Maa Shakumbhari University, SAHARANPUR U.P.

माँशाकुम्भरीविश्वविद्यालय, सहारनपुर, उत्तरप्रदेश

Syllabus

of

Botany

For First Three Years of Under-Graduate (UG) Programme

(As per guidelines of U.P. Government according to National Education Policy-2020 w.e.f. the session 2023-2024)

w.e.f. from - 2024-25

Members from the Board of Studies

S.No.	Name	Signature
1.	**Prof. Sanjeev Kumar**, Department of Botany, D.A.V. (P.G.) College, Muzaffarnagar **(Convener)**	
2.	**Prof. Ritu Agarwal**, Department of Botany, M.S. College, Saharanpur **(Member)**	
3.	**Dr. Rakesh Kumar**, Department of Botany, VSP Govt. (P.G.) College, Kairana, Shamli **(Member)**	
4.	**Dr. Yogendra Kumar**, Department of Botany, GDC, Saharanpur **(Member)**	
5	**Prof. Rupnarayan**, Department of Botany, CCSU, Meerut **(Member)**	
6	**Prof. Alok Srivastav,** Department of Plant Science, MJPRU, Bareilly **(External Expert)**	

(Internal Assessment of Practical Exam is adapted by U.P. Govt. guidline w.e.f - 2024-25.)

Semester-wise Titles of the Papers in B.Sc. (Botany)

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Year		Course Code	Paper Title	Theory/ Practical	Credits	Paper Code
Certificate Course in Microbial Technology & Applied Botany						
FIRST YEAR	I	B040101T	**Microbiology & Plant Pathology**	Theory	4	0120401
		B040102P	**Techniques in Microbiology &Plant Pathology**	Practical	2	0120480
	II	B040201T	**Archegoniates &Plant Architecture**	Theory	4	0220401
		B040202P	**Land Plants Architecture**	Practical	2	0220480
Diploma in Plant Identification, Utilization & Ethnomedicine						
SECOND YEAR	III	B040301T	**Flowering Plants Identification &Aesthetic Characteristics**	Theory	4	0320401
		B040302P	**Plant Identification technology**	Practical	2	0320480
	IV	B040401T	**Economic Botany, Ethnomedicine & Phytochemistry**	Theory	4	0420401
		B040402P	**Commercial Botany & Phytochemical Analysis**	Practical	2	0420480
Bachelor of Science						
THIRD YEAR	V	B040501T	**Plant Physiology, Metabolism & Biochemistry**	Theory	4	0520401
		B040502T	**Molecular Biology & Bioinformatics**	Theory	4	0520402
		B040503P	**Experiments in physiology, Biochemistry & molecular biology**	Practical	2	0420480
		B040504R	***Project-I**	Practical	3	0520465
	VI	B040601T	**Cytogenetics, Plant Breeding & Nanotechnology**	Theory	4	0620401
		B040602T	**Ecology & Environment**	Theory	4	0620402
		B040603P	**Cytogenetics, Conservation & Environment management**	Practical	2	0620480
		B040604R	***Project-II**	Practical	3	0620465

Subject prerequisites:

1. To study Botany, a student must have had the subject Biology/Biotechnology learnt at 10+2 level.
2. Keen interest in plants and plant-related research, Potential in mathematics, biology and chemistry
3. Skills and aptitude for scientific study and research
4. Creativity and good comprehension while working on scientific procedures and research
5. Computer aptitude.

COURSE INTRODUCTION

The new curriculum of B.Sc. in Science (Botany) offers essential knowledge and technical skills to study plants in a holistic manner. Students would be trained in all areas of plant biology using a unique combination of core, elective and vocational papers with significant inter-disciplinary components.
Students would be exposed to cutting-edge technologies that are currently used in the study of plant life forms, their evolution and interactions with other organisms within the ecosystem. Students would also become aware of the social and environmental significance of plants and their relevance to the national economy.
B.Sc. Botany Programme covers academic activities within the classroom sessions along with practical concepts at laboratory sessions. Infield, outstation activities and projects are also required to be organized for real-life experience and learning.
Candidates who have curiosity in plants kingdom, ecosystem, love exploring exotic places and wish to work as researchers or professions like Botanist, Conservationist, Ecologist, etc. can choose B.Sc. Botany course.

Programme outcomes (POs):

Transformed curriculum shall develop educated outcome-oriented candidature, fostered with discovery-learning, equipped with practice & skills to deal practical problems and versed with recent pedagogical trends in education including e-learning, flipped class and hybrid learning to develop into responsible citizen for nation-building and transforming the country towards the future with their knowledge gained in the field of plant science.

PO 1	CBCS syllabus with a combination of general and specialized education shall introduce the concepts of breadth and depth in learning
PO2	Shall produce competent plant biologists who can employ and implement their gained knowledge in basic and applied aspects that will profoundly influence the prevailing paradigm of agriculture, industry, healthcare and environment to provide sustainable development.
PO 3	Will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, enhance communication skill, social interaction, increase awareness in judicious use of plant resources by recognizing the ethical value system.
PO 4	The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry along with graduate preparation for national as well as international competitive examinations, especially UGC-CSIR NET, UPSC Civil Services Examination, IFS, NSC, FCI, BSI, FRI etc.
PO 5	Certificate and diploma courses are framed to generate self- entrepreneurship and self-employability, if multi exit option is opted.
PO 6	Lifelong learning be achieved by drawing attention to the vast world of knowledge of plants and their domestication.

Programme specific outcomes (PSOs):

B.Sc. I Year / Certificate course in Microbial Technology & Classical Botany

This Programme imparts knowledge on various fields of plant biology through teaching, interactions and practical classes. It shall maintain a balance between the traditional botany and modern science for shifting it towards the frontier areas of plant sciences with applied approach. This syllabus has been drafted to enable the learners to prepare them for self-entrepreneurship and employment in various fields including academics as well as competitive exams. Students would gain wide knowledge in following aspects:

1. Diversity of plants and microbes, their habitat, morphology, architecture and reproduction.

2. Plant disease causing microbes, symptoms & control.

3. Economic value of plants and their use in Human Welfare.

Programme specific outcomes (PSOs):

B.Sc. II Year/ (Diploma in Plant Identification, Utilization & Ethnomedicine)

This course provides a broad understanding of identifying, growing and using plants. This course is primarily aimed to introduce people to the richness of plant diversity found in surrounding areas. Lecture sessions are designed to cover fundamental topics concerning classification of plants and their utilization required for understanding the flora and vegetation. Practical sessions are organized following theory for easy understanding of the various parts of the plants, structural organization of floral parts and diversity therein. Participants are taken to different locations covering a variety of habitats and forest types to acquaint them with the native flora. in the long run, will contribute towards building momentum for

people's participation in environmental conservation without compromising on academic rigor and our rich wealth of knowledge inherited over generations.

1. The course will cover conventional topics in Field Botany like Evolutionary History & Diversity of plants, Complete Morphology, Nomenclature of plants, Systems of Classification, Keys to important Families of Flowering Plants, Field Data Collection & Herbarium Techniques.

2. The course is designed to become a commercial crop grower, florist, protected cultivator, green belt plant advisor to industries, pharmacologist & taxonomist.

Programme specific outcomes (PSOs):
B.Sc. III Year / Bachelor of Science

The learning outcomes of a three years graduation course are aligned with programme learning outcomes but these are specific to-specific courses offered in a program. The core courses shall be the backbone of this framework whereas discipline electives, generic electives and skill enhancement courses would add academic excellence in the subject together with a multi-dimensional and multidisciplinary approach.

1. Understanding of plant classification systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.

2. This course is suitable to produce expertise in conservation biology like ex-situ conservation, response to habitat change, genotype characterization and reproductive biology.

3. Understanding of various analytical techniques of plant sciences, use of plants as industrial resources or as a human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants.

4. Understanding of various life forms of plants, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, transgenic technology and use of bioinformatics tools and databases and the application of statistics to biological data.

5. Entrepreneurship Skill Development, Understand the issues of environmental contexts and sustainable development, Inculcation of human values,

6. Strengthen mathematical and computational skills. Enable students to use ICT & AI effectively.

7. Develop good skills in the laboratory such as observation and evaluation by the use of modern tools and technology.

PSO 1	Understanding the nature and basic concepts of all the plant groups, their metabolism, components at the molecular level, biochemistry, taxonomy and ecology. The course will make them aware of natural resources and the environment and the importance of conserving it. Hands-on training in various fields will develop practical skills, handling equipment and laboratory use along with collection and interpretation of biological materials and data. Knowledge gained through theoretical and lab-based experiments will generate technical personnel in various priority areas such as genetics, cell and molecular biology, plant systematics and biotechnology.

PSO 2	Botanists are able to contribute to all these fields and therefore, are mainly employed with educational institutions, government or public sectors or companies in industries, such as agriculture or forestry, oil, chemical, biotechnology, geological survey, environmental protection, drugs, genetic research, plant resources laboratories, plant health inspection services, lumber and paper, food, fermentation, nursery, fruit and so on. Jobs available as a Botanist: •Microbiologist, Plant pathologist, Taxonomist • Plant Physiologist • Plant Biochemist • Researcher • Mycologist • Ecologist • Weed Scientist • Palaeobotanist • Conservationist • Fruit Grower • Morphologist • Cytologist • Ethnobotanist • Plant geneticists etc.
PSO 3	Inculcate strong fundamentals on modern and classical aspects of Botany, understand knowledge of Botany is an essential pre-requisite for the pursuit of many applied sciences. It will facilitate students for taking up and shaping a successful career in Botany and allied sciences.
PSO 4	Introduction of research project will inculcate research aptitude and passion for higher education and scientific research.

	Year wise Structure of B.Sc. in Botany(CORE / ELECTIVE COURSES & PROJECTS)									
	Subject: **Botany**									**Total Credits /hrs/**
Course/ Entry –Exit Levels	Year	Sem.	Paper 1	Credit/ hrs	Paper 2	Credit/ hrs	Paper 3	Credits /hrs	Research Project	Credit/	
Certificate Course In Microbial Technology & Applied Botany	I	I	**Microbiology & Plant Pathology**	4/60	**Techniques in Microbiology & Plant Pathology**	2/60	--		Nil	Nil	6/120
		II	**Archegoniates & Plant Architecture**	4/60	**Land Plants Architecture**	2/60	--		Nil	Nil	6/120
Diploma in Plant Identification, Utilization & Ethnomedicine	II	III	**Flowering Plants Identification & Aesthetic Characteristics**	4/60	**Plant Identification technology**	2/60	--		Nil	Nil	6/120
		IV	**Economic Botany, Ethnomedicine & Phytochemistry**	4/60	**Commercial Botany & Phytochemical Analysis**	2/60	-		Nil	Nil	6/120
Bachelor of Science		V	**Plant Physiology, Metabolism & Biochemistry**	4/60	**Molecular Biology & Bioinformatics**	4/60	**Experiments in physiology, Biochemistry &**	2/60	***Project-I**	3/45	13/205

	III						molecular biology				
		VI	Cytogenetics, Plant Breeding & nanotechnology	4/60	Ecology & Environment	4/60	Cytogenetics, Conservation & Environment management	2/60	*Project- II	3/45	13/205
Comments	Total Credits/Hrs. / lectures: (Credits can be earned from On-line Portals of UGC to create Academic Bank and 15% of the topics of each paper can be taught by on-line/ Virtual/ ICT based as per choice of the Institution) * Suggestive List of Projects mentioned in Detailed Paper Syllabus										50/890

Botany Course is One of the Major Subjects for Biology Students and Minor or Elective for students of other faculties
Second Major Subject Can be Zoology/ Microbiology
Third Major Subject can be from Science or Any other faculty of UGC /AICTE – (Arts/ Agriculture/ Education/ law/ Commerce)
Fourth Subject is Minor or Elective to be selected from any one of other Faculties as per student's own interest
One Vocational Course has to be opted from the list given in Syllabus as per NSDC guidelines
One Co-curricular Course is compulsory

Internal Assessment & External Assessment

Internal Assessment	Marks	External Assessment	Marks
Class Interaction	5	Viva Voce on Practicals	10
Quiz	5	Report of Botanical Excursion/ Lab Visits/Industrial training/ Survey/Collection/ Models	10
Seminar	7	Table work / Experiments	45
Assignments (Charts/ Flora/ Rural Service/ Technology Dissemination/ Botanical Excursion/ Lab Visits/Industrial training)	8	Practical Record File	10
TOTAL *** Botanical Excursion/ Lab Visits/Industrial training Is compulsory**	25		75 100

DETAILED SYLLABUS FOR
CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY
OR
B.Sc.-I

CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY / B.Sc.-I		
Programme: ***Certificate Course in Microbial Technology & Classical Botany***	Year: **I**	Semester: **I/Paper-I**
Subject: **Botany**		
Course Code: B040101T	Course Title: **Microbiology & Plant Pathology**	

Course outcomes: After the completion of the course the students will be able to:

1. Develop understanding about the classification and diversity of different microbes including viruses, Algae, Fungi & Lichens & their economic importance.
2. Develop conceptual skill about identifying microbes, pathogens, biofertilizers & lichens.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in life sciences by usage of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens
8. Gain Knowledge about the economic values of this lower group of plant community.

Credits: **4**	**Core Compulsory**
Max. Marks: **25+75**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-0-0**

Unit	Topic	No. of Lectures (60 hrs)