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National Education Policy-2020

Common Minimum Syllabus for Uttarakhand State Universities and Colleges

Four Year Undergraduate Programme- FYUP/Honours Programme/Master in Science

PROPOSED STRUCTURE FOR FYUP/MASTER'S BOTANY SYLLABUS

DEPARTMENT OF BOTANY

Expert Committee

S. No.	NAME	DESIGNATION	DEPARTMENT	AFFILIATION
1.	Prof. S. S. Bargali	Professor	Botany	Kumaun University, Nainital
2.	Prof. L.M Tewari	Professor	Botany	Kumaun University, Nainital
3.	Prof. Sushma Tamta	Professor	Botany	Kumaun University, Nainital
4.	Prof. Neelu Lodhiyal	Professor	Botany	Kumaun University, Nainital
5.	Prof. G. K. Dhingra	Professor	Botany	Shri Dev Suman Uttarakhand University
6.	Dr. Dhani Arya	Associate Professor	Botany	Soban Singh Jeena University
7.	Dr. Shalini Rawat	Associate Professor	Botany	Shri Dev Suman Uttarakhand University
8.	Dr. Reema Mishra	Associate Professor	Botany	University of Delhi
9.	Dr. Harsh Kumar Chauhan	Assistant Professor	Botany	Kumaun University, Nainital
10.	Dr. Prabha Pant	Assistant Professor	Botany	Kumaun University, Nainital
11.	Dr. Aravinda	Coordinator, Biology	Botany	IISc Challakere Campus
12.	Dr. Santosh Satbhai	Assistant Professor	Botany	IISER Mohali
13.	Dr. Pooja Kukreti	Professor	Botany	Govt. Degree College, Maldevta, Raipur

Syllabus Preparation Committee

S. No.	NAME	DESIGNATION	DEPARTMENT	AFFILIATION
1.	Prof. S. S. Bargali	Professor	Botany	Kumaun University, Nainital
2.	Prof. L. M. Tewari	Professor	Botany	Kumaun University, Nainital
3.	Prof. Kiran Bargali	Professor	Botany	Kumaun University, Nainital
4.	Prof. Sushma Tamta	Professor	Botany	Kumaun University, Nainital
5.	Prof. Neelu Lodhiyal	Professor	Botany	Kumaun University, Nainital
6.	Prof. A. K. Bisht	Professor	Botany	Kumaun University, Nainital
7.	Dr. Kapil Khulbe	Assistant Professor	Botany	Kumaun University, Nainital
8.	Dr. Harsh K. Chauhan	Assistant Professor	Botany	Kumaun University, Nainital
9.	Dr. Prabha Pant	Assistant Professor	Botany	Kumaun University, Nainital
10.	Dr. Naveen C. Pandey	Assistant Professor	Botany	Kumaun University, Nainital
11.	Dr. Hem C. Joshi	Assistant Professor	Botany	Kumaun University, Nainital
12.	Dr. Himani Karki	Assistant Professor	Botany	Kumaun University, Nainital

List of Papers (DSC, DSE, GE) with Semester Wise Titles for 'Botany'

(DSC-Discipline Specific Course; DSE-Discipline Specific Elective; GE-Generic Elective)

Year	Semester	Course	Paper Title	Theory/ Practical	Credits
Undergraduate Certificate in Botany					
FIRST YEAR	I	BOT DSC 1	Plant Diversity I (Microbes, Fungi and Algae)	Theory	3
		BOTDSC 1P	Practical/Lab Course BOT DSC 1P	Practical	1
		BOT GE 1	Plant Cell Biology	Theory	4
	II	BOT DSC 2	Plant Diversity II (Bryophyta, Pteridophyta and Gymnosperm)	Theory	3
		BOT DSC 2P	Practical/Lab Course BOT DSC 2P	Practical	1
		BOT GE 2	Plant Science – I	Theory	4
Undergraduate Diploma in Botany					
SECOND YEAR	III	BOT DSC3	Plant Systematics and Developmental Biology (Taxonomy, Embryology and Anatomy)	Theory	3
		BOT DSC3P	Practical/Lab Course BOT DSC 3P	Practical	1
		BOT DSE 1	Plant Tissue Culture	Theory	4
		BOT GE 3	Plant Science – II	Theory	4
	IV	BOT DSC4	Cytology, Genetics and Biotechnology	Theory	3
		BOT DSC4P	Practical/Lab Course BOT DSC 4P	Practical	1
		BOT DSE 2	Ethnobotany	Theory	4
		BOT GE 4	Inheritance in Plant Biology	Theory	4

Bachelor in Botany					
THIRD YEAR	V	BOT DSC5	Plant Physiology and Biochemistry	Theory	3
		BOT DSC5P	Practical/Lab Course BOT DSC 5P	Practical	1
		BOT DSE 3	Conservation and Management of Natural Resources	Theory	4
		BOT GE 5	Medicinal Plants of Uttarakhand	Theory	4
		BOT IAPC	Internship/Apprenticeship / Project/ Community Outreach	Theory/ Practical	2
	VI	BOT DSC6	Plant Ecology and Biostatistics	Theory	3
		BOT DSC6P	Practical/Lab Course BOT DSC 6P	Practical	1
		BOT DSE 4	Fundamentals of Molecular Biology	Theory	4
		BOT GE 6	Global Climate Change	Theory	4
		BOT IAPC	Internship/Apprenticeship / Project/ Community Outreach	Theory/ Practical	2

Bachelor in Botany with Honours					
FOURTH YEAR	VII	BOT DSC7	Cryptogams	Theory	3
		BOT DSC7P	Practical/Lab Course BOT DSC 7P	Practical	1
		BOT DSE 5	Plant Biotechnology	Theory	4
		BOT DSE 6	Microbiology	Theory	4
		BOT DSE 7	Plant Development and Reproductive Biology	Theory	4
		BOT GE 7	Molecular Biology	Theory	4
		BOT GE 8	Fundamentals of Biochemistry	Theory	4

			Dissertation/Academic Project/ Entrepreneurship	Theory/ Practical	6
	VIII	BOT DSC8	Phanerogams	Theory	3
		BOT DSC8P	Practical/Lab Course BOT DSC 8P	Practical	1
		BOT DSE 8	Cytogenetics	Theory	4
		BOT DSE 9	Ecology	Theory	4
		BOT DSE 10	Plant System Physiology	Theory	4
		BOT GE 9	Methods in Plant Biology and their applications	Theory	4
		BOT GE 10	Traditional Knowledge System	Theory	4
			Dissertation/Academic Project/ Entrepreneurship	Theory/ Practical	6

Master's in Botany					
FIFTH YEAR	IX	BOT DSC9	Plant Resource Utilization and Conservation	Theory	3
		BOT DSC9P	Practical/Lab Course BOT DSC 9P	Practical	1
		BOT DSE 11	Evolutionary Biology of Plants	Theory	4
		BOT DSE 12	Plant Pathology	Theory	4
		BOT DSE 13	Protected Agriculture: Hydroponics and Organic Cultivation	Theory	4
		BOT GE 11	Forest Ecology	Theory	4
		BOT GE 12	Herbarium Techniques	Theory	4
			Dissertation/Academic Project/ Entrepreneurship	Theory/ Practical	6
	X	BOT DSC10	Environmental Monitoring and	Theory	3

			Ecological Restoration		
		BOT DSC10P	Practical/Lab Course BOT DSC 10P	Practical	1
		BOT DSE 14	Bioinformatics and Bio-safety norms	Theory	4
		BOT DSE 15	Advances in Plant Taxonomy	Theory	4
		BOT DSE 16	Plant Breeding	Theory	4
		BOT GE 13	Lichenology	Theory	4
		BOT GE 14	Palaeobotany	Theory	4
			Dissertation/Academic Project/ Entrepreneurship	Theory/ Practical	6

List of Skill Enhancement Courses Papers (SEC) with Semester Wise Titles for 'Botany'					
Year	**Semester**	**Course**	**Paper Title**	**Theory/ Practical**	**Credits**
Undergraduate Certificate in Botany					
FIRST YEAR	I	BOTSEC-MC-1	Mushroom Cultivation-I	Theory	1
		BOTSEC-MC-1P	Practical/Lab Course BOTSEC-MC-1P	Practical	1
	II	BOTSEC-MC-2	Mushroom Cultivation-II	Theory	1
		BOTSEC-MC-2P	Practical/Lab Course BOTSEC-MC-2P	Practical	1
Undergraduate Diploma in Botany					
SECOND YEAR	III	BOTSEC-MC-3	Mushroom Cultivation-III	Theory	1
		BOTSEC-MC-3P	Practical/Lab Course BOTSEC-MC-3P	Practical	1
	IV	BOTSEC-MC-4	Mushroom Cultivation-IV	Theory	1
		BOTSEC-MC-4P	Practical/Lab Course BOTSEC-MC-4P	Practical	1

Bachelor in Botany					
THIRD YEAR	V	BOTSEC-MC-5	Mushroom Cultivation-V	Theory	1
		BOTSEC-MC-5P	Practical/Lab Course BOTSEC-MC-5P	Practical	1
	VI	BOTSEC-MC-6	Mushroom Cultivation-VI	Theory	1
		BOTSEC-MC-6P	Practical/Lab Course BOTSEC-MC-6P	Practical	1

List of Skill Enhancement Courses Papers (SEC) with Semester Wise Titles for 'Botany'					
Year	**Semester**	**Course**	**Paper Title**	**Theory/ Practical**	**Credits**
Undergraduate Certificate in Botany					
FIRST YEAR	I	BOTSEC-H-1	Hydroponics-I	Theory	1
		BOTSEC-H-1P	Practical/Lab Course BOTSEC-H-1P	Practical	1
	II	BOTSEC-H-2	Hydroponics -II	Theory	1
		BOTSEC-H-2P	Practical/Lab Course BOTSEC-H-2P	Practical	1
Undergraduate Diploma in Botany					
SECOND YEAR	III	BOTSEC-H-3	Hydroponics-III	Theory	1
		BOTSEC-H-3P	Practical/Lab Course BOTSEC-H-3P	Practical	1
	IV	BOTSEC-H-4	Hydroponics-IV	Theory	1
		BOTSEC-H-4P	Practical/Lab Course BOTSEC-H-4P	Practical	1
Bachelor in Botany					
THIRD YEAR	V	BOTSEC-H-5	Hydroponics-V	Theory	1
		BOTSEC-H-5P	Practical/Lab Course BOTSEC-H-5P	Practical	1
	VI	BOTSEC-H-6	Hydroponics -VI	Theory	1
		BOTSEC-H-6P	Practical/Lab Course BOTSEC-H-6P	Practical	1

List of Skill Enhancement Courses Papers (SEC) with Semester Wise Titles for 'Botany'					
Year	**Semester**	**Course**	**Paper Title**	**Theory/ Practical**	**Credits**
Undergraduate Certificate in Botany					
FIRST YEAR	I	BOTSEC-NF-1	Nursery Development and Floriculture-I	Theory	1
		BOTSEC-NF-1P	Practical/Lab Course BOTSEC-NF-1P	Practical	1
	II	BOTSEC-NF-2	Nursery Development and Floriculture-II	Theory	1
		BOTSEC-NF-2P	Practical/Lab Course BOTSEC-NF-2P	Practical	1
Undergraduate Diploma in Botany					
SECOND YEAR	III	BOTSEC-NF-3	Nursery Development and Floriculture -III	Theory	1
		BOTSEC-NF-3P	Practical/Lab Course BOTSEC-NF-3P	Practical	1
	IV	BOTSEC-NF-4	Nursery Development and Floriculture-IV	Theory	1
		BOTSEC-NF-4P	Practical/Lab Course BOTSEC-NF-4P	Practical	1
Bachelor in Botany					
THIRD YEAR	V	BOTSEC-NF-5	Nursery Development and Floriculture -V	Theory	1
		BOTSEC-NF-5P	Practical/Lab Course BOTSEC-NF-5P	Practical	1
	VI	BOTSEC-NF-6	Nursery Development and Floriculture -VI	Theory	1
		BOTSEC-NF-6P	Practical/Lab Course BOTSEC-NF-6P	Practical	1

COURSE INTRODUCTION

The new curriculum of Botany offers essential knowledge and technical skills to study plants in a holistic manner. Students would be trained in all areas of plant biology usinga unique combination of core, elective and vocational papers with significant inter-disciplinary components. Students would be exposed to cutting-edge technologies that are currently being 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 in laboratory sessions. Fieldwork, outstation activities, and projects will also be organized to provide real-life experiences and learning opportunities. Candidates with a curiosity about the plant kingdom and ecosystems, a passion for exploring exotic places, and a desire to work as researchers or in professions such as Botanist, Conservationist, Ecologist, etc. can choose B.Sc. Botany course.

The M.Sc. - Botany programme is designed to equip students with essential knowledge and technical skills of plants in a holistic manner. Students would be trained in all areas of plant biology using a unique combination of core and elective papers with significant inter-disciplinary components. Students would be exposed to progressive 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.

Programme outcomes (POs):

Transformed curriculum shall develop educated outcome-oriented candidates, fostered with discovery-based learning, equipped with practice & skills to deal practical problems and versed in recent pedagogical trends in education including e-learning, flipped classrooms and hybrid learning. This approach prepares them to become responsible citizens, contributing to nation-building and driving the country forward with the knowledge they gain in the field of plant science..

Programme specific objectives (PSOs): B.Sc. I Year Certificate Course in Botany

- This certificate course will provide knowledge in various fields of basic Botany.
- The syllabus is designed to prepare students for competitive exams in frontier areas ofplant sciences.
- Students will be able to understand habit, habitat, morphology, anatomy and reproduction of various plant groups.

Programme specific outcomes (PSOs): B.Sc. II Year/ Diploma Course in Botany

- This programme will provide knowledge of plant morphogenesis, anatomy embryology and plant genetics.
- Laboratory sessions following theory will facilitate easy understanding of internal structure of various plant parts, structural organization, reproductive biology and genetics.
- This course will equip students to pursue a career as plant morphologists.

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

- The three year learning outcome of graduation will provide understanding of Plant Systematics, Economic Botany, Developmental Biology, Ecology, Biostatistics, Physiology, and Biochemistry.
- It will provide expertise in conservation biology and reproduction biology.
- Upon successful completion ofthis course, students will be able to contribute to the field of plant sciences. The research project will help cultivate a research aptitude for higher education and scientific research.

Programme specific outcomes (PSOs): M.Sc. I Year/ Bachelor of Botany with Honours

- The four year learning programme will provide knowledge on different aspects of Botany such as Microbiology, Phycology, Mycology, Lichenology and Bryology.
- The student completing the course will gain an understanding of the diversity and evolutionary biology of plants, concepts and processes in Plant Anatomy, Developmental Biology, Plant Breeding, Plant biotechnology and Fundamentals of Biochemistry.
- The course will also help students understand the Traditional Knowledge System.

Programme specific outcomes (PSOs): M.Sc. II Year/ Masters in Botany

- The student completing the course will understand the diversity and phylogeny of the Pteridophytes, Gymnosperms and Taxonomy of Angiosperms.
- This programme will provide knowledge on various life forms of plants, the design and execution of experiments related to basic studies on Ecology, Physiology, Biochemistry, and use of plants as industrial resources or as human livelihood support systems.
- The students completing the course will be capable of to understanding herbarium techniques.