DR. HOMI BHABHA STATE UNIVERSITY, MUMBAI

Faculty of Science and Technology

M.Sc. SYLLABUS FOR CORE AND SKILL ENHANCEMENT COURSES IN BOTANY

As Per U. G. C. Guidelines
Based on
Choice Based Credit System (CBCS)
BOTANY SEMESTER - WISE SYLLABUS
(Theory and Practicals)

To Be Implemented From Academic Year
2019 - 2020

Semester	Course Type	Course Code	Course Title	Credits
SEM I	Core Compulsory	MSBOCC101T	Plant Diversity I :Microbiology, Virology & Phycology	4
		MSBOCC101P		2
	Core Compulsory	MSBOCC102T	Plant Diversity II :Bryophytes, Pteridophytes, Paleobotany & Gymnosperms	4
		MSBOCC102P		2
	Core Compulsory	MSBOCC103T	Plant Physiology & Biochemistry	4
		MSBOCC103P		2
	Interdisiplinary Elective Course	MSBOIE101T	Genetics, Cell Biology & Plant Breeding	4
		MSBOIE101P		2
	Generic Elective Course	MSBOGE101T	Pharmacognosy	2
		MSBOGE102T	Biodiversity and Conservation	2
	Skill Enhancement Compulsory Course	MSBOSC101T	Presentation Skills	2
SEM II	Core Compulsory	MSBOCC201T	Plant Diversity III: Fungal Biology and Plant Pathology	4
		MSBOCC201P		2
	Core Compulsory	MSBOCC202T	Plant Diversity: Angiosperms (Taxonomy, Anatomy and Developmental Botany)	4
		MSBOCC202P		2
	Core Compulsory	MSBOCC203T	Ecosystem & Environmental Botany	4
		MSBOCC203P		2
	Interdisiplinary Elective Course	MSBOIE201T	Bioactive Molecules in Plants	4
		MSBOIE201P		2
	Skill Enhancement Compulsory	MSBOSC201T	Plant Tissue Culture-I	4
SEM III	Core Compulsory	MSBOCC301T	Instrumentation and Techniques-I	4
		MSBOCC301P		2
	Core Compulsory	MSBOCC302T	Cell and Molecular Biology-I	4
		MSBOCC302P		2
	Discipline Specific Elective	MSBODE301T	Plant Physiology, Biochemistry and Phytochemistry-I- Plant Biochemistry-I	4
		MSBOPR301P		2
	Discipline Specific Elective	MSBODE302T	Plant Physiology, Biochemistry and Phytochemistry-II- Phytochemistry	4
		MSBOPR302P		2
	Discipline Specific Elective	MSBODE303T	Molecular Biology, Cytogenetics and Biotechnology-I (Cancer and development)	4
		MSBOPR303P		2
	Discipline Specific Elective	MSBODE304T	Molecular Biology, Cytogenetics and Biotechnology-II (rDNA Technology)	4
		MSBOPR304P		2
	Discipline Specific Elective	MSBODE305T	Ecology, Environmental Botany and Biotechnology-I (Ecological Concepts and Climate Change)	4
		MSBOPR305P		2
	Discipline Specific Elective	MSBODE306T	Ecology, Environmental Botany and Biotechnology-II (Environmental Pollution)	4
		MSBOPR306P		2
	Generic Elective Course	MSBOGE301T	Environmetal Impact Assesment	2
	Skill Enhancement Compulsory Course	MSBOSC302T	Science Communication	2

SEM IV	Core Compulsory	MSBOCC401T	Instrumentation and Techniques-II	4
		MSBOCC401P		2
	Core Compulsory	MSBOCC402T	Cell and Molecular Biology-II	4
		MSBOCC402P		2
	Discipline Specific Elective	MSBODE401T	Plant Physiology, Biochemistry and Phytochemistry-III- Plant Biochemistry-II	4
		MSBOPR401P		2
	Discipline Specific Elective	MSBODE402T	Plant Physiology, Biochemistry and Phytochemistry-IV- Plant Biochemistry-III	4
		MSBOPR402P		2
	Discipline Specific Elective	MSBODE403T	Molecular Biology, Cytogenetics and Biotechnology-III (Immunology and Techniques)	4
		MSBOPR403P		2
	Discipline Specific Elective	MSBODE404T	Molecular Biology, Cytogenetics and Biotechnology-IV (Applications of rDNA Technology and Nanotechnology)	4
		MSBOPR404P		2
	Discipline Specific Elective	MSBODE405T	Ecology, Environmental Botany and Biotechnology-III (Conservation, Policies and Practices)	4
		MSBOPR405P		2
	Discipline Specific Elective	MSBODE406T	Ecology, Environmental Botany and Biotechnology-IV (Technologies for Pollution Control)	4
		MSBOPR406P		2
	Skill Enhancement Compulsory	MSBOSC401T	Plant Tissue Culture II	4
		MSBOSC402T	Applied Botany	4

SEM I

Course Type: Core Compulsory

Course Code: MSBOCC101T

Course Title: Plant Diversity I: Microbiology, Virology & Phycology

Credits-4

Course outcomes (Students will be able to……)

Learn basic microbiology lab techniques
Understand growth and differentiation in microorganism
Understand basic concepts of Virology in relation to plant virus.
Learn classification and diversity of Algae.
Understand algal biotechnology and its uses in human welfare.

Course Code: MSBOCC101T	Course Title: Plant Diversity I :Microbiology, Virology & Phycology	Allotted hours
Course Credit: 4	Total contact hours: 60 Hrs	

Course Contents (Topics & subtopics)

Unit I : General Microbiology **15**

Methods in microbiology:

Types of culture media, isolation of pure cultures, enrichment culture techniques, maintenance and preservation of bacterial cultures. Control of microorganisms: physical and chemical methods.

Growth and differentiation:

Measurement of growth, growth kinetics, synchronous growth, and continuous culture. Physico-chemical factors influencing bacterial growth. Differentiation: sporogenesis- physiobiochemical and genetic aspect

Unit II: Virology **15**

General Virology:

Virus classification. General properties and ultra-structure. Viral genome organizations. Cultivation of viruses, methods for detection and assay. Virus related agents: viriods, prions, and prion hypothesis.

Plant viruses:

Tobacco mosaic virus: capsid assembly, genome organization, and replication.

Unit III: Phycology **15**

Classification

Classification of Algae up to orders, according to system proposed by G.M. Smith.

Diversity

Habitat, thallus organization, cell structure, reproduction and patterns of life cycles with reference to Cyanobacteria, Chlorophyceae, Charophyceae, Bacillariophyceae, Xanthophyceae, Euglenophyceae, Chrysophyceae, Pyrrophyceae, Cryptophyceae, Phaeophyceae, and Rhodophyceae.

Unit IV: Applied Phycology **15**

Algal Biotechnology

Chlamydomonas reinhardtii as model organism; Hydrogen production by *C. reinhardtii*

Microalgae in Human welfare:

Nutraceuticals; Pharmaceuticals; Biofertilizers; Bio-fuel; CO_2 sequestration and pollution control. Culturing techniques and photo bioreactor based production.

LIST OF BOOKS

- General Microbiology by R.Y. Stanier, JL Ingrahm, ML Wheelis and PR Painter.
- Microbiology: Fundamentals and Applications by RM Atlas.
- General Microbiology by HG Schlegel
- Microbial Physiology by A G Moat and Foster
  Fundamental Bacterial Genetics by N Trun and J Trempy
- Bacterial Genetics by Snyder
- Microbial Genetics by Maloy, J E Cronan and D Friefelder
- Introduction to Modern Virology by NJ Dimmock, A J Easton and K N Leppard
- Basic Virology by EK Wagner, MJ Hewlett, DC Bloom and D Camerini.
- Principles of Fermentation Technology by P F Stanbury, A Whitaker and SJ Hall.
- Microbiology by Prescott L, Harley J, Klein D.
- Microbial Interactions in Agriculture and Forestry Vol. 2, NS Subba Rao and YR D
- Phycology (4th Edition) R.L. Lee
- Algae- An introduction to Phycology- C Van den Hoek Press
- Hand Book of Microalgal culture. Ed by A. Richmond. Blackwell Publishing House
- Algae- Anatomy
- Molecular Biology of Cyanobacteria- DA Bryant. Kluwer Academic Publisher
- Algal Ecology- Fresh Water Benthic Ecosystems. Ed by R. J Stevenson, ML Bothwell, R.L. Lowe, Academic Press, 1996.
- Ecology of Cyanobateria-Their diversity in time and space- B A Whittan, M Potts. Kluwer Academic Publishers.
- Origin of algae and their plastids. Ed. D Bhattacharya, Springer Wien, New York

Course Type: Core Compulsory

Course Code: MSBOCC101P

Course Title: Plant Diversity I: Microbiology, Virology & Phycology

Credits-2

Course Code:	**Course Title:**
MSBOCC101P	**Plant Diversity I : Microbiology, Virology & Phycology**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Basic microbiological techniques: preparation of media, sterilization, slant and stab preparation. Pouring of plates and pure culture by streak and pour plate method.
2. Determination of bacterial growth and growth kinetics.
3. Enrichment and isolation of nitrogen fixing bacteria from soil and their characterization.
4. Algal Diversity study Cyanobacteria, Chlorophyta, Bacillariophyta
5. Identification of seaweeds from different divisions - Chlorophyta, Phaeophyta, Rhodophyta
6. General Principles of culturing algae in laboratory and growth curve determination
7. Study and collection of marine algae.

Course Type: Core Compulsory

Course Code: MSBOCC102T

Course Title: Plant Diversity II: Bryophytes, Pteridophytes, Paleobotany & Gymnosperms

Credits-4

Course outcomes (Students will be able to……)

Learn to identify common bryophytes upto order level and understand their basic ecological and evolutionary significance.

Learn to identify common pteridophytes upto order level and understand the evolutionary significance of sporophyte

Understand basic principles of geological time scale and fossil types.

Learn to identify common gymnosperms up to order level and understand their basic economic and evolutionary significance.

Course Code: MSBOCC1	Course Title: Plant Diversity II :Bryophytes, Pteridophytes, Paleobotany & Gymnosperms	Allotted hours
Course Credit: 4	Total contact hours: 60 Hrs	

Unit I: Bryophytes **15**

Classification:

Classification of Bryophytes up to orders, according to system proposed by G.M. Smith, Peristome structures for classification of mosses.

Evolutionary & Ecological significance:

Alternation of generation, Origin and evolution with reference to habitat and forms, Evolution of gametophytes and sporophyte, Poikilohydry, Bryophytes as bioindicators.

Unit II: Pteridophytes **15**

Classification: Classification of Pteridophytes up to orders, according to system proposed by G.M. Smith.

Morphology & Evolutionary studies: Stomatal types, Origin and evolution of sporangium.

Unit III: Paleobotany **15**

Classification: Geological time scale, Types of fossils

Fossil flora :

Pteridophytes: *Horneophyton, Lepidodendron, Calamites, Cladaxylon, Sphenophylales & Coenopteridales*.

Gymnosperms: *Cordaites, Glossopteris & Gangamopteris*

Unit IV: Gymnosperms **15**

Classification: Classification of Gymnosperms up to orders, according to system proposed by C.J. Chamberlain.

General characters, Economic & Ecological significance:

Affinities and interrelationship of Cycadofilicales, Benititales and Corditales.

Economic importance in pharmaceuticals and food supplements. Endangered and endemic taxa and their conservation.

Suggested Readings:

BRYOPHYTES

- Introduction to Bryophytes Cambridge University Press, Edited by Alain
- Vanderpoorten and Bernard Goffinet.
- Bryophyte Biology 2nd Edition, Bernard Goffinet, Edited by A. Jonathan Shaw.
- Bryophyte Ecology edt. A. Smith, Springer Science &Business, Media, 2012.
- Bryophyte Ecology. Glime, J. M. Houghton: Michigan Technological Univ., 2007.
- Bryophytes and Lichens In A Changing Environment Bates, J. W., and A.M. Farmer, eds. Oxford: Clarendon, 1992.
- Handbook of Indian Mosses H. C. Gangulee, Amerind Pub. Co., 1985.
- Biology of Bryophytes eds R.N. Chopra and P.K. Kumra, New age International publisher, 2005.

PTERIDOPHYTES

- Dyer A. F. (1979). The Experimental Biology of Ferns. Academic Press, London.
- Gifford E. M, Foster A.S. (1989). Morphology and evolution of Vascular plants, (3rd Edn). W H.Freeman & Co.
- Kubitzki K. (1976). The families and Genera of Vascular plants: Vol. I Pteridophytes. Vikas Publishing House.

- Rashid A. (1976). An Introduction to Pteridophytes. Vikas Publishing House.
- Sporne K.R. (1986). Morphology of Pteridophytes. Hutchinson University Library, London.
- Surange K.R. (1966). Indian Fossil Pteridophytes. Council of Scientific and Industrial Research.
- Louis J.D. (1977). Evolutionary patterns and processes in ferns: Advances in Botanical Research.
- Scott. Studies in Fossil Botany. Haffner publications.
- Smith, G.M. (1976). Cryptogamic Botany Vol. II. Tata McGraw Hill, Publishing Co. Ltd. New Delhi.
- Chandra S. & Srivastava M. (2003). Pteridology in the New Millennium. Khuwar Acad. Publishers
- Stewart W.N. &Rothwell G.W. (2005).Paleobotany and the Evolution of Plants, (2nd Edn.) Cambridge University Press.
- Sharma O.P. (2006). Text book of Pteridophyta. Macmillan India Ltd., New Delhi.
- Ranker T.A. &Haufler C.H. (2008). Biology and Evolution of Ferns and Lycophytes. Cambridge University Press.
- Eames E.J. (1983). Morphology of vascular Plants. Standard University Press.

GYMNOSPERMS

- The Morphology of Gymnosperms. K.R. Sporne
- Morphology of Gymnosperms. John M. Coulter and Charles J. Chamberlain
- Gymnosperms. S.P. Bhatnagar and Alok Moitra
- The Gymnosperms. C. Biswas and B.M. Johri
- Morphology and Evolution of Vascular Plants. Ernest M. Gifford, Adriance S. Foster
- The Families and Genera of Vascular Plants. K.U.Krarner, P.S. Green (Edited by Kubitzki)

PALEOBOTANY

- Stewart, W.N. and Rothwell G.W. (1993), Palaeobotany and the Evolution of Plants, Cambridge University Press.
- Foster A.S. & Gifford F.M. (1967): Comparative morphology of vascular plants, Freeman Publishers, San Fransisco.
- Eames, A.J. (1974): Morphology of Vascular Plants-lower groups, Tata Mc-Graw Hill publishing Co., New Delhi.

- Arnold, C.A. (1947): Introduction to Palaeobotany, Mc-Graw Hill Book Co. Inc., New York and London.
- Kubitzki K. (1990), The families and genera of vascular plants Pteridophytes and
- Gymnosperms, Springer Verlag, New York
- Agashe, S.N. (1995), Palaeobotany, Oxford & IBH, New Delhi.

Course Type: Core Compulsory

Course Code: MSBOCC102P

Course Title: Plant Diversity II: Bryophytes, Pteridophytes, Paleobotany & Gymnosperms

Credits-2

Course Code:	**Course Title:**
MSBOCC102P	**Plant Diversity II :Bryophytes, Pteridophytes, Paleobotany & Gymnosperms**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Study of vegetative and reproductive structures in *Targionia Plagiochasma Fimbraria, Pellia* and *Pgonganatum.*
2. Workout on different types of peristome structure for classification on mosses
3. Study of vegetative and reproductive structures in : *Isoetes, Ophioglossum Pteris, Angiopteris, Lygodium* and *Azolla*
4. Study of fossils: *Sigillaria, Calamites, Cordaites, Sphenophyllum* and *Glossopteris*.
5. A study of following types *Auraucaria, Cupressus , Podocarpus* and *Juniperus.*

Course Type: Core Compulsory

Course Code: MSBOCC103T

Course Title: Plant Physiology & Biochemistry

Credits-4

Course outcomes (Students will be able to……)

Understand regulatory mechanism of photosynthetic pathways in eukaryotes
Understand photosynthetic mechanism in prokaryotes
Learn biochemistry of proteins, lipids and carbohydrates
Learn the metabolism of natural plant growth hormones

Course Code: MSBOCC103T	**Course Title: Plant Physiology & Biochemistry**	**Allotted hours**
Course Credit: 4	**Total contact hours: 60 Hrs**	

Course Contents (Topics & subtopics)

Unit I: Photosynthesis **15**

Regulation of C_3, C_4 and CAM:

Role of light in activation of dark phase enzymes

C_3 : Regulation of RUBISCO, Light dependent enzyme activation,

Ferredoxin–Thioredoxin system,

C_4: Regulation by light- PEP carboxylase, NADP-Malate dehydrogenase,

and Pyruvate–Orthophosphate dikinase

CAM: Phosphorylation of PEP carboxylase, long term regulation

Bacterial Photosynthesis, Types (Oxygenic & Anoxygenic), Pigment system in bacteria, Electron Transport Pathways in bacteria, rTCA,

Unit II: Respiration **15**

Metabolic regulation of glycolysis and citric acid cycle.
Gluconeogenesis; Glyoxylate cycle.

Unit III: Biomolecules **15**

Proteins
Structures – primary, secondary, tertiary and quaternary

Carbohydrates
Structure and Classification of Mono, di and polysaccharides, Conjugates of carbohydrates with other molecules- glycoproteins, glycolipids, proteoglycans, lipopolysaccharides and their biological roles.

Lipids
Classification, storage lipids, membrane lipids and biological role of lipids

Unit IV: PLANT HORMONES **15**

Biosynthesis, storage, breakdown and transport of Auxins, Gibberellins, Cytokinins, Abscisic Acid and Ethylene.

Suggested Readings

- Lehninger **Principles of Biochemistry**, Lehninger and Nelson D. L.;
- **Biochemistry**, Stryer L.;
- **Molecular Cell Biology**, Lodish H. and Darneu J.
- **Plant Physiology**: Taiz and Zeiger
- **Plant Biochemistry** Dey, PM, Harborne, JB (ed.):

Course Type: Core Compulsory

Course Code: MSBOCC103P

Course Title: Plant Physiology & Biochemistry

Credits-2

Course Code:	**Course Title:**
MSBOCC103P	**Plant Physiology & Biochemistry**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Isolation of Plant Pigments by Column Chromatography
2. Quantitative study of diurnal fluctuation in titratable acid number (TAN) in a CAM plant.
3. Construction of Protein Standard Curve using Folin's Lowry Method
4. Quantitative Estimation of Amino Acids by Ninhydrin
5. Estimation of reducing sugar by Nelson-Somogyi method.
6. Estimation of SDH activity
7. Estimation of oil or crude fat

Course Type: Interdisciplinary Elective Course

Course Code: MSBOIE101T

Course Title: Genetics, Cell Biology & Plant Breeding

Credits-4

Course outcomes (Students will be able to……)

Understand the mechanism of Cell cycle and Cell interaction in eukaryotic cells

Understand fine structure of gene in prokaryotes. Complementation analysis will help the student to understand whether two mutations associated with a specific phenotype represent two different forms of the same gene (alleles) or are variations of two different genes.

Understand of the various strategies deployed for improvement of crops based on the breeding systems.

Learn the different theories that have been proposed to explain heterosis.
- Different ways of exploiting heterosis.

Learn how to integrate molecular methods with conventional improvement strategies to accelerate plant breeding

Course Code: MSBOIE101T	Course Title: Genetics, Cell Biology & Plant Breeding	Allotted hours
Course Credit: 4	Total contact hours: 60 Hrs	

Course Contents (Topics & subtopics)

Unit I: Cytogenetics 15

Cell Regulation

Cell cycle-Eukaryotic cell cycle, checkpoints and regulations of cell cycle
Cell interaction-Cellular adhesions, junctions and junction proteins

Unit II: Molecular Biology 15

Microbial Genetics:

Molecular basis of transformation, transduction, Conjugation; fine structure of the gene, T4 Phage, complementation analysis, deletion mapping, cis-trans tests

Unit III: Recombinant DNA Technology 15

Vectors in gene cloning:
pUC19, phage, cosmid, BAC and YAC vectors. High and low copy number plasmids and its regulation.
Application of recombinant DNA technology for production of herbicide resistant plants, insect resistant plants, improving seed storage proteins and Golden rice.

Unit IV: Plant Breeding 15

Genetic systems and breeding methods - Selection and breeding strategies for self-pollinated, cross-pollinated and clonally propagated plants. Self-incompatibility, male sterility, apomixis.

Genetics and molecular basis of heterosis - Types of heterosis, genetic and molecular basis of inbreeding and heterosis, utilization in crop improvement.

Suggested readings

- Molecular Genetics of Plant Development, Howell SP (1998) Cambridge University Press
- The physical and chemical basis of molecular biology-Creighton
- Principles of Biochemistry-Nelson et al
- Lewin's Cell- Plopper, George (edtd)
- Principles of Mol. Biology-Tropp, Burton
- Cell Biology-Pollard
- The Cell: a molecular approach-Cooper
- Molecular Biology-Clarke, David
- Molecular Biology-Weaver

Course Type: Interdisciplinary Elective Course

Course Code: MSBOIE101P

Course Title: Genetics, Cell Biology & Plant Breeding

Credits-2

Course Code:	**Course Title:**
MSBOIE101P	**Genetics, Cell Biology & Plant Breeding.**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Preparation of cytological stains, fixatives and pretreatment agents.
2. Squash preparation from pre-treated root tips (colchicines/ Paradichlorobenzene/ Aesculin.
3. Squash preparation from mutagen treated root tips for study of aberrations.
4. Smear preparation from any suitable plant material.
5. Problems based on:
   Restriction map analysis and construction of restriction maps,
   Tetrad analysis in *Neurospora* – two genes and centromere.
   Deletion mapping in Bacteriophage.

Course Type: Generic Elective Course

Course Code: MSBOGE101T

Course Title: Pharmacognosy

Credits-2

Course Code: MSBOGE101T	Course Title: Pharmacognosy	Allotted hours
Course Credit: 2	Total contact hours: 30 Hrs	

Unit I : Introduction to Pharmacognosy **15**

History, Definition and Scope of Pharmacognosy

Alternative systems of medicines

Classification of drugs of natural origin

Evaluation of crude drugs

Unit II : Cultivation, collection, production and utilization of herbal drugs **15**

Cultivation, Collection and Processing of Herbal Drugs

Indian Trade in Medicinal and Aromatic Plants

Utilization of aromatic plants

Pharmacognostical studies of crude drugs containing Alkaloids and Volatile Oils

Suggested readings

- Pharmacognosy Phytochemistry – Medicinal Plants – Jean Brunetton,
- Medicinal Plant – Their Bioactivity, Screening and Evaluation – Published by CSIR
- Textbook of Pharmacognosy – Trease and Evans – 14th edition
- Pharmacognosy and Phytochemistry - Biren Shah & A.K. Seth
- Principles of Ayurvedic Therapeutics – Kumar A. V. –Sri Satguru Publications
- MateriaMedica of Homeopathic Medicines – Phatak S. R.
- Homeopathic Pharmacopoeia of India of India – Published Ministry of Health
- The Ayurvedic formulary of India. Part I & II- Published by Ministry of Health
- Chinese Materia Medica- You- PinZhu- Harwood Academic Publishers
- India Materia Meidca – Nadkarni A. K. – Bombay Popular Prakashan

Course Type: Generic Elective Course

Course Code: MSBOGE102T

Course Title: Biodiversity and Conservation

Credits-2

Course Code:	Course Title:	Allotted
MSBOGE102T	Biodiversity and Conservation	Hrs.

Course Credit: 2 **Total contact hours: 30 Hrs**

UNIT: 1 BIODIVERSITY **15**

Basic concepts of biodiversity, Biodiversity- definition, levels and types (genetic, species, ecosystem diversity), global biodiversity, biodiversity Indices.

Phytogeography regions of India, India as a mega diversity nation,

Hot-spots of biodiversity.
Floristic diversity of India and adjacent region, value of biodiversity: consumptive, productive use, social, ethical, aesthetic and option values.

UNIT II: MONITORING AND CONSERVATION **15**

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Effects of human activities on environment. Endangered and endemic species of India.

Conservation: Definition, Methods of conservation of living resources; red and green data books, world conservation strategy.

Conservation of biodiversity : In-situ and Ex-situ conservation of Biodiversity, Constitutional Framework for Biodiversity, International Conventions and initiatives, Environmental Education

Suggested readings:

- Atkinson, P.M. and Tate, N.J. (Eds.) 1999 Advances in remote sensing and GIS analysis. Wiley, New York.
- Environmental Science and Engineering - Meenakshi, Prentice Hall India.
- Environmental Studies - Benny Joseph - Tata McgrawHill-2005
- Environmental Studies - Dr. D.L. Manjunath, Pearson Education-2006.
- Environmental studies – R. Rajagopalan – Oxford Publication – 2005.

- Gunther,O. 1998 Environmen tal Information Systems. Berlin, New York, Springer.
- Gupta, N. Dass, Environmental Accounting, Wheeler Publishing, New Delhi, 1997.
- Odum, E.P. 1983 Basic Ecology. Saunders International Edition, Japan.
- Pandey, G.N., Environmental Management, Vikas Publishing House, New Delhi, 1997.
- Phillipson, J. 1972 Ecological Energetics, Edward Arnold.
- Principles of Environmental Science and Engineering - P. Venugoplan Rao, Prentice Hall of India.
- Recknagel , F. 2002 Ecological Informatics : Understanding Ecology by Biologically- Inspired Computation. Springer, New York.
- Text book of Environmental Science & Technology – M. Anji Reddy – BS Publication.
- Uberoi , N. K., Environmental Management, Excel Books, New Delhi, 2000.

Theory Examination Question Paper Pattern:

Time: 2:30 Hrs **Total Marks: 60**

Q. l- Two (2) Long Answer Questions on Unit- I out of which One has to be solved. (12 Marks)

Q.2- Two (2) Long Answer Questions on Unit- II out of which One has to be solved. (12 Marks)

Q.3- Two (2) Long Answer Questions on Unit- III out of which One has to be solved. (12 Marks)

Q.4- Two (2) Long Answer Questions on Unit- IV out of which One has to be solved. (12 Marks)

Q.5- Six (6) Short Answer Questions on all four Units out of which three have to be solved. (12 Marks)

Internal Examination Question Paper Pattern

Seminars: 20 Marks

Multiple choice questions: 20 Marks (5 marks from each Unit)

Note:

Total Marks: 40

1. A candidate shall be eligible for appearing at the examination provided he/she maintains percentage of attendance as specified by the University.

2. Minimum Marks of 20 are required in Every Practical Paper Examination in each semester.

3. A minimum of two field excursions (One long & One short) for habitat studies are compulsory.

4. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of M.Sc. Botany as per the minimum requirements. In case of loss of journal, a candidate must produce a certificate from the Head of the Department/ Institute that the student completed the practical for the academic year. However, such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.

Course Type: Skill Enhancement Compulsory Course

Course Code: MSBOSC101T

Course Title: Presentation Skills

Credits-2

Course outcomes (Students will be able to……)

Students learns the imports of presentations in their students and Professional life. Students learns pressure handling of presentation. Different skills of presentation. Group co-ordination, their responsibility in group presentation. Students learns different skills of how to make effective presentations. Students learns different skills of how to improve individual performance in presentations.

Course Code: MSBOSC101T	**Course Title: Presentation Skills**	**Allotted hours**
Course Credit: 2	**Total contact hours: 30 Hrs**	
Unit I: Development of Presentation Skill in Students- Purposes of student presentations / Importance Presentation. Pressures and problems of giving Presentations. A demonstration of your skills in using equipment. An individual presentation for a job interview. Benefits of student presentations. Effective Presentation- Careful planning and Preparation. Good communication skills. Appropriate use of technologies. Clear supporting documentation. Suitable audience participation. Appropriate use of technologies		15
Unit II: Improving your individual performance. Improving the Content. Using your body confidently. Ten Steps for Preparing your Presentation. Creating Audio- visual Aids and Handouts. Using PowerPoint Effectively. Copyright and Plagiarism Report Writing- Components of an excellent report, Definition of an excellent report, Objectives for reports. Planning and Resources for your Report. Organizing your Report.		15

Suggested readings:

- A Student's Guide to Presentations Making your Presentation Count (SAGE Essential Study Skills Series) by Barbara Chivers and Michael Shoolbred.
- Skills Converged.com/Soft Skills training Course.
- Report Writing/Skills training Corse by Dr. Margaret Greenhall

SEM II

Course Type: Core Compulsory

Course Code: MSBOCC201T

Course Title: Plant Diversity III: Fungal Biology and Plant Pathology

Credits-4

Objectives:

- This course aims to enhance understanding of students in basic concepts of mycology, Understand the diversity and biology of fungi and importance of fungi
- The course deals with basic concepts in plant pathology
- Principles of plant pathology, host-pathogen interactions with identification of diseases and disease causative agents
- Introduction to agricultural pathogens and pests of national importance will be accompanied by basic concepts in integrated disease/pest management

Course outcomes (Students will be able to……)

- Understand basic fungal biology, taxonomy of the fungi and major fungal lineages.
- Gain skills necessary to isolate and handle fungi from nature, and to learn important microscopic characteristics of fungi.
- Develop functional knowledge on differentiating disease caused by virus, fungi, and bacteria
- Knowledge of plant disease and integrated pest management

Course Code: MSBOCC201T	Course Title: Plant Diversity III: Fungal Biology and Plant Pathology	Allotted hours
Course Credit: 4	**Total contact hours: 60 Hrs**	

Unit I: General Mycology — 15

General Characters of Fungi, substrate relationship m fungi, cell ultrastructure and cell wall composition in fungi, nutrition, reproduction (vegetative, asexual, sexual), different types of ascocarps and basidiocarps, Heterothallism, heterokaryosis and parasexuality in fungi Importance and ecological role of fungi. Fungi in food spoilage

Unit II: Fungal Taxonomy **15**

General account of recent trends in classification of fungi

Classification of fungi: An outline of latest classification up to orders, according to the system proposed by C J. Alexopoulos and Mimes or Ainsworth

General account of spore bearing organs and their arrangements in various groups of fungi; spore release and dispersal.

Unit III: Applied Mycology Mycorrhiza: types, distribution and significance with reference to agriculture and forestry. **15**

Application of fungi in food and beverages industry, Yeast fermentation, biocontrol and medicines

Industrial and non-industrial Fungal Metabolites (Antibiotics, Enzymes, Organic acids, Phytoalexins and Mycotoxins)

Aeromycological analysis of allergenic airborne fungi

Medical Mycology: Dermatophytic fungi - Knowledge of common dermatophytes and human diseases caused by them; Aspergillosis

Unit IV: Plant Pathology **15**

Plant-pathogen interactions, Factors influencing infection, Integrated Pest Management (IPM)
Biotic agents of infections and diseases: bacteria, viruses, fungi, phytocoplasma: Study of diseases with reference to symptoms, causal organism and disease cycle and Management of diseases with reference to
following diseases :

- Angular leaf spot of Cotton
- Yellow vain mosaic of Bhindi
- Grassy shoot of sugarcane
- Downy mildew of grapes
- Leaf blotch of turmeric
- Rust of Wheat
- Tikka disease of groundnut

Suggested readings:

- Agrios, G. N. (1969) Plant Pathology, Academic Press, New York.
- Alexopolus, C. J., Minms, C. W. and Blackwell, M. (1999). (4th edn) Introductory Mycology.Wiley, New york.
- Bos, L. (1999) Plant viruses, unique and intriguing pathogens. Backhugs Publ. Leiden
- Casida, L. E. (1997). Industrial microbiology. New Age Publishers, New Delhi.
- Deacon, J. W. (2006). Fungal biology. (4th Ed.) Blackwell publishing, ISBN. 1405130660.

- Eggins, H.O.W. and Allsop (1975) The Filamentous Fungi Vol. I Industrial Mycology (Biodetoriation and Biodegradation by Fungi) Eds. J.E. Smith and D.R.Berry Edward Arnold, London.
- Emmons, C. W., C. H. Bin ford, J.P. Utz and Know Chung (1977) Medical Mycology, Lea and Febigo, Philadelphia
- Gupta, V. K. and V. S. Paul (2001) Disease of vegetable crops. Kalyani Publ. Ludhiana,
- Mehrotra, R. S. and Aneja, K.R. (1990). An introduction to mycology. New age publishers, ISBN 8122400892
- Rangaswaini G. & A. Mahadevan (2001) - Diseases of Crop Plants in India, Prentice Hall of India, New Delhi.
- Rangaswami, G. and S. Rajagopalan (1973) Bacterial Plant Pathology, T. N. Agri. Uni., Coimbatore
- Rangaswami, G. and A. Mahadevan (2001) Disease of crop plants in India, Prentice Hall of India, Pvt. Ltd., New Delhi.
- Raychaudhari, S. P. and T. K. Nariani (1977) Virus and Mycoplasma disease of Plants in India. Oxford and IBK Publ. Corp., New Delhi
- Sharma PD (2017) Mycology and Phytopathology. Rastogi Publishers, Meerut, India
- Sharma, O. P. (2007).Text book of Fungi. Tata McGraw Hill, Publishing Co. Ltd. New Delhi.
- Strange RN, (2003) Introduction to Plant Pathology, John Wiley & Sons, USA.
- V.K. Gupta & M,K. Behl (1994) Indian Plant Viruses & Mycoplasma, Kalyani Publishers, Ludhiana.
- Webster J and Weber R (2007). Introduction to Fungi. Third Edition. Cambridge University Press. Cambridge and New York

Course Type: Core Compulsory

Course Code: MSBOCC201P

Course Title: Plant Diversity III: Fungal Biology and Plant Pathology

Credits-2

Course Code:	**Course Title:**
MSBOCC201P	**Plant Diversity III: Fungal Biology and Plant Pathology**
Course Credit:	**Total contact hours: 60 Hrs**

1. Introduction to basic Mycological Techniques and culturing
2. Isolation and identification of fungi from infected plant tissues or rhizosphere using serial dilution technique
3. Study of representative genera belonging to following subdivisions of fungi with respect to vegetative, reproductive structures and classification with reasons: Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina (At least one example from each class)
4. Monitoring and analysis of Aeromycoflora (using Anderson sampler/settle plate method)
5. Preparation of fungal spore atlas isolated from the air environment
6. Symptomology and histopathology of some common diseases with diagnostic characteristics of the followings:
   a) Study of bacterial plant diseases b) Study of Phytoplasma diseases
   c) Study of viral plant diseases
   d) Study of fungal plant diseases
7. A mini field project to study crop diseases from field and market specimens (only Identification). Identification of specimens from field trip or Visit to Agriculture University, Plant Pathological Research Centers

Course Type: Core Compulsory

Course Code: MSBOCC202T

Course Title: Plant Diversity: Angiosperms (Taxonomy, Anatomy and Developmental Botany)

Credits-4

Objectives:

To enable the students:

- To understand the various aspects of plant nomenclature and classification
- To understand the classical and modern trends of Angiosperm taxonomy
- To understand the salient features of angiosperm families with special reference to sexual characters To enable the students:
- To develop the skill on the identification of plants with their salient features
- To develop the skills on preparation of herbarium and microslides for identification
- To create an overall knowledge on the identification of all group of plants including fossil

Course outcomes (Students will be able to……)

- Evaluate and discuss groups of plants in terms of their diversity and describe their evolution, phylogeny
- Apply the taxonomic principles in preparing keys and herbaria
- Analyse the anatomical and embryological stages of plants and their development
- Provides skill in structural and functional characteristics of various plant parts
- Acquire practical knowledge on identification of various groups of plants

Course Code: MSBOCC202T	**Course Title: Plant Diversity: Angiosperms (Taxonomy, and Developmental Botany**	**Allotted hours**
Course Credit: 4	**Total contact hours: 60 Hrs**	

Unit I: Angiosperms **15**

Systematics: Outline of classification of Angiosperms; Hutchinson, APG, merits and demerits.

Botanical nomenclature: International code of Botanic Nomenclature; principles: Rules and recommendations; priority; typification; Rules of effective and valid publications; retention and choice of names.

Unit II: Taxonomy of Angiosperms **15**

Diagnostic characteristics, systematic phylogeny and economic importance of families: Magnoliaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Orchidacae, Cyperaceae and Poaceae.

Unit III: Anatomy **15**

Vascular plants: Meristems; secondary growth; wood development and its diversity; cambial variants; ultrastructure and control of xylem and phloem differentiation; secretary ducts and laticifers; anatomical adaptations for special Habitats-biotic and abiotic stresses. Applications (in brief) of anatomical studies in systematics, archaeology, Climate studies, pharmacology, forensic sciences and biomedical research.

Unit IV: Developmental Botany **15**

Development of flower: Transition to flowering - vegetative to reproductive evocation, floral homeotic mutations (MAD box genes) in Arabidopsis, ABC model of flower development, gender expression in monoecious and dioecious plants.

Developmental biology of male and female gametophytes: microsporogenesis and microgametogenesis, megasporogenesis and megagametogenesis, pollen embryogenesis.

Pollen-pistil interaction: In vivo and in vitro pollen germination, pollen tube growth and guidance, double fertilization, self-compatibility mechanisms, incongruity.

Embryogenesis and seed development: Polarity during embryogenesis, pattern mutants, in vitro fertilization, endosperm development, apomixis, polyembryony, somatic embryogenesis.

Suggested readings

- Lawrence George H M (1951). Taxonomy of vascular plants. Oxford and IBH Publ. Co. Pvt. Ltd.
- Jeffrey C (1968). An Introduction to principles of Plant Taxonomy.
- Cole A J (1969). Numerical Taxonomy. Academic Press.
- Davis P H, Heywood V M (1973). Principles of Angiosperm Taxonomy. Robert E Kereiger Publ.
- Harrison H J (1971). New Concepts in Flowering Plant Taxonomy. Heiman Educational Books Ltd.
- Cronquist A (1981). An Integrated system of classifications of flowering plants. Columbia University Press.
- Heywood V H, D M Moore (Eds) (1984). Current concept in Plant Taxonomy.
- Naik V V (1984). Taxonomy of Angiosperms. Tata McGraw Hill Publ. Co. Ltd.
- Radford A E (1986). Fundamentals of Plant Systematics. Harper & Row Publ.
- Davis P H, V H Heywood (1991). Principles of Angiosperm Taxonomy. Today and

Tomorrow Publications.
- Stace C A (1989). Plant Taxonomy and Biosystematics. Etwaed Arnold.
- Woodland D W (1991). Contemporary Plant Systematics. Prentice Hall.
- Sivarajan V V (1991). Introduction to Principles of Plant Taxonomy. Oxford IBH
- Takhtajan A L (1997). Diversity and Classification of Flowering Plants. Columbia Univ. Press.
- Taylor D V, L J Hickey (1997). Flowering plants: Origin, evolution and phylogeny. CBS Publishers & Distributors.
- Stuessy T F (2002). Plant taxonomy: The systematic Evaluation of comparative data. Bishen Singh, Mahendra Pal Singh. Dehradun.
- Gurcharan Singh (2004). Plant Systematics: Theory and practice. Oxford and IBH Publishing.
- Wendy B Zomlefer (2006). Guide to Flowering Plant Families. Overseas Press India Private Ltd.
- International Code of Botanical Nomenclature (latest)
- Henry A N, Chandrabose M (1980). An aid to the International Code of Botanical Nomenclature.
- Cutter EG (1978) Plant Anatomy, Part I & II, Edward Arnold, United Kingdom
- Dickinson WC (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA. 8.
- Fahn A (1974) Plant Anatomy, Pergmon Press, USA & UK.
- Fosket DE. (1994) Plant, Growth and Development: A Molecular Approach, Academic Press.
- Hopkins WG. (2006). The Green World: Plant Development, Chelsea House Publication
- Howell SH. (1998) Molecular Genetics of Plant Development, Cambridge University Press.
- Leyser O and Day S (2003) Mechanism of Plant Development, Blackwell Press
- Mauseth JD (1988). Plant Anatomy, The Benjamin/ Cummings Publisher, USA 15.
- Nair MNB (1998). Wood Anatomy and Major Uses of Wood, Faculty of Forestry, University of Putra Malaysia, Malaysia.
- Raghavan V (2000) Developmental Biology of Flowering Plants, Springer, Netherlands
- Raghavan V (1997). Molecular Embryology of Flowering Plants. Cambridge. University Press.
- Richards AJ (1986) Plant Breeding System, George Allen and Unwin.
- Shivanna KR (2003) Pollen Biology and Biotechnology, Science Publishers.

Course Type: Core Compulsory
Course Code: MSBOCC202P

Course Title: Plant Diversity: Angiosperms (Taxonomy, Anatomy and Developmental Botany)
Credits-2

Course Code:	**Course Title:**
MSBOCC202P	**Plant Diversity: Angiosperms (Taxonomy, Anatomy and Developmental Botany**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Study of at least 10 locally available families of flowering plants
2. Identification of genus and species of locally available wild plants; location of key characters and preparation of key
3. Study of xylem and phloem elements using maceration, staining, light and electron micrographs (xerophytes, hydrophytes and halophytes)
4. Pollen in vitro germination methods: Sitting drop culture, suspension culture, surface culture.
5. Correlation between fertility (stainability), viability (TTC and FDA staining) and germinability (in vitro) of pollen grains.
6. Study of post-fertilization stage with the help of permanent slides and electron micrographs.
7. Role of transcription and translation inhibitors on pollen germination and pollen tube growth
8. Field excursion for familiarization with and study of vegetation type(s) and flora(s) of areas of different bioclimatic zones of India, and in the local areas, and training in collection and preservation methodologies. Submission of at least 05 herbarium specimens of common cultivated plants.

Course Type: Core Compulsory

Course Code: MSBOCC203T

Course Title: Ecosystem & Environmental Botany

Credits-4

Objectives: To enable the students:

The concepts and principles of ecology, biological diversity, conservation, Sustainable development, population, community and ecosystem structure and function, Application of these concepts to solve environmental problems.

Course outcomes (Students will be able to……)

Students will learn about ecology and environment,
Characteristics of organisms as population, community and ecosystems
Functions of the ecosystem, importance of food chain and food web
Phytogeographya, biodiversity and hotspots
Applications of ecological **knowledge for the benefit of anthropogenic society**

Course Code: MSBOCC203T	**Course Title: Ecosystem & Environmental Botany**	**Allotted hours**
Course Credit: 4	**Total contact hours: 60 Hrs**	

Unit I: Structure and Functions of Ecosystem **15**

An introduction to plant ecology and its scope.

Structure of ecosystem: Abiotic components, Biotic components, Ecological Pyramids (Pyramid of numbers, Biomass and energy)

Functions of ecosystem: Productivity (Primary and secondary productivity), food chains, Grazing and detritus food chains and food webs.

Ecosystem stability : concepts, natural and anthropogenic disturbances

Unit II: Habitat Ecology **15**

Habitat and Niche: concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Population Ecology: Characteristics of a population; population growth curves; life history strategies (r and K selection);

Concept of metapopulation – demes and dispersal, interdemic extinctions, age structured population

Unit III: Phytogeography and Biodiversity **15**

Biomes: Classification and components, Major biomes of the World -Terrestrial, Tundra, arboreal coniferous forests, temperate and tropical grasslands and deciduous forests, Mediterranean and Desert vegetation, Tropical rain forests; Aquatic
Types of Indian Forest. Diversity types and levels (alpha, beta and gamma)

Unit IV: Environmental Pollution **15**

Environmental pollution in relation to air, water and soil. Use of fertilizer, pesticides and other chemicals in agriculture

Effect of solid waste disposal on soil. Bioindicator and biomarkers of environmental health.

Concepts of ecological management and sustainable development

Climate change: Greenhouse gases, their sources, trends and role, Ozone layer and its depletion (Global warming, Sea level rise, UV radiation) acid rain

Course Type: Core Compulsory

Course Code: MSBOCC203P

Course Title: Ecosystem & Environmental Botany

Credits-2

Course Code:	**Course Title:**
MSBOCC203P	**Ecosystem & Environmental Botany**
Course Credit: 2	**Total contact hours: 60 Hrs**

1. To Study the Quantitative Characters of Plant Community by Quadrat Method (Frequency, Density, Abundance)
2. To calculate mean, mode median, variance, standard deviation, standard error related to ecological data
3. To calculate coefficient of variation and use t-test for comparing two means related to ecological data
4. To determine the turbidity of different water bodies using turbidity meter or Secchi disc method.
5. To estimate chlorophyll content in plants growing in polluted and non-polluted areas / SO_2 fumigated and non-fumigated plant leaves

6. Interpretation of satellite images and aerial photographs with respect to major vegetation/ landforms/ land use patterns.

7. Field visit: students should be taken for field visits to places of ecological/environmental interest or Research Institutes working in conservation of plants. They should submit detailed report of the visit in the form of project report in the final practical examination for evaluation. The report shall carry marks.

Course Type: Interdisciplinary Elective Course

Course Code: MSBOIE201T

Course Title: Bioactive Molecules in Plants

Credits-4

Objectives:

To impart knowledge on the status and export potential of medicinal and aromatic plants.
To inculcate the importance of conserving rare medicinal species
To discuss the problems in production and marketing of medicinal and aromatic crops.
To describe the importance of medicinal and aromatic plants in medicine, neutraceuticals, cosmetics, perfumery industry and Indian system of medicine.

Outcomes:

Gain knowledge on the Indian herbal industry
Develop an understanding on constraints and problems in production of medicinal and aromatic plants.
Develop expertise among the students for medicinal and aromatic plants.
Create niche market covering phytochemicals, value addition and market enhancement.
Develop entrepreneurship activities to establish value addition ventures, botanical extracts, isolation of bioactive compounds, aroma chemicals.
Transform the knowledge into skills for promotion of herbal industry.

Course Code: MSBOIE201T	**Course Title: Bioactive Molecules in Plants**	**Allotted hours**
Course Credit: 4	**Total contact hours: 60 Hrs**	
Unit I: Bioactive Compounds in Plants		**15**
Importance of active principles and uses of medicinal plants in different traditional systems of medicine. Major groups of Phytochemicals sources, Pharmaceutical and medicinal importance a) Alkaloids b) Terpenoids c) Flavonoids		
Unit II: Cultivation and Collection of Herbal Drugs		**15**
Soils, Seeds and Propagation Material, Factors Affecting Cultivation. Origin, Historical background. Active principles uses and cultivation practices of the following medicinal plants *Coleus forskohlii, Rauwolfia serpentina, Dioscoria sps* and *Plantago ovata*		

Unit III: Extraction, Isolation and Identification of Herbal Drugs	**15**
Extraction Methods:- Maceration, Percolation, Continuous Extraction-Soxhlet,Supercritical Fluid Extraction, Types of Extracts:- Decoction, Infusion, Digestion, Tinctures, Liquid Extracts, Soft Extracts, Dry Extracts Isolation and Identification of Natural Products: Chromatography:- Paper, TLC, HPTLC, Column, Flash Chromatography, HPLC and GC	
Unit IV: **Secondary Metabolites Production Using Plant Cell Cultures**	**15**
Plant Cell Culture Technique: Cell cultures, applications, advantages and disadvantages Strategies to Increase Secondary Metabolites Production: Selection according to Molecular & Biochemical characteristics, Targeting Metabolism:, Immobilization and Biotransformation. Industrial Production of useful Biochemicals	

Course Type: Interdisciplinary Elective Course

Course Code: MSBOIE201P

Course Title: Bioactive Molecules in Plants

Credits-2

Course Code: MSBOIE201P **Course Title: Bioactive Molecules in Plants**

Course Credit: 2 **Total contact hours: 60 Hrs**

1. Phytochemical Screening of Secondary Metabolites
2. Organoleptic and Microscopic analysis and identification of the following crude drugs.
   a) Leaf drugs Mentha and Thyme
   b) Root drugs Ginger and Licorice
   c) Bark drugs Cinnamon
   d) Flower drugs Chamomile
   e) Seeds drugs Fenugreek and Mustard
3. Histochemical identification of the following chemical substances:
   a) Carbohydrates b) Proteins c) Amino acids d) Starch e) Tannins
4. Extraction of volatile oil (Clove Oil and Hisperidin)

Suggested readings

- Pharmacognosy- Kokate et al

- Pharmacognosy- Trease & Evans-1996
- Pharmacognosy- Shaw and Quadri
- Pharmacognosy Laboratory Manual- Nidal Jaradat & Samah Al-Jabi

Course Type: Skill Enhancement Compulsory Course

Course Code: MSBOSC201T

Course Title: Plant Tissue Culture-I

Credits-4

Objectives:

The students will be technically and critically trained with good practical exposure to perform the plant, which is the most required in this field of science; This area can be taken up as micropropagation business with smaller investment by entrepreneurs. Many Central and State Government departments to name a few: The Department of Agriculture and Cooperation, National Horticulture Board (NHB) under the Ministry of Agriculture, Agricultural and Processed food products Export Development Authority (APEDA) under the Ministry of Commerce and Industry etc., are promoting by providing various schemes and subsidies along with incentives to strengthen this stupendous discipline.

Course outcomes (Students will be able to……)

The students will be technically and critically trained with practical exposure to perform both the plant and animal culture, which is the most required in this field of science, skilled candidates are absorbed in well-established and commercial tissue culture units. Agricultural literates of tissue culture have the ability to set up their own laboratories for the propagation of the plants which is the need in the society

Course Code: MSBOSC201T	Course Title: Plant Tissue Culture and Techniques	Reqd. hours
Course Credit: 4	**Total contact hours: 60 Hrs**	

Unit I: Plant Tissue Culture I — 15

Introduction. History. Scope. Advantages. Applications. Limitations. Guidelines for establishing academic and commercial laboratory. Steps involved in Plant Tissue Culture. Various nutrient medium compositions. Plant growth regulators and their role in nutrient media.

Unit II : Plant Tissue Culture II — 15

Types of organ cultures and their applications. Pathways of regeneration. Micro grafting of commercially important plants. In vitro approaches for crop improvement. Plant cell reactors. Microtechniques

Unit III: Micropropagation I — 15

Meristem culture for the production of virus free plants. Nucellus culture for clonal propagation and large-scale multiplication. Strategies of Micropropagation. Stages of micropropagation via axillary shoot proliferation in Monocots and Dicots.

Unit IV : Micropropagation II **15**

Stages in micro propagation via direct and indirect organogenesis. Stages in micro propagation via direct and indirect somatic embryogenesis. Low cost methods for micro propagation.

Suggested readings

- Bhojwani, S.S. 1990. Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers,
- Bhojwani, S.S. 1996. Plant Tissue Culture: Application and Limitations. Elsevier Science Publishers, New York, USA.
- Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer
- Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety and
- Glick, B.R. and Thomson, J. E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton,
- A Textbook of Biotechnology, R. C. Dubey, S. Chand Publication

Internal Assignments **in Plant** Tissue **Culture:** **40 Marks**

1. Handling and Instrumentation of Plant Tissue Culture.
2. Glassware Washing & Sterilization Techniques.
3. Preparation of stock solutions and nutrient media.
4. Surface sterilization of Explants.
5. Monocot and Dicot Seed cultures for the establishment of organ
6. Establishment of organ cultures for the induction of callus
7. Establishment of organ cultures for the induction of multiple shoots
8. Cytological study of calli cells
9. Establishment of embryogenic/ non embryogenic cell suspension
10. Embryo *I* Endosperm/ Ovules and anther Cultures.

Department of Botany

Theory Examination Question Paper Pattern

Time: 2:30 Hrs Total Marks: 60

Q.1- Two (2) Long Answer Questions on **Unit-** I. out of which One has to be solved. (12 Marks)

Q.2- Two (2) Long Answer Questions on **Unit-** II. Out of which one has to be solved. (12 Marks)

Q.3- Two (2) Long Answer Questions on **Unit-** III. Out of which one has to be solved. (12 Marks)

Q.4- Two (2) Long Answer Questions on Unit **-IV**. Out of which one has to be solved. (12 Marks)

Q.5- Four (4) Short Answer Questions on all four Units out of which three have to be solved. (12 Marks)

Internal Examination Question Paper Pattern

Seminars: 20 Marks

Multiple choice questions: 20 Marks (5 questions from each Unit)

Note:

Total Marks: 40

1. A candidate shall be eligible for appearing at the examination provided he/she maintains percentage of attendance as specified by the University.

2. Minimum Marks of 20 are required in Every Practical Paper Examination in each semester.

3. A minimum of two field excursions (One long & One short) for habitat studies are compulsory.

4. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of M.Sc. Botany as per the minimum requirements. In case of loss of journal, a candidate must produce a certificate from the Head of the Department/ Institute that the student completed the practical for the academic year. However, such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.