar, S.P. and MoitraAlok (1975) - The Gymnosperms
Stewart, W. N. (1983) - Paleobotany and the evolution of plants,

Paper – V (B O 2.1)
Cell and Molecular Biology

Total Lectures: 60

UNIT: I

1. Dynamic cell:
   General account of plant cell structure and its organization, cell organelles **(5)**
2. Plasma membrane: Structure, models and functions, sites for ATP ion carriers, channels and pumps, receptors, transport (**4)**

3. Plasmodesmata: structure, role in movement of molecules, comparison with gap junctions Cell signaling and cellular communication. **(6)**

UNIT: II

1. Organization and expression of chloroplast and mitochondrial genome (**4)**
2. Cell shape and motility: The cytoskeleton, organization and role of microtubules and microfilaments, motor movements implications in flagellar and other movements **(4)**
3. Cell division: Mitosis and meiosis (2)
4. Cell Cycle: Cell cycle control system, cell cycle check points,Cyclin dependent kinases, and cyclines, cell division control in animals, meiotic cell division and dynamics of chromosome movement during cell division, proteolysis (6)

UNIT: III

Concept of gene, Chemistry of gene andorganization of genetic material: a) DNA replication in prokaryotes and eukaryotes, Reverse transcription, DNA modification and repair (4), b) Packaging of DNA and repetitive and unique DNA sequences (4), c) Split genes, overlapping genes, pseudogenes and cryptic genes (4),d) The Genetic code (3

UNIT: IV

Gene expression and Gene regulation: a) Transcription in Prokaryotes and Eukaryotes (4),b) RNA processing (2),c) Synthesis and Transport of proteins (Prokaryotes and Eukaryotes) (4), d) Gene expression in Prokaryotes and gene expression in eukaryotes with variety of mechanisms (5)

Reference Books:

- Johnson Lewys – 2004 : Cell Biology ; sarup and sons, New Delhi
- E.J. Dupraw – 1970: Cell and Molecular Biology; Academic Press, London
- De Robertis and De Robertis – 1997 : Cell and Molecular Biology (VIII); B.I. Waverly Pvt. Ltd., New Delhi
- C. P. Swanson, T. Merz, and W.J. Young – 1982 : Cytogenetics ; Prentice – Hall of India Pvt. Ltd., New Delhi
- P.C.L. John (Ed.) – 1981 : The cell cycle; Cambridge University press
- Benjamin Lewin : Genes – VI, VII and VIII ; Oxford Press.
- R. A. Chapoldi 1977: Membrane proteins and their interactions with lipids; Marcel Dekker, inc. N. York

8. A. N. Mortonosi (Ed.) – 1985: The enzymes of Biological Membrames Vol. I, II and III;Plenum press, New York
9. Watson and others – 2004: Molecular Biology of the gene (V); pearsesEducatias,

Inc India
- P.C. Turner and others – 2002 : Molecular Biology (II); Viva Books, Pvt. Ltd., New Delhi.
- W. Ream and K. G. Field – 1999: Molecular Biology Techniques; Academic Press, London.
- Brace Albertsetal – 1983 : Molecular Biology of the cell ; Garland Publ. Inc., New York.
- Charlothe J. Avers – 1986: Molecular cell Biology; Addision. Wesley Publ. Company
- SandhyaMitra – 1988 : Elements of Molecular Biology ; McMillan India Ltd., N. Delhi

15. C. B. Powar – 1992 : Cell Biology; Himalaya Publishing House.

Current and Back Volumes of following Periodicals:

- Annual review of plant Biology
- Cell
- Cytologia
- Journal of Genetics
- The Journal of cytology and Genetics
- Journal of Experimental Biology
- The journal of Biochemistry
- Indian journal of Biochemistry and Biophysics.
- Trends in Biotechnology

Paper – VI (B O 2.2)

ANGIOSPERM SYSTEMATICS

Total lectures: 60

UNIT: I

TAXONOMY: Aims, principles and significance in charting, documentation, bioprospecting and CBD implementation, Taxonomy as the cornerstone of conservation and sustainable use of plants. (5)

TAXONOMIC TOOLS: Herbarium and botanical gardens, their role in teaching, research and conservation, important herbaria and botanical gardens of the world, checklists, floras, revisions and monographs. (5)

INTERNATIONAL CODE OF NOMENCLATURE OF ALGAE FUNGI AND PLANTS (ICN): Brief history, Principles, Scientific names, Principle of priority, typification, valid and effective publication, nominaconservanda, nominarejicienda. (5)

UNIT: II

EVOLUTIONARY CONCEPTS: Key concepts in evolution - origin of intra-population variation, population and environment, general biological principle, transference of function,adaptive radiation, punctuated equilibrium. (5)

PLANT SPECIATION: Morphological, biological species concepts; allopatric, abrupt, sympatric, hybrid and apomictic speciation. (5)

REPRODUCTIVE ISOLATING MECHANISMS: Premating-temporal, habitat, floral, reproductive mode; post mating, prezygotic-incompatibility; post mating, postzygotic- Incompatibility, Hybrid inviability, hybrid floral isolation, hybrid sterility, hybrid breakdown. (5)

UNIT: III

TAXOMETRICS: Principles, Numerical taxonomy, methodology and merits and demerits. (5)

CLADISTICS: Principles, cladistics, methodology. (5)

PHYLOGENETIC SYSTEMS OF ANGIOSPERM CLASSIFICATION: Cronquist's systems of classification (up to subclass level), Angiosperm Phylogeny group, APG III (2009) classification. (5)

UNIT: IV

FAMILIES OF ANGIOSPERMS: characteristic features, interrelationships, classification (APG) and economic importance of

families: **ANITA grade**: Amborellaceae, Nymphaeaceae, Hydatellaceae; **MAGNOLIIDS**: Magnoliaceae, **MONOCOTS:**Araceae, **COMMELINOIDS**: Arecaceae, **EUDICOTS**: Papaveraceae, **CORE EUDICOTS**: Amaranthaceae, **EUROSIDS-I:**Malpighiaceae, **EUROSID-II**: Malvaceae, **ASTERIDS:**Sapotaceae, **EUASTERIDS-I**:Gentianaceae, Acanthaceae, **EUASTERID-II**: Apiaceae, Asteraceae.

(15)

Books and References:

Briggs David 2009. *Plant microevolution and Conservation in Human-influenced Ecosystems*.Cambridge University Press.

Cronquist, A. 1981.*An Integrated System of Classification of Flowering Plants* Columbia University Press, New York.

Cronquist, A. 1988.*The Evolution and Classification of Flowering Plants* (2nded.) Allen Press, U.S.A.

Davis, P. H. and V. H. Heywood 1991.*Principles of Angiosperm Taxonomy***.**Today and Tomorrow Publications, New Delhi.

Hutchinson, J. 1959.*Families of Flowering plants.*

Judd W. S., Campbell, C. S., Kellogg, E. A., Stevens P. F. and M. J. Donoghue 2008.*Plant Systematics: A phylogenetic Approach.*Sunderland, Massachusetts, USA.

Lawrence George H. M. 195.1 *Taxonomy of Vascular Plants.*Oxford and IBH Publ. Co. Pvt. Ltd. New Delhi.

Leadlay E. and S. Jury (ed.) 2006.*Taxonomy and Plant conservation.*Cambridge University Press.

Manilal, K. S. and M. S. Muktesh Kumar [ed.] 1998.*A Handbook of Taxonomic Training.* DST, New Delhi.

Naik, V. N. 1984.*Taxonomy of Angiosperms*. Tata McGraw-Hill Publication Com. Ltd. New Delhi

Quicke, Donald, L. J. 1993.*Principles and Techniques of Contemporary Taxonomy.*Blakie Academic & Professional, London

Takhtajan, A. 1962.*Flowering plants- Origin and Dispersal.*

Taylor, D. V. and L. J. Hickey 1997. *Flowering Plants: Origin, Evolution and Phylogeny***.**CBS Publishers & Distributers, New Delhi.

Paper – VII (B O 2.3)

Plant Pathology

Total Lectures: 60

UNIT: I

1. History of plant diseases:

(i) Beginnings of modern plant pathology, conformation of Prevost's work.
(ii)Contribution of following plant pathologists to plant pathology: Anton De Bary, Kuhn, Woronin, S. D. Garrett, J. G. Horsefall, K.C. Mehta, T. S. Sadavasivan, M. J. Trimulachari and A. Mahadevan.
(iii) Plant pathology in 20th century. **(3)**

2. Symptomology and Epidemiology: Disease identification based on symptoms, (external and internal). Epidemiology: epiphytotics (Slow and rapid), disease forecasting. **(6)**

3. Methods of Studying plant diseases and their diagnosis: Field observation, collection of samples, laboratory studies, culturing of pathogenic organisms (fungi, bacteria and mycoplasma) , Koch's postulates. (**6)**

UNIT: II

1. Introductory Virology: History of virology, Nomenclature and classification of plant viruses, ultrastructure of TMV, TYMV, and Bacteriophage. Chemistry of plant viruses, isolation and purification of plant viruses.Economic importance of viruses.(**5)**

2. MLO: Classification, morphology and characteristics of MLO's Identification techniques of MLO's (**3)**

3. Stages of disease development: Pre penetration, Penetration, post penetration and colonization. (**3)**

4. Defence mechanism in host: Structural, physiological genetical and chemical. (**2)**

5. Role of environmental factors in disease development. (2)

UNIT: III

1. History, symptomology, causal organism, etiology and management of diseases of :

Rice, Sugarcane, Jowar, Wheat, Bajra, Pigeonpea, Rajmah, Tomato, Cabbage, Bhendi, Brinjal, Cucurbits, Chilly, Onion, Potato, Ginger, Turmeric.

(15)

Unit: IV

1. History, symptomology, causal organism, etiology and management of diseases of: Banana, Grapes, Coconut, Papaya, Citrus, Tobacco, Gerbera, Roses, Coffee, Cotton, Sunflower, Groundnut, Soybean, Sesamum, Teak, Dalbergia, Bamboo and Pomegranate. (**15)**

Reference Books:

Agrios, G. N. 2006: Plant Pathology, 5th Edition

Aneja, K. R. 1993. : Experiments in Microbiology, plant pathology and Tissue culture

Cooke, A. A. 1981. Diseases of Tropical and Subtropical field, Fiber and oil plants

Gangopadhyay , S. 2004: Clinical Plant Pathology

Kuijit, J. 1969: The Biology of parasitic flowering plants.

Mahadevan, A. and R. Shridhar, 1982. Methods in physiological plant pathology

Agarwal A. and Mehrotra, R. S. 2012: Plant Pathology

Nyvall, R. F. 1979 : Field Crop Diseases Handbook

Paul Khurama, S. M. 1998: Pathological Problems of Economic crop plants and their management

Planke, J. E. ander, 1968: Disease Resistance in plants.

Planke, J. E. Vander. 1963: Plant Diseases Epidemics and control

Rangaswami, G. 1979: Diseases of crop plants in India
Singh, R. S. 2009: Plant Diseases, 9th Edition

Current and back – Volumes of following periodicals:

1. Journal of phytopathology
2. Indian journal of phytopathology
3. Journal of Mycology and plant pathology
4. Annual review of plant pathology

Paper – VIII (B O 2.4)

PLANT STRUCTURE, DEVELOPMENT & REPRODUCTION

Total Lectures 60

Unit I: Embryology **(15)**

1. Gametophyte in Angiosperms: outline of development of male and female gametophyte. (04)

2. Ultrastructure of gametophyte: Vegetative cell, generative cell, pollen wall, pollen tube,abnormal male gametophyte and their function. (06)

3. Ultrastructure of female gametophyte: Synergids, Eggs, antipodal, central wall. (05)

Uni: II **(15)**

4. Pollen: Structure of stigma and style, Chemotropism, Pollen wall proteins, Stigma surface proteins, Post fertilization events. (04)

5. Experimental Embryology: Techniques for anther, ovary, nucellus, endosperms, embryoculture and their significance. (04)

6. Types of apomixis: Dilpospory, apospory. Causes, consequences and significances ofapomixis. (04)

7. Polyembryony: Classification, causes, experimental induction and partial importance. (03)

Unit III: Anatomy **(15)**

- Shoots development:- Organisation of shoots apical meristem (SAM) cytological and molecular aspects of SAM; Control of cell division and cell to cell communication; Control of tissue differentiation especially xylem and phloem. (04)
- Leaf growth and Differentiation:- Determination, control and leaf forms: Differentiation of epidermis (with special Suggested readings:- to stomata and trichomes) and mesophylls. (04)
- Root development:-Organisation of root apical meristem (RAM), Vesscular tissue differentiation, Lateral roots, root hairs, root- microbe's interaction. (04)
- Application:- Utility in systematics, archaeology climatic studies. (03)

Unit: IV Palynology: **(15)**

- Palynology: Scope and branches with special Suggested readings:- (01)
- Palynotaxonomy: Pollen morphology and plant taxonomy with Suggested readings: toGymnosperms and Angiosperms. (03)
- Paleopalynology: Principles, microfossil recovery theory and techniques, microfossil groups and oil exploration. (02)
- Aeropalynology: Principles, techniques, pollen analysis, pollen and spore allergy, allergic properties of pollen, pollen calendar and importance. (03)

5. Melittopalynology: Bee colony,foraging behaviour of bees , unifloralmultifloral

honey,application in crop productivity. (03)

6.Agropalynology: Pollen viability, pollen germination, pollen storage and their significance. (03)

SUGGESTED READINGS:-

Embryology:

- Maheshwari, P. 1950 :An introduction to the embryology of Angiosperm.
- Maheshwari, P.1963 : Recent advances on the embryology of Angiosperm.
- Johari, B M. 1963 : Experimental embryology of vascular plants.
- Stanley, R G and F.L. Linkens 1974: Pollen biology, Biochemistry management
- Shivanna, K. R. and B M Johari 1989: The Angiosperm pollen, structure

Anatomy:

- Barnova, M A. 1987: Historical developments of the present classification of morphological
- types of stomata. Bot.Res.53:53-79.
- Cutter, E G 1971 Plant Anatomy
- Dilcher, D D 1974: Approaches to the identification of angiosperms leaf remains. Bot.Rev. 40:2- 157
- Emmes, E J. and M C Danials, 1947: An introduction to plant anatomy.
- Easau, K. 1962: Plant anatomy –anatomy of seed plants.
- Fahn, A.1969: Secretary Tissue system
- Foster, A S 1942: Practical plant anatomy
- Haberland, G.1965: Physiological
- Masueth, J D. 1936 : Plant anatomy
- Metcalfe, C R and L Chalk, 1950: Anatomy of the dicotyledons
- Solender, H. 1908 : Systematics anatomy of the dicots
- Tomlinson, P S 1961: Anatomy of the monocotyledons.

Palynology

- Cunningham, D D1873 : Microscopic examination of air.
- Fageri, K and J Inversen, 1964: Text book of pollen analysis.
- Nair, P K K1964 : Advances in Palynology.
- Nair, P K K1966 : Essentials of Palynology.
- Heslop-Harrison, Y. 1971: Pollen development and physiology.

- Gregory, P H, 1973: Microbiology of atmosphere.
- Erdtman, G.1988 : Pollen morphology and plant taxonomy.
- Tilak, S T. 1989 : Airborne pollen and fungal spores.
- Shivanna K R and N S Rangaswami1992 : Pollen Biology, A Laboratory manual.
- Bhattacharya, K. , M R Majumdar and S G Bhattacharya 2006: A Text book of Palynology.
- Shivanna K R and B M Johari,1985: The Angiosperm Pollen, structure and function.
- Pandey and Chadha, 1992: Plant Anatomy and Embryology .

Journals:

- Journal of Plant Sciences,
- Experimental Biology
- Developmental Biology
- Phytomorphology
- Currents sciences
- Plant Biology
- Int. Journal of Plant Sciences
- Pollen Biology and Fertilization
- Pollen Morphology
- Journal of Paleontology