Syllabus of 4 + 1 Year Integrated UG and PG Programme

w. e. f 2024-25 Academic Year

GRADUATE SCHOOL

Mahatma Gandhi University

P. D. Hills P O

Kottayam, Kerala

www.gs.mgu.ac.in

www.mgu.ac.in

Schools offering Majors

SL.No	School/Centre
1	School of Bio Sciences
2	School of Chemical Sciences
3	School of Computer Sciences
4	School of Environmental Sciences
5	School of Gandhian Thought and Development Studies
6	School of International Relations and Politics
7	School of Pure and Applied Physics
8	School of Social Sciences

Sl. No.	Major	Intake
SCIENCE		
1	Bio Sciences	6**
2	Chemistry	6
3	Computer Science	6
4	Environmental Science	6
5	Physics	6
SOCIAL SCIENCES		
1	Development Studies	5
2	Gandhian Studies	5
3	History	10
4	International Relations and Politics	10

Majors offered and Intake *1 seat shall be sanctioned over and above the intake in each major in the 3rd semester for students who opt for a change of major after two semesters.

**Progression to PG Shall be based on the specialization selected by students as Biochemistry (2 seats) Biotechnology (2 seats) and Microbiology (2 seats) based on merit.

Schools offering Minors/MDCs/AECs/VACs/SECs

SL.No	School/Centre
1	School of Artificial Intelligence And Robotics
2	School of Behavioural Sciences
3	School of Biosciences
4	School of Chemical Sciences
5	School of Computer Sciences
6	School of Data Analytics
7	School of Energy Materials
8	School of Environmental Sciences
9	School of Food Science And Technology
10	School of Gandhian Thought And Development Studies
11	School of Gender Studies
12	School of Indian Legal Thought
13	School of International Relations And Politics
14	School of Letters
15	School of Mathematics And Statistics
16	School of Nanoscience And Nano Technology
17	School of Pedagogical Sciences
18	School of Polymer Science And Technology
19	School of Pure And Applied Physics
20	School of Social Sciences
21	School of Tourism Studies
22	International and Inter University Centre for Nanoscience and Nanotechnology
23	K N Raj School of Economics

Scheme for 4 + 1 Integrated UG and PG Programme
Graduate School
Mahatma Gandhi University
National Institute of Plant Science Technology

Course Code	Title	Credits	Hours per Week		Level	Type
			Theory	Practicals		
SEMESTER I						
MG1DSCUBP121	The science of plants	4	60	0	Foundation (100-199)	Minor
MG1DSCUBP141	Understanding Plant Physiology	4	60	0	"	Minor
MG1DSCUBP142	Essential Concept in Plant Biochemistry	4	60	0	"	Minor
MG1MDCUBP101	From Cells to Ecosystems	3	45	0	"	MDC
SEMESTER II						
MG2DSCUBP121	Recent advances and applications in plant science	4	60	0	"	Minor
MG2DSCUBP141	Comprehensive Insights on Herbal Medicine	4	60	0	"	Minor
MG2MDCUBP101	Fungi: From Culinary Delights to Biotechnological Marvels	3	45	0	"	MDC
SEMESTER III						
MG3DSCUBP221	Economic and Biotechnological Opportunities of Thallophytes	4	40	20	Intermediate (200-299)	Minor
MG3MDCUBP201	Taming the Invaders: Strategies for Invasive Species	3	45	0	"	MDC

	Management					
MG3VACUBP201	Cells in Bloom: Mastering the Techniques of Tissue Culture	3	30	15	“	VAC
SEMESTER IV						
MG4DSCUBP241	An introduction to vascular cryptograms	4	45	15	“	Minor
MG4SECUBP201	Insights into Phytochemical Isolation	3	30	15	“	SEC
MG4VACUBP201	Horticulture and nursery management	3	45	0	“	VAC
SEMESTER V						
MG5SECUBP301	Techniques for Advanced Plant Research	3	35	10	Higher (300-399)	SEC
MG5VACUBP301	The Essentials of Organic Farming	3	35	10	“	VAC
SEMESTER VI						
MG6SECUBP301	Conservation Biology	3	35	10	“	SEC
MG6SECUBP302	Ecotourism: A new possibility in Kerala	3	35	10	“	SEC
Total Credits		**58**				

SEMESTER VII						
MG7DSCUBP421	Angiosperm- The flowering plants & biodiversity assessment	4	45	15	Advanced (400-499)	Minor
Total Credits		**4**				

*Only for 4-Years Honours Students
**Only for students who opt for theory courses instead of Research Project

Note: General foundations courses shall be offered by different schools. Students can flexibly choose the courses across disciplines.

Level	Foundation (100-199	Intermediate (200-299)	Higher (300-399)	Advanced (400-499)	PG Level (500-599)

Type	Major	Minor	MDC	SEC	VAC	AEC

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology (NIPST)		
Programme	**M.Sc. Botany & Plant Science Technology**		
Course Title	**The Science of Plants**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUBP121		
Course Overview	This is a foundational course for undergraduate students, covering the basics of plant science. It gives a general introduction to the way how plants live and reproduce. The objective of the study is to understand how plants are used to produce food, alter environments, restore damaged landscapes, improve human health and well-being, improve community environments, and provide recreational and practical benefits to the public.		
Semester	1	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite			

	Basics of Biology in the 12 th standard

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	**CO1:** To impart knowledge on origin, evolution, structure, reproduction of plants and phytogeography	R/U	
2	**CO2:** Understand the plant diversity and its classification	R/U/An	
3	**CO3:** Identify the various areas allied to plant science	U/An/A	
4	**CO4:** Analyse how plants and humans are interdependent	R/U/A	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
Plant life: Why life in plants and animals, differences between plants and animals. Source of energy to life – producers. Origin of life, origin of plants / photosynthesis. Non motile life forms – rigid cells, tissue and structures – absorptive and assimilatory regions. Aquatic and terrestrial plant forms Plant associations – forests, various forms, phytogeography - endemism Reproduction – fertilization and meiosis. alternation of generations, life cycles.	**20 hr**	1

Module 2	**Hours**	
Diversity of plant life: Various groups of plants- algae, fungi, bryophytes, Pteridophytes, gymnosperms, and angiosperms. Plant taxonomy and classification Biosystematics	**15 hr**	2
Module 3	**Hours**	
Branches of plant science: Morphology, Anatomy, Plant physiology, Plant biochemistry, Plant genetics, Plant breeding, Plant ecology, Horticulture, Plant biotechnology, Plant evolution, etc.	**10 hr**	3
Module 4	**Hours**	
Plants and human beings: Plant diversity and human welfare – Economic botany, ecosystem services – climate change and global warming. Plants: various sources of human needs – food, shelter, medicine etc. Future prospects in plant science studies.	**15 hr**	4

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities:**
Mode of Assessment	1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar - 10 mark 3. Write a detailed report on a given topic based on research findings-10 marks Semester End examination – 60 marks

Learning Resources

1. The science of plants: Inside Their Secret World by Katherine J. Willis, DK publishers, 2022, ISBN 0744048435

2. Textbook of Botany by O. P Sharma, Vol.1, 2nd Edn, 2023

3. An introduction to plant biology by James D. Mauseth, ISBN 9781449648848, 2012

Relevance of Learning the Course/ Employability of the Course
'The Science of Plants' helps the students to understand the mysterious inner workings of the plant world. The topics covered in this course are relevant for an introductory plant science class at an undergraduate level.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology(NIPST)		
Programme	**4 + 1 Integrated UG and PG Programme**		
Course Title	**Understanding Plant Physiology**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUBP141		
Course Overview	Plant Physiology is a foundational course for undergraduate students, offering a comprehensive introduction to the vital processes and functions of plants. The course covers the mechanisms of plant growth, development, and responses to environmental stimuli, with a focus on the biochemical and physiological processes that underpin these functions. This course is typically divided into 4 modules, with each module covering specific areas of plant physiology.		
Semester	1	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	Understanding of basic science		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand the fundamental physiological processes in plants.	R/U	
2	To understand and explain the mechanisms of different metabolism in plants and also their variations across different environmental conditions and plant types.	U/A	
3	To identify plant hormone responses	R/U/A	
4	Analyze how plants respond to environmental stimuli and stress conditions.	U/An	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
WaterTransport: Basics of water movement in plants, Transpiration and its role in water movement **Nutrient Transport:**Essential nutrients for plants, Mechanisms of nutrient uptake	**10 hr**	1
Module 2	**Hours**	
Photosynthesis: Overview of chloroplasts and photosynthetic pigments, Light-dependent and light-independent reactions (Calvin cycle), Differences between C3, C4, and CAM plants **Respiration:** Cellular respiration process: glycolysis, Krebs cycle,Role of mitochondria, electron transport chain.	**20 hr**	1, 2
Module 3	**Hours**	
Nitrogen metabolism: Atmospheric nitrogen fixation, nitrogen cycle, nitrogen assimilation	**20 hr**	1, 2

Phytohormones: Types, functions, and mechanisms of action. **Growth and Development:** Cell division and expansion, Differentiation and morphogenesis, Root and shoot growth patterns		
Module 4	**Hours**	
Plant-Environment Interactions: Plant stress, Responses to light, temperature, and water availability **Plant-microbe interactions:** symbiosis and pathogenesis	**10 hr**	4

Mode of Transaction	**Classroom activities:**Direct Instruction: Brainstorming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities**
Mode of Assessment	**Continuous Internal Assessment (CIA)** 1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar - 10 mark 3. Write a detailed report on a given topic based on research findings-10 marks Semester End examination – 60 marks

Learning Resources

1. Heldt, Hans-Walter, and Birgit Piechulla. *Plant biochemistry*. Academic Press, 2021.

2 Taiz L and E Zeiger (2010) Plant Physiology, Sinauer Associates

3. Peter Scott (2008) Physiology and Behaviour of Plants,Wiley-Blackwell

Relevance of Learning the Course/ Employability of the Course

Understanding plant physiology is crucial for undergraduate students as it provides essential knowledge about how plants function, grow, and interact with their environment, forming the basis for advances in agriculture, biotechnology, and environmental science.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology(NIPST)		
Programme	4 +1 integrated UG and PG programme		
Course Title	Essential Concepts in Plant Biochemistry		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUBP142		
Course Overview	This course provides an in-depth understanding of the structure, function, and classification of biomolecules essential for biological systems. Topics include carbohydrates, proteins, lipids, and nucleic acids, with a focus on their roles in cellular processes and organismal function.		
Semester	1	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	Understanding of basic science		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	To understand the diverse array of biomolecules essential	U	1

	for life		
2	Describe the structure, function, and classification of biomolecules.	U/A	1,2
3	To elucidate how various biomolecules interact and collaborate within intricate living systems to execute coordinated functions	A/An	1,2
4	To contrast the structures and functionalities of biomolecules within plant systems.	A	1,3

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Carbohydrates: Classification, monosaccharides, open chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone). Structure and biological importance of disaccharides (sucrose, lactose, maltose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin), Glycosides	**20 hr**	**1,2,3,4**
Module 2	**Hours**	
Amino acids & Proteins: Structure, function and classification of amino acids, Peptides: Formation of peptide bond. Proteins: Classification based on solubility, shape and function. Structural organization of proteins- primary, secondary, tertiary and quaternary structures.	**15 hr**	**1,2,3,4**
Module 3	**Hours**	
Lipids-Lipids: Classification of lipids with examples, classification of fatty acids, chemical constants of fatty acids-saponification number, acid number, iodine number and their application. Steroids: Structure of steroid nucleus:- cholesterol, ergosterol, stigmasterol	**20 hr**	**1,2,3,4**
Module 4	**Hours**	
Nucleic Acids: Nature of nucleic acids, Structure of purines and pyrimidines, nucleosides, nucleotides, Stability and formation of Phosphodiester linkages, Watson -Crick model of DNA structure. Types of DNA and RNA	**5 hr**	**1,2,3,4**

Mode of	**Classroom activities:**Direct Instruction: Brainstorming lecture, Explicit Teaching,

Transaction	E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities**
Mode of Assessment	**Continuous Internal Assessment (CIA)** 1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar-Maximum marks 10 3. Write a detailed report on a given topic based on research findings - Maximum marks 10 Semester End examination – 60 marks

Learning Resources

1. Lehninger Principles of Biochemistry, Fourth Edition by David L. Nelson, Michael M. CoxPublisher: W. H. Freeman; Fourth Edition edition (April 23, 2004) ISBN-10: 0716743396 ISBN-13: 978-0716743392

2. Biochemistry 6th Edition (2007) by Jeremy M.berg John L.tymoczko Lubert Stryer Publisher: B.i.publicationsPvt.Ltd ISBN:071676766X ISBN-13: 9780716767664, 978-716767664

Relevance of Learning the Course/ Employability of the Course
Studying essential concepts in plant biochemistry is crucial for undergraduate students as it provides a foundational understanding of the biomolecules that drive plant life processes.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology(NIPST)		
Programme	**4 +1 integrated UG and PG programme**		
Course Title	From Cells to Ecosystems		
Course Type	MDC		
Course Level	100-199		
Course Code	MG1MDCUBP101		
Course Overview	This interdisciplinary course offers a comprehensive exploration of biological systems, with a specific focus on plant biology, ranging from cellular processes to ecosystem dynamics. Students will delve into the structure and function of plant cells, population ecology, community interactions, and ecosystem processes. Emphasis will be placed on understanding plant-specific concepts and their ecological significance.		
Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	45	0	
Pre-requisite	High school biology or equivalent		

COURSE OUTCOMES (CO)

CO	Expected Course Outcome	Learning	PSO No.

No.		Domains	
	Upon completion of this course, students will be able to;		
1	Understand the organization and functioning of plant cells and their organelles	R/U/An	
2	Examine the organization of plants at tissue, organ, and system levels and their adaptation patterns	U/An	
3	Investigate plant population dynamics, community ecology, and ecosystem processes.	R/U/An	
4	Analyze the ecological significance of plants in terrestrial and aquatic ecosystems.	U/An/A	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Cell Structure: Cell structure and function, Organelles and their roles	**10 hr**	**1**
Module 2	**Hours**	
Plant Organ Systems and Adaptations: Plant tissue organization, Root and shoot systems, Leaf anatomy and function, Morphological adaptations in plants	**10 hr**	**1, 2**
Module 3	**Hours**	
Co-evolution and Plant-Animal Interactions: Coevolution with pollinators, Co-evolution with herbivores, Mutualistic relationships (e.g., seed dispersers, protective ants) **Plant Ecology and Community Dynamics:**Plant population dynamics, Plant community structure and interactions, Plant communications	**15 hr**	**2, 3,4**
Module 4	**Hours**	
Plant Ecosystems and Environmental Interactions: Plant roles in terrestrial and aquatic ecosystems, Energy flow and nutrient cycling in plant ecosystems, Human impacts on plant communities and ecosystems	**10 hr**	**3, 4**

Mode of Transaction	**Classroom activities:**Direct Instruction: Brainstorming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active cooperative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities**
Mode of Assessment	**Continuous Internal Assessment (CIA)** 1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar - 10 mark 3. Write a detailed report on a given topic based on research findings-10 marks Semester End examination – 60 marks

Learning Resources

1. Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter

2. Botany: An Introduction to Plant Biology" by James D. Mauseth.

3. Community Ecology by Gary G. Mittelbach and Brian J. McGil

Relevance of Learning the Course/ Employability of the Course
The course "From Cells to Ecosystems" is highly relevant for undergraduate students, offering a well-rounded education in biology that spans from cellular mechanisms to ecological interactions.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology (NIPST)		
Programme	**M.Sc. Botany & Plant Science Technology**		
Course Title	**Recent advances and applications in plant sciences**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUBP121		
Course Overview	The aim of this course is to identify how new technologies can and will transform plant science to address the challenges of new biology. This course assesses where we stand today regarding current technologies and to address questions about where we may go in the future and whether we can get an idea of what is at and beyond the horizon.		
Semester	2	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	Understanding of basic science		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	**CO1:** Understand the history and gap areas of plant science research	R/U	
2	**CO2:** Analyse the recent advances in plant science and the future prospects	R/U/An	
3	**CO3:** Understand the interdisciplinary perspectives in plant science	U/An/A	
4	**CO4:** Identify the new technologies and its applications for betterment of humankind	R/U/A	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
History of plant science researches: Major findings and milestones of plant science research. Important scientists and their contributions Gap areas in plant science research. 21st Century the 'Bio Century'	**10 hr**	1
Module 2	**Hours**	
Recent advances in plant science research: New areas of research – nano biotechnology, forensic science, climate change-carbon sink, plants and global warming. Future prospects in plant science research.	**10 hr**	2

Module 3	**Hours**	
Interdisciplinary approaches and new applications: New sources for medicines: ethnomedicine, vaccines, etc Conventional and new sources: energy: bio-fuels – energy plantations, bioplastics, biopesticides, bio-flavourings and bio-colours for food and cosmetics. Application of plant sources in net zero carbon emission – carbon sink, Application in nature disasters: prediction and prevention of landslides etc. New combinations of plant science studies and research: Bioinformatics etc	**20 hr**	3
Module 4	**Hours**	
New technologies for plant science research: Gene replacement/editing technology, artificial chromosomes, manipulation of gene and protein functions, biosensors for plant hormones, plant communications-agriculture, remote sensing of photosynthetic efficiency, stress resilient crops, etc	**20 hr**	4

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:**

	Lab based activities:
Mode of Assessment	**Continuous Internal Assessment (CIA)** **1. Internal** Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar Maximum marks 10 3. Write a detailed report on a given topic based on research findings -10 mark **Semester End examination – 60 marks**

Learning Resources

1. Bulchandani, Bhagwan & Chahal, Kavita & Parashurama, Dr. T.R & Patil, Minal. (2022). Advances in Plant Science Volume IV.
2. Technological Advancements in Plant Sciences by **Raghvendra Pratap Narayan, Durgesh K. Tripathi, Rajarshi Kumar Gaur**

3. Plant biotechnology: the genetic manipulation of plants, 2nd edn by Adrian slatter, oxford publishers

Relevance of Learning the Course/ Employability of the Course
Plant science is a forerunning field of study that could address the foremost disputes facing humanity in the 21st century; coupled with the development of new tools and techniques, it could aid in finding solutions to diagnose these unsolved questions. This course summarizes the recent technological advances of plant science.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology(NIPST)		
Programme	**4 +1 integrated UG and PG programme**		
Course Title	**Comprehensive Insights into Herbal Medicine**		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUBP141		
Course Overview	This course provides an in-depth exploration of herbal medicine, encompassing the principles, practices, and applications of traditional and modern herbal remedies. Students will gain comprehensive insights into the botanical, chemical, pharmacological, and therapeutic aspects of medicinal plants, along with their cultural, historical, and ethical dimensions.Gain knowledge of the historical, cultural, and philosophical foundations of herbal medicine.		
Semester	2	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60	0	
Pre-requisite	High school biology or equivalent		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Explore the historical and cultural importance of herbs in various civilizations and their significance in traditional medicine systems	R/U	
2	Conduct a comprehensive study of medicinal plants in Kerala.	R/U/A	
3	Explore the chemical constituents, pharmacological properties, and analytical techniques used in the study of medicinal plants.	U/A/An	
4	Investigate the common herbal remedies, evidence-based medicine, and safety considerations associated with herbal therapy.	U/A/E	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction to Herbal Medicine: Historical and cultural significance of herbs in human civilization, Introduction to Indian medical system	**10**	**1**
Module 2	**Hours**	
Indigenous Herbal Medicines of Kerala: An In-Depth Study of Key Medicinal Plants:- Dashapushpam, Kanikkonna -Thumba - Kadaladi- Erukku- Karinochi Kattar Vazha- Veppu-Manjal- (Kasthuri Manjal - Mara Manjal) Shankhu Pushpam- Vayambu- Chembaratti -Tottavadi - Adalodakam Nalikeram- Muttanga- Patha thali- Naruneendi - Vayalchulli Shatavari- Kurunthotti- Avanakku- Brahmi/ Kudangal- Puliyaral	**20**	**1, 2**
Module 3	**Hours**	
Phytochemical Analysis: Chemical constituents of medicinal plants,	**20**	**2, 3**

Pharmacological properties, Analytical techniques		
Module 4	**Hours**	
Therapeutic Applications: Common herbal remedies and their uses, Evidence-based medicine in herbal therapy, Safety considerations and adverse effects, Ethnomedicine	**10**	**2, 3, 4**

Mode of Transaction	**Classroom activities:**Direct Instruction: Brainstorming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities**
Mode of Assessment	**Continuous Internal Assessment (CIA)** 1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar - 10 mark 3. Write a detailed report on a given topic based on research findings-10 marks Semester End examination – 60 marks

Learning Resources

1.The Ayurvedic Pharmacopoeia of India by The Government of India

2. Medicinal Plants of Kerala: A Handbook by V. Sasidharan

3.Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis by J.B. Harborne

Relevance of Learning the Course/ Employability of the Course
By studying this course, students not only gain valuable knowledge about the medicinal plants of Kerala but also develop a holistic understanding of the interplay between traditional practices,

modern science, and sustainable development.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	National Institute of Plant Science Technology(NIPST)		
Programme	**4 +1 integrated UG and PG programme**		
Course Title	Fungi: From Culinary Delights to Biotechnological Marvels		
Course Type	MDC		
Course Level	100-199		
Course Code	MG2MDCUBP101		
Course Overview	This course focuses on the culinary aspects of fungi, exploring their diversity, flavors, and culinary applications in various cuisines around the world. Students will learn about different types of culinary fungi, their cultivation, culinary techniques, and their role in creating exquisite dishes and culinary masterpieces.		
Semester	2	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	45	0	
Pre-requisite	High school biology or equivalent		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.

	Upon completion of this course, students will be able to;		
1	Provide an overview of fungal classification, diversity, morphology, life cycle and its importance	R/U/An	
2	Introduce students to culinary fungi, including cultivation methods, flavor profiles, and culinary applications.	U/A	
3	Explore the role of molds and yeasts in fermentation processes and introduce fungal delicacies from diverse culinary traditions.	U/A	
4	Discuss the industrial and environmental applications of fungi in biotechnology, including fermentation, bioremediation, and pharmaceutical production.	U/A/E	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction to Fungi: Fungal classification and diversity, Basic fungal morphology and life cycle	**10**	**1**
Module 2	**Hours**	
Culinary Fungi: Introduction to Culinary Fungi, Edible mushroom**,** Nutritional Value of Mushrooms, Preservation and Storage of Mushrooms, Gourmet mushrooms: cultivation, flavors, and culinary uses, Fungal delicacies from around the world, Foraging for Wild Mushrooms, Quorn	**20**	**1,2**
Module 3	**Hours**	
Fungi in Fermented foods: Health benefits of fermented food, Fermentation chemistry, Role of molds and yeasts in fermentation processes **Biotechnological Applications of Fungi:** Industrial fermentation-production of enzymes, antibiotics, and biofuels, Bioremediation: fungal degradation of environmental pollutants, Fungi in biopharmaceuticals and drug discovery	**15**	**1, 2, 3,4**

Mode of Transaction	**Classroom activities:** Direct Instruction: Brainstorming lecture, Explicit Teaching, E-learning, interactive Instruction:, Active co-operative learning, Seminar, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative **Field activities:** **Lab based activities**
Mode of Assessment	**Continuous Internal Assessment (CIA)** 1. Internal Tests of maximum 20 marks 2. Seminar Presentation – a theme is to be discussed and identified to prepare a paper and present in the seminar - 10 mark 3. Write a detailed report on a given topic based on research findings-10 marks Semester End examination – 60 marks

Learning Resources

1. Presscott/Harley/Klein's Microbiology - Joanne Willey, Linda Sherwood and ChrisWoolverton.

2. On Food and Cooking: The Science and Lore of the Kitchen by Harold McGee

Relevance of Learning the Course/ Employability of the Course
The Course provides a multifaceted understanding of fungi, highlighting their importance in food science, medicine, industry, and environmental sustainability.