DEPARTMENT OF BOTANY, OSMANIA UNIVERSITY
M.Sc. BOTANY (CBCS)
New Syllabus (Effective from Academic Year 2022-2023)
Course Structure
Proposed Scheme

Semester I					Semester II					Semester III					Semester IV				
	Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks
1	**CORE 1** MBOT.CC.T.1.101	3	3	30+70	1	**CORE 1** MBOT.CC.T.1.201	3	3	30+70	1	**CORE 1** MBOT.CC.T.2.301	3	3	30+70	1	**CORE 1** MBOT.CC.T.2.401	3	3	30+70
2	**CORE 2** MBOT.CC.T.1.102	3	3	30+70	2	**CORE 2** MBOT.CC.T.1.202	3	3	30+70	2	**CORE 2** MBOT.CC.T.2.302	3	3	30+70	2	**CORE 2** MBOT.CC.T.2.402	3	3	30+70
3	**CORE 3** MBOT.CC.T.1.103	3	3	30+70	3	**CORE 3** MBOT.CC.T.1.203	3	3	30+70	3	**ELECTIVE - I** MBOT.CC.T.2.303	3	3	30+70	3	**ELECTIVE - III** MBOT.CC.T.2.403	3	3	30+70
4	**CORE 4** MBOT.CC.T.1.104	3	3	30+70	4	**CORE 4** MBOT.CC.T.1.204	3	3	30+70	4	**ELECTIVE - II** MBOT.CC.T.2.304	3	3	30+70					
5	**CORE 1** Practical MBOT.CC.P.1.105	4	2	50	5	**CORE 1** Practical MBOT.CC.P.1.205	4	2	50	5	**CORE 1** Practical MBOT.CC.P.2.305	4	2	50	4	**CORE 1** Practical MBOT.CC.P.2.405	4	2	50
6	**CORE 2** Practical MBOT.CC.P.1.106	4	2	50	6	**CORE 2** Practical MBOT.CC.P.1.206	4	2	50	6	**CORE 2** Practical MBOT.CC .P.2.306	4	2	50	5	**CORE 2** Practical MBOT.CC.P.2.406	4	2	50
7	**CORE 3** Practical MBOT.CC.P.1.107	4	2	50	7	**CORE 3** Practical MBOT.CC.P.1.207	4	2	50	7	**ELECTIVE-I** Practical MBOT.CC.P.2.307	4	1	50	6	**ELECTIVE-III** Practical MBOT.CC.P.2.407	4	1	50
8	**CORE 4** Practical MBOT.CC.P.1.108	4	2	50	8	**CORE 4** Practical MBOT.CC.P.1.208	4	2	50	8	**ELECTIVE-II** Practical MBOT.CC.P.2.308	4	1	50	7	**PROJECT** MBOT.CC.P.2.408	4	6	150
9	Seminar	2	0		9	Seminar	2	1		9	Seminar	2	1		9	Seminar	2		
	Total		**20**	**600**		**Total**		**21**	**600**		**Total**		**19**	**600**		**Total**	**29**	**20**	600

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Course Structure
Semester – I

S.N.	Subject Code	Subject Title	Credits	Instruction Hrs/week	Duration of (hrs) Exam.	Evaluation		Total Marks
	THEORY					Internal	External	
1.	MBOT.CC.T.1.101	Phycology and Mycology	3	3	3	30	70	100
2.	MBOT.CC.T.1.102	Bryophyta and Pteridophyta	3	3	3	30	70	100
3.	MBOT.CC.T.1.103	Angiosperm Systematics	3	3	3	30	70	100
4.	MBOT.CC.T.1.104	Plant Biochemistry	3	3	3	30	70	100
	PRACTICALS							
5.	MBOT.CC.P.1.105	Practical Lab-I	2	4	3	-	50	50
6.	MBOT.CC.P.1.106	Practical Lab-II	2	4	3	-	50	50
7.	MBOT.CC.P.1.107	Practical Lab-III	2	4	3	-	50	50
8.	MBOT.CC.P.1.108	Practical Lab-IV	2	4	3	-	50	50
Total:			**20**	**28**		**600**		**600**

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M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.101 (CORE) 3 Hrs/Week 3 Credits

PAPER – I: Phycology and Mycology

UNIT-I: Classification of Algae and Fungi

1. General characters and comparative study of important systems of Classification of Algae-Fritsch and Parker systems of classification
2. Criteria used in the primary classification of Algae: a) Pigments b) Reserve food materials c) Flagella
3. Algae on diverse habitats – Terrestrial, Freshwater, Marine, Reproduction in algae (vegetative, asexual and sexual)
4. General characters of true fungi and fungi like organisms, Classification of fungi (Alexopoulus and Mims 1996 and Hibbett *et.al* 2007)
5. Brief account of hyphal structure, mode of nutrition, types of reproduction in fungi (asexual, sexual and fruiting bodies). Heterokaryosis, Parasexual cycle and Sex Pheromones (hormones) in fungi.

UNIT – II: Algae

Morphology, life history and classification of the following groups of algae.

1. Cyanophyceae: *Microcystis*, *Lvngbya* and *Aulosira*
2. Chlorophyceae: *Eudorina*, *Pediastrum*, *Hydrodictyon*, *Pithophora*
3. Chlorophyceae: *Ulva, Stigeocolmum*, *Draparnaldiopsis*
4. Chlorophyceae: *Cosmarium*, *Closterium* and *Bryopsis*
5. Charophyceae: *Nitella*

UNIT – III: Fungi

Morphology life cycle (Hibbett et.al 2007) of the following types.

1. Microsporidia: General account
   Chytridiomycota: *Synchytrium*
2. Blastocladiomycota: *Allomyces*, *Pilobolus*
   Neocallimastigomycota: General account
3. Detailed account of Ascomycota - *Taphrina*, *Emericella*, *Neurospora, Gibberella, Glomerella, Morchella*

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M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.102 (CORE) 3 Hrs/Week 3 Credits

PAPER-II: Bryophyta and Pteridophyta

UNIT – I: Bryophyta

1) General characters and classification system (proposed by G.M. Smith) of Bryophytes.

2) Distribution, structure and reproduction of the following groups.

a). Marchantiales : *Targionia*
b). Jungermaniales : *Pellia, Porella*
c). Anthocerotales : *Notothylas*
d). Sphagnales : *Sphagnam*
e). Polytrichales : *Polytrichum*

3) Structure and evolution of Gametophyte in Bryophytes

4) Structure and evolution of Sporophyte in Bryophytes.

5) Economic importance of Bryophytes.

UNIT – II: Pteridophyta

1). General characters and classification system proposed by Sporne in Pteridophytes.

2) Distribution, structure and reproduction of the following groups.

a). Psilatales : *Psilotum*
b). Lycopodiales : *Phylloglossum*
c). Selaginellales : *Selaginella*
d). Isoetales : *Isoetes.*
e). Equisetales : *Equisetum.*
f). Filicales : *Adiantum, Salvinia, Azolla*

3) Telome theory and its applications

4) Stellar Evolution in Pteridophytes

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4. Basidiomycota: *Melampsora, Phallus, Ustilago*
5. Oomycota: *Peronospora*, Fungi-like organisms - *Stemonitis*

MBOT.CC.P.1.105 Practicals (Labs) **4 Hrs/Week 2 Credits**

1. Identification of the genera mentioned in Cyanophyceae
2. Identification of the genera mentioned in Chlorophyceae.
3. Collection algal material in and around university college/campus (a minimum of 20)
4. Introduction to basic Mycological Techniques and Lab Safety
5. Methods of sterilization, media preparation and culturing of fungi
6. Identification of fungal cultures, slides and specimens - *Synchytrium, Allomyces, Glomus Emericella, Neurospora, Morchella, Fusarium, Colletotrichum*
7. Identification of fungal cultures, slides and specimens- *Melampsora, Phallus, Ustilago, Peronospora, and Stemonitis*
8. Study of Symptomology of fungal diseases
9. Identifying the fungal diseases by taking sections and slide preparation: Downy mildews, Tikka disease, *Melampsora* rust, Wheat rust and White rust.
10. Collection of fungal plant disease material (a minimum of 20)

REFERENCES

1. Fritsch, F.E. The structure and reproduction of algae volume 1 and 2
2. Robin South,G and Alan Whittick: Introduction to Phycology
3. Morris,I: An Introduction to Algae
4. Bold, H.C. and Wynne, M.D.: Introduction to the Algae structure and reproduction
5. H.D.Kumar: Introductory Phycology
6. John Webster and Roland W.S. Weber - Introduction to Fungi
7. Alexopoulos C.J., C.W. Mims and M. Blackwell – Introductory Mycology
8. Mehrotra R.S. and K.R. Aneja – An Introduction to Mycology
9. Smith, J.E. - The Filamentous Fungi
10. DS. Hibbett *et.al.*2007. A higher level Phylogenetic classification of fungi Mycol Res. 111(Pt 5): 509.47.

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UNIT – III: Paleobotany

1). Paleobotany: Introduction, Fossils, fossilization and types of Plant fossils.

2). Fossil Bryophytes

3). Geological time scale, Carbon dating

4). Origin and evolution of early vascular Plants.

5). General characters of *Lepidodendrales*, *Calamitales* and *Sphenophyllales*.

MBOT.CC.P.1.106 Practicals (Labs) **4 Hrs/Week 2 Credits**

BRYOPHYTES:

I. Morphological and Structural Study using whole mount of

1) *Plagiochasma* 2). *Fimbriaria /Asterella* 3). *Targionia*

4). *Notothylas* 5). *Sphagnum* 6). *Polytrichum*.

PTERIDOPHYTES:

II. Morphology and Anatomy of vegetative and reproductive organs using cleared whole mount sections.

7) *Psilotum* 8) *Isoetes* 9) *Adiantum* 10). *Salvinia* 11) *Azolla*

12) Slides and Specimens of Bryophyta and Pteridophyta.

REFERENCE BOOKS

1. Smith, G.M. Cryptogomic Botany. Vol.II
2. Parihar, N.S.: Bryophyta
3. Parihar, N.S.1976: Biology and Morphology of Pteridophytes
4. Sporne, K.R. Pteridophyta
5. Rashid: Introduction to Pteridophyta
6. Cavers, F. Inter-relations of Bryophytes.

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M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.103 (CORE) 3 Hrs/Week 3 Credits

PAPER – III: Angiosperm Systematics

UNIT – I: Taxonomy and Systematics

1. Taxonomy and Systematics: History, Definitions, Principles, Fundamental objectives and scope.
2. Taxonomic tools: Taxonomic keys - Dichotomous keys (Indented & bracketed keys); Herbarium (concept, development & functions, major herbaria in the world & India. Role of Botanical gardens and botanical museums.
3. Biosystematics: Definition, Categories and Deme terminology. Species concept - Taxonomic, Biological, Microspecies, Successional species.
4. Evolution of Angiosperms: Ancestral history, Origin, Dominance, Geographic distribution pattern and Endemism.
5. Synthetic approaches in systematics: Cytotaxonomy, Chemotaxonomy, Palynotaxonomy, Numerical taxonomy, Molecular taxonomy (DNA barcoding).

Unit-II: Plant Nomenclature & Classifications

1. Plant Nomenclature: Origin and development of code, International Code of Nomenclature (ICN) for Algae, Fungi and Plants. Type concept, Typification. Taxonomic rank; Effective and Valid publication; Rule of priority; Author citations, Rejection of names.
2. Brief account of Artificial (Linnaeus), Natural (Bentham & Hooker), Phylogenetic systems of classifications (Engler and Prantl).
3. An overview of classifications of the Phylogenetic systems: Hutchinson, Cronquist, Takhtajan, with emphasis on advantages and disadvantages.
4. Novel approaches in Plant Taxonomy: Cladistics – Definition and Methodology (Plesiomorphic and apomorphic characters, Homology and Analogy, Parallelism and Convergence).
5. Detailed account on an updated version of Angiosperm Phylogeny system of classification (APG system).

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Unit-III: Systematic study of the families (APG -IV)

Detailed systematic account and economical importance (includes: medicinal, horticultural, floricultural, Silvicultural) of the following families (16) in the following clades (in a *Sensu stricto*):

1. ANA grade (Basal Angiosperms): Nymphaeales - *Nymphaceae*; Magnoliids: *Magnoliaceae*; Piperales – *Piperaceae*.
2. Monocots: Poales – *Poaceae*; Dioscoreales –*Dioscoreaceae*;
3. Commelinids: Zingiberales – *Musaceae*, *Zingiberaceae*.
4. Eudicots: Ranunculales –*Menispermaceae*, *Ranunculaceae*; Proteales-*Nelumbonaceae*; Fabids: Fabales–*Fabaceae*,Rosales – *Rosaceae*.
5. Malvids:Myrtales–*Combretaceae*;Asterids: Ericales – *Ebenaceae*;Campanulids:Apiales-*Araliaceae*; Lamiids:Gentianales–*Loganiaceae*.

MBOT.CC.P.1.107 Practical(Labs) **4Hrs/week 2Credits**

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1. Identification of locally available plant families based on the floral parts (minimum of 10 families).
2. Construction of dichotomous keys – Indented and Bracketed keys for given plant material.
3. Identification of locally available (native/indigenous) plants up to species level by using Floras. (Minimum of 10 species)
4. Study and recording of intraspecific variations in the wild taxa available locally.
5. Study and identification of key characters in a group of species of a genus and construction of keys. (Locally available genera with minimum of 5 species).
6. Study of simple Nomenclatural problems.
7. Identification of genus and species by using Pollen morphology.
8. Hands on training on Herbarium techniques & Botanical Museum (collection, pressing, poisoning, drying, mounting and deposition) (Students required to submit at least fifty herbarium specimens of the local flora (native/indigenous) along with field note book).
9. Hands on training on GPS and GIS applications in plant identification and species mapping.

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10. Practice of plant identification by using e-resources (virtual herbaria, e-floras, plant data bases, App-Plantnet, Google images etc.).
11. Botanical excursions or local field visits for taxonomic studies. (Arboretums, Botanical gardens, Herbal gardens/nurseries, urban forest parks, national parks, wild life sanctuaries, tiger reserves, sacred groves etc.).

REFERENCES:

Books:

- APG IV (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV Botanical Journal of the Linnean Society, 2016, 181, 1–20.
- Bhattacharyya, B. and Johri, B.M. (1998). Flowering Plants. Taxonomy and Phylogeny. Springer Verlag &Narosa Publishing House, New Delhi.
- Chattarjee, D. (1962). Phytogeographical Regions of India.
- Cox, C. B., Healey, I. N. & Moore, P. D. (1976). Biogeography. An Ecological and Evolutionary Approach. 2nd Edition. Blackwell Scientific Publications.
- Cronquist, A. (1981). An Integrated System of Classification of Flowering Plants. Columbia University Press, New York.
- Dahlgren, R. M. T. (1980). "A revised system of classification of the angiosperms". *Botanical Journal of the Linnean Society*. 80 (2): 91–124.
- Dahlgren, R.M.T. 1985. The Families Of The Monocotyledons: Structure, Evolution, And Taxonomy. Springer Verlag. Berlin-Germany.
- Gamble, J.S. (1915-36) Fischer, CEC. Flora of the Presidency of Madras. Vol. 1-3, Adlard and Son Ltd., London.
- Hills, D.M. et al. 1996. Molecular Systematics (Ed. 2). Sinauer Associates, USA.
- Hooker, J.D. ([1872-] 1875 -1897). Flora of British India. Reeve & Co. Ltd., London.Vol. 1 - 7.
- Hutchinson, J. (1973). The Families of Flowering Plants. Third edition. Oxford University Press. London.
- Jain, S.K. and Rao, R.R. (1976). A Hand Book of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi.
- Janick, J. et al. 2002. International Code of Nomenclature of Cultivated Plants.

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- Kitching, I.J. et al. 1998. Cladistics – the theory and practice of Parsimony Analysis. Oxford University Press.
- Lawrence, H.M. George (1969). Taxonomy of Vascular plants. Second edition. Oxford and IBH Publishing CO. Calcutta.
- McNeill, J. et al. (Eds.) 2012. International Code of Nomenclature for Algae, Fungi and Plants (Melbourne Code). Regnum Vegetabile 154, Koeltz Scientific Books.
- Naik, V.N. 1988. Taxonomy of Angiosperms. Tata Mcgraw-hill Pub. New York.
- Naqshi, A.R. 1993. An introduction to Botanical Nomenclature. Scientific Publishers, Jodhpur.
- Pullaiah, T. and Karuppusamy, S. (2018). Taxonomy of Angiosperms. Fourth Revised Edition. Regency Publications, India.

References:

- Sharma, O.P. (2013). Plant Taxonomy. Second edition. MC GRAW HILL INDIA.
- Shivarajan, V.V. and Robson, N.K. (1991). Introduction to the Principles of Plant Taxonomy. Second Edition. Cambridge University Press.
- Sivarajan, V.V. 1991. Introduction to the Principles of Plant Taxonomy. Oxford & IBH
- Takhtajan , A, and Jeffrey,C. (1981). Flowering Plants. Origin and Dispersal.Bishen Singh Mahendra Pal Singh, 1981;
- Takhtajan A. (1997). *Diversity and classification of flowering plants*. New York: Columbia University Press.
- Takhtajan, A. (1997). Diversity and classification of flowering plants. Columbia University Press. New York.
- Thorne, F. Robert. (1992). An Updated Phylogenetic Classification of the Flowering Plants. A Journal of Systematics and Floristic Botany. Vol. 13 (2) 365 – 389.
- Turland N.J. et al. (eds.). 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code). Regnum Vegetabile
- Glashütten: Koeltz Botanical Books.

Online Resources - Plant data bases links:

- POWO: https://powo.science.kew.orgThe Plant List: http://www.theplantlist.org
- BHL: https://www.biodiversitylibrary.orgTropicos: https://www.tropicos.org/home
- IPNI: https://www.ipni.orgefloras: http://www.efloras.org/index.aspx
- https://sites.google.com/site/efloraofindia/

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M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.102 (CORE) 3 Hrs/Week 3 Credits

PAPER – IV : Plant Biochemistry

UNIT-I: Bioenergetics and Enzymatics

1. **Concepts of thermodynamics:** Thermodynamic Systems and Potentials; Internal Energy, Helmholtz free energy, Enthalpy, Gibb's Free Energy, Entropy, Disorder; Laws of Thermodynamics in Biological Systems.
2. **Energy Flow:** Electromagnetic radiation, energy content of light, harvesting the Sunlight, biochemical energy, energy conservation, unlocking the energy, storage in Photo assimilates and circulation of energy, endergonic and exergonic reactions.
3. **Bioenergetics:** Energy coupled reactions in Photophosphorylation and glycolysis; Energy currency-ATP synthesis and reactions energy rich compounds, biological energy transducers.
4. **Enzymes:** Structure and classification, Co-factors, isozymes, activation, inhibition and covalent modification; role of covalent modification in enzymatic activity; zymogens.
5. **Principles of catalysis:** Mechanism of enzyme action, regulation of enzyme action, enzyme kinetics, Michaelis - Menten kinetics; pH and temperature optima of enzymes.

UNIT-II: Biomolecules - Metabolites-I

1. **Carbohydrates:** Basic concepts of Carbohydrates, Structure, Classification, and functions of carbohydrates a) monosaccharides b) oligosaccharides c) polysaccharides, storage polysaccharides, structural polysaccharides, glycoproteins.
2. **Lipids:** Basic concepts of Lipids, Classification of lipids - simple lipids, compound lipids, sterols, polyunsaturated fatty acids, lipoproteins.
3. **Lipid Metabolism:** Biosynthesis of fatty acids, oxidation of fats, α-oxidation, β-oxidation, glyoxylate cycle, gluconeogenesis.
4. **Amino acids:** General properties, Classification, and characteristics a) non-protein amino acids b) peptide bonds c) Biosynthesis of amino acids with reference to GS and GOGAT.

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5. **Proteins:** General introduction, biological functions of Proteins a) Structure and Classification of proteins and Ramachandran plot

UNIT-III: Biomolecules - Metabolites -II

1. General introduction to plant secondary metabolites, chemical classification, distribution, and functions
2. Extraction techniques for secondary metabolites: Maceration, Percolation, Soxhlet extraction, Distillation, Microwave assisted extraction, and Super critical fluid extraction.

Properties, chemical classification, applications and study of the following phytochemicals:

3. **Alkaloids:** *Withania somnifera*, *Rauwolfia serpentina*, *Papaver somniferum*
4. **Glycosides:** Cardiac glycosides in *Digitalis purpurea*, Saponin glycosides in *Glycyrrhiza glabra* and *Dioscorea deltoidea*, Anthraquinone glycosides in *Cassia angustifolia*
5. **Terpenes & Terpenoids:** *Artemisia annua*, *Taxus brevifolia*, *Mentha piperita*, *Eugenia caryophyllus*, and *Foeniculum vulgare*

MBOT.CC.P.1.108 Practicals (Labs) **4 Hrs/Week 2 Credits**

1. Preparation of Buffers, pH measurements
2. Measurement of luminous intensity of the light
3. Determination of amylase activity
4. Estimation of reducing sugars in fruits
5. Estimation of fructose
6. TLC demonstration for separation of amino acids
7. Quantitative Estimation of protein
8. Determination of iodine number
9. Extraction and estimation of total alkaloid content
10. Estimation of total phenolic content
11. Preliminary phytochemical tests for Flavonoids
12. Preliminary phytochemical tests for Phenols

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REFERENCES:

1. Plant Physiology, biochemistry and molecular biology. David, T: Dennis and Davis Turnip.Longman. Scientific and technical U.K. 1990.
2. Plant Biochemistry Voet, D and Voet J.G. International
3. Outlines of biochemistry. 5th edition Con E.E. and Stump P.K. 1995. Willey
4. Principles of biochemistry, Lehnenger, A.L. 1982 CBS Publication
5. Biochemistry, Strayer W.H. 1976. Foreman Company.
6. Introduction to Plant Physiology. Willium G. Hopkins and Norman P. A. Huner
7. Plant Physiology. Lincoln Taiz and Eduardo Zeiger. International Edition
8. Plant Biochemistry. P.M. Dey and J.B. Harborne
9. Plant Biochemistry. Hans-Walter Heldt
10. Physicochemical and Environmental Plant Physiology. Park S. Nobel

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	THEORY					Internal	External	
1.	MBOT.CC.T.1.201	Applied Phycology and Mycology	3	3	3	30	70	100
2.	MBOT.CC.T.1.202	Gymnosperms and Embryology of Angiosperms	3	3	3	30	70	100
3.	MBOT.CC.T.1.203	Plant Anatomy and Palynology	3	3	3	30	70	100
4.	MBOT.CC.T.1.204	Plant Physiology	3	3	3	30	70	100
	PRACTICALS							
5.	MBOT.CC.P.1.205	Practical Lab-I	2	4	3	-	50	50
6.	MBOT.CC.P.1.206	Practical Lab-II	2	4	3	-	50	50
7.	MBOT.CC.P.1.207	Practical Lab-III	2	4	3	-	50	50
8.	MBOT.CC.P.1.208	Practical Lab-IV	2	4	3	-	50	50
Total:			**20**	**28**		**600**		**600**

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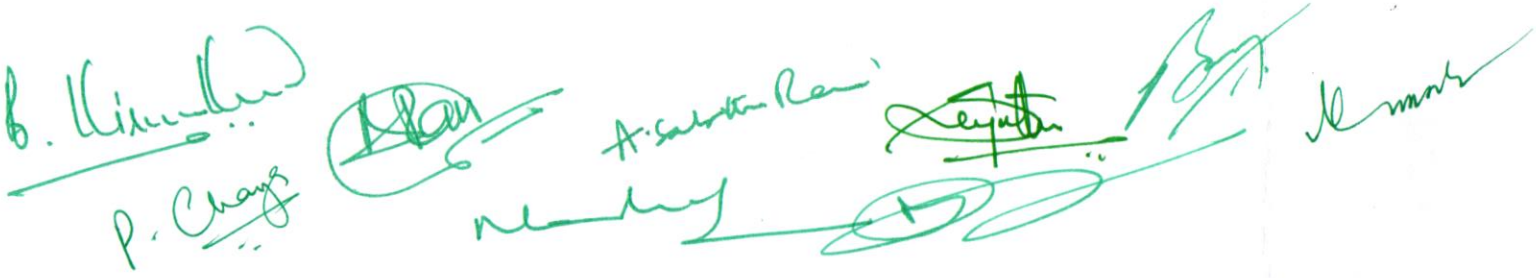
	Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks		Course	Hrs /Wk	Credits	Marks
1	**CORE 1** MBOT.CC.T.1.101	3	3	30+70	1	**CORE 1** MBOT.CC.T.1.201	3	3	30+70	1	**CORE 1** MBOT.CC.T.2.301	3	3	30+70	1	**CORE 1** MBOT.CC.T.2.401	3	3	30+70
2	**CORE 2** MBOT.CC.T.1.102	3	3	30+70	2	**CORE 2** MBOT.CC.T.1.202	3	3	30+70	2	**CORE 2** MBOT.CC.T.2.302	3	3	30+70	2	**CORE 2** MBOT.CC.T.2.402	3	3	30+70
3	**CORE 3** MBOT.CC.T.1.103	3	3	30+70	3	**CORE 3** MBOT.CC.T.1.203	3	3	30+70	3	**ELECTIVE - I** MBOT.CC.T.2.303	3	3	30+70	3	**ELECTIVE - III** MBOT.CC.T.2.403	3	3	30+70
4	**CORE 4** MBOT.CC.T.1.104	3	3	30+70	4	**CORE 4** MBOT.CC.T.1.204	3	3	30+70	4	**ELECTIVE - II** MBOT.CC.T.2.304	3	3	30+70					
5	**CORE 1** Practical MBOT.CC.P.1.105	4	2	50	5	**CORE 1** Practical MBOT.CC.P.1.205	4	2	50	5	**CORE 1** Practical MBOT.CC.P.2.305	4	2	50	4	**CORE 1** Practical MBOT.CC.P.2.405	4	2	50
6	**CORE 2** Practical MBOT.CC.P.1.106	4	2	50	6	**CORE 2** Practical MBOT.CC.P.1.206	4	2	50	6	**CORE 2** Practical MBOT.CC .P.2.306	4	2	50	5	**CORE 2** Practical MBOT.CC.P.2.406	4	2	50
7	**CORE 3** Practical MBOT.CC.P.1.107	4	2	50	7	**CORE 3** Practical MBOT.CC.P.1.207	4	2	50	7	**ELECTIVE-I** Practical MBOT.CC.P.2.307	4	1	50	6	**ELECTIVE-III** Practical MBOT.CC.P.2.407	4	1	50
8	**CORE 4** Practical MBOT.CC.P.1.108	4	2	50	8	**CORE 4** Practical MBOT.CC.P.1.208	4	2	50	8	**ELECTIVE-II** Practical MBOT.CC.P.2.308	4	1	50	7	**PROJECT** MBOT.CC.P.2.408	4	6	150
9	Seminar	2	0		9	Seminar	2	1		9	Seminar	2	1		9	Seminar	2		
	Total		**20**	**600**		**Total**		**21**	**600**		**Total**		**19**	**600**		**Total**	**29**	**20**	600



M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.201 (CORE) 3 Hrs/week 3 Credits

PAPER – I: Phycology and Mycology

UNIT-I: Microbial diversity

1. General account of Archaebacteria and Eubacteria; Ultra structure of bacterial cell, biochemistry of cell wall, nutritional and growth factors of bacteria
2. Characteristics and ultrastructure of viruses Classification (ICTV) of viruses; Symptomatology and Transmission of plant viruses; Importance of the viruses.
3. General characters of Mollicutes, transmission and diseases caused by Spiroplasmas and Phytoplasmas.
4. Economic importance of Alge- algal Bio-fertilizers, Alge as food and feed. Role of algae in Industry (Alginic acid, Agar, Carrageenan)
5. Algal blooms, Toxic algae and Fossil Algae

UNIT – II: Algae

Morphology, life history and classification of the following groups of algae

1. Xanthophyceae- *Vaucheria, Botrydium*
2. Bacillariophyceae – *Cyclotella, Cymbella, Gomphonema.*
3. Euglenophyceae - *Euglena, Phacus*
4. Phaeophyceae - *Laminaria, Padina*
5. Rhodophyceae - *Porphyra, Gracillaria, Corallina.*

UNIT – III: Fungi

1. Fungi in Industry: Production of alcohol and organic acids.
2. Fungi in Medicine: Types of metabolites used in medicine and production of antibiotics.
3. Fungi in Agriculture and Forestry:
   - **a)** Fungi as plant parasites (Wilts, Leafspots, Root rots, Smuts and Rusts).
   - **b)** Fungi as bio-fertilizers: Ecto and Endomycorrhizae.
   - **c)** Fungi as biopesticides: mycofungicides, weedicides, and insecticides.
4. Fungi as human and animal parasites (medical mycology)
5. Fungi as food: Mushrooms: Types of mushrooms, biology and growth of mushrooms, nutritional and medicinal value of edible mushrooms; Fungal protein (Saccharomycetes and *Fusarium*).

MBOT.CC.P.1.205 **Practicals (Labs)** **4 Hrs/ week 2 Credits**

1. Identification of the genera mentioned in Xanthophycea, Bacillariophyceae, Euglenophyceae, Phaeophyceae and Rhodophyceae.
2. Identification of bloom forming algae.
3. Identification of Algal biofertilizers.
4. Identification of toxic algae.
5. Identification of fungal cultures, slides and specimens *of Rhizopus/Mucor, Aspergillus, Penicillium, Saccharomycetes, Fusarium, Alternaria, Cercospora, Pythium,* VAM fungi, *Trichoderma, Beauveria.*
6. Study of Mycorrhizal colonization in roots of *Parthenium* and *Tagetus.*
7. Study of Mushroom specimens
8. Staining of Gram + ve and Gram - ve Bacteria
9. Herbarium of diseased plants (fungal, bacterial, viral & mycoplasma diseases available locally – at least 2-3 specimens of each to be submitted).

Reference books

1. Fritsch, F.E. The structure and reproduction of algae volume I and II
2. Robin South,G and Alan Whittick: Introduction to Phycology
3. Morris,I: An Introduction to Algae
4. Bold, H.C. and Wynne, M.D.: Introduction to the Algae structure and reproduction
5. H.D.Kumar: Introductory Phycology.
6. Change. S.T. and P.G. Miles - Edible mushrooms and their cultivation
7. Mosses, B.V.A. - Mycorrhizae
8. Powel, C and D. J. Bagyaraj - V.A. Mycorhizae
9. Berry, R. - Industrial mycology (Vol. I)
10. Dubey, S.C. - Biotechnology.
11. Jeffrey C. Pommerville - Alcamo's Fundamentals of Microbiology
12. Arora D.R. and B. Arora - Text book of Microbiology

M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.202 (CORE) 3 Hrs/week 3 Credits

PAPER – II: Gymnosperms and Embryology of Angiosperms

UNIT-I: Introduction and Classifications

1.1. Progymnosperms – Introduction, Classification (Beck, 1960), General characteristics and affinities of the following: i) Pityales ii) Aneurophytales iii) Protopityales.

1.2. Fossil gymnosperms - Introduction, General characteristics and affinities of the following: Pteridospermales, Pentoxylales, Bennettitales and Cordaitales.

1.3. Origin, evolution and distribution of extant gymnosperms.

1.4. Classifications – Morphological systems (Birbal Sahni, 1920), (Chamberlain, 1934), (Sporne, 1965). Phylogenetic system (Y Yang et al., 2022).

UNIT – II: Detailed Study of Extant Gymnosperms and Conservation

2.1. Study of morphology, anatomy and reproductive structures of the following: Cycadales – Cycas; Ginkgoales – Ginkgo; Araucariales – Araucaria; Pinales – Podocarpus; Gnetales – Gnetum.

2.2. Embryology of gymnosperms – Pollination mechanism; Formation of Endosperm; Structure, development of male and female gametophytes; Fertilization and post fertilization changes.

2.3. Conservation of gymnosperms – IUCN red listed threatened species. Indian endemics. Conservation priority areas in India: North East India, Eastern and Western Himalayas.

2.4. Economic importance of gymnosperms: As a source of gums, food, medicinal, ornamentals, resins and timber.

UNIT – III: Embryology of Angiosperms

3.1. Microsporangium – Structure of microsporangium, microsporogenesis, male gametophyte development and morphology.

3.2. Megasporangium: Structure and types of ovules, megasporogenesis, development of female gametophyte; structure and types of embryo sac.

3.3. Fertilization; self-incompatibility; barriers of fertilization; endosperm development and types; embryogeny; polyembryony; apomixis and parthenocarpy.

3.4. Recent advances and applications of embryology in Taxonomy, Agriculture and Horticulture.

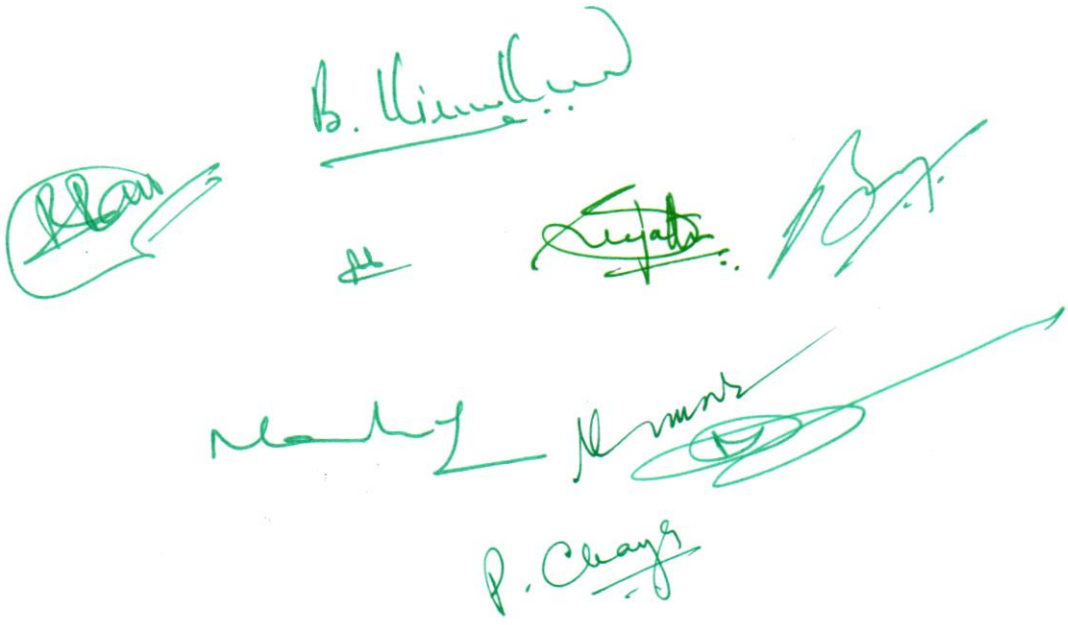
MBOT.CC.P.1.206 Practicals (Labs) 4 Hrs/ week 2 Credits

1. Progymnosperms: i) Pityales ii) Aneurophytales iii) Protopityales. Specimens or Images to be displayed for study.
2. Fossil gymnosperms – Pteridospermales, Pentoxylales, Bennettitales and Cordaitales. Specimens or Images to be displayed for study.
3. Extant/living gymnosperms – Study of the vegetative, reproductive parts (pollen and seed cones) and anatomy (primary root, stem, leaf/leaflet) of the following: a) Cycas / Zamia, b) Araucaria/ Cupressus /Thuja c) Cedrus / Podocarpus/Pinus c) d) Ephedra/ Gnetum / Welwitschia.
4. Wood anatomy of Conifers: TS, TLS and RLS of the following woods - Araucaria Cupressus and Thuja.
5. Pollen (microspore) viability test by Evans blue method.
6. Embryology: Permanent slides of the following to be displayed for study.
   a) T.S. of anther b) Study of ovules c) Globular embryo
   d) Mature embryo) Polyembryony
7. Types of endosperm Permanent slides of the following to be displayed for study.
   a) Nuclear endosperm b) Cellular endosperm c) Helobial endosperm.
8. Field visits/Botanical excursions to the places of Gymnosperms in India: Eastern Ghats; Western Ghats; North East India; Eastern and Western Himalayas or Gymnosperms conservation institutions and gardens.

Reference books

1. Biswas Chhaya and B.M. Johri (1997). The Gymnosperms. Springer – Verlag Berlin Heidelberg GmbH.
2. B.M. Johri (1984). Embryology of Angiosperms.
3. Christenhusz et al. 2011. A new classification and linear sequence of extant gymnosperms. Phytotaxa 19:55 -70.
4. C.J. Chamberlain (2009). Gymnosperms. Structure &Evolution. CBS.
5. C.M. Govil. 2007.The gymnosperms Extinct and Extant. Krishna Prakashan Media (P) Ltd.
6. K.R. Sporne. (Print 2020).The Morphology of Gymnosperms. United Book Prints. New Delhi.
7. Panchanan (P) Maheshwari (1950). An Introduction to the Embryology of Angiosperms. New York. McGraw-Hill.
8. S.S. Bhojwani, S.P. Bhatnagar, P.K. Dantu (2015). The Embryology of Angiosperms, 6th Edition. Vikas Publishing House PVT LTD.2015.

9. S.S. Bhojwani and W.Y. Soh. (Editors). 2001. Current trends in the Embryology of angiosperms. Kluwer Academic Publishers. Dordrechat/Boston/London.
10. S.P. Bhatnagar and Alok Moitra (1996) (Reprint. 2004). Gymnosperms. New Age International (P) Limited, Publishers. New Delhi.
11. T. Pullaiah (2001).Text Book of Embryology of Angiosperms. Regency Publications.
12. Y Yang et al. (2022). Recent advances on phylogenomics of gymnosperms and a new classification.
13. *Online Resources of Gymnosperms:
14. The Gymnosperm Database - Conifers.org.
15. Conifers of the world - Conifers.org.
16. The Cycad page. The world List of Cycads. Cycadlist.org
17. The Ginkgo pages.
18. The IUCN red list of threatened species. iucnredlist.org



M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.203 (CORE) 3 Hrs/week 3 Credits

Paper: III Plant Anatomy and Palynology

UNIT –I: Anatomy and Epidermology

1. Introduction, importance and relationship of Plant Anatomy with Taxonomy
2. Characteristics and classification of Meristems. Vegetative shoot apex: Structure of shoot apex in Pteridophytes, Gymnosperms and Angiosperms. Theories to explain the organization of shoot apex: Mantle-Core Hypothesis, Tunica corpus theory and Anneau Initial & Meristem Diattente theory.
3. Root Apex: Structure of Root apex, quiescent centre concept. Theories to explain the organization of root apex: Apical cell theory, Histogen theory, Korper-Kappe theory.
4. Leaf: Structure with reference to C_3 and C_4 plants. Kranz Anatomy and its importance.
5. Epidermology: Structural composition of Epidermal cell complex, Stomatal complex, Trichome complex. Classification of Stomata and Trichomes.

UNIT –II: Xylotomy

1. Secondary growth with reference to Dicot stem. Structure and functions of vascular cambium.
2. Dicot wood anatomy: Morphology and arrangement of vessels, Tyloses. Distribution of the Axial Parenchyma, Ray Parenchyma and Wood Fibers.
3. Periderm: Origin of Phellogen, Phellum and Phelloderm and Lenticels.
4. Wood structure: Macro and Microscopical characteristics of wood, Wood maceration, Sapwood and Heartwood, Porus wood and Non-porus wood.
5. Salient features of the following woods.a) *Tectona grandis,* b) *Dalbergia sissoo* c) *Mangifera indica*
   d) *Vachellia nilotica.*

UNIT – III: Palynology

1. Palynology: Definition, Scope, Techniques (Acetolysis) and importance.
2. Morphology of pollen – Polarity, symmetry, size and shape, aperture pattern, NPC Classification, Exine stratification.
3. Aeropalynology –Introduction and types of allergic reactions in human beings. Applications of ELISA for diagnosis of pollen allergy in Clinical Palynology.
4. Melissopalynology– Introduction and Applications ofMelissopalynology in codification of honeys.
5. Forensic Palynology: Introduction and Applications of Forensic Palynology in solving the crime with some case studies.

MBOT.CC.P.1.207 Practicals (Labs) **4 Hrs/ week 2 Credits**

Practical Lab-III

1. Study of angiosperm leaf epidermis stomata, trichomes in the available taxa: *Crotalaria, Portulaca* or *Talinium, Tridax, Petunia* or *Datura, Tradescantia spathacea* or *Commelina, Cyperus* and Grass.
2. Estimation of stomatal frequency and stomatal index in the any available leaf material.
3. Maceration of wood and identification of various elements in *Magnolia champaca, Bombax ceiba, Tectona grandis, Terminalia arjuna* and *Azadirachta indica.*
4. Study of wood structure with the help of T.S., T.L.S., and R.L.S. in the following: a) *Tectona grandis* b) *Dalbergia sissoo* c) *Mangifera indica* d) *Vachellia nilotica.*
5. Histochemical tests for identification of the following: a) Cellulose b) Lignin c) Pectin d) Starch e)Suberin.
6. Study of shoot apex in suitable locally available materials to understand cyto-histologicalzonation (*Coleus* and *Kalanchoe*)
7. Study of the pollen grains of *Vachellia, Azadirachta, Cocos* and Grass.
8. Acetolysis technique.

REFERENCES

1. Fahn, A. Plant Anatomy (4th Ed.), 1990.
2. Easu, K. Anatomy of Seed Plants.
3. Easu, K. Plant Anatomy, 2nd Ed. Wiley N.Y. 1965.
4. Cutter, E.G. Plant Anatomy, Part I and II Edward Arnold; London, 1971 and 1978
5. Metcalf and Chalk. Anatomy of dicots (2nd Edition) (1983). Clarendon Press, Oxford.
6. Metcalf (1982-87) Anatomy of Dicots Vol. I to III
7. Meureth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Pub1. Inc., Menlo Park California.
8. Carliquist. S. (1988). Comparative wood anatomy, Springer – Berlag, Berlin.
9. Jeffrey, E.C. The Anatomy of woody plants.
10. Rao, K.R. & K.B.S. Juneja (1971) A Hand book for identification of fifty important Timbers of India.
11. Pearspm & Brown – Commercial Timbers
12. Lyndon R.F. 1990. Plant development – The cellular basis. Unnin. Hyman, London.
13. Steeves T.A. & Sussex 1. M, 1989, Pattersacin plant development 92nd Edition) Cambridge UNIT y
    Press, Cambridge.
14. P.K.K. Nair. Pollen Morphology of angiosperms.
15. P.K.K. Nair: Essentials of Palynology
16. Moor & Moor: Pollen analysis
17. R.B. Knox, Pollen allergy
18. M.R. Suxena : Palynology
19. A text book of Palynology: Kashinath Bhattacharya
20. Plant Anatomy: Pijush Rai

M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.204 (CORE) 3 Hrs/week 3 Credits

Paper-IV: Plant Physiology

UNIT –I

1.1 Water relations:

a. Water potential
b. SPAC concept

1.2 Mineral nutrition: Mechanism of ion uptake

a. Electrochemical potential
b. Uptake of solutes and macromolecules from soil
c. Ion channels
d. ATPase carrier
e. Aquaporins

1.3 Assimilation of Nutrients:

a. Physiology and biochemistry of nitrogen fixation
b. Sulphate reduction and assimilation

UNIT –II

2.1 Photosynthesis:

a. Properties of light and absorption of light by photosynthetic pigments, Composition and characterization of photo systems I and II
b. Photophosphorylation
c. Path of carbon in C_3 and C_4 plants, differences between C_3 and C_4 plants
d. CAM pathway and its regulation
e. Photorespiration, biosynthesis of glycolate and regulation of photorespiration

2.2 Respiration:

a. Glycolysis, fermentation, tricarboxylic acid cycle, Regulation of TCA cycle.
b. electron transport and oxidative phosphorylation, Coupling oxidative phosphorylationto electron transport, chemiosmotic hypothesis.
c. Hexose monophosphate shunt and its significance, Cyanide – resistant respiration

UNIT –III

3.1 Hormonal control of growth and development

a. General role of auxins, Gibberellins, Cytokinins, Ethylene and Abscissic acid
b. Mechanism of hormonal regulation-hormone receptors, and secondary messengers
c. Amplification of kinases.
d. Structure and functions of Calmodulin

3.2 Physiology of flowering

a. Photoperiodism
b. Phytochrome – structure and function

3.3 Physiology and biochemistry of seed dormancy and germination:

a. Causes of dormancy and methods of breaking dormancy
b. Biochemical changes accompanying seed germination.

1. Determination of water potential by Shardolo's methods.
2. Determination of total and titrable acidity.
3. Separation of chloroplast pigments by solvent method
4. Determination of chlorophyll a, chlorophyll b and total chlorophylls in C_3 and C_4 plants.
5. Determination of Anthocyanin Pigments.
6. Estimation of I.A.A

References

1. Principles of Plant nutrition 4th Edition by Mengel K. and E.A. Kirby International Institute of Polesh Switzerland 1987.
2. Mineral nutrition of crop plants. H. Marshener academic Press 1986.
3. Plant Physiology by F.B. Salisbury and C.W. Ross. Wordsworth biology series.
4. Growth and differentiation in plants by Warering and Phillips, Pergamon press.
5. Plants Cell structure and metabolism. J.L. Hall, Flower and Roberts, ELBS, Longman.
6. Advanced Plant Physiology by M.B. Wilkinson, ELBS, Longman
7. Introduction to Plant Physiology by G.R. Noggle and G.J. Fritz, Printice Hall Press
8. Cell Biology by C.B. Powar, Himalaya Publishing
9. Plant Physiology by R.N. Devlin and F.H. Witham, CBS 1986
10. Introduction to plant physiology W.G. Hopkins and Norman P.A. Huner
11. Plant Physiology. Lincoln Taiz and Eduardo Zeiger

Minutes of the meeting of Board of Studies held in the Department of Botany, University college of Science, Osmania University.

The Board of studies meeting for M.Sc. Botany has been held on 28.01.2023 in the Department of Botany, University college of Science, Osmania University.

The following members have attended the meeting:

1. Prof. E. Sujatha - Chairperson, BOS in Botany
   Department of Botany,
   University College of Science, OU
2. Prof. B. Ramadevi - Head, Department of Botany,
   University College of Science, OU
3. Prof. P. Kamalakar - Department of Botany,
   University College of Science, OU
4. Prof. A. Sabitha Rani - Department of Botany,
   University College of Science, OU
5. Prof. K. Shailaja - Department of Botany,
   University College of Science, OU
6. Prof. N. Lakshmi Bhavani - Department of Botany,
   University College of Science, Saifabad, OU
7. Dr. A. Vijaya Bhaskar Reddy - Department of Botany,
   University College of Science, OU
8. Dr. P. Chaya - Department of Botany,
   University College of Science, Saifabad
9. Dr. M. Venkata Ramana - Department of Botany,
   University College of Science, Saifabad
10. Dr. B. Kiran Kumar - Department of Botany,
    University College of Science, OU
11. Dr. M. Vanaja - Senior Scientist, CRIDA, Hyderabad
12. Dr. C. Sudhakar Reddy - Scientist-F, Forest and Ecology Division,
    National Remote Sensing Centre,
    Balanagar, Hyderabad

Minutes of the Meeting

1. The meeting was conducted to discuss the syllabus of M.Sc. Botany, II Semester as per the new credit system.
2. The syllabus of all four optional papers have been discussed by the BoS committee
3. It has been resolved to reduce the number of units to three and frame the syllabus as per the guidelines
4. The changes suggested by the members of BOS committee, senior faculty and Subject experts were incorporated in the syllabus, following UGC Guidelines.
5. It is resolved to approve the revised syllabus of all four Optional Papers of M. Sc. II Semester and to be implemented from the Academic year 2022-2023, present first year students.