

MASTER OF SCIENCE IN BOTANY (NON - SEMESTER PATTERN)

(From Academic Year 2021 onwards)



தமிழ்நாடு திறந்தநீலைப் பல்கலைக்கழகம்

Tamil Nadu Open University

[A State Open University established by Government of TamilNadu, Recognized by UGC-DEB,
Member in Asian Association of Open Universities and Association of Commonwealth Universities]

**School of Science
Department of Botany**



தமிழ்நாடு திறந்தநிலைப் பல்கலைக்கழகம்
Tamil Nadu Open University, Chennai
சென்னை - 15

அறிவியல் புலம்
School of Science
தாவரவியல் துறை
Department of Botany

**Master of Science in Botany
(Non - Semester Patern)**

(From Academic Year 2021-22 onwards)

பாடத்திட்ட அறிக்கை & விரிவான பாடத்திட்டம்
Programme Project Report (PPR) & Detailed Syllabus



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SEPTEMBER 2020



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No- 577, Anna Salai, Saidapet, Chennai -600015, Tamil Nadu, India

Prof. K.Parthasarathy
Vice-Chancellor

FOREWORD

My dear Learners, Vanakkam,

I deem it a great privilege to extend a hearty welcome to you to the Post Graduate Programme being offered by the Tamil Nadu Open University (TNOU). I also appreciate your keen interest of know about the curriculum of the Programme, in which you shall gain an enthralling experience, and pleasurable and beneficial learning.

With passing a specific act in the Tamil Nadu Legislative Assembly (TNLA) in 2002, the TNOU came into existence as a State Open University (SOU). It has been offering the socially relevant academic Programmes in diverse disciplines with due approval of the University Grants Commission (UGC) and the Distance Education Bureau (DEB), New Delhi since its inception. This Post Graduate Programme is one among the approved Programmes.

The Board of Studies, a statutory academic body of the University, consisting of the versatile scholars, eminent teachers including both internal and external, well acclaimed industrialists, outstanding alumni, and prospective learners as members, has designed the robust curriculum of this Programme. The curriculum is overhauled to be more suitable to the socio-economic and scientific needs in the modern era based on the emerging trends in the discipline of State and National as well as International level and accordingly, modified to our local context. Moreover, the whole syllabi of this Programme have special focuses on promoting the learners to the modern learning environment.

With a Credit System / Choice Based Credit System (CBCS), this Programme is offered in semester / non-semester pattern. The Self-Learning Materials that are the mainstay of pedagogy in the Open and Distance Learning (ODL) have been developed incorporating both the traditional and the modern learning tools, like web-resources, multi-media contents, text books and reference books with a view to providing ample opportunities for sharpening your knowledge in the discipline.

At this juncture, I wish to place on record my deepest appreciations and congratulations to the Chairperson and the Members of the Board of Studies concerned for having framed the curriculum of high standard. I would also like to acknowledge the Director, the Programme Coordinator and the members of staff of the respective School of Studies for their irrevocable contributions towards designing the curriculum of this Programme.

Last but not least, I register my profuse appreciation to Prof. S. Balasubramanian, the Director (i/c), Curriculum Development Centre (CDC), TNOU, who have compiled this comprehensive Programme Project Report (PPR) that includes the regulations and syllabi of the Programme, and also facilitated the designing in the form of e-book as well as printed book.

I am immensely hopeful that your learning at TNOU shall be stupendous, gratifying, and prosperous. Wish you all success in your future endeavours!

With regards,

Date: 05.10.2020

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TAMIL NADU OPEN UNIVERSITY
SCHOOL OF SCIENCE
DEPARTMENT OF BOTANY
(From Academic Year 2021 onwards)

M.Sc., in Botany

Programme Project Report (PPR)

Programme: M. Sc. in Botany

Botany deals with the different aspects of plant forms and processes in a specific habitat including taxonomy, systematic, evolutionary changes of plant species, distribution of plant species, phytogeography, plant diversity and ecological details along with their economic importance. Plant physiology, bio chemistry and genetics also come under purview of botany. Special emphasis is given on forestry. From this point of view, programme project has been prepared.

Programme Mission and objective: The proposed programme has the mission and objectives in relation to the teaching and learning in open and distance mode. In order to afford Quality Education for every one through distance learning mode ,need based academic programmes for livelihood and lifelong learning at post graduate level has been adopted. In order to set highest benchmark for quality and standards of Indian open distance learning strategy introduction of this programme has enormously been spread. The post graduate Programme in science to be offered through ODL mode will have certain learning outcomes. This programme will help the learners

To disseminate the knowledge of plant science among the people who have interest this—discipline.

To spread higher education especially among the rural people who are socio economically—backward.

To rid underprivileged society of social evils

Capacity building among the rural as well as backward population.—

Concept of open learning and distance education system focuses on open access education and training to make the learners free from the constraints of time and place, and offering flexible learning opportunities to individuals and groups of learners. Open and distance learning (ODL) is one of the most rapidly growing fields of education now a days and it has substantial impact on all education delivery systems. The new ODL system is growing fast because of the development of Internet-based information technologies. The concept of ODL education came from an idea where the learners and the teachers can not be in a class room and they should be separated by some geographical distance or may be they cannot come close to each other to make the entire education system flexible. Higher education playing the role of leadership in the society education act as catalyst of social change and spread of education in a society is the foundation of success in countries that are latecomers for development. Distance education is playing an important role in providing higher education to those who are unable to be the part of conventional system. The main objective of ODL is to reach the unreached and provide education at the doorstep of the learners and according to their convenience. The mission of the proposed programme is to foster an environment of excellence by attracting and supporting the good students needed to sustain the vision of the institute. We focus on the patterns and processes that enable predictive understanding of plants and their environments at local, regional, and global scales, leading to strengths in the areas of ecology, evolution, and systematics. The curriculum for the Master's Program in Botany has been designed with an aim to encourage the broad instructional goals and to support the growing demands and challenging trends in the educational scenario. The curriculum caters to the all – round development of the student, rolling out globally ready individuals into the fast pacing world. The specific objectives of the program are as follows:

1. Know the importance and scope of the discipline
2. Inculcate interest in and love of nature with its myriad living forms
3. Create a scientific attitude to make students open minded,
4. Develop the ability to work hard and make students fit for society
5. Develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of biological materials and data
6. Inculcate genuine interest in Biological research
7. Make aware of natural resources and environment and the importance of conserving it.
8. Develop the ability for the application of acquired knowledge in various fields of life so as to make our country self sufficient

Relevance of the programme with HEI Mission

Mission of the Tamil Nadu Open University is defined in its logo “Education for All” with special emphasis on a curriculum relevant to the ethnic, sociological and geographical needs on the catchment region ,yet not ignoring the demands of mainstream education. The main missions of the university are

- i. To improve the economic condition of the region and offer courses which should have the potential to garner employment.
- ii. To build human resource with strong character and competence, having the strength to face the challenges of the changing realities both in global and local levels and to adapt to the fast evolving technologies.
- iii. To promote an all round development of its students with a proper blending of knowledge and wisdom acquiring adequate skill in his own subject or trade or vocation through teaching learning process and human qualities like compassion, a sense of social responsibility and commitment and ethical sense (honesty), tolerance and empathy through various social, cultural, sports and ethical value addition programs.
- iv. To strive for the creation and dissemination of knowledge through continuous research and learning process.
- v. To strive for academic excellence

The missions of the proposed Programme are in conformity with the missions of the institute. It aims to enable learners to learn and retain a broad base of knowledge in the various domains of the subject. The distance mode education has been started in the university with a mission to revitalize educational leadership, to set the standard for the production and dissemination of knowledge as well as to become an effective instrument of change in the society. The PG courses in Science to be offered through ODL mode is very much relevant to the HEI’s mission and goals as it aims to provide quality education to those aspiring candidates who are deprived of higher education due to the limited number of intake in the traditional mode of higher education in the Universities. Moreover, to keep the quality intact the curriculum and syllabus has been designed at par with the conventional mode keeping in mind the specific needs and acceptability of the learners in the distance mode and in keeping with the aims and objectives of the University. The proposal of the present subject will fulfil the above objectives of the university as well as distance mode education. The Botany masters program is designed to help the students gain the maximum knowledge of the subject and be prepared for the real world applications and challenges. The university takes care of the all-round development of the students so that they can handle their professional life successfully. The university provides a competitive environment so that the students are positively motivated to improve themselves. The mission of the programme is to apply

conventional and nonconventional tools to understand plant process and to develop human resource with expertise in frontier areas of plant sciences.

Nature and target group of learners:

For the present subject the following groups of learners have been targeted:

(1) Those are distracted from the admission in the regular mode due to limited intake capacity of HEIs (2) Those employed in various organizations who desire to track higher education as a passion or as a means for movement up the promotional ladder.

(3) Drop outs primarily due to social, financial and economic compulsions as well as population related factors.

(4) Rural population those living in remote areas where higher education institutes are not easily accessible.

(5) Job seekers of particular field or subjects

(6) People of any age can participate in higher education programmes as there is no age bar in ODL mode education. .

(d) Appropriateness of the programme to be conducted in the ODL mode for acquiring specific skills and competence

Tamil Nadu Open University University emphasized in innovative approach towards curriculum designing, while conforming to the basic or core requirements to create a common knowledge base for the state and the nation. Post graduate Programme in Arts, Commerce and Science to be offered through ODL mode will have certain learning outcomes. This programme will help the learners to spread higher education in all sectors of community.

- Capacity building among the students particularly from the rural population.
- To apply skills and knowledge in an internship experience.
- To develop skills on hand practical related to science subject and also hands on training in field exposure. Botany is the plant science, plant biology or phytology. Each climate has its own particular botany. Today emphasis is also given on study regarding bacteria ,fungi and algae.

Instructional Design: The first step of instructional design in distance mode is curriculum design. A growing number of students globally are enrolling in distance education programs and it is becoming important now, more than ever before, to design curriculum that reflects educational principles, represents elements of engagement and pedagogy and meets institutional and industry requirements. In doing so, it is vital to design contemporary curriculum

that ensures these outcomes are attained. In order to effectively design curriculum, the role of the educator as a conductor, technician and choreographer. Finally, a triad has been proposed comprising of pedagogy, technology and an engaged community of learners as a basis for ensuring curriculum meets contemporary practices. For All these subjects the objective of this Open & Distance Learning (ODL) system of education is to develop capacity within and across the region to organize distance learning effectively in order to address the educational challenges and opportunities, particularly in higher education.

The Master of Science in Botany Programme is offered through the Learner Support Centres established by TNOU in the affiliated Arts and Science College, where the same Programme is offered through Conventional Mode.

The Faculty Members available at Department of Botany, School of Science of Tamil Nadu Open University and the faculties approved as Academic Counselors of TNOU at Learner Support Centres will be used for delivering the Master of Science Degree Programme in Botany.

The credits systems suggested as per UGC-ODL Regulations-2020 have been assigned to The Master of Science in Botany Programme. The total number of credit assigned for the Programme is 68. The Self Learning Materials in the form of print, e-content and audio/video materials wherever required has also been developed for the Programme.

Procedure for admissions, curriculum transaction and evaluation:

Eligibility: A candidate who has passed U.G. degree in Botany/Plant Science/Biotechnology/Microbiology/Biochemistry as a main subject in Part - III of any affiliated Institution/University accepted by syndicate shall be permitted to admission for M.Sc. Botany programme of this University after a course of two academic years. Admissions performed in academic year only.

The Programme Fee is Rs.20000/- for two years, plus Registration and other Charges. The admission are carried out by Tamil Nadu Open University and through its Regional Centres located within the State of Tamil Nadu. The Theory Counselling and the Practical Counselling will be conducted through the Learners Support Centres of Tamil Nadu Open University. The evaluation will be carried by Tamil Nadu Open University consists of Continuous Internal Assessment through Assignment and External Assessment through Term End Examination.

Financial Assistance: SC/ST Scholarship available as per the norms of the State Government of Tamil Nadu. Complete Admission fee waiver for the Physically challenged/ differently abled persons.

Policy of Programme delivery: The Academic Calendar for the Programme will be available for the learners to track down the chronological events/ happenings. The Counselling schedule will be uploaded in the TNOU website and the same will be intimated to the students through SMS.

Evaluation System: Examination to Master Degree Programme in Botany is designed to maintain quality of standard. Theory will be conducted by the University in the identified Examination Centres. For the Assignment students may be permitted to write with the help of books/materials for each Course, which will be evaluated by the Evaluators appointed by the University.

Continuous Internal Assessment (CIA): Assignment: 1 assignment for 2 credits are to be prepared by the learners. E.g. If a Course is of Credit 6, then 3 number of Assignments are to be written by the learner to complete the continuous assessment of the course. Assignment carries 30 Marks (Average of Total no of Assignment), consists of Long Answer Questions (1000 words) for each Course.

Sec-A	Answer any one of the question not exceeding 1000 words out of three questions.	1 x 30 = 30 Marks
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Theory Examination: Students shall normally be allowed to appear for theory examination by completing Practical and Assignment. The Term -End Examination shall Carry 70 marks and has PART: A, B and C and will be of duration 3 hours.

Question Pattern for Theory Examinations:

Max. Marks: 70

Time: 3 hours

PART - A (5 × 2 = 10 marks)

Answer all FIVE questions in 50 words
[All questions carry equal marks]

1. From Block - I
2. From Block - II
1. From Block - III
2. From Block - IV
3. From Block- V

PART - B (4 × 5 = 20 marks)

Answer any FOUR questions out of Seven questions in 150 words
All questions carry equal marks

4. From Block - I
5. From Block - II
6. From Block - III
7. From Block - IV
8. From Block- V
9. From any Block
10. From any Block

PART - C (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions in 400 words
[All questions carry equal marks]

11. From Block - I
12. From Block - II
13. From Block - III
14. From Block - IV
15. From Block - V
16. From any Block
17. From any Block

Question Pattern for Practical Examinations;

Awarding of Marks for Practical Examinations -External Only

Time: 3 hours

Max.marks:100

1. Major question – system/experiment - 35 marks
2. Minor question – analysis/mounting/experiment - 15 marks
3. Spotters (5 only) (5 x 6) - 30 marks
4. Record note book - 10 marks
5. *vivavoce* - 10 marks

Passing Minimum:

For Theory Examination: The candidate shall be declared to have passed the examination if the candidate secures not less than 32 marks in the University examination in each theory paper and overall 50 percent in both Term End Examination and Continuous Internal Assessment (Assignment) taken together.

Continuous Internal Assessment (CIA)		Term End Examination (TEE)		Overall Aggregated Marks	Maximum Marks
Minimum Pass Mark	Maximum Mark	Minimum Pass Mark	Maximum Mark	CIA + TEE	
13	30	32	70	50	100

For practical examination: The candidate shall be declared to have passed the examination if the candidate secures not less than 50 marks in the University practical examination and the mark distributions on results, record note book, procedure writing and *vivavoce* taken together is required to pass the examinations. However submission of record notebook is a must.

Classification of Successful Candidate: Candidates who pass all the Courses and who secure 60 per cent and above in the aggregate of marks will be placed in the First Class. Those securing 50 per cent and above but below 60 per cent in the aggregate will be placed in the Second Class.

Requirement of laboratory and Library Resources:

The Programme will be offered through the Learner Support Centre (LSC) maintained by

Tamil Nadu Open University. The LSC's have the required infrastructural facilities to conduct the Counselling for the students who wish clear their doubts and also they are having well equipped laboratory facilities relevant to the Master Degree Programme in Botany.

A well-equipped Library is available in the University Headquarters with about 24,000 books and lot of research journals. The Learners Support Centre through which the Degree Programme is to be offered is also equipped with a full-fledged library having books and journals related to Botany.

Cost estimate of the Programme and the provisions:

S.No	Details	Amount in Rs.
1	Programme development and launching cost (Expenditure)	-4626960
2	Programme Fee charged for 2 years per student (Income)	-20000
3	Examination Fee charged for 2 years (Income) per student	9000
4	Examination expenses per student for 2 years per student (Expenditure)	-15000

Quality Assurance Mechanism and Programme Outcomes: The Quality of the Master's Degree Programme in Botany is maintained by adopting the curriculum suggested by the UGC. As per UGC guidelines the core courses, two subject specific elective courses, two practical courses are included in the Programme. The Curriculum of Master's Degree Programme in Botany was approved by the Board of Studies on 18.06.2020. It will be placed for approval forthcoming Academic Council and Syndicate of our University subsequently. As a part of Quality assurance, the curriculum for the Programme will be updated once in three years. Necessary steps will be taken to obtain feedback from the students and the Academic Counselors who are part of the Programme for effective delivery of the Programme.

Programme Outcomes

1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at ideas and decisions (intellectual, organisational, and personal) from different perspectives.
2. Analytical Skill: To analyse from various branches of knowledge and arrive at independent conclusions.
3. Effective Communication: Communicate and comprehend clearly in person and through electronic media in English and to make meaning of the world by connecting people, ideas, books, media and technology.

4. Social Responsibility: To be conscious of the society and its requirements, and contribute towards it.
5. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
6. Ethics & Morals: Recognize different value systems, understand the moral dimensions of decisions, and accept responsibility for them.
7. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
8. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.
9. Science projects and funding: Demonstrate knowledge for writing and managing scientific projects in various disciplines and apply these to its own work, as a member and leader in a team, manage funds for scientific projects from various funding agencies and NGOs.

M.Sc., Botany Structure (Non - Semester)

Year	Paper/ Code	Title	Mark Distribution	Max. Mark	Credits
			Int. + External		
1 st year	Paper 1 MBOT11	Plant Diversity– I (Algae, Fungi, Lichens and Bryophytes)	30+70	100	6
	Paper 2 MBOT12	Plant Diversity – II (Pteridophytes, Gymnosperms and Palaeobotany)	30+70	100	6
	Paper 3 MBOT13	Microbiology, Immunology and Plant Pathology	30+70	100	6
	Paper 4 MBOT14	Morphology, Plant Anatomy and Embryology	30+70	100	6
	Paper 5 MBOT15	Plant Taxonomy and Economic Botany	30+70	100	6
	Paper 6 MBOTL1P	Practical – I	30+70	100	4
2 nd year	Paper 1 MBOT21	Cell and Molecular Biology	30+70	100	6
	Paper 2 MBOT22	Plant Physiology	30+70	100	6
	Paper 3 MBOT23	Plant Genetics, Plant Breeding and Biostatistics	30+70	100	6
	Paper 4 MBOT24	Plant Ecology, Forestry and Evolution	30+70	100	6
	Paper 5 MBOT25	Biochemistry, plant Biotechnology and Bioinformatics	30+70	100	6
	Paper 6 MBOTL2P	Practical – II	30+70	100	4
				1200	68



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Plant Diversity - I
Course Code	MBOT - 11
Course Credit	6

Course Objective:

1. To understand the life of lower plants
2. To know the values and importance of marine and terrestrial vegetation.

Course Outcome:

1. The students will have overview and understanding about the structure and relationship of various forms of cryptogams.
2. will understand the reproductive cycle of non flowering plants
3. will understand evolutionary trends among non flowering plants.
4. Identify the application aspects of statistical methods

Block I: Algae

- 1.1 Classification of Algae (F.E. Fritsch)
- 1.2 Comparative Study
- 1.3 Economic Imporyance of Algae

Block II – Algae – Type study

- 2.1 Volvax
- 2.2 Chlorella
- 2.3 Oscillatoria
- 2.4 Oedogonium
- 2.5 Diatoms
- 2.6 Batrocospermum
- 2.7 Polysiphonia

Block III: Fungi

- 3.1 General Classification - by C.J. Alexopoulos (1962)
- 3.2 Salient Features
- 3.3 Host-Parasite Interaction
- 3.4 Heterothallism
- 3.5 Economic Importance of Fungi
- 3.6 Mushroom Cultivation
- 3.7 Cercospora
- 3.8 Polyporus
- 3.9 Phytophthora
- 3.10 Rhizopus

Block IV: Lichens

- 4.1 Introduction
- 4.2 Classification
- 4.3 Thallus Organization
- 4.4 Reproduction
- 4.5 Pollution Indicators
- 4.6 Economic Importance
- 3.7 Mycorrhizae

Block V: Bryophyte

- 5.1 Introduction to Bryophytes
- 5.2 General Classification - Classification of Bryophytes by Smith (1955)
- 5.3 Reproduction and dispersal
- 5.4 Economic Importance of Bryophytes
- 5.5 Type Study Marchantia, Anthoceros, Porella, Pogonatum.

Books for Reference:

1. Fritsch, F.E., 1935-45, The structure and reproduction of Algae. Cambridge University Press UK Vol. I & II
2. Smith, G.M., 1955, Cryptogamic Botany, Vol. I, Tata McGraw Hill book Co., N.Delhi.
3. Chapman, V.J. & Chapman, D.J., 1973, The Algae- 2nd edition Edward Arnold, London.
4. Alexopoulos C.J., Mims C.W., and Black Well M., 1996, Introductory Mycology, John Wiley and sons INC. Singapore.
5. Webster J., 1991, Introduction to Fungi.
6. VashistaSinha B.R., Singh, V.P., 2002, Botany for Degree students, Algae 9th revised edition, S. Chand & Company Ltd., New Delhi.
7. Chopra G.L., A Text book of Fungi, S.Nagin& Co. Meerut, India
8. Smith, G.M., 1955, Cryptogamic Botany Vol. I & II, McGraw Hill Company



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Plant Diversity - II
Course Code	MBOT - 12
Course Credit	6

(Pteridophytes, Gymnosperms and Palaeobotany)

Course Objective:

1. To understand about plants of naked seeds and high altitude trees
2. To know about the fossil plants

Course Outcome:

1. General characters, morphology, reproductive organs, classification and economic importance of Gymnosperms.
2. Students will be conversant with general characters, morphology and anatomy of Cycas, Pinus, Podocarpus, Araucaria, Ephedra and Gnetum.
3. Student gets knowledge in the methods of fossil and fossilization.

Block I: Pteridophytes

- 1.1 Pteridophytes General Introduction
- 1.2 General Classification
- 1.3 Reproduction
- 1.4 Origin of Seed Habit
- 1.5 Economic Importance of Pteridophytes
- 1.6 Type Study

Block II: Gymnosperms – salient features

- 1.1 General Introduction
- 1.2 Reproduction
- 1.3 Origin of Gymnosperms**
- 1.4 General Classification

1.5 General Account

Block III: Gymnosperms – type study

- 3.1 Araucaria
- 3.2 Podocarpus
- 3.3 Ginkgo
- 3.4 Ephedra

Block IV: Palaeobotany – History and Origin

- 4.1 Concept of Palaeobotany
- 4.2 Diversification of Land Plants
- 4.3 Origin of Flowering Plants
- 4.4 Adaptations
- 4.5 Geological Time Scale

Block V: Palaeobotany – Classification

- 5.1 Classification of Fossils
- 5.2 Coalballs
- 5.3 Fossil Fuels
- 5.4 Fossil – Rhynia

Books for Reference:

1. Vashista, P.C., 1976, Botany for Degree Students Vol. V (Gymnosperms) S.Chand & Co. New Delhi.
2. S. P. Bhatnagar, Alok Moitra, Gymnosperms, New Age International, 1996.
3. Sukla & Mishra, S.P., 1982, Essentials of Palaeobotany, Vikas Publishing House
4. Arnold, C.A., 1947, An Introduction to Palaeobotany, McGraw Hill Publisher.
5. [Chhaya Biswas](#) and [B.M. Johri.](#), 2013. The Gymnosperms, Springer Science & Business Media.



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Microbiology, Immunology and Plant Pathology
Course Code	MBOT - 13
Course Credit	6

Course Objective:

1. To understand and visualize the microbial world
2. To know the value and importance of microbes
3. To understand the immune system

Course Outcome:

1. The students will get an understanding about the diversity of microbes.
2. They will learn the potentialities of microbes enhancing human welfare
3. They will be enlightened about the role of microbes in ecological balancing of nature

Block I: General Microbiology

Introduction

History of Microbiology

Concepts of Microbiology

1.5 Classification

1.6 Ultra Structure of Cell Wall

1.7 Bacterial Staining

1.8 Bacterial Reproduction

Block II: Applied Microbiology

2.1 Spoilage of Food

2.2 Fermented Products

2.3 Microbes in sewage treatment

2.4 Role of Microbes in Agriculture

- 2.5 Mycotoxins
- 2.6 Industrial Applications

Block III: General Virology

- 3.1 History of Viruses
- 3.2 Classification of Virus
- 3.3 Structure of Viruses
- 3.4 Transmission of Virus
- 3.5 Isolation of Virus
- 3.6 Life cycle of Virus
- 3.7 Medicinal Importance of Virus
- 3.8 Special Study

Block IV: Immunology

- 4.1 Introduction
- 4.2 Immunity
- 4.3 Immune System
- 4.4 The Immune Response
- 4.5 Immunoglobulins
- 4.6 Antigen –Antibody Reaction

Block V: Plant Pathology

- 5.1 History, scope and significance of Plant Pathology –
- 5.2 Principles of plant infection – inoculum potential – infection and dissemination of pathogens. Causal agents of plant diseases - biotic Koch's postulates - Symptoms of plant diseases.
- 5.3 Host – parasite interactions
- 5.3 Defense mechanisms: Host defense (Structural and Biochemical defenses).
- 5.5 Disease resistance – Genetics of virulence and resistance, Gene-for-gene concept,
- 5.6 Methods for incorporation of resistant genes – Electroporation – Agrobacterium mediated transformation. Important diseases of crop plants in

Books for Reference:

1. Pelczar, Chan and Krieg, 1986, Essentials of Microbiology
2. Dube, H., 1978, A text book of Fungi, Bacteria and Virus. Vikas Publishers.
3. Prescott's Microbiology, by Joanne Willey, Linda Sherwood and Christopher J. Woolverton 9th Edition
4. Brock Biology of Microorganisms, 14th Edition by Michael T. Madigan, John M. **Martinko**,

Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock

5. Immunology by [Thomas J. Kindt](#), 2002.

6. Cellular and Molecular Immunology by [Abul K. Abbas](#) 1991.

7. Agrios, A.G. 2007. Plant Pathology, Elsevier. **ISBN:** 9780120445653.

8. Singh, R.S. 2018. Introduction to Principles of Plant Pathology, 4th Edition.

9. Mehrotra, R.S. and Aggarwal, A. 2017. Plant Pathology. McGraw Hill Publisher.

10. Chaube, H.S. and Singh, R. 2015. Introductory Plant Pathology CBS Publishers, ISBN: 978-8123926704.

11. Ravi Chandra, N.G. 2013. Fundamentals of Plant Pathology, Phi Learning, ISBN: 812034703X.



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Morphology, Plant Anatomy and Embryology
Course Code	MBOT - 14
Course Credit	6

Course Objective

1. To gain knowledge about the internal structure of plant system
2. To understand the reproductive system in flowering plants

Course Outcome

1. The students will gain ability to apply the acquired knowledge and skills in the field of plant morphology and anatomy.
2. They gain Knowledge about the rules of generative and vegetative plant multiplication.
3. The students are enabled to understand the plant reproduction organs of flowering plants.

Block I: Morphology

- 1.1 Leaf: Phyllotaxy, simple, compound and modifications;
- 1.2 inflorescence-types; Flower: description of floral parts;
- 1.2 Fruits-types.

Block I Theories of Meristem

- 2.1 Introduction
- 2.2 Meristem
- 2.3 Plant Tissue Classification
- 2.4 Dermal Tissue System
- 2.5 Ground tissue system
- 2.6 Vascular system
- 2.7 Secretory Tissues

Block II Root and Stem Anatomy

- 3.1 Root
- 3.2 Stem
- 3.3 Secondary Growth
- 3.4 Origin Lateral Roots
- 3.5 Formation of Adventitious Roots
- 3.6 Dendrochronology

Block III Leaf Anatomy

- 4.1 Introduction
- 4.2 Internal Structure of Leaf
- 4.3 Nodal Anatomy
- 4.4 Periderm

Block IV Embryogenesis, Pollination and Fertilization

- 5.1 Introduction
- 5.2 Androecium
- 5.3 Gynoecium
- 5.4 Structure of Ovule
- 5.5 Megasporogenesis
- 5.6 Pollination
- 5.7 Fertilization
- 5.8 Embryogeny
- 5.9 Embryo rescue

Books for Reference

1. Esau, K., 1975, Plant Anatomy, Wiley Eastern Private Ltd., New Delhi.
2. Maheswari, P., 1971, An introduction to Embryology of Angiosperms, Tata McGraw Hill Publishing Co.Ltd, New Delhi.
3. Vasishta, P.C., A Text Book of Plant Anatomy, Pradeep Publications, Jullunder.
4. Bhojwani, S.S. and Bhatnagar, S.P., 1978, The embryology of Angiosperms, publishing House, N.Delhi.
5. Parihar, N.S., 1967, An introduction to Embryophyta Vol. II –Central Book depot, Allahabad



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Plant Taxonomy and Economic Botany
Course Code	MBOT - 15
Course Credit	6

Course Objective

1. To gain knowledge about higher plants and flowering plants
2. To understand the nomenclature of plant system

Course Outcome

1. The students are able to understand about Plant taxonomy and their systematic classification systems
2. Students are able to understand about modern approaches in taxonomic studies.
3. To be enlightened about the role of taxonomy in conservation of biodiversity

Block I: TAXONOMY – HISTORY and CLASSIFICATION

- 1.1 Introduction
- 1.2 Principles of Taxonomy
- 1.3 Theories of Taxonomy
- 1.4 Classification of Flowering Plants
 - 1.4.1 Types of Botanical Classification
 - 1.4.2 Classification - Bentham and Hooker
 - 1.4.3 Classification - Engler and Prantl

Block II: TAXONOMY - CODES

- 2.1 ICBN
- 2.2 Rules

Block III: TAXONOMY – APPLICATIONS

- 3.1 Botanical Survey of India
- 3.2 KEW Garden London
- 3.3 Monographs
- 3.4 Cladistics
- 3.5 Dendrogram
- 3.6 Molecular Taxonomy
- 3.7 Serotaxonomy
- 3.8 Numerical Taxonomy
- 3.9 Herbarium
- 3.10 Author Citation

Block IV: TAXONOMY – FAMILY DESCRIPTION

- 4.1 Annonaceae
- 4.2 Meliaceae
- 4.3 Myrtaceae
- 4.4 Nyctaginaceae
- 4.5 Sapotaceae
- 4.6 Apiaceae
- 4.7 Verbenaceae
- 4.8 Poaceae
- 4.9 Cyperaceae
- 4.10 Orchidaceae
- 4.11. Magnoliaceae
- 4.12. Moraceae
- 4.13. Menispermaceae
- 4.14. Asclepiadaceae
- 4.15 Aracaceae,
- 4.16. Liliaceae

Block V: Economic Botany

- 5.1 General account on economic botany – Cultivation and utilization of selected crop plants – Cereals (rice, maize and wheat) – Pulses (green gram, red gram and black gram) Sugar yielding plants (sugarcane and sugar beet) – Spices and condiments (cardamom, cinnamon)
- 5.2 Commercial crops – Fibre (jute and manila hemp), Timber (Teak and red sanders wood)
- Resins and gums (Asafoetida and gum arabic) –
- 5.3 Essential oils (lemon grass, eucalyptus and menthol)

Beverages (tea, coffee and cocoa) - Oil yielding plants (Groundnut, coconut, gingelly and sunflower,) –

5.4 Drug yielding plants (Cinchona, Coleus, Rawolfia, Withania and Gloriosa).

Books for Reference:

1. Rendle, R.B., The Classification of flowering plants, Vol. I, II & III, Oxford-Clarendon.
2. Vasisha, P.C., 1994, Taxonomy of Angiosperms R.S. Chand & Company
3. Sharma, O.P., 1993, Plant Taxonomy, Tata McGraw Hill.
4. Sambamurty, S.S, Taxonomy of Angiosperms. I K International Publishing House. 2005.
5. Tod F. Stuessy., 2009. Plant Taxonomy, Columbia University Press.
6. David M. Spooner., 2003. Plant Nomenclature and Taxonomy. John Wiley & Sons, Inc.
7. Sambamurty, A.V.S.S. and Subramaniam, N.S. 2016. A textbook of modern economic Botany, CBS Publishers.
8. Pandey, P.B. 2017. Textbook of Botany: Angiosperms-Taxonomy, Anatomy, Economic Botany and Embryology. Chand Publishing, New Delhi.



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M. Sc. Botany SYLLABUS I YEAR (Distance Mode)

Course Title	Practical – I
Course Code	MBOT - 11
Course Credit	4

Course Objective

1. To understand the live of lower plants practically
2. To know and identify the higher plants by seeing and visualizing the plant parts especially the flowers and inflorescence
3. To understand the functions and structures of higher plants
4. To understand the structure and mode of action by the microbes under microscopy and biochemical tests.

Course Outcome:

1. Develop the skill for micro slidepreparation and understand the internal structure of algae, fungi and bryophytes.
2. Students are capable to become practical knowledge in T.S. of stem and Leaf (Monocot and Dicot).
3. To get acquireknowledge in secondary thickening dicot stem and anomalous secondary thickening in the stems.
4. Students get adequate knowledge in internal structure of anther, L.S. of ovule, types of ovules and dicot embryo dissection.
5. Expertise in media preparation, sterilization, isolation and identification of microbes.
6. Develop skill on isolation of rhizobium from root module and acquire knowledge in methylene blue reduction test.
7. Understand the internal structural variation of pteridophytes and gymnosperms through T.S and L.S.
8. Understand the importance of fossil forms and interprets it's geological type scale.
9. Identification of plants

Major Practical:

1. Plant Identification
2. Bacterial staining
3. Isolation of microbes from soil and water
4. Measurement of stomatal index and frequency.

Minor Practical:

1. Lower plant Sectioning
2. Dichotomous key
3. Blood group determination
4. Embryo separation from plant Flower

Spotters:

1. Algae Slides
2. Microbes Slides
3. Fungi Slides
4. Gymnosperms
5. Fossil
6. Plant Identification from Herbarium (One plant)
7. Slides of Anatomical structures
8. Slides of Embryological structures



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M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Cell and Molecular Biology
Course Code	MBOT - 21
Course Credit	6

Course Objectives

1. To study an overview of the cellular and molecular mechanism that governs plant development.
2. To explain the basic concepts and most recent scientific advances in the cell and molecular biology.
3. To study the receptors, ligands and signal transduction pathway
4. To promote the students' abilities to correlate the concepts across different disciplines of Plant Science.

Course Outcomes

1. Knowledge on the cellular and molecular level that govern plant development.
2. Understand various macromolecular components of cells and their functions.
3. Know various levels of gene regulation and protein function including signal transduction and cell cycle control.
4. Knowledge on general principles of gene organization and expression.
5. Understand the role of receptors and ligands in cell signalling.

Block I: Plant – The Cell

- 1.1 Introduction
- 1.2 Structure of Cell
- 1.3 Cell Cycle
- 1.4 Cell Division

Block II: Organelles

- 2.1 Introduction
- 2.2 Plastids and Protoplast
- 2.3 Mitochondria

- 2.4 Ribosomes
- 2.5 Chromosomes
- 2.6 Golgi body
- 2.7 Endoplasmic reticulum
- 2.8 Lysosomes
- 2.9 Peroxisomes
- 2.10 Vacuoles
- 2.11 Cilia and Flagella

Block III: The Nucleus

- 3.1 Nucleus
- 3.2 Cell Division

Block IV: Structure and Function of DNA

- 4.1 Introduction
- 4.2 Types of DNA
- 4.3 Structure of DNA
- 4.4 Genetic Information
- 4.5 Genetic Code

Block V: Gene Expression

- 5.1 Introduction
- 5.2 Regulation of Gene Expression in Prokaryotes
- 5.3 Regulation of Gene Expression in Eukaryotes
- 5.4 Transcription in Prokaryotes
- 5.5 Transcription in Eukaryotes
- 5.6 Translation in Prokaryotes
- 5.7 Translation in Eukaryotes
- 5.8 Stability of Messenger RNA (mRNA)
- 5.9 Splicing
- 5.10 Capping
- 5.11 Polyadenylation
- 5.12 mRNA Surveillance

Reference Books

1. Ajoy Paul, 2009. Text book of Cell and molecular biology, Books and Allied (p) Ltd Kolkata.
2. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2002). Molecular biology of the cell (IV Edition). Garland Science, Taylor and Francis group, New York.

3. Cooper, G.M. and Hausman, R.E. 2013. *The Cell: A Molecular Approach*. 6th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Smith, A, Coupland, G., Dolan, L., Harberd, N., Jones, J., Marting, C., Sablowski, R. and Amey, A. 2010. *Plant Biology*. Garland Science, Taylor and Francis Group.
5. Karp, G. 2018. *Cell and Molecular Biology: Concepts and Experiments*. 6th Edition. John Wiley & Sons. Inc.
6. Kumar, H.D. 2000. *Molecular Biology*. Vikas Publishing House Pvt. Ltd. New Delhi.
7. Verma, P.S. and Aggarwal, V.K. 2010. *Molecular Biology*, Chand Publishing, New Delhi.
8. Lewin, 2017. *Gene XII*. Jones and Barlett Pub. ISBN. O 7637 5222 3
9. Lodish, et al. 2016. *Molecular and Cell Biology*. W.H. Freeman & Co. New York.
10. Verma P.S. and Agarwal V.K. 2007. *Cell biology, Genetics, molecular biology and evolution*, S. Chand Publishing, New Delhi.
11. Buchanan, B., Gruissem, W. and Jones, R. 2000. *Biochemistry & Molecular Biology of Plants* by American Society of Plant Physiology, Rockville, MD,



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M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Plant Physiology
Course Code	MBOT - 22
Course Credit	6

Course Objectives:

1. To understand the functions of tissues in higher plants
2. To know the transport of minerals and water in plant system
3. To know the metabolisms of plant systems
4. To understand the biological clock and rhythms of plant system.

Course Outcome:

1. The Students will learn about absorption, translocation and utilization of water and other minerals.
2. Comprehend the changes during growth process (germination to abscission).
3. Understand the energy flow and various metabolic cycles with their integration.
4. Get an overall perception about various physiological processes occurring in plants.

Block I: Plant – Water Relation

- 1.1 Introduction
- 1.2 Importance of Water
- 1.3 Water Potential
- 1.4 Imbibition
- 1.5 Diffusion
- 1.6 Osmosis
- 1.7 Absorption of Water
- 1.8 Transpiration
- 1.9 Guttation
- 1.10 Ascent of Sap

1.11 Essential Mineral Elements

Block II: Photosynthesis

- 2.1 Introduction
- 2.2 Photosynthesis
- 2.3 Respiration
- 2.4 Photorespiration

Block III: Nitrogen Metabolism

- 3.1 Nitrogen metabolism
- 3.2 Ammonification and Nitrification
- 3.3 Nitrogen Fixation
- 3.4 Amino acids
- 3.5 Lipids

Block IV: Plant Growth Hormones

- 4.1 Introduction
- 4.2 Auxins
- 4.3 Cytokinins
- 4.4 Gibberellins
- 4.5 Ethylene
- 4.6 Abscisic acid
- 4.7 Phytochrome

Block V: Photoperiodism

- 5.1 Introduction
- 5.2 Photoperiodism
- 5.3 Vernalization
- 5.4 Ripening
- 5.5 Circadian Rhythms
- 5.6 Senescence

Books for Reference

1. Frank B. Salisbury and Celon W. Ross, Plant Physiology, GBS Publishers and distribution, New Delhi.
2. Jain, V.K., Plant Physiology, S.Chand & Company, N.Delhi.
3. Sinha, R.K., Modern Plant Physiology, Narosa Publishing House.
4. Lincoln Taiz, 2010. Plants Physiology and Development, Sinauer Associates Inc.
5. Mukherjee . S, Ashim Kumar Ghosh. 2009. Plant Physiology, New Central Book Agency



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M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Plant Genetics Plant Breeding and Biostatistics
Course Code	MBOT - 23
Course Credit	6

Course Objectives

1. To study the fundamental principles of Genetics,
2. To understand the structure, function and changes in the genetic materials.
3. To learn the principles of Plant Breeding and the application of molecular To acquire skill on the comprehensive analysis of experimental data with statistical tools.
4. To develop laboratory skill one the analysis and interpretation of various biochemical and molecular biology experiments.
5. To train on basic computer knowledge to tabulate, analyse and interpret the data.

Course Outcomes

1. Knowledge on the fundamental principles of Genetics
2. Knowledge on the structure, function and changes in the genetic materials.
3. Understanding the different principles of plant breeding and the application of molecular genetics techniques in crop improvement.
4. Skill for the statistical analysis of experimental data with software's.
5. Laboratory skills for the analysis and interpretation of various biochemical and molecular biology experiments.
6. Knowledge on basic computer application to tabulate, analyse and interpret the data.

Block I: Genetics

- 1.1 Introduction
- 1.2 History of Genetics
- 1.3 Mendelian Laws of Heredity
- 1.4 Linkage
- 1.5 Crossing over

- 1.6 Extrachromosomal inheritance.
- 1.7 Cytoplasmic male sterility in plants
- 1.8 Chromosomal mapping

Block - II Concepts of Gene

- 2.1 Gene concept– Factor concept of Mendel, One gene -One enzyme hypothesis.
- 2.2 Benzer's concepts of Cistron, muton and recon.
- 2.3 Types and description of gene family (housekeeping genes, transposons overlapping genes, pseudogenes, gene cluster).
- 2.4 Gene mutation- Molecular basis of mutation, physical and chemical mutagens and their mode of action. Detection of mutation by CLB and Muller methods – Biochemical mutants in bacteria and Neurospora.

Block III: Plant Breeding

- 3.1 Centers of origin of cultivated plants. Domestication syndrome in cultivated plants.
- 3.2 Plant breeding methods in self-fertilized, cross fertilized and vegetative propagated plants.
- 3.3 Plant breeding work in India with special reference to Rice, cotton and Sugarcane. Role of polyploidy in plant improvement. Heterosis breeding with examples.
- 3.4 Role of molecular markers in plant breeding- RAPD, RFLP, VNTR, SSR and ISSR. Marker assisted selection and QTL mapping. Germplasm maintenance of rice and sugarcane. Role of IBPGR, Italy and NBPGR, New Delhi in germplasm conservation.

Block- IV: Biostatistics - Principles

- 4.1 Experimental designs: Principles - replication and randomization. Common designs in biological experiments: Completely randomized design, randomized block design and Latin square design.
- 4.2 Methods of data collection. Primary and secondary data, qualitative and quantitative data. Frequency distribution table construction. Graphical representation of data.
- 4.3 Measures of central tendency- Mean, Median and Mode. Measures of dispersion- Mean deviation, Standard deviation, variance, standard error and coefficient of variation.

Block – V: Probability

- 5.1 Probability - Definition, mutually exclusive events, independent events. Theorems on probability.
- 5.2 Tests of statistical significance - Null hypothesis and alternate hypothesis. Significance level and level of confidence. t- test. Chi square test (goodness of fit, independence of qualitative characters), F-test. Correlation and Regression. One way ANOVA, multiple mean comparison tests (DMRT, Tukey's test).

Books for reference

1. Allard, R.W. 2010. Principles of Plant Breeding (2nd Edition). John Wiley and Sons, Inc.
2. Benjamin A. Pierce, 2008. Genetics: A conceptual approach(4th Edition). W H Freeman and Company Ltd.
3. Brian, K.H. and Benedict, H. 2014. Evolution (5th Edition). Jones & Bartlett Publishers.
4. Daniel L. Hartl, 2017. Genetics: Analysis of genes and genomes(8th Edition). Jones and Bartlett Publishers.
5. David R. Hyde, 2010. Genetics and molecular biology (1st Edition). Tata-McGraw Hill. Gardner, E.J. 2019. Principles of Genetics, 8th Edition, John Wiley, New York.
6. Gupta, P.K., 2007, Genetics Classical to Modern, Rastogi Publications, Meerut.
7. William S Klug and Michael R Cummings, 2018. Concepts of Genetics(12th Edition). Pearson Education Pvt. Ltd., Singapore.
8. Chahal, G.S. and Gosal, S.S. 2002. Principles and procedures of Plant Breeding. Narosa Publishing House.
9. Allard, R.W. 2010. Principles of Plant Breeding (2nd Edition). John Wiley and Sons, Inc.
10. Prasad, 2011. Elements of Biostatistics – S. Rastogi Publications, Meerut.



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M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Plant Ecology, Forestry and Evolution
Course Code	MBOT - 24
Course Credit	6

Course Objective

1. To understand the environment and its interaction with the vegetation.
2. To know the energy flow among the components of ecosystem
3. To understand the forests and its acts
4. To understand the silviculture system.

Course Outcome

1. The students will have the ability to understand the importance of the local ecology, culture, history and economic development balanced with a social responsibility,

Understand the basic concepts of plant ecology and our surrounding ecosystem.

2. To identify the natural resources which can be conserve for future and sustainable development.
3. Awareness of conserving natural resources and maintaining the integrity of the indigenous culture.

Block I: Ecosystem

- 1.1 Introduction
- 1.2 Components of Ecosystem
- 1.3 Energy Flow
- 1.4 Biogeo Chemical Cycle

Block II: Ecological Adaptations

- 2.1 Categories of Adaptations
- 2.2 Hydrophytes
- 2.3 Xerophytes
- 2.4 Methods of studying Vegetation

Block III: Pollution

- 3.1 Air Pollution
- 3.2 Water Pollution
- 3.3 Thermal Pollution
- 3.4 Noise Pollution

Block IV: Forest types and Forest Utilization

- 4.1 Introduction
- 4.2 Types of Forests
- 4.3 Importance of Forests
- 4.2 Commercial Forestry
- 4.3 Agro Forestry
- 4.4 Silviculture

Block V: Evolution

- 5.1 Evolution: Darwin concept of variation, adaptation, struggle, fitness and natural selection.
- 5.2 The evolutionary synthesis. Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller.
- 5.3 The first cell. Origin of prokaryotic and eukaryotic cells. Evolution of unicellular eukaryotes. Concepts of neutral evolution, molecular divergence and molecular clocks – Micro and macro evolution.
- 5.4 Concept of Wallace and his contributions.

Books for Reference

1. Eugene P Odum, Fundamentals of Ecology, Nataraj Publishers
2. Sharma, P.D., Ecology & Environment, Rastogi Publications.
3. S.S. Negi, Forestry, New Delhi.
4. Navjot S. Sodhi, Paul R. Ehrlich, 2010. Conservation Biology, Oxford University Press.
5. Oscar Galelio, 2014. Biodiversity: The Dynamic Balance of the Planet, InTech.

6. Burton V. Barnes, Donald R. Zak., 1998. Forest Ecology, John Wiley & Sons.
7. Maxtoshi Nei and Sudhir Kumar, 2000. Molecular Evolution and phylogenetics. Oxford University Press.
8. Roderic, D., Page, M. and Holmes, E.C. 1998. Molecular Evolution: A phylogenetic approach. Blackwell Science Ltd.
9. Brian, K.H. and Benedict, H. 2014. Evolution (5th Edition). Jones & Bartlett Publishers.



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M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Biochemistry Plant Biotechnology and Bioinformatics
Course Code	MBOT - 25
Course Credit	6

Course Objective

1. To study the fundamentals and significance of Plant Biochemistry.
2. To know the structure and properties of plant biomolecules.
3. To learn the fundamental and applications of Plant Biotechnology.
4. To understand the structure, function and changes in the genetic materials.
5. To learn the principles of Plant Breeding and the application of molecular techniques in crop improvement.

Course Outcome:

1. Knowledge on the fundamentals and significance of Plant Biochemistry.
2. Understanding on the structure and properties of plant biomolecules.
3. Knowledge on the production of hybrid plants through rDNA technology
4. Understanding on the importance of differential regulation of gene expression plant systems.
5. Knowledge on the structure, function and changes in the genetic materials.
6. Understanding the different principles of plant breeding and the application of molecular genetics techniques in crop improvement.

Block I: Basis of Biochemistry

- 1.1 Calorimetry
- 1.2 Buffer
- 1.3 Bonding
- 1.4 Isomerism
- 1.5 Carbohydrates

Block IV: Amino acids

- 2.1 Concepts of Amino acids
- 2.2 Proteins
- 2.3 Lipids

Block III: Enzymes

- 3.1 Enzymes
- 3.2 Classification of Enzymes
- 3.3 Mechanism of Enzyme Action
- 3.3 Factors affecting Enzymes
- 3.5 Enzyme Specificity
- 3.6 Enzyme Inhibition
- 3.7 Importance of Enzymes

Block IV: Genetic Engineering and Plant Biotechnology

- 4.1 Introduction
- 4.2 Strategies of Genetic Engineering
- 4.3 Hybridization
- 4.4 Application of Genetic Engineering
- 4.5 Types of Culture
- 4.6 Callus Culture
- 4.7 Protoplast Culture
- 4.8 Meristem Culture

Block V: Bioinformatics

- 5.1 Definitions and History of Bioinformatics. Computational Biology and Bioinformatics.
- 5.2 Applications and scope of Bioinformatics.
- Biological databases-
- 5.3 Information retrieval from databases – search concepts, tools for searching.

Books for Reference:

1. Bonner, J. and Warner, W.H. 1961. Plant Biochemistry. Academic Press. Inv. New York.
2. Gupta, S.N. 2016. Biochemistry Rastogi Publications, Meerut.
3. Satyanarayana, U. and Chakkrapani, U. 2013. Biochemistry. Elsevier India Pvt Ltd & Books Allied Pvt.Ltd, New Delhi.
4. Nelson, D.L. and Cox, M.M. 2017. Lehninger's Principles of Biochemistry, Prentice Hall, International N.J, 7th Edition.
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தமிழ்நாடு திறந்தநீலைப் பல்கலைக்கழகம்
Tamil Nadu Open University, Chennai
சென்னை - 15

M. Sc. Botany SYLLABUS II YEAR (Distance Mode)

Course Title	Practical – II
Course Code	MBOTL - 21
Course Credit	4

Course Objective:

1. To observe and identify the lower and higher plants by morphological anatomical and biochemical methods
2. To understand the nature of metabolism and functions by experimental methods

Course Outcome:

1. Students are able to gain knowledge in cell and molecular techniques.
2. The laboratory courses help the student to understand and learning principles of laboratory.
3. The Students enable to acquire the practical knowledge about determination, extraction estimation, preparation and measurement of various plant physiological experiments/assay.
4. The students will understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.
5. The students understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
6. In biochemistry, the student gets practical knowledge in order to Preparation of molal, molar, normal and percentage solutions and their dilutions
7. Practically students able to find out the ecological parameters such as plant species distribution, abundance and density in a defined area by quadrat method.
8. Students will be able to gain knowledge on estimation of dissolved oxygen content, chloride content, carbonate and bicarbonate in water and total
9. The students gain proficiency in laboratory technique and bio-instrumentation principle, and be able to apply these instrument mechanisms to the process of

experimentation in future research field.

10. Students are able to learn to solve various genetic problems.
11. Students learn about the techniques of emasculation, crossing and bagging.

Major Practical:

1. Quantification of Proteins
2. DNA Isolation
3. Estimation of Sugars
4. Water analysis including pH, conductivity, salinity, total Hardness
5. Estimation of O₂ Evolution from plant (Hydrilla)
6. Pigment estimation

Minor Practical:

1. Quadrature method/ Line transect Method
2. Sectioning of Plant parts (Shoot, Root and leaf)
3. Complementary color
4. Paper Chromatography
5. Preparation of mitotic and meiotic spreads and analysis of various stages of cell division (Allium)
6. Seed viability – Tetrazolium chloride test.

Spotters:

1. Organelles structure - Slides
2. Laws of Genetics
3. Calculation of gene frequencies
4. Cot curve
5. DNA melting curve
6. tertiary structure of protein
7. HIND III
8. pUC Plasmid