Shiksha Mandal's
Bajaj College of Science, Wardha

Proposed Syllabus for M.Sc. semester-IV Program
(Academic Session 2024-25)

Syllabus
DISCIPLINE SPECIFIC CORE (DSC), DISCIPLINE SPECIFIC ELECTIVES (DSE), AND OTHER COURSES

MSc- Semester IV course in Botany

Syllabus under Autonomy
As per National Education Policy (NEP) 2020

M.Sc. BOTANY SEMESTER -IV

S. N.	Course Category	Name of Course	Course Code
1	DSC – 13	Advanced Plant Physiology and Biochemistry	PBO641T13
2	DSC – 14	Plant Biotechnology and Bioinformatics	PBO642T14
3	DSC – 15	Plant Resources	PBO643T15
4	DSC – 15	Practical on Advanced Plant Physiology and biochemistry, Plant Biotechnology and bioinformatics	PBO64P
5	DSE – 4	Mycology and Plant Pathology – II **OR** Molecular Biology and Plant Biotechnology - II **OR** Equivalent MOOC course	PBO645T16
6	RP	Research Project	PBO648P

M.Sc. BOTANY SEMESTER - IV

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)		Total Credit	Examination Scheme			
							Max Marks			Passing Marks
				(Th)	P		ESE	CIA	Total Marks	
1	DSC – 13	Advanced Plant Physiology and biochemistry	PBO641T13	4		4	60	40	100	50
2	DSC – 14	Plant Biotechnology and bioinformatics	PBO642T14	4		4	60	40	100	50
3	DSC – 15	Plant Resources	PBO643T15	4		4	60	40	100	50
4	DSC – 15	Practical on Advanced Plant Physiology and biochemistry, Plant Biotechnology and bioinformatics	PBO64P	2		2	30	20	50	25
5	DSE – 4	Mycology and Plant Pathology – II **OR** Molecular Biology and Plant Biotechnology - II **OR** Equivalent MOOC course	PBO645T16	2		2	30	20	50	25
7		RP	PBO648P			6	200		200	100
Total				14	16	**22**			**600**	

Master of Science (Botany)	**Semester IV - DSC – 13**
Course Code	**PG-BOT (06) – S4- T13**
Course Name	**Advanced Plant Physiology and Biochemistry**
Course Credit	**04**
Course Working hours	**60 hrs.**
Course Structure	**Theory and Practicals**

Course objectives: This course aims to provide an in-depth understanding of plant physiology, focusing on membrane transport, sensory photobiology, organelle functions, plant defense mechanisms, and the biochemical pathways of primary and secondary metabolites.

Course Learning Outcomes:
CO1: Students will be able to analyze the structure and function of plant membranes, including channels, pumps, carriers, and the role of photoreceptors in light-induced responses.
CO2: Students will describe the physiological roles of organelles such as plastids and mitochondria in the biosynthesis and transport of key molecules.
CO3: Students will understand the molecular mechanisms underlying plant defense systems, including phytoalexin production and the role of R-genes in plant-pathogen interactions.
CO4: Students will examine the biosynthesis and application of primary and secondary metabolites, and assess plant responses to various biotic and abiotic stresses.

Course Content:

Module I:	**Transport and photobiology**

1.1 Membrane transport – Structure and organization of membrane, Glucoconjugates and protein membrane systems; Channels, pumps and carriers of membrane. Aquaporines – Structure and functions.
1.2 Sensory photobiology – Phytochromes and Cryptochromes – Phytochemical and biochemical properties.
1.3 Photophysiology of light induced responses; molecular mechanism of photomorphogenic receptors; signaling and gene expression.

Module II:	**Plant organelles and their role in physiology**

2.1 Plastids – Chemical composition, structure and transport functions of plastid membranes.
2.2 Biosynthesis of Chlorophylls, Carotenoids and fatty acids. Thylakoid membrane network; protein synthesis, nuclear proteins for photosynthesis.
2.3 Mitochondria – Chemical composition, Transport across the membrane; Proteins synthesis; nuclear proteins for respiration.

Module III:	**Plant defense and physiology of senescence**

3.1 Plant defence systems – Overview of plant pathogens and plant diseases; Phytoalexins and their host specificity.
3.2 Molecular basis of phytoalexin elicitation; R- genes; mode of action and its role.
3.3 Post infectional compounds of some economically important plants.
3.4 Senescence and programmed cell death – Types of cell death observed in plants. Overview of senescence, pigment and protein metabolism during senescence.

Module IV:	**phytochemistry**

4.1 Primary and Secondary metabolites – Coordinated control of metabolism; Metabolites as important natural products.

4.2 Types, biosynthesis and applications of terpenes, alkaloids, phenolic compounds, lignins, flavonoids, glycosides, and coumarins.
4.3 Stress Physiology – Plant responses to biotic and abiotic stress, Mechanism of biotic and abiotic stress tolerance, HR and SAR. Water deficit and draught resistance; salinity stress, freezing and heat stress and oxidative stress.

Practicals:

1. The separation of leaf pigments by adsorption chromatography.
2. The separation of amino acids by two-dimensional chromatography.
3. The identification of sugar in Fruit juices by TLC.
4. Determination of Chl- a, Chl-b & total chlorophyll in C3 & C4 plants by spectrophotometry.
5. The quantitative estimation of amino acids by using the ninhydrin reaction.
6. Estimation of total carbohydrates by anthrone reagent.
7. Detection of secondary metabolites by TLC (any one).
8. Profile study of secondary metabolites by TLC (any one).
9. Spectrophotometric estimation of secondary metabolites.
10. Preparation of absorption spectrum of chlorophylls & carotenoids.
11. Estimation of stress induced amino acids (proline)

Suggested Readings

- Buchanan, B.B., Gruissem, W., Jones, R.L. (2000) Biochemistry & Molecular Biology of Plants, American Society of Plant Physiologists, Rockville, Maryland.
- Clayton, R.K. (1980). Photosynthesis: Physical mechanism & Chemical patterns. Cambridge University Press, Cambridge.
- Dangi, J.L. (1995). Bacterial Pathogenesis of Plants & Animals, Molecular & Cellular Mechanism. Springer-Verlag, Berlin.
- Daniel, M. and R. P. Purkayastha (1995). Handbook of Phytoalexin metabolism & action, Marcel Dekker, Inc., New York.
- Davies, D.D., (1987). The Biochemistry of Plants, Vol. II, Academic Press, London, 1987.
- Duke, J.A. (1992). CRC Handbook of Phytochemical Constituents of GRAS Herbs, Foods & other Economic Plants. CRC Press, Boca Raton, FL.
- Hopkins, W.G. (1995). Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
- Taiz, L. & Zeiger, E. (1998). Plant Physiology 2nd ed. Academic Press, Sandiago, U.S.A. 1998.

Suggested URLs/Websites:

- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=944

Master of Science (Botany)	**Semester IV - DSC – 14**
Course Code	**PG-BOT (06) – S4- T14**
Course Name	**Plant Biotechnology and Bioinformatics**
Course Credit	**04**
Course Working hours	**60 hrs**
Course Structure	**Theory and Practicals**

Course objectives: This course aims to equip students with a comprehensive understanding of recombinant DNA technology, genetic engineering, plant tissue culture, and bioinformatics, with practical insights into their applications in research and biotechnology.

Course Learning Outcomes:

CO1: Students will be able to understand basics of gene cloning techniques, vector selection, and the construction and screening of DNA libraries.

CO2: Students will Apply genetic engineering principles to the development of transgenic plants and microbial genetic manipulation, including DNA sequencing and fingerprinting.

CO3: Students will Understand the principles and applications of plant tissue culture, including somatic embryogenesis, protoplast culture, and transgenic crop production.

CO4: Students will Utilize bioinformatics tools for sequence analysis, database management, and phylogenetic studies, integrating computational approaches into biological research.

Course Content:

Module I	**Recombinant DNA technology**

1.1 Recombinant DNA technology: Gene cloning- Principles and technique;

1.2 vectors- types (cloning & expression; plasmid & viral) and their properties; construction of DNA libraries (gDNA and cDNA); splicing of insert into the vector; screening of DNA libraries.

1.3 Genetic engineering of plants: Aims, strategies for development of transgenics (with suitable examples); Agrobacterium- the natural genetic engineer; T-DNA and transposon mediated gene tagging.

Module II	**Genetic engineering**

2.1 Microbial genetic manipulation: Bacterial transformation, selection of recombinantsand transformants,

2.2 Genomics and proteomics: high throughput sequencing; functional genomics; Protein profiling and its significance.

2.3 DNA synthesis: DNA sequencing; basic polymerase chain reaction and applications of PCR; DNAfingerprinting

Module III	**Plant tissue culture**

3.1 Plant tissue culture: Basic concepts; Principles and scope; tissue culture media; callus induction and cell suspension; aspects of morphogenesis;

3.2 haploid and triploid production;production of somatic embryos; applications of plant tissue culture; protoplast isolation and culture; production of cybrids

3.3 Transgenic production: Methods to introduce gene in plants; selection of transformed plants/explants; Application of transgenic crop production.

Module IV	**Bioinformatics**

4.1 Bioinformatics: Introduction, History, Definition and applications of bioinformatics; Database: Sequences (nucleotide and amino acid); nomenclature- IUPAC symbols, nomenclature

of DNA& protein sequences,
4.2 Definitions, types and classification of databases- Primary Databases, Secondary databases. Applications of bioinformatics.
4.3 sequence alignment, pairwise and multiple sequence alignment, types of phylogenetic trees

Practicals :

1. To study the growth characteristics of *E. coli* using plating and turbidimetric methods.
2. To isolate the plasmid from *E. coli* and quantify it with suitable method.
3. To perform restriction digestion of the given plasmid DNA and to estimate of the sizeof various DNA fragments.
4. To Clone the given DNA fragment in a plasmid vector.
5. To prepare competent cells from the given bacterial culture.
7. To prepare the media for plant tissue culture.
8. To surface sterilize the given seeds/explant for tissue cultural manipulation.
9. To isolate protoplast and determine its viability.
10. To workout the DNA sequence from the given autoradiogram and identify the geneusing online tools.
11. To search literature database of different organisms.
12. To search the genes in the Genebank.
13. To use the various tools to retrieve information available from NCBI
14. To locate gene(s) on chromosomes for a given disease/disorder.

Suggested Readings

1. Baxevanis, A. D., Davison, D. B.; Page, R. D. M.; Petsko, G. A.; Stein, L. D. and Stormo, G. D. 2008 Current Protocols in Bioinformatics, John-Wiley and Sons Publications, New York.
2. Baxevanis, A. D. and Ouellate, B. F. F. 2009 Bioinformatics: A Practical Guide to the analysis ofgenes and proteins. John-Wiley and Sons Publications, New York.
3. Brown, T. A. 1999. Genomes, John Wiley &Sons (Asia) Pvt. Ltd., Singapore.
4. Callow, J. A., Ford-Lloyed, B. V. and Newbury, H. J. 1997. Biotechnology and Plant Genetic Resources: Conservation and Use, CAB International, Oxon UK.
5. Chrispeeels, M. J. and Sadava, D. E. 1994,Plants, Genes and Agriculture. Jones & Barlett Publishers, Boston, USA.
6. Dubey, R. C. 2014 Advanced Biotechnology. S. Chand & Co. Pvt. Ltd., New Delhi. Glazer, A. N. and Nikaido, H. 1995. Microbial Biotechnology. W. H. Freeman & Company, NewYork, USA.
7. Gustafson, R. J. 2000. Genomes. Kluwer Academic Plenum Publishers, New York, USA. Henry, R. J. 1997. Practical Applications of Plant Molecular Biology. Chapman & Hall, London,UK.
8. Jain, S. M., Sopory, S. K. and Veilleux, R.E. 1996. In vitro Haploid Production in Higher Plants,Vols. 1-5, Fundamental Aspects and Methods. Kluwer Academic Publishers, Dordrecht, The Netherlands.
9. Jolles, O. and Jornvall, H. (eds) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
10. Kartha, K. K. 1985. Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, FloridaUSA.
11. Kingsman, S. M. Genetic Engineering : An Introduction to Gene Analysis and Exploitation inEukaryotes, Blackwell Scientific Publications, Oxford, 1998 Mount W. 2004 Bioinformatics and sequence genome analysis 2nd Edi. CBS Pub. New Delhi
12. Old, R. W. and Primrose, S. B. 1989. Principles of Genome Analysis. Blackwell

Scientific Publications. Oxford, UK.
13. Primrose, S. B.1995. Principles of Genome Analysis. Blackwell Scientific Ltd., Oxford, UK.

Suggested URLs/Websites:

- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=14
- http://www.surendranathcollege.org/new/upload/KOUSIK_GHOSH2020-04-05APG%20III%20Classification%20COMPILED.pdf
- http://francescofiume.altervista.org/taxa/APG.pdf
- http://www.mobot.org/MOBOT/Research/APweb/welcome.html

Master of Science (Botany)	**Semester IV - DSC -15**
Course Code	**PG-BOT (06) – S4- T15**
Course Name	**Plant Resources**
Course Credit	**4**
Course Working Hours	**60 hrs**
Course structure	**Theory**

Course objectives: This course aims to provide students with a broad understanding of the economic importance of plants, focusing on their role in food, medicine, and industry, as well as the phytochemical properties of plant-based drugs.

Course Learning Outcomes:

CO1: Students will be able to understand the historical and economic significance of various food plants, fiber-yielding plants, and other economically important plant resources.

CO2: Students will Identify and classify crude drugs based on plant anatomy and evaluate them using organoleptic, microscopic, and chemical methods.

CO3: Students will Analyze the phytochemistry of plant-based drugs, including secondary metabolites like glycosides, alkaloids, and phenolics, and their medicinal properties.

CO4: Students will Explore the industrial applications of plants, including their use in the paper and pulp industry, production of beverages, extraction of dyes, essential oils, and the cultivation and processing of rubber.

Course Content:

Module I	**Economic Botany and food adulteration**

1.1 Important Firewood and timber yielding plants; non wood forest products (NWFP) such as Bamboo, Rattam raw materials for paper making, gums, resins, tannins, dyes, fruits, medicinal plants, aromatic plants.

1.2 Green Revolution: Benefits and consequences, sustainable agriculture, agroecosystems. Innovative approaches for meeting world food demands.

1.3 Food Adulteration: Types of food adulteration; methods to detect food adulteration.

Module II	Pharmacognosy

2.1 Introduction, classification of crude drugs, plant anatomy (stomata, trichomes, xylem, Phloem, ergastic substances).
2.2 Evaluation of drugs: organoleptic, microscopic, chemical, physical and biological.
2.3 Drug Adulteration: Types; Methods of drug evaluation.

Module III	Plant based Drugs and their Phytochemistry

3.1 Drug: A brief introduction, classification and phytochemistry of different drugs of plant Origin.
3.2 Classification of Secondary metabolites of Plants and their medicinal properties: Glycosides and glycosidal drugs.
3.3 Phytochemistry: active principles and methods of their testing; identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

Module IV	Industrial Botany

4.1 Paper and pulp industry: Paper making, raw materials, manufacture of wood pulp, paper manufacture, kinds of paper and paper products.
4.2 Dyes: Plant sources (Description, chemical nature, extraction of dyes). Essential oil: Occurrence, extraction, essential oils used in perfumery and other industries.
4.3 Rubber and latex: Classification of rubber, Natural rubber- source, cultivation, collection of latex, processing, uses of rubber

Suggested Readings:

1. Ali Mohammed (1998) Textbook of Pharmacognosy. CBS Publi., New Delhi.
2. Kokate, C.K., Purohit, A.P. & Gokhale, S.B. (2019).6th Edt. Pharmacognosy. Nirali Publication, Pune.
3. Sabnis, S. D. and Daniel, M. (1990) A Phytochemical approach to Economic Botany. Kalyani Publi.,
   New Delhi.
4. Sharma, O. P. (1996) Hill‟s Economic Botany. TMH Publi., New Delhi.

Suggested URLs/Websites:

- https://www.uou.ac.in/sites/default/files/slm/BSCBO-302.pdf
- https://content.kopykitab.com/ebooks/2014/06/3256/sample/sample_3256.pdf
- https://botany.org/home/resources/plant-talking-points/what-is-economic-botany.html

Master of Science (Botany)	**Semester IV - DSE -16**
Course Code	**PG-BOT (06) – S4- T16**
Course Name	**Mycology and Plant Pathology-I**
Course Credit	**2**
Course Working Hours	**30 hrs**
Course structure	**Theory**

Course objectives: This course aims to provide students with a foundational understanding of mycology, plant pathology, and plant disease management, with a focus on the identification, control, and impact of various plant diseases in economically important crops.

Course Learning Outcomes:

CO1: Students will be able to understand the history of mycology, principles of plant pathology, and the defense mechanisms plants use against pathogens, including both morphological and biochemical strategies.

CO2: Students will be able to apply principles and methods of plant disease control, including cultural, chemical, biological, and transgenic approaches, and evaluate the effectiveness of biopesticides.

CO3: Students will describe the role of biological control and integrated pest management (IPM).

CO4: Students will be able to identify and assess the symptoms, causes, and control measures of diseases in various crops.

Course Content:

Module I	**Mycology and phytopathology**

1.1 History:- Milestones in Mycology with particular reference to India. Altered metabolism of plants under biotic and abiotic stresses. Major epidemics and their social impacts.

Koch's Postulates, Indian Institutes and their research activities in Mycology and Plant Pathology,

1.2 Principles of plant pathology- Principles of plant pathology-Importance, nature, classification and general symptoms of plant diseases.

1.3 Defense mechanism in host plants against pathogens: morphological, structural defense mechanism, Biochemical defense mechanisms- role of enzymes and Toxins.

Module II	**Plant disease control**

2.1 Principles and methods of plant disease control - Introduction, definition, concepts and tools of disease management, cultural methods, chemical methods, transgenic approach for plant disease control, Biopesticides.

2.2 Biological control: definitions, importance, principles of plant disease management with bio-agents, history of biological control, merits and demerits of biological control.

2.3 Integrated pest management (IPM,): components of integrated disease management- their limitations and implications.

Module III	**Plant diseases**

3.1 A Detailed study of the Diseases of the following crops caused by pathogens with effective control measures.

Diseases of Vegetable crops: Chili, Brinjal, Onion, Bhindi.

Diseases of Oil Seed Crops and Fruit Trees: *Sesamum*, Groundnut, Mustard.

Citrus, Apple, Mango, Banana .

3.2 Ornamental crops – Rose, Marigold, Chrysanthemum.
Bacterial diseases of crops: Bacterial blight of rice, Bacterial soft rot of fruits and vegetables
3.3 Mycoplasma Diseases of Plants- Citrus greening, Rice yellow dwarf, Little leaf of Brinjal, Sandal Spike.
Nematode Diseases of Plants: Root knot of Vegetables, Ear cockle of wheat

Suggested Readings

1.Aneja, K.R. (2015). Experiments in Microbiology Plant Pathology and Biotechnology. New Age International Publisher, New Delhi.6th Edition.
2.Dubey and Maheshwari. (2016). Practical Microbiology. S. Chand and Company Private Limited, New Delhi.
3.Hait, G. (2016). A Textbook of Mycology. New Central Book Agency, Kolkata.
4.Nair, L.N. (2001). Topics in Mycology and Pathology. New Central Book Agency, Kolkata.
5.Sethi and Walia. (2011). A Textbook of Fungi & Their Allies. Macmillan publishers, New Delhi. India.

Master of Science (Botany)	**Semester IV - DSE -16**
Course Code	**PG-BOT (06) – S4- T16**
Course Name	**Molecular Biology and Plant Biotechnology-II**
Course Credit	**2**
Course Working Hours	**30 hrs**
Course structure	**Theory**

Course objectives: This course aims to impart comprehensive knowledge of plant tissue culture techniques, DNA fingerprinting, gene expression analysis, and the application of genetic transformation in developing transgenic plants for agricultural and industrial purposes.

Course Learning Outcomes:

CO1: Students will be able to explain the various methods of gene transfer in plants, including Agrobacterium-mediated and direct DNA transfer techniques.

CO2: Students will Apply DNA fingerprinting techniques and PCR-based markers in marker-assisted breeding and genetic analysis.

CO3: Students will Analyze gene expression at the transcriptional level using techniques like Northern hybridization, differential display, and DNA microarrays.

CO4: Students will evaluate the applications of genetic transformation in creating transgenic plants with enhanced traits such as herbicide and insect resistance, and explore the implications of transgenics in molecular farming.

Course Content:

Module I	**Plant tissue culture**

1.1 Transgenic plants: Methods for gene transfer, *Agrobacterium tumefaciens* mediated gene transfer- Basis of tumor formation, features of Ti and Ri plasmids, mechanisms of DNA transfer, role of virulence genes;

1.2 Direct DNA transfer: particle bombardment, electroporation, microinjection, liposomes, pollen transformation; PEG method;

1.3 transformation of monocots; transgene stability and gene silencing; chloroplast transformation.

Module II	**DNA fingerprinting and global gene expression**

2.1 **DNA fingerprinting and marker assisted breeding**: DNA based markers definition and properties of molecular marker, Hybridisation based marker- RFLP and its applications,

2.2 PCR-based markers: RAPDs, ISSRs, SSR (microsatellites); SCAR (sequence characterized amplified regions); SNPs, molecular marker assisted selection

2.3 **Techniques used to study gene expression at transcription level**: Northern hybridization,differential display of mRNA, ESTs, DNA microarrays

Module III	**Application of transformation**

3.1 Applications of transformation: Herbicide resistance; insect resistance; Bt genes,

3.2 Trasngenics showing fungal and viral disease resistance; Nutritional quality, hazards, and safety regulations for transgenic plants.

3.3 Transgenics and molecular farming: Production of secondary metabolites; industrial enzymes; biodegradable plastics (PHB); edible vaccines; antibody production.

Suggested Readings:

1. Aneja, K.R. (2003). Experiments in Microbiology, Plant Pathology & Biotechnology. New Age International Publisher, NewDelhi.
2. Bacevanii, A.D. & Francis Ouellette, B.F. (2006). Bioinformatics – A practical guide to the analysis of genes and proteins. Wiley India Pvt. Ltd., New Delhi.
3. Das, H.K. (2010).A text book of Biotechnology. 4th Edt. Wiley India Pvt. Ltd., New Delhi.
4. Ghosh, Z. & Mallick, B. (2008). Bioinformatics- Principles and Applications. Oxford University Press. London.
5. Kar, D. & Halder, S. (2011). Cell biology, Genetics & Molecular biology. New Central Book Agency (P)ltd. London.
6. Klug, W., Cummings, M., Spenger, C.A. & Palladino, M.A.(2016). Concepts of Genetics. Pearson Education Service Pvt. Ltd.Chennai.
7. Krebs, J.E., Goldstein, E.S. & Kilpatrick, S.T. (2011) Lewin's Gene X.10th edt. Jones and Bartlett Publishers, Canada.
8. Kumar, B. & Gautam, S. (2014). Plant tissue culture. Sonali Publication, New Delhi.
9. Rastogi, S. & Pathak, N. (2016). Genetic Engineering. 7th Edt. Oxford University Press. New Delhi
10. Razdan, M.K. (2016). Introduction to Plant tissue culture. Oxford & IBH publishing Co. Pvt. Ltd. New Delhi.
11. Tandon, P. Advances in Plant tissue culture in India. Pragati Prakashan, Meerut.Co. pvt. Ltd. New Delhi.
12. Zesk. A.M. (2008). Introduction o Bioinformatics. Oxford University Press. London.

Suggested URLs/Websites:

- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=3

https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4

Master of Science (Botany)	**Semester IV - RP**
Course Code	**PBO648P**
Course Name	**Research Project in Botany**
Course Credit	**6**
Course Working Hours	**120 hrs**
Course structure	**Practical**

Course Structure Project based or research based

Course Description:

The research project in Botany course provides MSc Botany students with a unique opportunity to immerse themselves in real-world research and data collection experiences. Over a period of eight to ten weeks, students will have the chance to conduct research project in various settings, locally to address specific research questions related to the field of botany. This course is designed to complement the theoretical knowledge acquired during present and past courses and enable students to gather primary and/or secondary data that cannot be accessed through desk research alone.

Course Learning Objectives:

CO1: To develop practical research skills in the field of botany.
CO2: To design and implement a research project relevant to botany.
CO4: To gain hands-on experience in data collection techniques specific to botany.
CO4: To analyze and interpret field-collected data to address research questions.

Course Learning Outcomes:

Upon successful completion of the research project in Botany course, students will be able to:
CO1: Design a research project with a clear research question related to botany.
CO2: Demonstrate proficiency in various data collection methods, including plant observation, specimen collection, and environmental data recording.
CO3: Conduct semi-structured interviews and surveys to gather relevant information for botanical research.
CO4: Analyze and interpret field data to draw meaningful conclusions and prepare comprehensive research project reports and presentations.
CO5: Collaborate effectively in research project teams and adapt to diverse cultural and environmental contexts during research project.

Course Content:

The course will cover the following key topics and activities:
Week 1-2: Introduction to research project in Botany
Overview of course objectives and expectations
Selection of research topics and formulation of research questions
Ethical considerations in research project
Preparing a research project plan and proposal (two-page)
Week 3-4: Data Collection Techniques
Plant identification and specimen collection
Environmental data collection (e.g., soil analysis, climate data)
Introduction to equipment and tools used in botany research project
Week 5-6: Research in Local Settings

Conducting research project in local locations (e.g., local parks, villages, agricultural farms, forests, and Industrial area, Experimental work, Plant collections)
Implementing structured surveys and interviews
Data recording and management

Week 7-8: Literature search and primary work

Planning and executing research project (subject to safety recommendations)
Engaging with diverse communities wherever necessary. Students will be advised on suitable locations and conditions for their research project projects.

Week 9-10: Literature writing and primary work -part of thesis writing and presentation of project based on introduction, literature search, review writing and method preparation.

Assessment: Final draft of project and presentation, viva-voce examination during presentation

Suggested Readings:

•Tomović, G., Mitrović, V., & Stevanovic, B. (2002). Methods of field studies in botany. Genetika,34. https://doi.org/10.2298/GENSR0203085T
•Narayana P S , Varalakshmi D and Pullaiah T (2021) Research Methodology in Plant Science, Scientific Publishers, India.