National Education Policy-2020

Common Minimum Syllabus for Uttarakhand State Universities and Colleges

PROPOSED SYLLABUS OF FORESTRY

Effective from the academic session 2025-26

of

Four Years Undergraduate Programme/ HonoursProgramme/Master's in Forestry

DEPARTMENT OF FORESTRY

0EXPERT COMMITTEE

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1.	PROF. JEET RAM	PROFESSOR AND HEAD	FORESTRY	KUMAUNUNIVERSITY, NAINITAL
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SYLLABUS PREPARATION COMMITTEE

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CONTENTS

List of Papers (DSC, GE, AEC, SEC, VAC) with Semester wise Titles for 'Forestry'					
Year	**Semester**	**Course**	**Paper Title**	**Theory/ Practical**	**Credits**
Undergraduate Certificate in Forestry					
FIRST YEAR	I	DSC	Introductory Forestry	Theory/Practical	3+1
		GE	Principles and Practices of Forestry	Theory/Practical	3+1
		AEC	Indian Language	Theory	2
		SEC	Nursery Technology (University Pool)	Theory	0+2
		VAC	Environmental Education	Theory	2
	II	DSC	Forest Ecology	Theory/Practical	3+1
		GE	Participatory Forest Management (University Pool)	Theory/Practical	3+1
		AEC	Indian Language	Theory	2
		SEC	Nursery Technology (University Pool)	Theory	0+2
		VAC	Environmental Education	Theory	2
Undergraduate Diploma in Forestry					
SECOND YEAR	III	DSC	Principles of Silviculture	Theory/Practical	3+1
		DSE/ GE	Forest Biodiversity and Conservation	Theory/Practical	3+1
		AEC	Indian Language	Theory	2
		SEC	Plantation Technology/IAPC (University Pool)	Theory	0+2
		VAC	Value addition to NTFP	Theory	2
	IV	DSC	Agroforestry	Theory/Practical	3+1
		DSE/ GE	Forest Protection	Theory/Practical	3+1
		AEC	Indian Language	Theory	2
		SEC	Plantation Technology/IAPC (University Pool)	Theory	0+2

		VAC	Value addition to NTFP'S	Theory	2
Bachelor of Forestry					
THIRD YEAR	V	DSC	Forest Mensuration	Theory/Practical	3+1
		DSE/GE	Watershed Management	Theory/Practical	3+1
		SEC	Propagation of Medicinal and Aromatic Plants/IAPC (University Pool)	Theory	0+2
	VI	DSC	Forest Management and Policies	Theory/Practical	3+1
		DSE/GE	Seed Science and Technology	Theory/Practical	3+1
		SEC	Propagation of Medicinal and Aromatic Plants/IAPC (University Pool)	Theory	0+2

Bachelor of Forestry with Honours					
FOURTH YEAR	VII	DSC	Advances in Forest Ecology	Theory/Practical	3+1
		DSE 1	Advances in Silviculture and Systems	Theory/Practical	3+1
		DSE 2	Remote Sensing and GIS	Theory/Practical	3+1
		DSE 3/	Forest Pathology	Theory/Practical	3+1
		GE 1	Environmental Audit and EIA	Theory/Practical	3+1
		GE 2	Forest Resource Assessment	Theory/Practical	3+1
		DISSERTATION	Dissertation on Major OR Dissertation on Minor or Academic Project/Entrepreneurship	Theory/Practical	4+2
	VIII	DSC	Forest Utilization	Theory/Practical	3+1
		DSE 1	Forest Entomology	Theory/Practical	3+1
		DSE 2	Advance Agroforestry	Theory/Practical	3+1
		DSE 3	Environmental Management	Theory/Practical	3+1
		GE1	Tree Physiology	Theory/Practical	3+1
		GE2	Dendrology	Theory/Practical	3+1
		DISSERTATION	Dissertation on Major OR Dissertation on Minor or AcademicProject/Entrepreneurship	Theory/Practical	4+2
Master's in Forestry					
FIFTH YEAR	IX	DSC	Forest Products and Industries	Theory/Practical	3+1
		DSE 1	Energy Plantation and Biofuels	Theory/Practical	3+1
		DSE 2	Natural Resources and Management	Theory/Practical	3+1
		DSE 3	Advances in Tree Seed Technology	Theory/Practical	3+1
		GE 1	World Forestry and Tribal development	Theory/Practical	3+1
		GE2	Analytical Technique	Theory/Practical	3+1
		DISSERTATION	Dissertation on Major OR	Theory/Practical	4+2

			Dissertation on Minor or Academic Project/Entrepreneurship		
	X	DSC	Forest Economics	Theory/Practical	3+1
		DSE 1	Research Methodology	Theory/Practical	3+1
		DSE 2	Biostatistics	Theory/Practical	3+1
		DSE 3	Forest Genetics and Tree Improvement	Theory/Practical	3+1
		GE1	Climate Change and Mitigation	Theory/Practical	3+1
		GE2	Fundamentals of Soil Science	Theory/Practical	3+1
		DISSERTATION	Dissertation on Major OR Dissertation on Minor or Academic Project/Entrepreneurship	Theory/Practical	4+2

ABILITY ENHANCEMENT COURSE (AEC) PREPARED FOR THE POOL OF COURSES

	Paper Title	Theory/Practical	Credits
Ability Enhancement Course (AEC)	Indian Language	Theory	2

VALUE ADDITION COURSE (VAC) PREPARED FOR THE POOL OF COURSES

	Paper Title	Theory/ Practical	Credits
Value Addition Course (VAC)	Environmental Education	Theory	2
Value Addition Course (VAC)	Non-Timber Forest Products	Theory	2

SKILL ENHANCEMENT COURSES (SEC) PREPARED FOR THE POOL OF COURSES

	Paper Title	Theory/ Practical	Credits
Skill Enhancement Courses (SEC)	Nursery Technology (University Pool)	Practical	0+2
Skill Enhancement Courses (SEC)/IAPC	Plantation Technology (University Pool)	Practical	0+2
Skill Enhancement Courses (SEC)/IAPC	Propagation of Medicinal and Aromatic Plants (University Pool)	Practical	0+2

Abbreviations-

DSC-Discipline Specific Course; DSE-Discipline Specific Electives;

GE-Generic Electives; AEC-Ability Enhancement Course; VAC-Value Addition Course

IAPC- Internship/Apprentice/Project/Community outreach

Programme Specific Outcomes (PSOs) (Undergraduate Programme) After this programme, the learners will be able to:	
PSO 1	It will impart basic knowledge and skills of forestry among the students.
PSO 2	It will inculcate forestry knowledge and practical skills among the students for diagnosis and analysis of existing problems in the fields of forestry and environment.
PSO 3	It will be helpful to produce trained forestry graduates to fill the requirements of different sectors, i.e., private, public, NGOs, and other organizations.
PSO 4	Assessment of various forestry problems and developing methods for their solutions.
PSO 5	Students will become forestry professionals and use their knowledge in research and technology.

Programme Specific Outcomes (PSOs)-MASTER'S IN FORESTRY After this programme, the learners will be able to:	
PSO 1	Students comprehend the numerous functions of forests, how to regenerate and conserve them, and how to prevent their destruction.
PSO 2	Students at an advanced level of knowledge in specific fields of forestry to continue graduate studies or meet professionals in various roles in the public and private sectors.

Semester-VII

Bachelorof Forestry with Honours

DISCIPLINE SPECIFIC COURSE (DSC)- Advances in Forest Ecology

No. of Hours - 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSC: Advances in Forest Ecology	4	3	0	1	Passed Class III Year (VI semester)	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: *Bachelor of Forestry withHonours*	**Year: IV**	**Semester: VII** **Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title:Advances in Forest Ecology**	
Course outcomes: To develop an understanding of students about the ecological aspects of forests,		
		Discipline Specific Course
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No.ofHours
Unit I	Concept of ecology and forest ecology; Major issues and challenges; Origin of earth; Composition of atmosphere, lithosphere, hydrosphere and biosphere; Classification of world vegetation and vegetation forms of India; Biogeographic regions of world and India; Methods of sampling of communities.	15
Unit II	Forest ecosystem and structure; Biotic and abiotic components of ecosystem; Biomass, productivity, litter fall and litter	15

	decomposition; Forest nutrient and cycling-input, accumulation (storage) and output (ecosystem loss) and nutrient use efficiency.	
Unit III	Disturbance in forest ecosystem, nature of disturbance, fire, wind, flood and invasive species and restoration of degraded ecosystems; Forest nutrition and Biogeochemical Cycle	15
Unit IV	Succession: Introduction, definition, causes and mechanism of succession; Types of succession and concept of climax.	15

Practical

1. Map preparation of world vegetation and mapping of different biogeographic regions of world and India.
2. Vegetational analysis of different plant communities.
3. Experiments on sapling methods used in ecological research.
4. Estimation of biomass and net primary productivity in different forest types.
5. Estimation of litter production and decomposition rate of different forest types.

Suggested Readings:

1. Basic Ecology by E.P. Odum
2. Manual of Plant Ecology by K.C. Misra
3. Ecological Methods for Field and Laboratory Investigations by P. Michael
4. Tropical Forest Ecology: The Basis for Conservation and Management by F. Montagnini and C.F. Jordan
5. The Conservation of Plant Biodiversity by O.H. Frankel, A.H.D Brown and J.J Burdon
6. Forest Ecology of India by S.S. Sagwal

Semester-VII

Bachelor of Forestry with Honours

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE 1: Advanced Silviculture and Systems	**4**	**3**	**0**	**1**	**Passed Class III Year (VI semester)**	**Nil**

BACHELOR OF FORESTRY WITH HONOURS		
Programme: ***Bachelor of Forestry withHonours***	**Year: IV**	**Semester:VII Paper: DSE1**
Subject: Forestry		
Course: DSE 1	**Course Title:Advanced Silviculture and Systems**	
Course Outcomes: In this course, students will learn about the regeneration, cultivation and establishment, and development of tree species in natural and man-made forests for better stand development.		
Credits: 4	**Discipline Specific Elective**	

Max. Marks: As per univ.rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Introduction, definition, and scope of silviculture; Objects of silviculture; Form and growth of trees; Tree morphology: Stem, root system, form of roots, adaptability, mycorrhiza, ligno tubers and root nodules; Tree growth: Stages of growth, phenology, germination and establishment; Seasonal progress of growth; Height and diameter growth.	15
Unit II	Forest Regeneration: Introduction, definition, and types of regeneration; Natural regeneration: Definition, methods of natural regeneration (from seeds and vegetative parts); Seed production; Seed dispersal; Seed germination; Seedling establishment; Assisted Natural Regeneration (ANR);	15
Unit III	Artificial regeneration: Definition and objectives; Essential preliminary considerations (choice of species, site selection, composition of a plantation, choice of sowing, planting staff and labour); Mechanization operations (soil preparation, ploughing, harrowing, ridging, pit digging, transport of items, protection from fire and irrigation); Regeneration through vegetative parts.	15
Unit IV	Classification of silviculture systems: Clear felling system, shelterwood system, Uniform system, group system, irregular shelterwood system, strip system, selection system, group selection system, accessory system, coppice system, coppice selection System, and coppice with standard system.	15

Practical

1. Identification of Forest (Local/regional) Tree Species
2. Study of tree morphology for form growth and root systems.
3. Phenology and silviculture characteristics of selected tree species.
4. Germination of plants from seeds/vegetative parts.
5. Identification of mycorrhizal association of tree species.
6. Silviculture Systems.
7. Tending Operations.

Suggested Readings:

1. Principles and Practice of Silviculture by L.S. Khanna
2. A textbook of Silviculture by A.P. Dwivedi
3. Manual of Silviculture by W.M. Sunlich
4. Silviculture by R.D. Nyland
5. The Practices of Silviculture by D.M. Smith
6. Theory and Practice of Indian SilviculturalSystems by L.S. Khanna
7. Silviculture of Important Indian Trees by R.S. Troup

Semester-VII

Bachelor of Forestry with Honours

No. of Hours- 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE2:Remote Sensing and GIS	4	3	0	1	Passed Class III Year (VI semester)	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry withHonours	**Year: IV**	**Semester: VII** **Paper: DSE2**
Subject: Forestry		
Course: DSE2	**CourseTitle:Remote Sensing and GIS**	
Course Outcomes: In this course, students will learn about the different remote sensing techniques used in forest surveying.		
Credits: 4	**Discipline Specific Elective**	
Max. Marks: As per Univ. rules	**Min. Passing Marks: As per Univ. rules**	

Unit	Topic	No. of Hours
Unit I	Introduction, definition and importance of remote sensing; Basic of remote sensing; Platform and sensor remote sensing (active and passive system); Aerial remote sensing.	**15**
Unit II	Remote sensing satellites, image and ground truth; Systems for data collection and analysis.	**15**
Unit III	GIS: Basic concept, tools and components; GIS application in forestry; GPS and its uses; Advantages of RS and GIS in future prospect.	**15**
Unit IV	Collection, storage, analysis of data and information of forest resources through remote sensing; Software used in remote sensing and GIS.	**15**

Practical

1. Uses of various photogrammetry instruments.
2. Ground truthing and satellite images.
3. GPS data collection.
4. Hands-on practice on remote sensing and GIS software.
5. Visual and digital interpretation of satellite images.
6. Recognition and identification of objects in photography, a compilation of map and their interpretation.

Suggested Readings:

1. Textbook of Remote Sensing and Geographical Information Systems byM. Reddy
2. GIS Fundamentals: Applications and Implementations by K. Elangovan
3. Fundamentals of Remote Sensing by George Joseph.
4. Remote Sensing of the Environment: An Earth Resource Perspective by J. R. Jensen
5. Remote Sensing and Image Interpretation by T. Lilles, R.W. Kiefer and J. Chipman
6. Remote Sensing: Principles and Interpretation by F.F. Sabins
7. Textbook of Remote Sensing and Geographic Information Systems by K.C. Sahu

Semester-VII

Bachelor of Forestry with Honours

DISCIPLINE SPECIFIC ELECTIVES (DSE3) - Forest Pathology

No. of Hours- 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisiteof the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE 3: Forest Pathology	4	3	0	1	Passed Class III Year (VI semester)	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry withHonours	**Year: IV**	**Semester: VII Paper : DSE3**
Subject: Forestry		
Course: DSE3	**Course Title: Forest Pathology**	
Course Outcomes: To understand the major pathogens that affect forest ecosystems.To explore the biology and ecology of forest pathogens. To examine the interactions between pathogens, trees, and the environment. To learn about the symptoms and signs of common forest diseases. To discuss methods for disease prevention, diagnosis, and management. To analyze case studies and current research in forest pathology.		

Credits:4		**Discipline Specific Elective**
Max.Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No. of Hours**
Unit I	Introduction to Forest Pathology:Definition and scope of forest pathology, Importance of forest health, Historical perspectives	**15**
Unit II	Protection against injuries by Diseases: definition of disease, kind of symptoms of diseases, methods and control	**15**
Unit III	Root diseases and their control, heart rot, nursery diseases, common diseases in selected forest trees	**15**
Unit IV	Common Forest Diseases: Foliage diseases, Stem and root diseases, Vascular wilts and cankers, Decay and wood-rotting fungi, Symptoms and signs of forest diseases, Laboratory and field techniques	**15**

Practical

1. Symptoms and identification key of important diseases of natural forests and Plantations.
2. Preparation of fungicidal concentration and its application in forests and plantations.

Suggested Readings:

1. PlantPathologybyG.NAgrios
2. PlantPathologybyR.S.MehrotraandA.Aggarwal
3. PlantDiseasesbyR.S.Singh
4. IntroductiontoPrinciplesofPlantPathologybyR.S.Singh
5. PrinciplesofPlantPathologybyE.C.StakmanandJ.G.Harrar

Semester-VII

Bachelor of Forestry with Honours

DISCIPLINE SPECIFIC ELECTIVES (GE) ENVIRONMENTAL Audit and EIA

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
GE: **Environmental Audit and EIA**	4	3	0	1	Passed Class III Year (VI semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry withHonours	**Year: IV**	**Semester: VII** **Paper: GE 1**
Subject: Forestry		
Course: GE1	**Course Title: Environmental Audit and EIA**	
Course Outcomes: The course outcomes for Environmental Audit and Environmental Impact Assessment (EIA) are typically designed to equip students with the knowledge and skills required to assess environmental risks, evaluate the impact of projects, and contribute to sustainable development. Students will gain a solid understanding of national and international environmental regulations, including laws governing environmental protection, conservation, and sustainability. Knowledge of environmental regulations such as the Environmental Protection Act, EIA regulations, and policies at the local, regional, and global levels. Students will develop a comprehensive understanding of the principles and processes of environmental auditing, which includes assessing environmental performance, compliance, and management systems.		
Credits: 4		**Generic Elective**
Max. Marks: As per univ.rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of

		Hours
Unit I	Introduction, principle and purpose of EIA and its significance for the society; Environmental components of EIA: Air, water, land, noise and ecological environment; Cost and benefits of EIA.	15
Unit II	EIA involvement during project life cycle; EIA management; Principles and management of EIA;	15
Unit III	Main stages in EIA processes: Screening, scooping, prediction, mitigation and alternatives auditing; EIA techniques, checklists, matrices, network method.	15
Unit IV	Main participants in EIA process, public consultation and participation in EIA process, EIA formulation. Basic concept of environmental audit (EA), emerging issues, stages and onsite activities, data evalution and reporting, post-audit activities and management.	15

Suggested Readings:

1. Report of the National Forest Commission. Govt. of India, New Delhi.
2. Global Environmental Crisis by K. L. Barik.
3. Natural Resource Conservation and Management by S. C. Tewari and P. P. Dabral.
4. Environmental Impact Assessment by A. K. Srivastava.
5. Environmental Impact Assessment by P. R. Trivedi.
6. Environmental Impact Assessment by G. Vankhede.

Practical

1. Preparation of the EIA report of a given project.
2. Preparation of SEA report.

Semester-VII

Bachelor of Forestry with Honours

GENERIC ELECTIVE (GE 1)-Forest Resource AssessmentGENERIC ELECTIVE (GE 1)-Environmental

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
GE2:Forest Resource Assessment	4	3	0	1	Passed Class III Year (VI semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry withHonours	**Year: IV**	**Semester: VII** **Paper: GE 2**
Subject: Forestry		
Course: GE1	**Course Title: Environmental Audit and EIA**	
Course Outcomes: A forest resource assessment course typically focuses on evaluating forest resources using various methods, tools and techniques.		
Credits: 4		**Generic Elective**
Max. Marks: As per univ.rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of

		Hours
Unit I	Introduction of forest resource assessment: definition and importance of forest resources, key objectives of forest resource assessment, role of forest assessment in sustainable forest management and climate change mitigation. Forest types and classifications: different types of forest (tropical, temperate and boreal etc). Forest classification systems and their significance. Forest Inventory Basics: Sampling methods, plot based, remote sensing and aerial surveys. Common measurement techniques: tree height, DBH (diameter at breast height), crown cover.	15
Unit II	Remote sensing and GIS in forest resource Assessment: remote sensing technologies (imagery, LiDAR, UAVs), application of remote sensing in forest health and land use changes, image process and analysis techniques.	15
Unit III	Forest carbon assessment: forest carbon stocks, carbon measurement techniques, role of forest in climate change mitigation, carbon trading and forest based carbon markets.	15
Unit IV	Biodiversity and ecosystem services: methods of biodiversity assessment, forest ecosystem and their services, ecological indices and biodiversity monitoring. Forest health and protection: monitoring of pests, diseases and forest disturbances, forest fire assessment.	15

Semester-VII

Bachelor of Forestry with Honours

DISSERTATION

CREDITDISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course		Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial/Fieldwork/ Practical/Practice		
DISSERTATION	6	2	4	Passed Class III Year (VI semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS			
Programme: Bachelor of Forestry with Honours		**Year: IV**	**Semester: VII** **Paper: Dissertation**
Subject: Forestry			
Course: DISSERTATION	**CourseTitle: Dissertation**		
Course Outcomes:			
Credits: 6		**Dissertation**	
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**	
Unit	**Topic**		**No. of**
Unit I	Dissertation on Major OR Dissertation on Minor OR Academic Project/ Entrepreneurship		**30**

Semester-VIII

Bachelor of Forestry with Honours

DISCIPLINE SPECIFIC COURSE (DSC)-Forest Utilization

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSC: Forest Utilization	4	3	0	1	Passed Class III Year (VII semester	Nil

BACHELOR OF FORESTRY WITH HONOURS

Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester: VIII Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Forest Utilization**	

Course Outcomes: In this course, students will gain knowledge about the importance of various timbers and non-timber forest product, their uses, and the concept of costs and benefits for better use.

Credits:4	**Discipline Specific Course**
Max. Marks: As per Univ. rules	**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Introduction, definition, scope and importance of forest utilization; Logging practices: Felling, season of felling, method of felling and conversion and tools used in forest logging; logging and extraction techniques and principles. Transportation: Major and minor transportation; Storage and wood depots; Management and disposal of timber.	**15**
Unit II	Seasoning of wood: Principles and methods; Classification and types of seasoning; Composite and improved woods. Wood structure and properties: Physical properties of wood: Weight, density, reaction of heat, sound, light, and electricity on wood, thermal; Other wood qualities: Expansion, moisture content, porosity, colour, and woodworking qualities; Mechanical properties of wood: Standard test, special testing on wood store and timber products, factor influencing strength, hardiness, flexibility, elasticity, fissility and combustibility.	**15**

Unit III	Defects and abnormalities of wood- Natural defects: Knots, shakes, cross-grain, reaction wood, defects due to climber; Other defects; Seasoning defects: Warping, checks, splits and shake, case-hardening, reverse case- hardening and honeycombing, collapse; Defects due to conversion and woodworking: Boxed-heart, imperfect grains, machine burn, machine notches, machine gauge, miscut timber, mis-matching, skip and wane.	**15**
Unit IV	Definition and scope, collection of gums, resins, oleoresins, fibres, oil seeds, nuts, rubber, canes, bamboos, medicinal plants, charcoal, lac and shellac, bidi leaves collection, processing and disposal. Present position of supply of raw material to pulp, paper and yayon industry.	**15**

Practical

1. Identification and uses of various (local) NTFP's.
2. Extraction of grass oil, distillation unit.
3. Extraction method of lac cultivation.
4. Extraction method of resin and rosin.
5. To visit the cutch and katha industries.
6. To visit the pulp and paper industries.
7. To visit the different timber depot.
8. To determine the SWOT analysis.
9. To determine the demand and supply curve
10. Law of equilibrium.

Suggested Readings:

1. Forest Utilization FRI Publication
2. A Handbook of Forest Utilization by T. Mehta
3. Forest Product and their Utilization by S.S. Negi
4. Forest: The Non-wood Resources by A.P. Dwivedi
5. Forestry for Economic Development by M.M. Pant
6. Forest Economics: Principle and Application by J.C. Nautiyal

Semester-VIII

Bachelor of Forestry with Honours

DISCIPLINE SPECIFIC ELECTIVES (DSE 1)-Forest Entomology

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE1: Forest Entomology	4	3	0	1	Passed Class III Year (VII semester	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor ofForestry withHonours	**Year: IV**	**Semester: VIII Paper DSE1**
Subject: Forestry		
Course: DSE1	**CourseTitle: Forest Entomology**	
Course Outcomes: Forest entomology, the study of insects and their relationships with forest ecosystems, has numerous important outcomes and applications.		
Credits:4	**Discipline Specific Elective**	

Max. Marks :As per univ.rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Introduction of entomology including classification, identification and Important insect-pests of seed, nursery and plantation; Important defoliators, skeletonizers, shoot borers and wood borers of Sal, Shisham, Khair, Teak, Poplar, Eucalyptus, Oak, Pine and Deodar.	**15**
Unit II	Categories of pests; Concept of IPM; Practices, scope and limitations of IPM; Classification of insecticides, toxicity of insecticides and formulations of insecticides; Chemical control importance, hazards and limitations;	**15**
Unit III	Recent methods of pest control, repellents, anti-feed ants, hormones, attractants, gamma radiation; Insecticides Act 1968-Important provisions;	**15**

Unit IV	Physical, cultural, chemical and biological control methods of insects; Use of attractions and repellants, male sterility techniques principles and methods of integrated pest's managements.	**15**

Practical

1. Collection, preservation and identification of different insects.
2. Inspection and collection of insect damaged materials.
3. Identification and use of plant protection equipments.
4. Preparation of different concentration of pesticides.
5. Collection and preservation of butterflies and moths.

Suggested Readings:

1. Principles of Insect Pest Management by G.S. Dhaliwal and R. Arora
2. Introduction to general and Applied Entomology by V.B. Awasthi
3. General Entomology by M.S. Mani
4. Modern Entomology by D.B. Tembhare

Semester-VIII

Bachelor of Forestry with Honours

DISCIPLINE SPECIFIC ELECTIVES (DSE 2)-Advances in Agroforestry

No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE 2: Advances in Agroforestry	4	3	0	1	Passed Class III Year (VII semester	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester: VIII Paper DSE2**
Subject: Forestry		
Course: DSE2	**Course Title: Advances in Agroforestry**	
Course Outcomes:		
Credits: 4	**Discipline Specific Elective**	

Max. Marks: As per univ.rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No. of Hours**
Unit I	Agroforestry – concept, scope, benefits of agroforestry, historical development of agroforestry and overview of global agroforestry, objectives, classification of agroforestry systems: structural, functional, socio-economic and ecological. Diagnosis and design of agroforestry systems, land capability classification, and land use pattern.	**15**
Unit II	Agroforestry systems- shifting, taungya, alley cropping, shelter-belts, windbreaks, home gardens, agriculture based systems, forest based systems, pasture based and horticulture based systems. Selection of tree species and crop/inter crop in different agro-climatic zones of India.	**15**
Unit III	Conservation and management of soil and water, soil organisms, nitrogen fixing tree species, nutrient cycling and budgeting, production and productivity in different agroforestry systems. Tree crop interactions- ecological and economic, concept of allelopathy and its impact of agroforestry.	**15**

Unit IV	Energy plantations: choice of species and its management, lopping of top-feed species such as freuuency and intensity of lopping, organic farming, financial analysis and Economic evalution of agroforestry system: cost benefit and land equivalent ratio, Agroforestry practices and systems in different agro-ecological zones of India.	**15**

Suggested Reading:

1. Agroforestry Principles and Practice by A. P. Dwivedi
2. An Introduction to Agroforestry by P. K. R. Nair
3. Agroforestry Handbook by S. S. Negi
4. Advance in Agroforestry by S. K. Sinha
5. Advance in Agroforestry by L. K. Jha

Practical

1. Survey and analysis of land use systems in the adjoining areas.
2. Design and plan suitable models for improvement.
3. Mineral nutrient analysis of soil and plants.
4. Study of crop–weed association and fertilizer response in different crops. Preparation and application of herbicides.
5. Application of various methods in formulation and appraisal of agro-forestry projects.
6. Nutrient analysis of forages derived from fodder trees/shrubs. Digestibility of some agro-forestry forages.
7. Benefit-cost ratio estimation of agroforestry systems.
8. Case studies on harvesting, post-harvest management, and marketing of agroforestry products.
9. Visit to nearby agroforestry practicing area and interact with the practicing farmers.

Semester-VIII

Bachelor of Forestry with Honours

No. of Hours - 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSE 3: Environmental Management	4	3	0	1	Passed Class III Year (VII semester	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester:VIII Paper: DSE3**
Subject: Forestry		
Course: DSE 3	**Course Title:Environmental Management**	
Course Outcomes: A course on Environmental Conservation and Sustainable Development typically aims to equip students with knowledge, skills, and competencies that help them understand the interconnectedness of environmental, social, and economic systems and how to manage resources responsibly.		

Credits: 4	Discipline Specific Elective
Max. Marks: As per univ.rules	Min. Passing Marks: As per Univ. rules

Unit	Topic	No. of Hours
Unit I	Multidisciplinary nature of environmental studies: Definition, scope and importance. Natural Resources : Renewable and non-renewable resources: Natural resources and associated problems- Forest resources, Water Mineral resources, Energy resources, Land resources	15
Unit II	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Biodiversity and its conservation: Introduction, Definition: genetic, species and ecosystem diversity. • Biogeographical classification of India. Value of biodiversity, Biodiversity at global, National and local levels. Inida as a mega-diversity nation, Hot-sports of biodiversity. Threats to biodiversity: Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	15
Unit III	Environmental Pollution: Definition, Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise	15

	pollution f. Thermal pollution g. Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. • Pollution case studies. • Diaster management: floods, earthquake, cyclone and landslides.	
Unit IV	Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy, Water conservation, rain water harvesting, watershed management Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Consumerism and waste products. • Environment Protection Act: Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act, Wildlife Protection Act Forest Conservation Act.	**15**

Suggested Readings:

1. Ecology and Environmental Science and Conservation by J. S. Singh, S. P. Singh and S. R. Gupta.
2. Ecology ana environment by P. D. Sharma
3. Environmental Studies by R. Rajacopalan
4. A Text Book of Environmental Studies by D. K. Asthana and M. Asthana
5. Environmental Impact Assessment by A. K. Srivastava

Practicals:

1. Estimate of water quality, air quality and pollution level.

Semester-VIII

Bachelor of Forestry with Honours

GENEERIC ELECTIVES (GE1)-Tree Physiology

No.ofHours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisiteof the Course (if any)
		Lecture	Tutorial	Practical/Practice		
GE 1: Tree Physiology	4	3	0	1	Passed Class III Year (VII semester	Nil

Programme: Bachelor of Forestry withHonours		Year: IV	Semester: VIII Paper : GE 1
Subject: Forestry			
Course: GE 1	Course Title: Tree Physiology		
Course Outcomes: Tree physiology, the study of how trees function at a biological and biochemical level, yields numerous important outcomes with broad applications			

No. of Hours-60

Credits: 4	Discipline Specific Elective	
Max. Marks: As per univ.rules	Min. Passing Marks: As per Univ. rules	
Unit	**Topic**	**No. of Hours**
Unit I	Introduction and practical application in forestry. The plant cell, water solution and colloidal system, diffusion, osmosis and imbibitions. Absorption of water, Soil-water, water-conducting system, water stress and drought. Ascent of sap, absorption of water.	**15**
Unit II	Photosynthesis-pigment, mechanisms and factors affecting photosynthesis. Respiration- mechanism, glycolysis and Kreb cycle, anaerobic respiration and respiratory quotients.Photoperiodismgermination and dormancy of seeds, plant movements.	**15**

Unit III	Growth and growth regulators, relative growth rate, plant growth hormones- auxins, gibberellins, cytokinin, and ethylene. Essential and non-essential elements and their deficiency symptoms.	**15**
Unit IV	Transpiration andGuttation, mechanism of stomatal transpiration, significance of transpiration, factor affecting stomatal movement, measurement of transpiration, factor affecting rate of transpiration.	

Recommended Readings:

1. Physiology of woody plants by T. T. Kozlowaski and S. G. Pallardy
2. Physiology of woody plants by S. G. Pallardy

Practicals:

1 Estimation of transpiration rate.

2 Estimation of respiration quotient by Ganongrespirometer

3 Measurement of tree water potential by pressure chamber

4 Estimation of chlorophyll content in plants

5 Estimation of the relative water content of twigs

6 P-V curve (s) preparation

Semester-VIII

Bachelor of Forestry with Honours

GENERIC ELECTIVES(GE 2)-Dendrology

No. of Hours – 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre- requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
GE 2: Dendrology	4	3	0	1	Passed Class III Year (VII semester	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester: VIII Paper: GE2**
Subject: Forestry		
Course: GE2	**Course Title: Dendrology**	
Course Outcomes: Students will learn about the basic aspects of dendrology and its application in forestry, and its role in the present scenario and employment generation through different forestry areas.		
Credits: 4		**Generic Elective**
Max. Marks: As per univ.rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Introduction, importance and scope of dendrology; Principles and systems of classification of plants; Bentham and Hooker's and Hutchinson's System; Modern classification.	**15**
Unit II	Plant Nomenclature: Objectives, principles and international code of botanica nomenclature; Role of vegetative morphology in identification of woody plants Herbarium techniques, collection, processing and preservation of plant material Arboretum and xylarium.	**15**
Unit III	Important families and their decriptions: *Magnoliaceae, Dipterocarpaceae, Malvaceae, Tiliaceae, Rutaceae, Meliaceae, Sapindaceae, Anacardaceae, Rhizophoraceae, Caesalpiniaceae, Mimosaceae, Combertaceae, Myrtaceae, Lythraceae, Ericaceae, Sapotaceae, Ebenaceae, Oleaceae, Verbenaceae, Lauraceae, Santalaceae, Euphorbiaceae, Ulmaceae, Moraceae, Betulaceae, Fagaceae, Salicaceae, Palmaceae, Pinaceae, Cupressaceae, Taxaceae, Cyperaceae.*	**15**
Unit IV	Geographical distribution of important Important Indian trees, native trees, exotic trees, endemism, allelopathy with respect to forest trees.	**15**

Suggested Readings:

1. Gernraplantarum by G. Benthem and J. D. Hooker
2. Taxonomy and diversity by A.K. Pandey
3. Forest Taxonomy by Singh. M. P
4. Aforest flora of Kumaun by A. E. Osmaston
5. Flora of District Garhwal North West Himalaya by R. D. Gaur
6. Indian Tree by D. Brandis
7. Silviculture of Indian trees by R. S. Troup
8. The Flora of British India by J. D. Hooker

Practicals:

1. Morphological description of plant parts
2. Methods of plant material collection and Techniques of preparing herbarium species
3. Application of different preservatives used in herbarium
4. Survey and descriptive study of woody flora

Semester-VIII

Bachelor of Forestry with Honours

DISSERTATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Creditdistributionofthe Course		Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial/Fieldwork/ Practical/Practice		
DISSERTATION	6	2	4	Bachelor of Science in Forestry	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry withHonours	Year: IV	Semester: VIII Paper: DISSERTATION
Subject: Forestry		
Course: DISSERTATION	Course Title: Dissertation	

Course Outcomes:

After studying this course, the students will be able to:

- Develop advanced research skills, including the ability to formulate research questions, design methodologies, gather and analyze data, and draw meaningful conclusions.
- Enhance their critical thinking abilities through the evaluation and synthesis of existing literature, identification of gaps in current knowledge, and the development of innovative approaches to their research topic.
- Improve their written and oral communication skills by effectively articulating their research findings.
- Demonstrate the ability to work independently, manage their time effectively, and take responsibility for their own learning and research process.
- Develop problem-solving skills by addressing challenges and obstacles encountered during the research process.
- Cultivate an understanding of ethical considerations in research, including issues related to plagiarism, and responsible conduct of research.
- Enhance their ability to deliver effective presentations, including the creation of compelling visual aids, engaging with audiences, and responding to questions and feedback.

Credits:6	**Dissertation**	
Max. Marks: As per univ. rules	**Min. Passing Marks: As per Univ. rules**	
Unit	**Topic**	**No. of Hours**
Unit I	Dissertation on Major OR Dissertation on Minor OR Academic Project/Entrepreneurship	**30**