National Education Policy-2020

Common Minimum Syllabus for Uttarakhand State Universities and Colleges

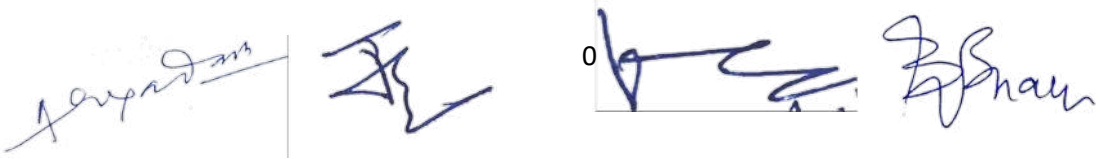
PROPOSED SYLLABUS OF FORESTRY

Effective from the academic session 2025-26

of

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

DEPARTMENT OF FORESTRY

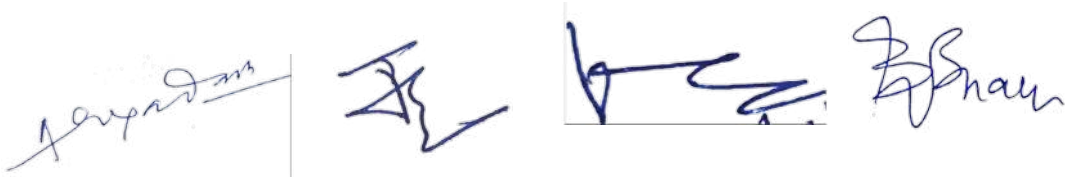


EXPERT COMMITTEE

S.N.	NAME	DESIGNATION	DEPARTMENT	AFFILIATION
1.	PROF. JEET RAM	PROFESSOR AND HEAD	FORESTRY	KUMAUNUNIVERSITY, NAINITAL
2.	PROF. A. K. YADAVA	PROFESSOR AND HEAD	FORESTRY	SOBAN SINGH JEENA UNIVERSITY, ALMORA
3.	DR. H.C. JOSHI	ASSOCIATE PROFESSOR	FORESTRY	UTTARAKHAND OPEN UNIVERSITY, HALDWANI

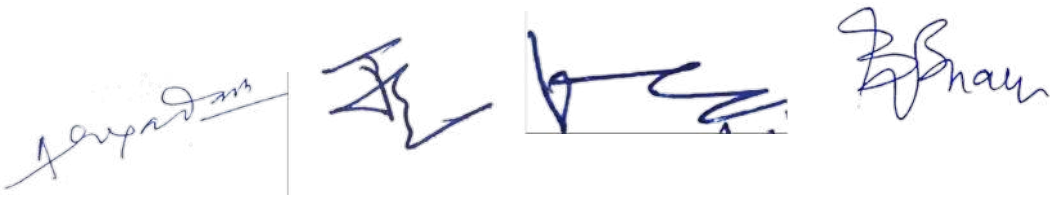
SYLLABUS PREPARATION COMMITTEE

S.N.	NAME	DESIGNATION	DEPARTMENT	AFFILIATION
1.	PROF. JEET RAM	PROFESSOR AND HEAD	FORESTRY	KUMAUN UNIVERSITY, NAINITAL
2.	PROF. A.K. YADAVA	PROFESSOR AND HEAD	FORESTRY	SOBAN SINGH JEENA UNIVERSITY, ALMORA
3.	PROF. L.S. LODHIYAL	PROFESSOR	FORESTRY	KUMAUN UNIVERSITY, NAINITAL
4.	PROF. ASHISH TEWARI	PROFESSOR	FORESTRY	KUMAUN UNIVERSITY, NAINITAL
5.	DR. NEETA ARYA	ASSISTANT PROFESSOR	FORESTRY	KUMAUN UNIVERSITY, NAINITAL



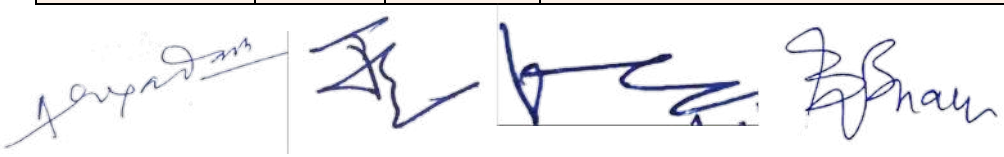
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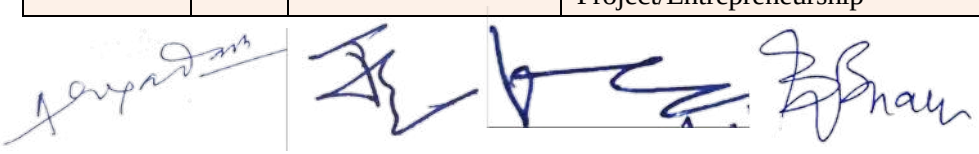
List of Papers (DSC, GE, AEC, SEC, VAC) with Semester wise Titles for 'Forestry'					
Year	**Semester**	**Course**	**Paper Title**	**Theory/ Practical**	**Credits**
Undergraduate Certificate in Forestry					
FIRST YEAR	I	DSC	Introductory Forestry	Theory/Practical	3+1
		GE	Principles and Practices of 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 (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 (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 (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 (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

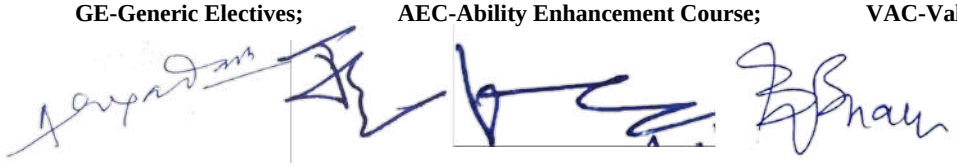
SKILL ENHANCEMENT COURSES (SEC) PREPARED FOR THE POOL OF COURSES

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

Abbreviations-

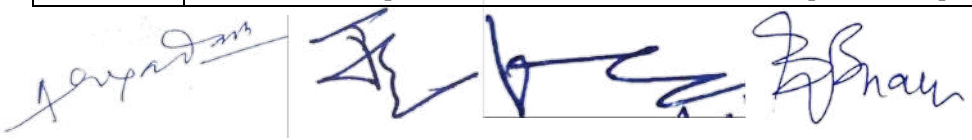
DSC-Discipline Specific Course; **DSE-Discipline Specific Electives;**

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



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.



Department of Forestry

Semester - I

Undergraduate **Certificate in Forestry**

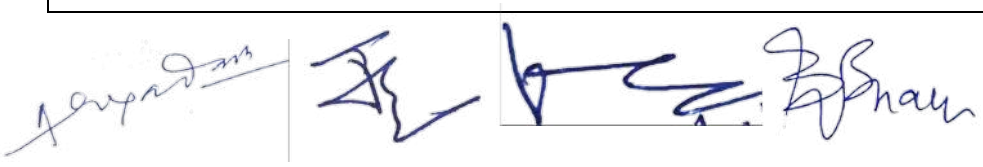
DISCIPLINE SPECIFIC COURSE (DSC)- Introductory Forestry

No. of Hours - 45

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: Introductory Forestry	4	3	0	1	Passed Class XII	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Introductory Forestry**	
Course Outcomes: The student will impart Fundamental knowledge and skills of forest and forestry and its branches, forest acts and policies, forest and their branches, forest ecosystem, climate and environment, forest types and composition, tree morphology, tree measurement, and skills of plant management and protection.		



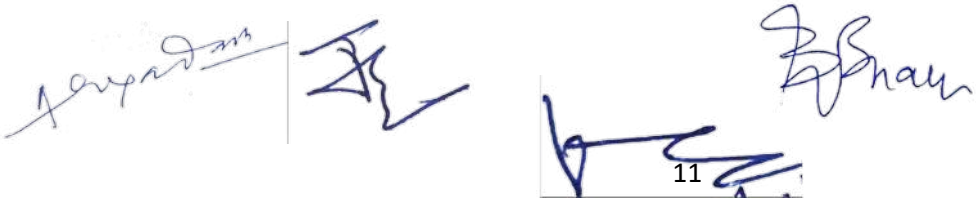
INTRODUCTORY FORESTRY		
Credits : 4		**Discipline Specific Course**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No.of Hours**
Unit I	Definition and Introduction of forestry; Forest and plantation, Brief history of forestry; Branches of forestry; Legal classification of forests: reserved forest, protected forest, un-classified forest, village forest and community forest (Van Panchayat). Forest area and cover in the state, country, and world. Category of forest on the basis of origin, Primary forest and secondary forest; Importance of forests for community, environment, climate change and sustainable development. Forest of worlds	15
Unit II	Basic principles of silviculture: Introduction, definitions, objects, scope and importance; Regeneration of forests: natural and artificial regeneration of forest. Tree morphology, different forms and growth of trees, stem, root and other parts; Mycorrhiza, lignotubers and root nodules.	15
Unit III	Introduction and definitions of forest Mensuration; Principles of tree measurement: Height, diameter, circumference, basal area and volume; Tree measuring instruments in forestry: Christian's hypsometer, tree Caliper, Ravi multimeter, Abney's level, Haga altimeter, meter tape, wedge prism, weighing machine and Pressler's increment borer.	15
Unit IV	Basic principles of forest Management, Introduction, definition and scope of forest management, Participatory Forest Management (PFM) and Joint Forest Management (JFM). Forest products: Important timber and non-timber products. Forest Protection: Introduction and definition, important insects and pests of nurseries and trees, shifting cultivation, encroachment, illegal felling, grazing and forest fire.	15

Practical

1. Field visit in different forest sites.
2. Identification of tree species and their local and botanical name.
3. Introduction about instruments used in forestry (Christen's Hypsometer, tree caliper, Ravi multimeter, Abney's level, Haga altimeter, meter tape, Gunter chain, wedge prism, weighing machine, Pressler's increment borer, soil pH meter, soil thermometer, Swedish bark gauge, seed germinator, oven, balance etc.).
4. Measurement of tree height, diameter, basal area, circumference.
5. Nursery development, preparation of nursery layout, nursery beds, uses of different container, planting material seeds and vegetative parts, raising of plants of different tree species.

Suggested Readings:

1. Ecology and Environment by P.D. Sharma
2. Principles and Practices of Silviculture by L.S. Khanna
3. A text Book of Silviculture by A.P. Dwivedi
4. Forest Management by Ram Prakash
5. Forest Mensuration, A.N. Chaturvedi
6. Theory and Practices of Silviculture by L.S. Khanna
7. Forest of Himalaya by J.S. Singh and S.P. Singh
8. Plantation Forestry in India by R.K. Luna
9. Nursery and Plantation Practices by Vinod Kumar



Semester-I

Undergraduate Certificate in Forestry

GENERIC ELECTIVE (GE)- Principles and Practices of Forestry

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: **Principles and Practices of Forestry**	4	3	0	1	Passed Class XII	Nil

Course Outcomes (CO): The student will impart Fundamental knowledge and skills of forest and forestry and its branches, forest acts and policies, forest and their branches, forest ecosystem, climate and environment, forest types and composition, tree morphology, tree measurement and skill of plant management and protection.

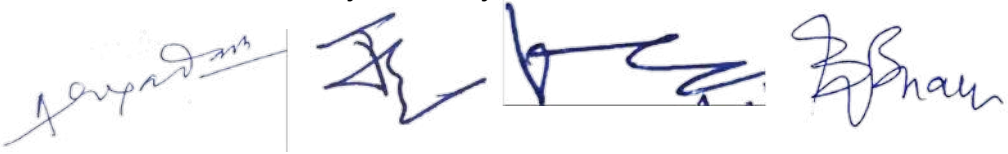
Unit	Topic	No .of Hours
Unit I	Forest and forestry, Definitions, Branches of forestry and their interrelationship, classification of forest and forestry, importance of forests, History of forestry development in India, and forest of world and India. Definition, concept, and types of social forestry, people participation, status of social forestry projects in different states of India.	15
Unit II	Introduction, the basic concept of ecology, definition of ecology, types of ecology, scope and importance of ecology in forestry, basic concept of habitats, and ecological niche. Concept and definition of an ecosystem, classification and distribution of ecosystem, structural component and important ecosystem (freshwater, marine water, forest, and desert ecosystem)	15
Unit III	Introduction, definition, objective and scope of forest mensuration, scale of mensuration (nominal, ordinal, interval and ratio scale) and units of measurement and standards of accuracy implied in their expression,	15
Unit IV	Introduction, definition and scope, peculiarities of forest management, principles of forest management and their applications and objects of management. Forest policy: definition, necessity and scope and legal and institutional approaches to forest resource management. National Forest Policies of India (1894, 1952, 1988). Indian Forest Act, 1927 and wildlife (Protection) Act, 1972	15

Practical

1. Field visit in different forest sites.
2. Identification of tree species and their local and botanical name.
3. Introduction about instruments used in forestry (Christien's Hypsometer, tree caliper, Ravi multimeter, Abney's level, Haga altimeter, meter tape, Gunter chain, wedge prism, weighing machine, Pressler's increment borer, soil pH meter, soil thermometer, Swedish bark gauge, seed germinator, oven, balance etc.).
4. Measurement of tree height, diameter, basal area, circumference.

Suggested Readings:

1. Ecology and Environment by P.D. Sharma
2. Principles and Practices of Silviculture by L.S. Khanna
3. A text Book of Silviculture by A.P. Dwivedi
4. Forest Management by Ram Prakash
5. Forest Mensuration, A.N. Chaturvedi
6. Forest of Himalaya by J.S. Singh and S.P. Singh
7. Plantation Forestry in India by R.K. Luna



Semester-I

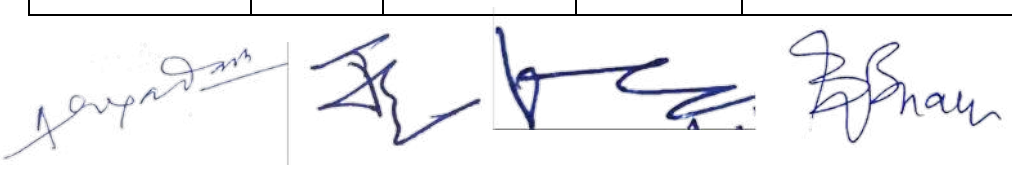
Undergraduate Certificate in Forestry

Ability Enhancement Course (AEC)-Indian Language

No. of Hours- 45

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		
AEC: Indian Language	2	2	0	0	Passed Class XII	Nil



Semester-I
Undergraduate Certificate in Forestry

Skill Enhancement Course (SEC)-Nursery Technology

No. of Hours-45

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisiteo f the course(if any)
		Lecture	Tutorial	Practical/Practice		
SEC: Nursery Technology	2	0	0	2	Passed Class XII	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme:Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course:SEC	**Course Title: Nursery Technology**	
Course Outcomes: The study will learn about the different techniques of nursery raising of different forest tree species and their management.		
Credits:2		**Discipline Specific Course**
Max. Marks: As Per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Introduction and Types of nursery, Nursery planning and design, layout of nursery, Soil preparation, preparation of seed bed, size of seed bed. Pits digging of planting Seed sowing: methods of sowing, time of sowing. Growing media. Seed and vegetative propagation, Water and irrigation system. Identification of important useful tree species. Seed collection and germination, plus and elite trees, seedling development.	**15**
Unit II	Nursery cultural practices: Weeding, hoeing, irrigation, fertilization etc. and controlled measures, seedling gradiness and hardening and transplanting; Nursery and tools, Plant containers; Potting media.	**15**

Suggested Reading:

1. Nursery and Plantation Practices by V. Kumar
2. Principles and Practices of Silviculture by L. S. Khanna
3. Plantation Forstry in India by R. K. Luna
4. Plant Nursery Management by P. K. Ray

Semester-I
Undergraduate Certificate in Forestry

Value Addition (VAC)- Environmental Education

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		
VAC: Environmental Education	2	2	0	0	Passed Class XII	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course:VAC	**CourseTitle: Environmental Education**	
Course Outcomes: In this course, students will learn about the different aspects of environmental science, the current status of the environment, global warming, and sustainable development.		
Credits: 2	**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 and components- atmosphere, hydrosphere, lithosphere and biosphere. Natural resources and their management- Forest, wildlife, water, and land resources.	**15**
Unit II	Environmental pollution- Types of pollutants, control and prevention of air, water and noise pollution, Causes, source and control measures.	**15**

Suggested reading:

1. Ecology and Environment by P. D. Sharma
2. Environmental Laws and Policies in India by S. Devan
3. A Text Book of Environmental studies by D. K. Asthana and M. Asthana

Semester-II

Undergraduate Certificate in Forestry

DISCIPLINE SPECIFIC COURSE (DSC)- FOREST ECOLOGY

No. of Hours - 60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisiteo f the course(if any)
		Lecture	Tutorial	Practical/Practice		
DSC:Forest Ecology	4	3	0	1	Passed Class I Semester	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme:Undergraduate Certificate in Forestry	**Year: I**	**Semester:II Paper: DSC**
Subject:Forestry		
Course:DSC	**CourseTitle: Forest Ecology**	
Course Outcomes: Students will learn about the basic structure of the forest and their function for future management.		
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 and definition of ecology; Forest ecology: Definition and its importance in forest ecosystem management; structure and components of ecosystem, energy flow, Types of ecosystems: Forest, grassland, desert and aquatic ecosystem; Tropic structure, ecological pyramids, food chain, food web. Ecosystem function	**15**
Unit II	Introduction, definition, scope and importance of biodiversity; Threats and conservation of biodiversity; loss of biodiversity, Assessment of biodiversity, protected areas. Classification of forests Champion and Seth 1968. Biogeographical zones of India; Hotspot; Major biomes of the world.	**15**
Unit III	Locality factors-Climatic factors: Light, temperature, moisture, wind and their effects; Topographic factors: Altitude, slope, aspects and exposure and their effects; Edaphic factors and Biotic factors.	**15**

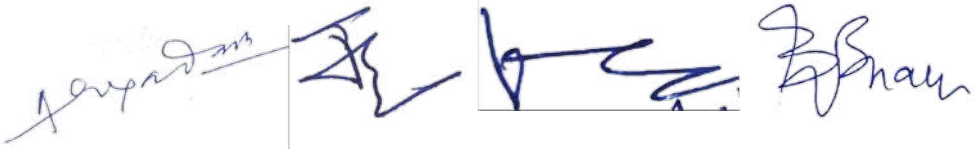
Unit IV	Forest vegetation: trees shrubs, herbs, epiphytes and parasites.Methods of forest vegetation analysis, Forest composition, distribution Succession: causes and mechanism of succession; Types of succession and concept of climax.	**15**

Practical

1. To determine the minimum size of quadrates.
2. To determine density of tree species in forest.
3. To determine frequency of tree species in forest.
4. To determine abundance and A/F ratio of tree species in forest.
5. To determine relative density, relative frequency and relative dominance and Important Value Index (IVI) of tree species in forest.
6. To determine basal area of tree species in forest.
7. To draw the population structure of tree species in forest.
8. To determine species diversity in forest by Shannon-Weiner Index, Simpson index.

Suggested Readings:

1. Ecology, Environmental Science and Conservation by J.S. Singh, S.P. Singh and S.R. Gupta
2. Ecology and Environment by P.D. Sharma
3. Fundamental of Ecology by E.P. Odum
4. Concept of Ecology by E.J. Kormondy
5. Ecology by M.P. Arora
6. Ecology by S.N. Jha
7. Concept of Modern Ecology by P.C. Tewari.



Semester-II

Undergraduate Certificate in Forestry

GENERIC ELECTIVE (GE)- Participatory Forest Management

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: Participatory Forest Management	4	3	0	1	Passed Class I Semester	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: II Paper: GE**
Subject: Forestry		
Course:GE	**Course Title: Participatory Forest Management**	
Course Outcomes: Techniques for resolving conflicts and addressing competing interests among different stakeholders, including indigenous communities, government agencies, NGOs, and private sector actors. Understanding and promoting sustainable forest management practices that balance conservation goals with the socio-economic needs of local communities, such as agroforestry, selective logging, and non-timber forest product harvesting.		
Credits:4		**Generic Elective**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No.of Hours
Unit I	Concept, history, scope and types of participatory forest management, Joint Forest Management (JFM), Forest Development Agency (FDA), compensatory Afforestation Fund Management and Planning Authority (CAMPA).	**15**
Unit II	Community forestry, Van Panchayat, user groups and NGO's. Van-Panchayat rules and modification, Van –Panchayat in Uttarakhand, success and failure of JFM.	**15**
Unit III	Role of community in natural resource management (NRM). Objectives of PRA.	**15**
Unit IV	The Logic and merits of the PRA. Major methods of PRA. The fundamental concepts of PRA. Principles of PRA.	**15**

Practicals:

1. Preparation of micro-plan of a given village
2. Application of various appraisal methods in participatory projects
3. Case studies of JFMs

Suggested Readings:

1. Joint Forest Management in India by N. H. Ravindra Nath
2. Participatory Natural Resource Management by S. S. Negi
3. Participatory Rural Apprisal by A. Mukherjee



Semester-II

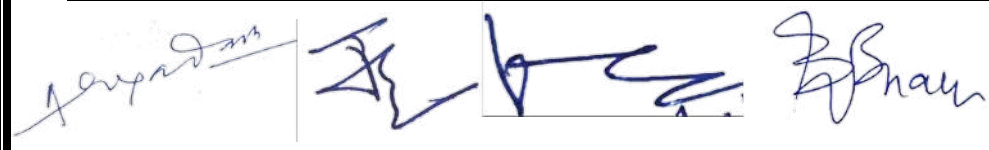
Undergraduate Certificate in Forestry

Ability Enhancement Course (AEC)-Indian Language

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		
AEC: Indian Language	2	2	0	0	Passed Class I Semester	Nil



Semester-II

Undergraduate Certificate in Forestry

Skill Enhancement Course (SEC)- Nursery Technology

No. of Hours-45

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisiteo f the course(if any)
		Lecture	Tutorial	Practical/Practice		
SEC: Nursery Technology	2	0	0	2	Passed Class Ist semester	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course: SEC	**Course Title: Nursery Technology**	
Course Outcomes: The study will learn about the different techniques of nursery raising of different forest tree species and their management.		
Credits:2		**Discipline Specific Course**
Max. Marks: As Per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Manuring (Organic compost/manure), Farm Yard Manure (FYM); Bio-fertilizers; Mycorrhiza and fertilizer application methods.	**15**
Unit II	Nursery visits, report preparation, preservation and viva-voce.	**15**

Suggested Reading:

5. Nursery and Plantation Practices by V. Kumar
6. Principles and Practices of Silviculture by L. S. Khanna
7. Plantation Forstry in India by R. K. Luna
8. Plant Nursery Management by P. K. Ray

Semester-II

Undergraduate Certificate in Forestry

Value Addition (VAC)- Environmental Education

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		
VAC: Environmental Education	2	2	0	0	Passed Class I semester	Nil

UNDERGRADUATE CERTIFICATE IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course: VAC	**Course Title: Environmental Education**	
Course Outcomes: In this course, students will learn about the different aspects of environmental science, the current status of the environment, global warming, and sustainable development.		
Credits: 2		**Discipline Specific Course**
Max. Marks: As Per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Acid rain; Global warming; Ozone layer depletion; Sewage and waste water management. Impact of different pollutions on humans and other organisms. Biological magnification; Toxins and Eutrophication. Causes of environmental degradation: Deforestation and anthropogenic pressure; Explosion of human population, ecological and economic issues; National and International conventions and summits and their major achievements;	**15**
Unit II	Environmental policy and legislation in Indian perspective; The Environment (Protection) Act 1986, The Water (Prevention and Control of Pollution) Act 1974, The Air (Prevention and Control of Pollution) Act 1981; Role of forest for sustainable environment	**15**

Suggested reading:

1. Ecology and Environment by P. D. Sharma
2. Environmental Laws and Policies in India by S. Devan
3. A Text Book of Environmental studies by D. K. Asthana and M. Asthana

Semester-III

Undergraduate Diploma in Forestry

DISCIPLINE SPECIFIC COURSE (DSC)-Principles of Silviculture

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: Principles of Silviculture	4	3	0	1	Passed Class I Year	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Diploma in Forestry	**Year: II**	**Semester:III Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Principles of Silviculture**	
Course Outcomes: In this course student will learn about the regeneration, cultivation and establishment, development of tree species in natural and man-made forest for better stand development.		
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, and scope of silviculture; Objects of silviculture; Silvicultural characteristics; Phenology and regeneration; Growth, management and economic of Conifers: *Abies pindrow*, *Picea smithiana*, *Cedrus deodara*, *Pinus* species, Broadleaf species: *Quercus* species, *Acacia catechu*, *Acacia nilotica*, *Dalbergia sissoo*, *Shorea robusta*, *Eucalyptus* species, *Populus* species, *Tectona grandis*, *Casuarina equisetifolia* and Bamboo species., Exotics: Importance, role in forest economy, purpose of introduction, ecological factors, establishment and management of Eucalyptus, poplar and exotic conifers (*Pinus spp*).	15

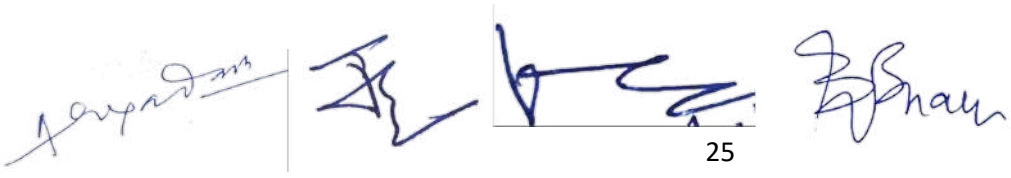
Unit II	Forest Regeneration: Introduction, definition, and types of regeneration; Natural regeneration: Definition, methods of natural regeneration (from seeds and vegetative parts); Seed production; Seed dispersal; Seed germination; Seedling establishment; Assisted Natural Regeneration (ANR); Artificial regeneration: Definition and objectives; Essential preliminary considerations (choice of species, site selection, composition of the 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 III	Tending operations - weeding, cleaning, thinnings, definitions, objectives and methods, increment felling, and improvement felling. Pruning and lopping. Control of climbers and undesirable plants.	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 forms 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. Principle 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 silvicultural systems by L.S. Khanna
7. Silviculture of important Indian trees by R.S. Troup



Semester-III

Undergraduate Diploma in Forestry

DISCIPLINE SPECIFIC ELECTIVES (DSE) - Forest Biodiversity and Conservation

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: Forest Biodiversity and Conservation	4	3	0	1	Passed Class I Year	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Diploma in Forestry	**Year: II**	**Semester: III Paper: DSE**
Subject: Forestry		
Course: DSE	**CourseTitle: Forest Biodiversity and Conservation**	
Course Outcomes: To develop an understanding of students about ecological aspects of forests, conservation of forest resources & biodiversity, consequences of depleting biodiversity, and sustainable use of biodiversity.		
Credits:4	**Discipline Specific Elective**	



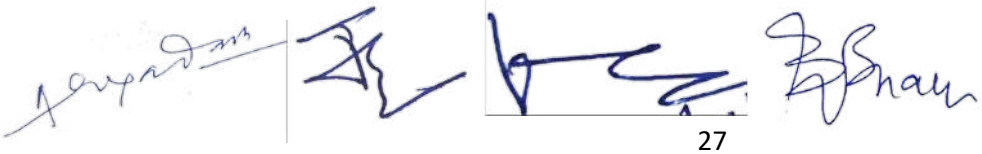
Max. Marks: As per Univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Definition, concept of biodiversity, importance, use and threats to biodiversity; levels of biodiversity. Uses and threats to biodiversity. Causes of biodiversity loss and the IUCN red list.	**15**
Unit II	Assessment of biodiversity: Inventory, monitoring, REDD, REDD+. Natural resources: Types, degradation and conservation, In-situ and Ex-situ conservation, hotspot areas, protected area network: wildlife sanctuaries, national parks, biosphere reserves, zoos, botanical gardens, arboretum, etc., and conservation of sacred groves. Impact of climate change on biodiversity, climate change and threats to species and ecosystem, distribution and adaptation pattern of plants and animals, vulnerability to climate change.	**15**
Unit III	Role of community in biodiversity conservation; Indigenous knowledge of biodiversity; Biodiversity conservation and community development; Biodiversity and ecosystem services.	**15**
Unit IV	International efforts for conservation of biodiversity; International Union for Conservation of Nature and Natural Resources; United Nations Environmental Program; Convention on Biodiversity; World Heritage Convention; Conference on Parties; Convention on International Trade of Endangered Species (CITES), World Wide Fund for nature and natural resources.	**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.
6. Field inventory for biological diversity and determination of minimum size of sampling unit for trees, shrubs and herbs.
7. Collection, identification and herbarium preparation of plant species.
8. Calculation of different indices of biodiversity, evenness, concentration of dominance, similarity and α, β and γ diversity of a landscape index.
9. Visit to National Parks, wildlife sanctuaries, botanical gardens and arboretum.
10. List of IUCN indexed plants of India.

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-III

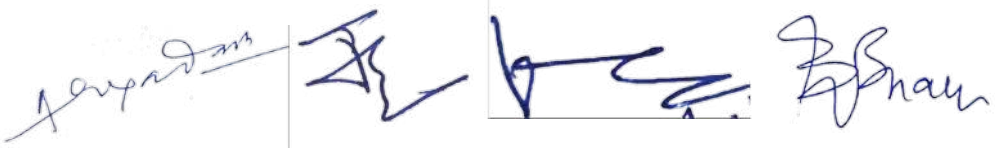
Undergraduate Diploma in Forestry

Ability Enhancement Course (AEC)-Indian Language

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		
AEC: Indian Language	2	2	0	0	Passed Class I year	Nil



Semester-III

Undergraduate Diploma in Forestry

Skill Enhancement Course (SEC)- Plantation Technology

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		
SEC: Plantation Technology	2	0	0	2	Passed Class Ist year	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: I**	**Semester: I** **Paper: DSC**
Subject: Forestry		
Course: SEC	**CourseTitle: Plantation Technology**	
Course Outcomes: Students will learn the practical aspects and knowledge about raising, care, development and use of tree species in a specific site and specific objectives.		
Credits:2		**Discipline Specific Course**
Max. Marks: As Per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Introduction of plantation, types of plantation, identification and selection of plantation sites, site preparation, and tree plantation techniques. Assessment of the quantity of raising the plantation. Assessment of planting material required under different planting material (seed/seedling/ETPs), planting patterns, and assessment of spacing under different planting patterns	**15**
Unit II	Plantation activities, fertilizer and soil management, weed, pest, and disease control: weed management, Integrated Pest and Disease Management. Value of plantation: ecological, social, and economic.	**15**

Suggested Readings:

1. Plantation Forestry in India by R. K. Luna
2. Nursery and Plantation Practices by V. Kumar
3. Alternative Energy Development and Management by S. A. Abbasi

Semester-III

Undergraduate Diploma in Forestry

Value addition Course (VAC) – Non-Timber Forest Products

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		
VAC: Non-Timber Forest Products	2	2	0	0	Passed Class I year	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Diploma in Forestry	**Year: II**	**Semester: III Paper:VAC**
Subject: Forestry		
Course: VAC	**Course Title: Non-Timber Forest Products**	
Course Outcomes: In this course student will learn about the different non-timber forest product, their use and techniques of extraction of such product from forest species.		
Credits: 2	**Discipline Specific Course**	
Max. Marks: As Per Univ. rules	**Min. Passing Marks: As per Univ. rules**	

Unit	Topic	No. of Hours
Unit I	Non-timber forest produce, definitions, General survey, types, Economic importance; Mode of collection, trade and marketing.	**15**
Unit II	Major NTFP and their uses: Fiber and flosses, grasses, bamboo, canes, essential oils, oil seed, tans & dye, gum, resins, drugs, spices, edible and wild plants.	**15**

Suggested Readings:

1. Forests: The Non wood resources by A. P. Dwivedi
2. A hand book of Forest Utilization by T. Metha
3. Manual of Indian Forest Utilization by Trotter H. 1982
4. Forest Utilization by FRI, Dehradun
5. Forest Products and their Utilization by S. S. Negi

Semester-IV

Undergraduate Diploma in Forestry

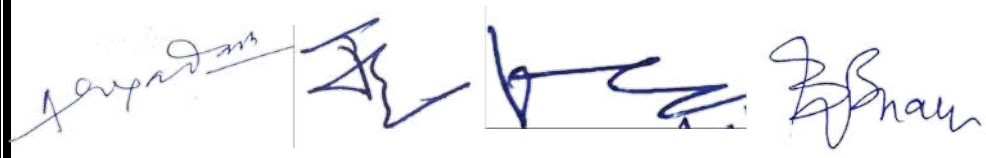
DISCIPLINE SPECIFIC COURSE (DSC)- Agroforestry

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: **Agroforestry**	**4**	**3**	**0**	**1**	**Passed Class III Semester**	**Nil**

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: ***Undergraduate Diploma in Forestry***	**Year: II**	**Semester:IV** **Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Agroforestry**	
Course Outcomes: To impart knowledge on recent developments in agroforestry models and their economics.		
Credits: 4		**Discipline Specific Course**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**



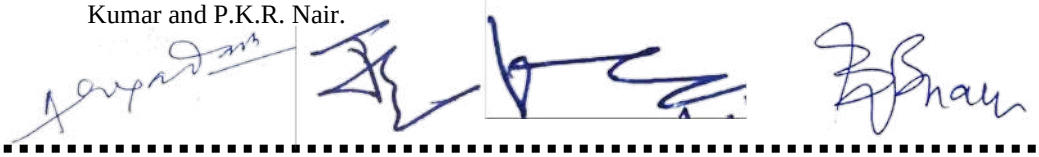
Unit	Topic	No. of Hours
Unit I	Introduction, definition, objectives, scope, and importance of agroforestry; History of agroforestry, traditional practices of agroforestry; Choice and characteristics of species for agroforestry; Multipurpose trees (MPTs) in Agroforestry; Potential and constraints of Agroforestry systems.	**15**
Unit II	Agroforestry systems: Forest-based agroforestry systems, agriculture-based agroforestry systems, and pasture-based agroforestry systems; Shifting cultivation; Taungya system; Alley cropping; Home gardens; Agri-silvicultural system; Agri-silvipastoral system; Agri-horticultural system; Agri-horti- pastoral system; Tree-crop interaction.	**15**
Unit III	Diagnosis and design techniques; Socio-economic and ecological aspect of agroforestry; Economic aspects of agroforestry; Cost, benefit, benefit-cost ratio; Land equivalent ratio (LER); Protein banks; Fodder species; Lopping cycle; Fodder values of trees; Alley cropping/hedge cropping; Ecological aspects of agroforestry; Species diversity of plant components; Soil fertility and productivity aspect; Soil and water conservation aspects in agroforestry.	**15**
Unit IV	Management of trees in agroforestry; Important tree species of agroforestry systems: Eucalyptus, poplar, Gmelina, Bamboo etc; Legume trees species: Subabul, Causaurina, Sesbenia, Grewia, Kachnar, Celtis, Ficus etc and important fruit plants; Tree crop interactions, selection of tree species for agroforestry, fodder, fuel and medicinal plants in agroforestry.	**15**

Practical

1. Survey and analysis of land use systems in the adjoining areas.
2. Design and plan of 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 interaction with the practicing farmers.

Suggested Readings:

1. Plant Research and Agroforestry by P.A. Huxley.
2. Tropical Agroforestry by P. Huxley.
3. Carbon Sequestration Potential of Agroforestry Systems: Opportunities and challenges. Advance in Agro forestry by B.M. Kumar and P.K.R. Nair.



4. Ecological Methods for Field and Laboratory Investigations by P. Michael.
5. New Vistas in Agroforestry by P.K.R. Nair, M.R. Rao and L.E. Buck.
6. An Introduction to Agroforestry by P.K.R. Nair.
7. Agroforestry Systems in the Tropics P.K.R. Nair.
8. Agroforestry as a strategy for carbon sequestration by P.K.R. Nair, B.M. Kumar and D.N. Vimala.
9. Agroforestry: Potentials and Opportunities by P.S. Pathak and Newaj Ram

Semester- IV

Undergraduate Diploma in Forestry

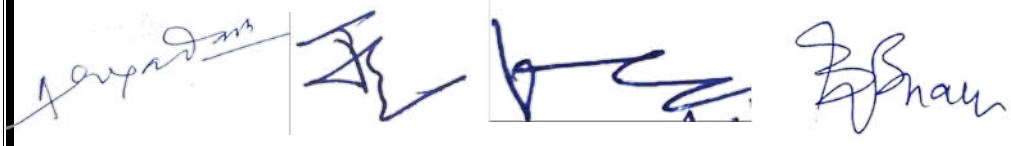
SPECIFIC COURSE/GENERIC ELECTIVES (DSE/GE)-Forest Protection

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/GE: Forest Protection	4	3	0	1	Passed class in III semester	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Diploma in Forestry	**Year: II**	**Semester: IV** **Paper: GE 2**
Subject: Forestry		
Course: DSC/GE	**Course Title: Forest Protection**	
Course Outcomes: In this course, students will become aware of different forest tree diseases and different methods to control them for better productivity and management of the forest.		
Credits: 4	**Generic Elective**	
Max. Marks: As per Univ. rules	**Min. Passing Marks: As per Univ. rules**	



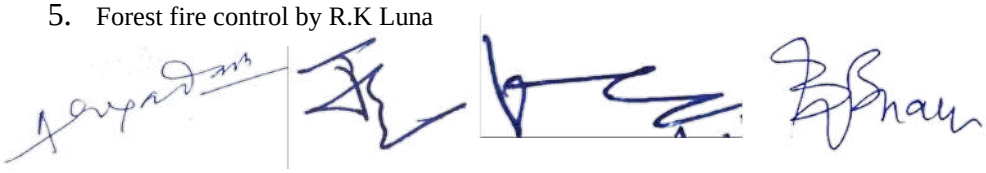
Unit	Topic	No. of Hours
Unit I	Introduction of forest pathology and forest entomology; Introduction of various plants pathogens: Fungi, bacteria, viruses etc; Symptomatology and identification of plant diseases.	**15**
Unit II	Classification of forest tree diseases and their control; Common diseases in forest trees: Root rot, heart rot, wilt, stem canker, stem rust, die-back, galls, leaf spots, leaf blight, powdery mildew and leaf rust; Nursery diseases and control measures of diseases.	**15**
Unit III	Forest insects and its effect on plants: defoliating, skeletonizers, shoot borers, wood borers, twig and root insects, seed and cone insects, and gall markers; Methods of control against insects and pests: Silvicultural, biological and chemical.	**15**
Unit IV	Forest fire; Encroachment; Shifting cultivation; Illicit felling; Grazing/ browsing.	**15**

Practical

1. Identification and symptoms of different forest tree diseases.
2. Various pathogenic and non-pathogenic diseases of forest tree species.
3. Forest fires and their types.
4. Various diseases of Sal, Shisham, Teak, Chir, Deodar, Eucalyptus and Khair.

Suggested Readings:

1. Forest protection by L.S. Khanna
2. Handbook of forest protection by S.S. Negi
3. Forest Entomology by K.C. Joshi
4. Forest fire by S.S. Negi
5. Forest fire control by R.K Luna



Semester-IV

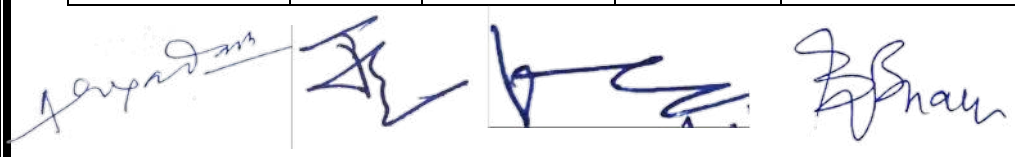
Undergraduate Diploma in Forestry

Ability Enhancement Course (AEC)-Indian Language

No. of Hours - 45

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		
AEC: Indian Language	2	2	0	0	Passed Class III Semester	Nil



Semester-IV

Undergraduate Diploma in Forestry

Skill Enhancement Course (SEC)- Plantation Technology

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		
SEC: Plantation Technology	2	0	0	2	Passed Class III semester	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY		
Programme: Undergraduate Certificate in Forestry	**Year: II**	**Semester: IV** **Paper: SEC**
Subject: Forestry		
Course: SEC	**CourseTitle: Plantation Technology**	
Course Outcomes: Students will learn the practical aspects and knowledge about raising, care, development and use of tree species in a specific site and specific objectives.		
Credits:2		**Discipline Specific Course**
Max. Marks: As Per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Afforestation of problematic sites- drought prone, arid, marshy, saline land, sandy soil and suitable species for plantation of these sites. Failures of plantations- reason for failure and remedial techniques. Seed stands, seed collection, storage and supply of seeds.	**15**
Unit II	Important tree species of plantation i.e. native and exotic, broad leaves: Oak, Sal, Shisham, Acacia, Eucalyptus, Popular and Bamboo. Conifers: Chir-pine, Deodra, Surai.	**15**

Suggested Readings:

4. Plantation Forestry in India by R. K. Luna

5. Nursery and Plantation Practices by V. Kumar

6. Alternative Energy Development and Management by S. A. Abbasi

Semester-IV

Undergraduate Diploma Forestry

Value addition Course (VAC) – Value addition to NTFPs

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		
VAC- Value addition to NTFPs	2	2	0	0	Passed Class III Semester	Nil

UNDERGRADUATE DIPLOMA IN FORESTRY

Programme: Undergraduate Diploma in Forestry	**Year: II**	**Semester: IV** **Paper: VAC**
Subject: Forestry		
Course: VAC	**Course Title: Value addition to NTFPs**	

Course Outcomes: In this course, the student will learn about the different non-timber forest product, their use and techniques of extraction of such products from forest species.

Credits:2	**Discipline Specific Course**
Max. Marks: As Per Univ. rules	**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit III	Forest based industries: Pulp and paper industry, katha & cutch, and sports goods.	**15**
Unit IV	Regulation of international timber trade; World Trade Organization; GATT and International Timber Trade Organization (ITTO).	**15**

Suggested Readings:

1. Forests: The Non- wood resources by A. P. Dwivedi
2. A hand book of Forest Utilization by T. Metha
3. Manual of Indian Forest Utilization by Trotter H. 1982
4. Forest Utilization by FRI, Dehradun
5. Forest Products and their Utilization by S. S. Negi

Semester-V

DISCIPLINE SPECIFIC COURSE (DSC)-Forest Mensuration

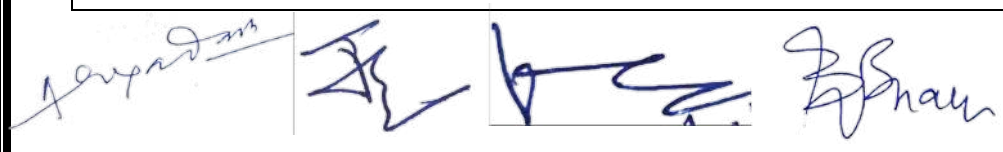
BACHELOR OF FORESTRY

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 Mensuration	4	3	0	1	Passed Class II Year (IV semester)	Nil

BACHELOR OF FORESTRY		
Programme: *Bachelor of Forestry*	**Year: III**	**Semester:V Paper DSC**
Subject: Forestry		
Course: DSC	**CourseTitle: Forest Mensuration**	
Course Outcomes: In this course, the student will get knowledge about the measurement of different standing and felled forest tree species, their use in different forest-based industries, and how to manage different forest and their category.		
Credits: 4		**Discipline Specific Course**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**



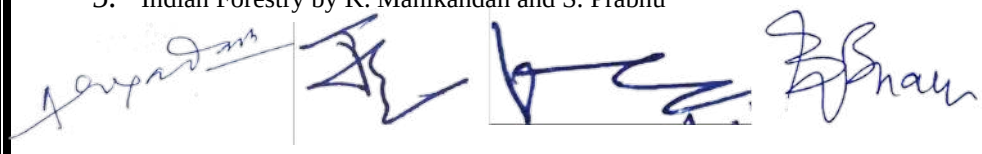
Unit	Topic	No.of Hours
Unit I	Forest mensuration; Definition and objectives; Scales of measurement; Units of measurements; Precision, bias, and accuracy.	**15**
Unit II	Tree measurements: Diameter and girth measurements; Breast height measurements; Instruments used; Measurement of height; Definitions; Methods of measurement of height ocular; Non-instrumental and instrumental methods; Sources of error in height measurements of leaning trees.	**15**
Unit III	Tree stem form; Metzgr's theory; Form factor; Types of form factor; Form height; Form quotient; Form class; Volume measurements of standing trees fell tree and volume tables.	**15**
Unit IV	Determination of growth of trees; Diameter and height growth; Increment; Types of increment; CAI and MAI; Increment percent and instrument used; Stem density; Canopy density; Crown; Competition factor; Site quality.	**15**

Practical

1. Determination of length, measurements of diameter, girth and basal area of trees using calipers, tape, ruler, pentaprism, and tree caliper, etc.
2. Measurement of height using non-instrumental method.
3. Preparation and use of simple height measuring instruments: Christen's hypsometer, Smithies hypsometer.
4. Measurement of tree height using instrumental methods: Ravi Altimeter, Abney's level, Haga altimeter, relaskop, clinometer, blumeleiss, hypsometer, and laser hypsometer.
5. Volume determination of standing and felled trees.
6. Exercise on stump analysis.
7. Exercise on stem analysis, annual ring counting using ring borer.
8. Preparation of volume tables and local volume tables.

Suggested Readings:

1. Forest Mensuration and Biometry by A.N. Chaturvedi and L.S. Khanna
2. Forest mensuration: A Handbook for Practitioners by Forestry Commission Publications
3. Forest Mensuration by B. Husch, T.W. Beers and Kershaw
4. Forest Mensuration by V.A. Laar and A. Akca
5. Indian Forestry by K. Manikandan and S. Prabhu



Semester-V

Bachelor of Forestry

DISCIPLINE SPECIFIC ELECTIVES/ GENERIC ELECTIVE (DSE/GE)-Watershed Management

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/GE: Watershed Management	4	3	0	1	Passed Class II Year (IV semester)	Nil

BACHELOR IN FORESTRY

Programme: ***Bachelor in Forestry***	**Year: III**	**Semester: V** **Paper: DSE**
Subject: Forestry		
Course: DSE	**Course Title: Watershed Management**	

Course outcomes: Students will learn about the watershed, its types, their uses, and how to manage a watershed i particular region.

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

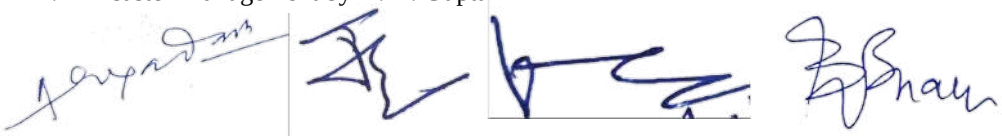
Unit	Topic	No. of Hours
Unit I	Introduction, objectives and importance of watershed; Watershed characteristics; Degradation of watershed; Soil and water erosion and their conservation measures.	**15**
Unit II	Hazards in watershed: Flood, drought, sedimentation and their management; Monitoring and evaluation of watershed projects.	**15**
Unit III	Role of forests in watershed management; Role of community in watershed Management and PRA tools and techniques used for watershed development.	**15**
Unit IV	Methods of soil conservation: strip cropping, contour farming, conservation drainage, gully control, agroforestry.	**15**

Practical:

1. Soil testing and measurement of soil loss
2. Calculation of water storage capacity of soil
3. Measurement and estimation of run-off

Suggested Reading:

1. Watershed Management by M.E.M. Tidemen
2. Watershed Management by Chandrawati and J. Shagufta
3. Principles of Watershed Management by S. K. Dutta
4. Disaster Management by H. K. Gupta



Semester-V

BACHELOR OF FORESTRY

SKILL ENHANCEMENT COURSE (SEC)- Propagation of Medicinal and Aromatic Plants

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		
SEC: Propagation of Medicinal and Aromatic Plants	2	0	0	2	Passed Class II Year (IV semester)	Nil

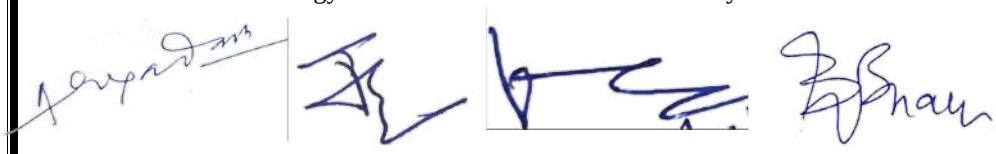
BACHELOR OF FORESTRY

Programme: Undergraduate Diploma in Forestry	**Year: III**	**Semester:V** **Paper: SEC**
Subject: Forestry		
Course: SEC	**Course Title: Propogation of Medicinal and Aromatic Plants**	
Course Outcomes: Students will learn the practical aspects and knowledge about different medicinal and aromatic plants, their distribution, habitat, importance, and use, especially those growing in the Himalayan region.		
Credits: 4		**Generic Elective**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Identification of medicinal and aromatic plants. Ecology and biology, propagation techniques of medicinal and aromatic plants (seed and vegetative parts), germinationcharacteristics, viability and plant percent, survival rate of selected medicinal and aromatic plants.	15
Unit II	Effect of growing media. Drug descriptors for medicinal and aromatic plants, Production, storage and marketing of medicinal and aromatic plants. Important constituents of medicinal and aromatic plants, different uses and benefits of medicinal and aromatic plants	15

Suggested Readings:

1. Medicinal and Aromatic Plants by Malhotra Publ. House
2. Reviews on Indian Medicinal Plants by A. K. Gupta & M. Sharma
3. Quality Standards of Indian Medicinal Plants by A. K. Gupta, N. Tandon & M. Sharma
4. Breeding research on aromatic and medicinal plants by C. B. Johnson & C. Franz
5. Agrotechniques of Medicinal Plants by R. Sharma
6. Role of Biotechnology in Medicinal and Aromatic Plants by I. Alikhan & A. Khanum



Semester-VI

Bachelor of Forestry

DISCIPLINE SPECIFIC COURSE (DSC)- Forest Management and Policies

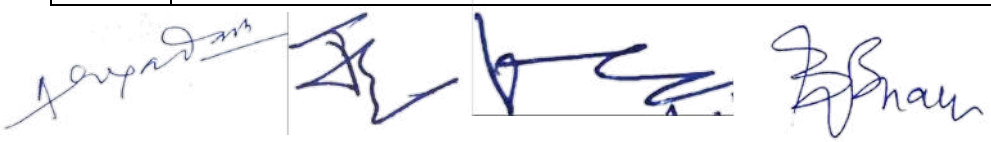
No. of Hours - 60

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		
DSC: Forest Management and Policies	4	3	0	1	Passed Class II Year (V semester)	Nil

BACHELOR OF FORESTRY		
Programme: Bachelor of Forestry	**Year: III**	**Semester: VI Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Forest Management and Policies**	
Course Outcomes: In this course, students will learn about the forest, their types, classification based on classification, their different management strategies, and also different legislation and policies related to forests and wildlife.		
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	Definition, scope, objective, and principles of forest management; Classification of forests: Administrative, territorial, silviculture;	15



Unit II	Sustained yield: Definition, principles and limitations; Rotation: Definitions, various types of rotations, length of rotations, choice of type and kind of rotation; Normal forest: Definitions, basic factors of normality, kinds of abnormality in regular and irregular forest; CAI and MAI curves and increment percent. Distribution of age classes and age gradation in even and uneven aged forest and growing stock;	15
Unit III	Yield regulation: Definition, principle and method of yield, area method, and Von Mental method for yield regulation. Forest working plan- Preparation, working plan code, measurement of growing stock, case study of working plan of division	15
Unit IV	Forest policy: Relevance and scope; National Forest Policy-1894, 1952 and 1988; Forest laws; Indian Forest Act-1927; Forest Conservation Act-1980; General provision and silent features; Forest (Conservation) rules and amendments. Wildlife Protect Act-1972 and amendments; The Biological Diversity Act-2002; Environmental (Protection) Act 1986, National Green Tribunal Act-2010; Important forest rules and guidelines; Silent features and national biodiversity authority; Forest Right Act-2006.	15

Practical

1. Visit different forest divisions to study the various stand management aspects including thinning, felling, and sale of timber.
2. Study forest organizational setup and forest range administration including the booking of offenses.
3. Visit to forest plantation- Field Exercise for the estimation of actual growing stock volume.
4. Study the different field exercises for data collection for working plan.

Suggested Readings:

1. Essentials of Forest Management by S. Balakathiresan
2. Forest Management in India-Issues and Problems by V. Desai
3. Timber Management: A Quantitative Approach by Jerome. L. Cutteretal
4. National Working Plan Code by MoEFCC, New Delhi.
5. Forest Management, IBD, Dehradun.
6. Forest Management by P.R. Trivedi and K.N. Sudarshan
7. Forest Management by Ram Prakash.
8. Forest Policy and Law by A.N. Chautervedi
9. Forest Policy and Laws by S.S. Negi
10. Forest Laws and Policies in India by A.K. Poddar
11. Compilation of Forest Policy and Laws by C.A. Rahman
12. Indian Forest Act 1972 by Vinod Rishi
13. Legal forestry by S. Mehra.

Semester-VI

Bachelor of Forestry

DISCIPLINE SPECIFIC ELECTIVES/GENERIC ELECTIVE (DSE/GE)- Seed Science and Technology

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/GE: Seed Science and Technology	4	3	0	1	Passed Class II Year (V semester)	Nil

BACHELOR OF FORESTRY

Programme: Bachelor of Forestry	**Year: III**	**Semester:VI Paper: DSE**
Subject: Forestry		
Course: DSE	**CourseTitle: Seed Science and Technology**	

Course Outcomes: The course will equip the students regarding physical characteristics of seed, germination and treatment in seed, seed dormancy, seed viability test, seed quarantine, seed legislation, angiosperm and gymnosperm seed, and the importance of seed for regeneration of forests.

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	Definition of seed, classes-types of seed and its importance; Role of seed technology in nursery stock production; Production of quality seed; Seed biology and seed production, seed sources, seed collection and handling.	**15**
Unit II	Identification of seed collection areas seed orchards; Maintenance of genetic purity; Isolation and rouging; Seed source (provenance and stands)., Seed testing, seed storage, seed dormancy. Seed germination and seedling establishment. Seed certification and quarantine.	**15**

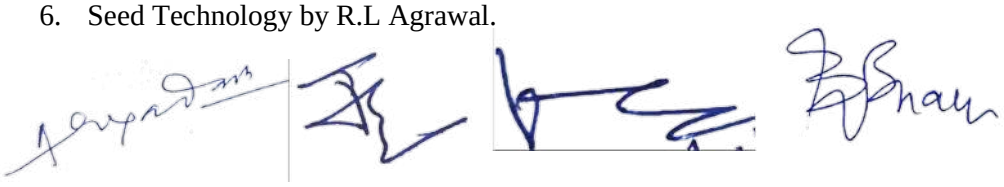
Unit III	Selection of seed tree (genotypic and phenotypic selection); Plus tree (pure stands, elite seed tree, isolated tree and their location); Seed Collection: Planning and organization, collection methods, factors affecting seed collection and seed maturity; Seed processing: Seed extraction, drying, blending, cleaning, grading, treating, bagging, labeling and storage; Orthodox, intermediate and recalcitrant seeds, precautions of handling of recalcitrant seeds, natural longevity of tree seeds, factors affecting longevity.	**15**
Unit IV	Seed Act and International seed testing agencies, seed requirement and exchange. Seed pathology, important seed insects and pests	**15**

Practical:

1. Collection, extraction and cleaning of fruits/seeds
2. Seed maturity indices in the given plants
3. Determination of seed size, weight, moisture content and purity of seed lots
4. Estimation of germination capacity and germination value, cutting excised embryo
5. TTZ test of viability estimation
6. Seed pathological test

Suggested Reading:

1. Forest tree improvement and seed technology by M. Dutta
2. Hand book of Seed Science and Technology.
3. An introduction of seed technology by J.R. Thompson.
4. Techniques in seed science and technology by P.K. Agrawal and M. Dadlani.
5. Principles of seed technology by P.K. Agrawal.
6. Seed Technology by R.L Agrawal.



Semester-VI

BACHELOR OF FORESTRY

SKILL ENHANCEMENT COURSE (SEC)- Propagation of Medicinal and Aromatic Plants

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		
SEC: Propagation of Medicinal and Aromatic Plants	**2**	**0**	**0**	**2**	**Passed Class II Year (V semester)**	**Nil**

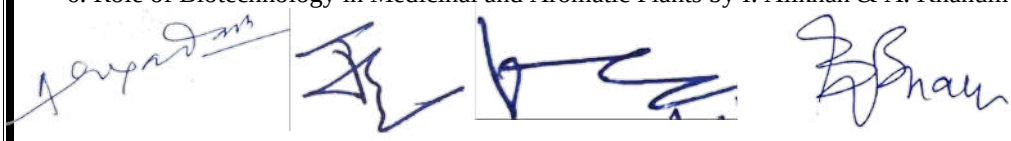
BACHELOR OF FORESTRY

Programme: Undergraduate Diploma in Forestry	**Year: III**	**Semester:VI Paper: SEC**
Subject: Forestry		
Course: SEC	**Course Title: Propogation of Medicinal and Aromatic Plants**	
Course Outcomes: Students will learn the practical aspects and knowledge about different medicinal and aromatic plants, their distribution, habitat, importance, and use, especially those growing in the Himalayan region.		
Credits: 4		**Generic Elective**
Max. Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**

Unit	Topic	No. of Hours
Unit I	Assessment of population in natural habitat in major medicinal and aromatic plants. Calculation of species richness of diversity of medicinal plants in different forest types. Conservation of medicinal plants and its techniques: In situ, ex- situ and biotechnological.	15
Unit II	Cultivation and propagation of medicinal and aromatic plants: *Valeriana jatamasi, Viola species, Rauvolfia serpentina, Ocimum sanctum, Phyllanthus emblica,* Terminalia bellirica, Terminalia arjuna, Terminalia chebula, *Centella asiatica, Berberis species, Asparagus officinalis, Tinospora cordifolia,Taxus baccata, Vinca rosa, Cymbopogon spp. Cedrus deodara, Prunus armenica*	15

Suggested Readings:

1. Medicinal and Aromatic Plants by Malhotra Publ. House
2. Reviews on Indian Medicinal Plants by A. K. Gupta & M. Sharma
3. Quality Standards of Indian Medicinal Plants by A. K. Gupta, N. Tandon & M. Sharma
4. Breeding research on aromatic and medicinal plants by C. B. Johnson & C. Franz
5. Agrotechniques of Medicinal Plants by R. Sharma
6. Role of Biotechnology in Medicinal and Aromatic Plants by I. Alikhan & A. Khanum



Semester-VII

Bachelor of 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 with Honours*	**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.of Hours
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

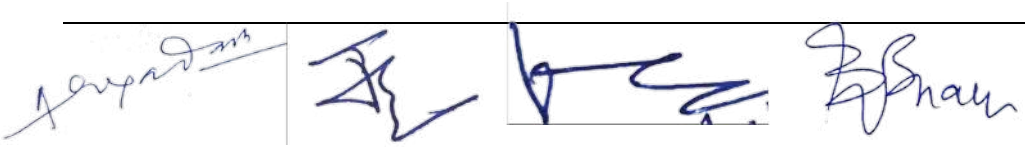
	decomposition; Forest nutrient and cycling-input, accumulation (storage) and output (ecosystem loss) and nutrient use efficiency.	
Unit III	Disturbance in forest ecosystem, nature of disturbance, fire, wind, flood and invasive species and restoration of degraded ecosystems; Forest nutrition and Biogeochemical 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

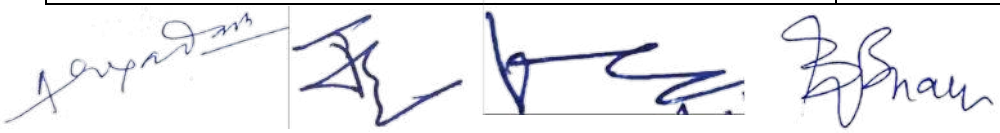
Bachelor of Forestry with Honours

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 with Honours***	**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**	



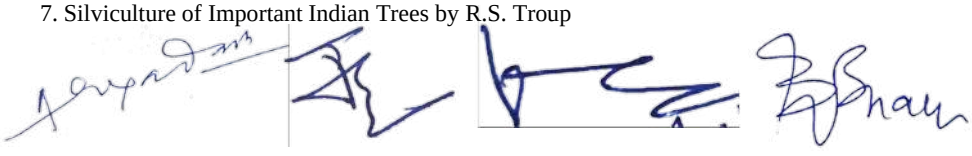
Max. Marks: As per univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Introduction, definition, and scope of silviculture; Objects of silviculture; Form and growth of trees; Tree morphology: Stem, root system, form of roots, adaptability, mycorrhiza, ligno tubers 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 Silvicultural Systems 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 with Honours	**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**	



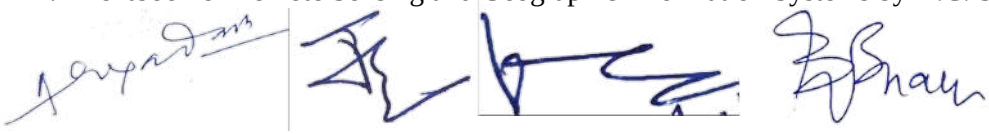
Unit	Topic	No. of Hours
Unit I	Introduction, definition and importance of remote sensing; Basic of remote sensing; Platform and sensor remote sensing (active and passive system); Aerial remote sensing.	**15**
Unit II	Remote sensing satellites, image and ground truth; Systems for data collection and analysis.	**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 by M. 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

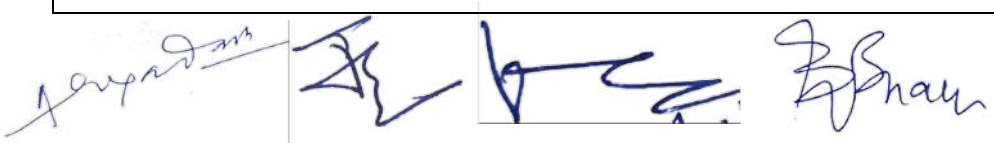
DISCIPLINE SPECIFIC ELECTIVES (DSE3) - Forest Pathology

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 with Honours	**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.		



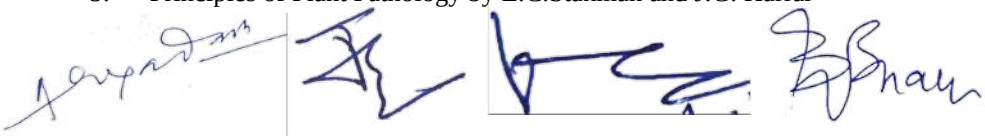
Credits:4		**Discipline Specific Elective**
Max.Marks: As per Univ. rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No. of Hours**
Unit I	Introduction to Forest Pathology:Definition and scope of forest pathology, Importance of forest health, Historical perspectives	**15**
Unit II	Protection 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. Plant Pathology by G.N Agrios
2. Plant Pathology by R.S.Mehrotra and A.Aggarwal
3. Plant Diseases by R.S.Singh
4. Introduction to Principles of Plant Pathology by R.S. Singh
5. Principles of Plant Pathology by E.C.Stakman and J.G. Harrar



Semester-VII

Bachelor of Forestry with Honours

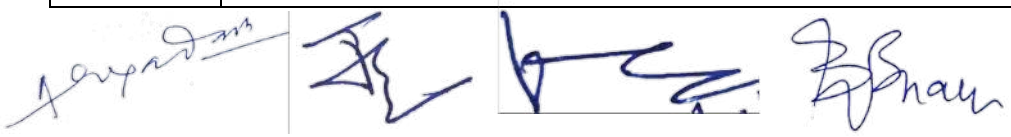
DISCIPLINE SPECIFIC ELECTIVE (GE): ENVIRONMENTAL AUDIT AND EIA

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 with Honours	**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**



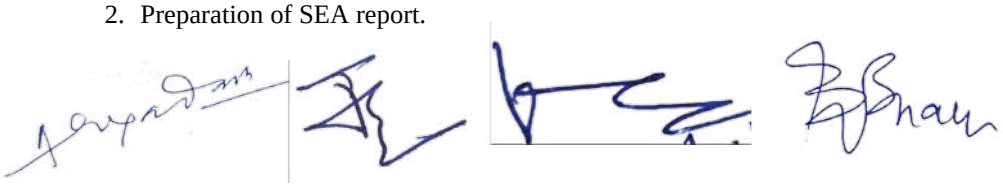
		Hours
Unit I	Introduction, principle and purpose of EIA and its significance for the society; Environmental components of EIA: Air, water, land, noise and ecological environment; Cost and benefits of EIA.	15
Unit II	EIA involvement during project life cycle; EIA management; Principles and management 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 Assessment

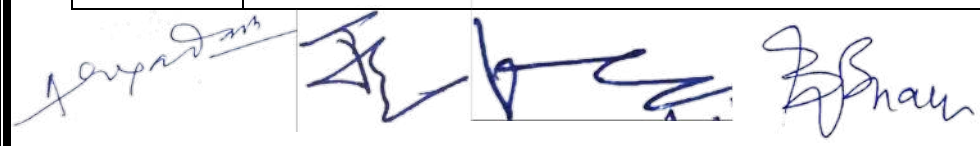
No. of Hours-60

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

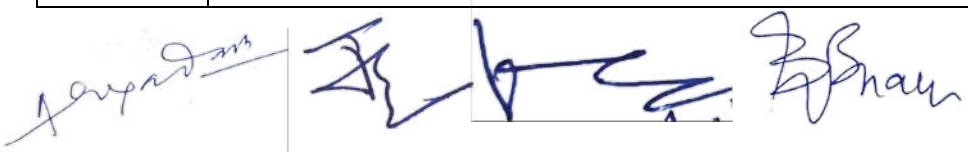
CourseTitle	Credits	Credit distribution of the Course			Eligibility criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
GE2: Forest Resource Assessment	4	3	0	1	Passed Class III Year (VI semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester: VII** **Paper: GE 2**
Subject: Forestry		
Course: GE1	**Course Title: Forest Resource Assessment**	
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

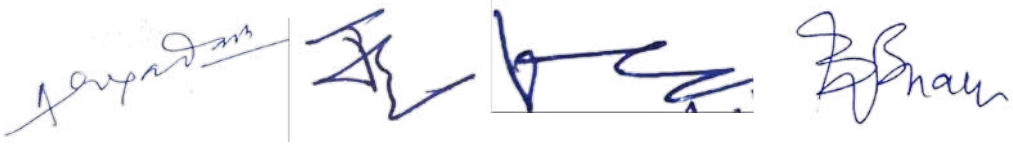
Bachelor of Forestry with Honours

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	**Course Title: 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

Course Title	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 semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS		
Programme: Bachelor of Forestry with Honours	**Year: IV**	**Semester:VIII Paper: DSC**
Subject: Forestry		
Course: DSC	**CourseTitle: 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 semeste	Nil

BACHELOR OF FORESTRY WITH HONOURS

Programme: Bachelor of Forestry with Honours	**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**

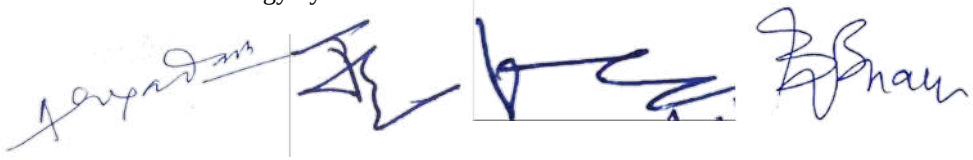
Unit IV	Physical, cultural, chemical and biological control methods of insects; Use of attractions and repellants, male sterility techniques principles and methods of integrated pest's managements.	**15**

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 semeste	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,	**15**

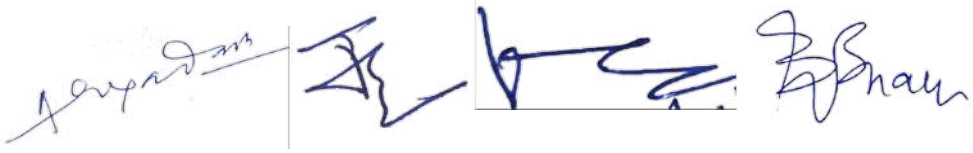
	concept of allelopathy and its impact of agroforestry.	
Unit IV	Energy plantations: choice of species and its management, lopping of top-feed species such as freuuency and intensity of lopping, organic farming, financial analysis and Economic evalution of agroforestry system: cost benefit and land equivalent 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

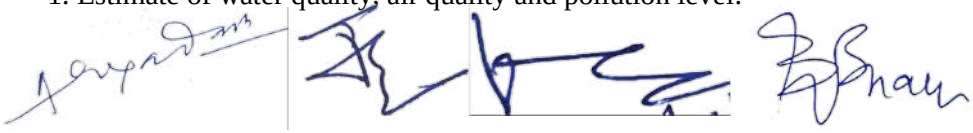
	pollution f. Thermal pollution g. Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. • Pollution case studies. • Diaster management: floods, earthquake, cyclone and landslides.	
Unit IV	Social 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. 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		
GE 1: Tree Physiology	4	3	0	1	Passed Class III Year (VII semester	Nil

Programme: Bachelor of Forestry with Honours		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.

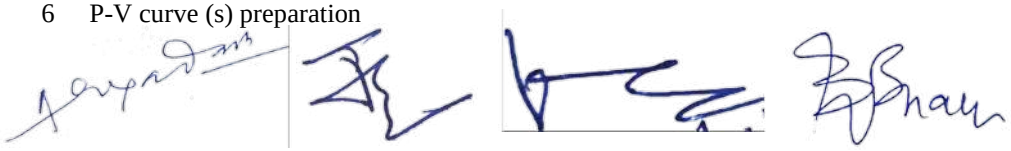
2 Estimation of respiration quotient by Ganong respirometer

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**



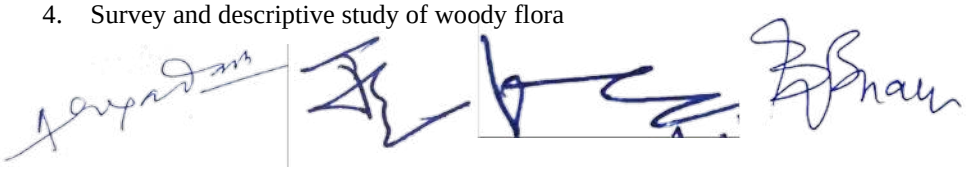
Unit	Topic	No. of Hours
Unit I	Introduction, importance and scope of dendrology; Principles and systems of classification of plants; Bentham and Hooker's and Hutchinson's System; Modern classification.	**15**
Unit II	Plant Nomenclature: Objectives, principles and international code of botanica nomenclature; 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. Gernra plantarum 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

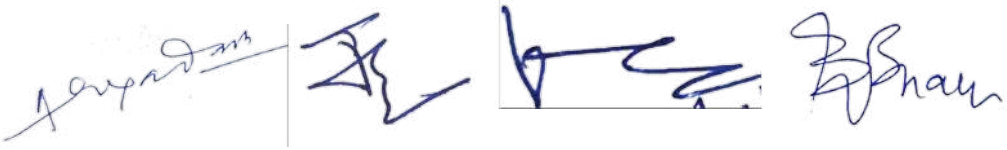
Bachelor of Forestry with Honours

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 with Honours	Year: IV	Semester: VIII Paper: DISSERTATION
Subject: Forestry		
Course: DISSERTATION	Course Title: Dissertation	

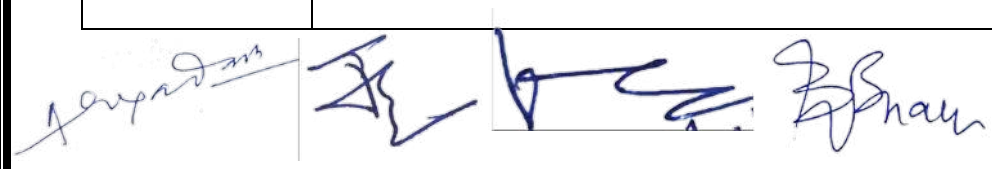


Course Outcomes:

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**



Semester-IX

Master's in Forestry

DISCIPLINE SPECIFIC COURSE (DSC)- Forest Products and Industries

No. of Hours -60

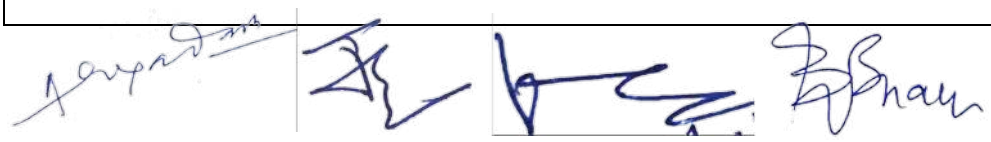
CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title	Credits	Credit distribution of the Course			Eligibility criteria	Pre- requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
DSC: Forest Products and Industries	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY

Programme: *Master's in Forestry*	**Year: V**	**Semester: IX** **Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Forest Products and Industries**	

Course Outcomes: The course will equip the students with knowledge of wood-based industries. How is it affecting the economy of the country, such as paper and pulp, match and splint, sports and pencil making, besides this, wood extracts resins and gum, katha, tannin, and various types of non-timber products? Practice will make them aware of the extraction method of different products of wood.



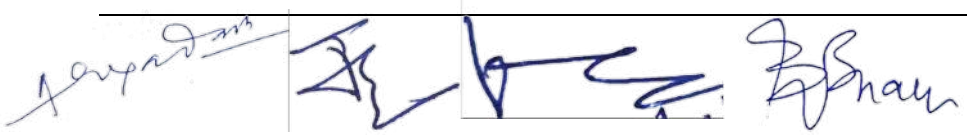
Credits: 4		Discipline Specific Course
Max. Marks: As per univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Introduction, scope, and importance of forest-based industries about the Indian economy; Brief description of types of forest-based industries in India.	**15**
Unit II	Pulp and paper industry: Types of paper, raw material, pulping (mechanical, chemical, and semi-chemical), beating, bleaching, sizing, and sheet formation; Description of rayon and other cellulose-derived products. Scarification of wood chemistry and processes. Manufacture of katha and cutch.	**15**
Unit III	Wood improvement: Composite wood, plywood, laminated wood, core board, sandwich board, particle board, and their manufacturing processes; Properties and uses; Principles of destructive distillation of hardwood and softwood; Preparation of wood alcohol, acetic acid, acetone, charcoal, and allied chemicals; Production of wood molasses, alcohol yeast and other by-products from wood hydrolysis and wood substitution.	**15**
Unit IV	Manufacture of katha and cutch; NTFP-based industries drugs and essential oils, bidi, resin, turpentine, rosin, oleoresin, gum-resin, lac and shellac, tans, dyes, leaves and fodder of various tree species, honey, wax, silk, soap, fibers, nuts, fruits, flowers, oil yielding plants and grasses, minerals, medicinal and aromatic plants and spices.	**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 in dustries.
6. To visit the pulp and paper industries.
7. Identification of different types of wood.

Suggested Readings:

1. Wealth of India by CSIR
2. Yearbook of Forest Products by FAO
3. Forest: The Non-wood Resources by A.P. Dwivedi
4. Forest Products and Their Utilization by S.S. Negi
5. A Handbook of Forest Utilization by T. Mehta
6. Handbook of Paper and Pulp Technology by W. Britt and Kenneth
7. The Chemistry of Solid Wood by R. Rowell



Semester-IX

Master's in Forestry

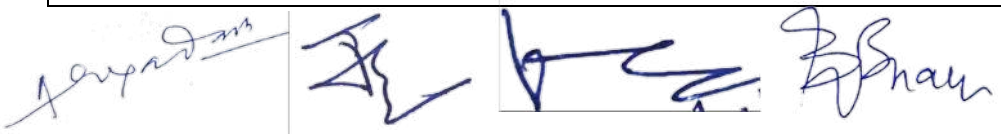
DISCIPLINE SPECIFIC ELECTIVES (DSE1)-Energy Plantation and Biofuels

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: Energy Plantation and Biofuels	**4**	**3**	**0**	**1**	**Honours Degree in Forestry**	**Nil**

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX Paper DSE1**
Subject: Forestry		
Course: DSE1	**CourseTitle: Energy Plantation and Biofuels**	
Course Outcomes: To acquaint oneself with various aspects of production, integrated nutrient and irrigation management, and ecological factors in raising forest plantations.		



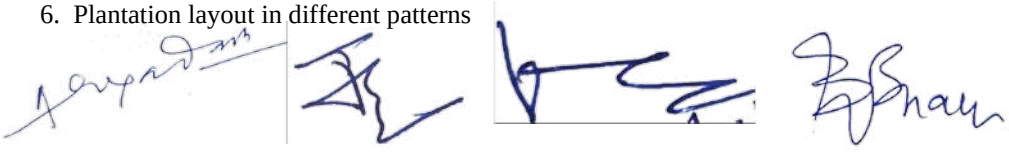
Credits: 4		Discipline Specific Elective
Max. Marks: As per univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Selection of site for planting operations, arrangement of staff, organization of plantation work, method of planting techniques, planting activities and maintenance of plantations; Choice of species adopted; Characteristics of fodder and fuel-wood.	**15**
Unit II	Problems, techniques, and suitable species for afforestration in desert, waterlogged area, saline and alkaline soils, degraded hills, mine spoil; Energy and biomass consumption pattern in India; Environment impact of biomass energy.	**15**
Unit III	Assessment of bio-energy programs in India; Power generation from energy plantation; High Density Energy Plantation (HDEP); Land and biomass availability for sustainable bio energy; Petro- crops; Criteria for evaluation of different species for energy plantation.	**15**
Unit IV	Impact of energy efficiency in power sector; Need for research and development on environment friendly and socio-economically relevant technologies; Network of NGOs in renewable energy use; Energy from Plants, it's Problems and prospects; Recent energy technologies in the production of bio-fuels.	**15**

Suggested Reading:

1. Plantation Forestry in India by R. K. Luna
2. Nursery and Plantation Practices by Vinod Kumar
3. Plantation and Nursery Techniques of Forest Trees by Ram Prakash
4. Biodiseal: Biodegradable alternative fuel for dieseal engines by Shastry and Gadepalli

Practicals:

1. Identification of important fuel woods and petro-crop
2. Dtermination of calorific values, moisture and ash content biomass
3. Study of different bio-fuels used in India
4. Study of energy consumption pattern in rural and urban areas through survey
5. Visit to nearby energy plantation and energy unit
6. Plantation layout in different patterns



Semester-IX

Master's in Forestry

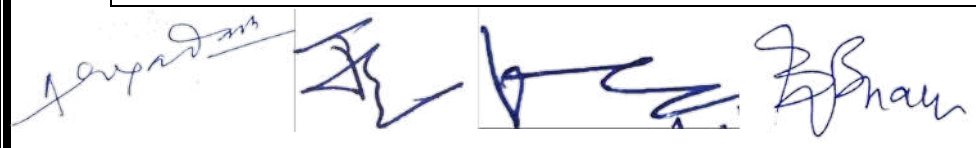
DISCIPLINE SPECIFIC ELECTIVES (DSE 2)- Natural Resources Management

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: Natural Resources and Management	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX Paper DSE2**
Subject: Forestry		
Course: DSE2	**CourseTitle: Natural Resources and Management**	
Course Outcomes: To develop an understanding of students about various energy resources, fossil fuels, global climatic changes and their effect on forest aquatic ecosystems, climatology, and meteorology.		



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	The energy resources, uses, and crises; conventional and non-conventional sources of energy; Global change and sustainable issues; Concept of minimum viable population; Importance of energy; Per capita energy consumption; Energy conservation; Forest resources.	**15**
Unit II	Fossil fuels (coal, petroleum, LPG and natural gas); Types: Solar energy, wind energy, hydro energy, tidal energy, geothermal energy and OTEC; Nuclear energy; Biogas; Indian Renewable Energy Development Agency (IREDA); The role of energy manager; Environmental impact of energy; Energy Legislation-Energy Conservation Act, 2001.	**15**
Unit III	Climate change: An overview; Climate and weather; Climate change mitigation; Tools to study the climate change; Impact of climate change in the mountain, glacial and coastal region; Global warming and the possible effect of global warming; Greenhouse effect; Greenhouse gases; Approaches to deal with global warming.	**15**
Unit IV	Climatology: Tropical Cyclone, Hurricanes, and Tsunami; Atmospheric stability and environmental lapse rate; Role of national and international organization in policy, Planning, and sustainable development; Meteorology: Seasons, monsoon and monsoon circulation, isobars and wind speeds; Measurements of wind, cloud and humidity; Weather.	**15**

Practical

1. To briefly study about the wind energy.
2. To briefly study about the ocean energy.
3. To briefly study about the geothermal energy
4. To briefly study about the hydroelectric energy.
5. To briefly study about the nuclear energy.
6. To briefly study about the solar energy.
7. To study the effect of Rainfall, Temperature, Latitude and Longitude, Aspect and Slope on given forest areas.
8. To study the Environmental Lapse Rate.
9. To Observe, Analysis and Prediction of local area.
10. Measurements of Wind, Cloud and Humidity of local area.
11. Study of tools to study climate change.
12. To study organization for tracking climate and environment problems.
13. Study of different instrument used to examine several environmental conditions.

Suggested Readings:

1. Textbook of Renewable Energy Woodhead Publishing India in Energy Series by S. C. Bhatia, R. K. Gupta.
2. Renewable Energy in India. By Pramod Deo.
3. Energy Resources and Systems. by Tushar Ghosh, .Mark Prelas
4. Energy Crisis: The Future of Fossil Fuels by Daniel R. Faust 2007.

5. The Climate Solution: India's Climate-Change Crisis by Mridula Ramesh.
6. India in a Warming World: Integrating Climate Change by Navroz K. Dubash.
7. Ecological Climatology: Concepts and Applications by Gordon B. Bonan 2008.



Semester-IX

Master's in Forestry

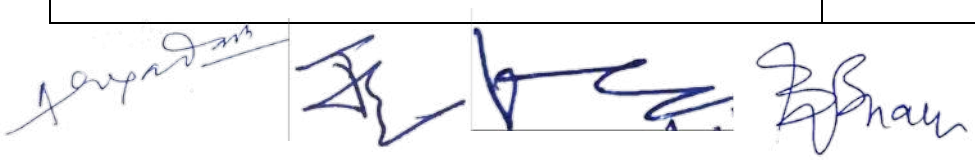
DISCIPLINE SPECIFIC ELECTIVES (DSE 3)-Advances in Tree Seed Technology

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 3: Advances in Tree Seed Technology	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX Paper DSE3**
Subject: Forestry		
Course: DSE3	**CourseTitle: Advances in Tree Seed Technology**	
Course Outcomes: The course will equip the students regarding the physical characteristics of seeds, germination, and treatment in seeds, seed dormancy, seed viability test, seed quarantine, seed legislation, angiosperm and gymnosperm seed, and the importance of seed for regeneration of forest.		
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 history of seed industry in India; Flowering and seed production in gymnosperms and angiosperms; Development and maturation of seed/ fruit; Definition of seed, classes-types of seed and its importance; Role of seed technology in nursery stock production; Production of quality seed; Identification of seed collection areas-seed orchards; Maintenance of genetic purity; Isolation and rouging; Seed source (provenance and stands).	**15**
Unit II	Selection of seed tree (genotypic and phenotypic selection); Plus tree (pure stands, elite seed tree, isolated tree and their location); Seed Collection: Planning and organization, collection methods, factors affecting seed collection and seed maturity; Seed processing: Seed extraction, drying, blending, cleaning, grading, treating, bagging, labeling and storage; Orthodox, intermediate and recalcitrant seeds, precautions of handling of recalcitrant seeds, natural longevity of tree seeds, factors affecting longevity.	**15**
Unit III	Eco-physiological role of seed storage; Classification of seed storage potential; Factors affecting seed longevity; Pre-storage treatment; Physiological change during aging; Storage of orthodox, recalcitrant, and pre-storage intermediate seeds; Fumigation and seed treatment; Seed testing (sampling, mixing, and dividing, determination of genuineness, germination, moisture, purity, vigor, viability); Seed dormancy, classification and breaking of seed dormancy; Different viability and vigor tests, seed pelleting, seed health; Classes of tree seeds, certification and procedures of tree seeds certification.	**15**
Unit IV	Role of temperature, humidity and light in seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging and seed extraction; Seed dispersal mechanism; Field and seed standards and seed legislation; Importance of genetically improved seed in plantation forestry; Status of seed production among major plantation species; Short term supply of superior seed.	**15**

Practical

1. Identification of seeds of tree species, Seed maturity tests.
2. Physical purity analysis.
3. Determination of seed moisture.
4. Seed germination test.
5. Hydrogen peroxide test.
6. Tetrazolium test for viability.
7. Seed vigor and its measurements.
8. Study of seed structure, colour size, shape and texture.
9. Harvesting and seed extraction.
10. Methods of seed production.
11. Seed processing machines.
12. Visit to seed production units.

Suggested Readings:

1. An Introduction to Seed Technology by J.R. Thompson.
2. Techniques in Seed Science and Technology by P.K. Agrawal and M. Dadlani.
3. Principles of Seed Technology by P.K. Agrawal.
4. Seed Technology by R.L Agrawal.

Semester-IX

Master's in Forestry

GENERIC ELECTIVES (GE 1)- World Forestry and Tribal Development

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 1: World Forestry and Tribal Development	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX** **Paper: GE1**
Subject: Forestry		
Course: GE1	**CourseTitle: World Forestry and Tribal Development**	
Course Outcomes: World Forestry and Tribal Development often refer to initiatives and programs aimed at promoting sustainable forest management and improving the livelihoods of indigenous and tribal communities who depend on forests.		

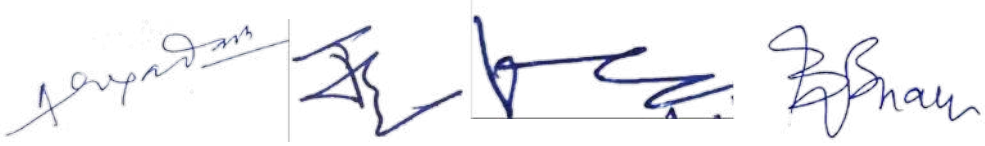
Credits: 4		**Generic Elective**
Max. Marks: As per univ. rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No. of Hours**
Unit I	Introduction, world distribution of forests and their classification. Important forests of the world, North America, South America, Europe, Africa, Asia.	**15**
Unit II	Critical examination of world forest resources. Major forest-based industries of the world. International Forestry organizations and agencies. Trade pattern in forestry raw material. Employment opportunities in forestry sectors.	**15**
Unit III	Introduction and characteristics of tribes, tribal life and livelihood. Tribal demography and administration. Social organization, race of Indian tribes, major Indian tribes- Gonds, Santhal, Bhils, Tharu, Bhotia, Van Rawat and other tribes of Uttarakhand.	**15**
Unit IV	Tribal economy and policies of tribal welfare. Tribal in relation to forest. Tribal cooperative societies. Relation between tribes and forest.	**15**

Recommended Readings:

1. World Forestry by S. S. Negi
2. Global Forest Resources by R. N. Chauhan
3. Tribal Development in India by Rajeeva
4. The Scheduled Tribals and Other Types
5. Tribal and Community Forest Management by M. Bandi

Practicals:

1. Comments and marking of various forest types of the world
2. Forest types of Africa, Asia, Australia, Europe, North America, South America contients separately on the maps,
3. Comments on various international forestry organizations and agencies
4. Visit to tribal villages of the state and note their traditions and cultures



Semester-IX

Master's in Forestry

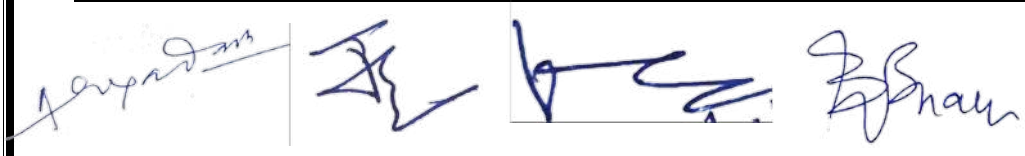
GENERIC ELECTIVES (GE 2)- Analytical Technique

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: Analytical Technique	4	4	0	0	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX** **Paper: GE2**
Subject: Forestry		
Course: GE2	**CourseTitle: Analytical Technique**	
Course Outcomes: The outcomes for a course in "Analytical Techniques" typically focus on equipping students with the skills and knowledge needed to apply various analytical methods in practical scenarios. These techniques can be used in a wide range of fields, including science, engineering, business, and social sciences.		
Credits: 4	**Generic Elective**	



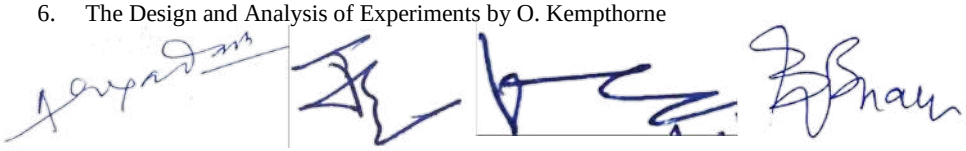
Max. Marks: As per univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Determine the pH of soil, soil moisture content, water holding capacity, physical parameter, chemical parameter, Identification of wood,	**15**
Unit II	Estimation and testing hypothesis, estimate and estimator, properties of good estimator, test of significance- t, chi- square test, test of significance, Analysis of variance (ANOVA)- one way and two way classification with single and more than one cell frequency.	**15**
Unit III	Phytosociological analysis, Method of Sampling- simple random sampling, stratified random sampling, multistage sampling, cluster sampling. Quardat methods, line transect method, point-frame methods.	**15**
Unit IV	Design of experiment, principles of experimental design, complete random design (CRD), Random Block Design (RBD), Latin Square Design (LSD).	**15**

Practical

1. Formation of frequency distribution. Diagrammatic and graphic representation. Calculation ofdifferent measures of central tendency.
2. Computation of various measures of dispersion.
3. Calculation of coefficient of variation-coefficients of skewness and kurtosis.
4. Computation of product-moment correlates on coefficient-rank correlation, coefficient-and coefficient of concordance.
5. Fitting of linear regression models for prediction. Simple problems on probability fitting of binomial distribution. Fitting of Poisson distribution, problems on normal distribution.
6. Selection of simple random sample – estimation of parameters – sample size determination.
7. Large sample tests. Small sample tests, t and F tests, Chi-square test, test of goodness of fit test of independence of attributes in a contingency table - computation of mean–square contingency.
8. Analysis of variance-construction of ANOVA table of one-way classified data. Analysis of
9. variance-construction of ANOVA table of two-way classified data.

Suggested Readings:

1. Statistical Theory in Research by R.L Anderson and Bancroft
2. Experimental Designs by W.G Cochran and G.M. Cox
3. Design and Analysis of Experiments by M.N. Das and N.C Giri
4. Experimental Design by W.T. Federer and Macmillan
5. Statistical Procedures for Agricultural Research by K.A. Gomez and A.A Gomez
6. The Design and Analysis of Experiments by O. Kempthorne



Semester-IX

Master's in Forestry

DISSERTATION

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/Fieldwork/ Practical/Practice		
DISSERTATION	6	2	4	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: IX** **Paper: DISSERTATION**
Subject: Forestry		
Course: DISSERTATION	**Course Title: Dissertation**	

Course Outcomes:

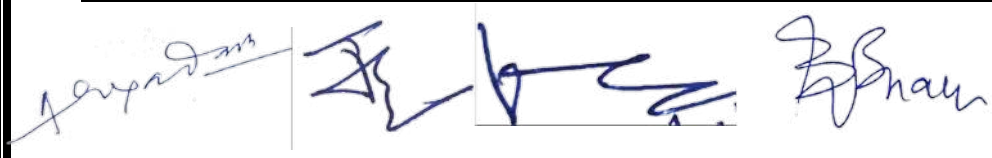
After studying this course, the students will be able to:

- 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.
- 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.

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**



Semester-X

Master's in Forestry

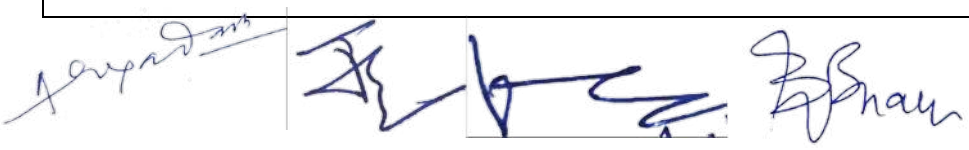
DISCIPLINE SPECIFIC COURSE (DSC)- Forest Economics

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		
DSC: Forest Economics	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: X** **Paper: DSC**
Subject: Forestry		
Course: DSC	**Course Title: Forest Economics**	
Course Outcomes: They consolidate and develop an understanding of students with respect of the theory and applications of forest economics.		



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

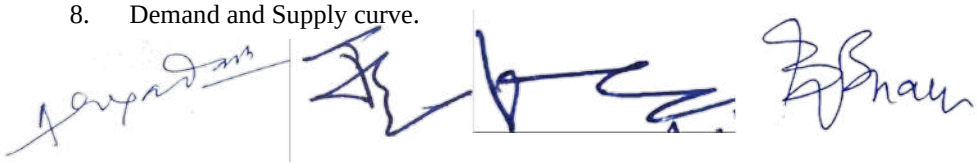
Unit	Topic	No. of Hours
Unit I	Forest Economics: Meaning and definition; Basic concepts: Goods, wealth, income, capital, cost particular of forest economics; Basics of micro and macroeconomics; Consumer and consumer behavior; Law of diminishing returns;	**15**
Unit II	Law of equimarginal utility; Consumer and utility; Influence of external factors on consumer behavioral; Consumer surplus, meaning, definition and importance. Demand: Meaning, definition, kinds of demand, demand schedule, demand curve, law of demand, extension and contraction v/s increase and decrease in demand;	**15**
Unit III	Elasticity of demand: Types of elasticity of demand, degrees of price elasticity of demand, methods of measuring elasticity, factors influencing demand, elasticity of demand, and importance of elasticity of demand; Supply: Meaning and supply function; Law of supply: Factors influencing supply; Elasticity of supply. Economics of timber and non-timber forest products; Forest planning, forest policy and development; Production Theory: Meaning, factors of production-land, labor, capital, organization;	**15**
Unit IV	Production function: Average and marginal physical products; Production theory applies to forestry; National income: Cost and type of cost. Marketing definition; Market dynamics; Market period; Marketing process; Need for marketing; Role of marketing; Marketing functions; Classification of markets; Perfect competition; Monopolistic competition, duopoly, oligopoly, and monopoly; Price discrimination; Monopoly pricing; Forest valuation of ecosystem services; Forestry for economic development; Forestry for employment promotion; Forest industry; Marketing efficiency; Integration; Constraints in marketing of forest produce; SWOT analysis.	**15**

Recommended Readings:

1. Modern Economics Theory by K. K. Dewett.
2. Elementry Economic Theory by K. K. Dewett and K. Verma.2004
3. Macro-economics Theory by M. L. Jhingan
4. Agricultural Economics by S. S. Reddy, P. Raghu Ram, T. V. Neelakanta and D. I. Bhavani.

Practical:

1. Techno-economic parameters for preparation of projects.
2. Preparation of Bankable projects for various agricultural products and its value-added products.
3. Identification of marketing channel.
4. Calculation of Price Spread.
5. Identification of Market Structure.
6. Visit to different Markets.
7. SWOT analysis.
8. Demand and Supply curve.



Semester-X

Master's in Forestry

DISCIPLINE SPECIFIC ELECTIVES (DSE 1)- Research Methodology

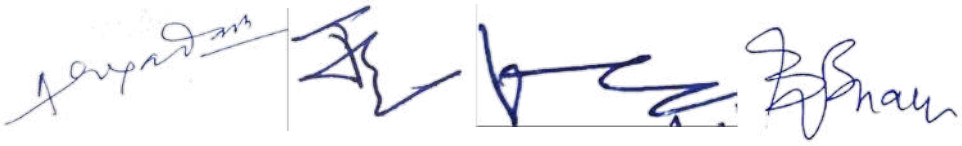
No. of Hours- 60

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: Research Methodology	**4**	**3**	**0**	**1**	**Honours Degree in Forestry**	**Nil**

MASTER'S IN FORESTRY

Programme: ***Master's in Forestry***	**Year: V**	**Semester: X** **Paper: DSE1**
Subject: Forestry		
Course: DSE1	**Course Title: Research Methodology**	
Course Outcomes: A course in Research Methodology typically aims to provide students with a comprehensive understanding of the research process, including how to design, conduct, and analyze research effectively.		



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

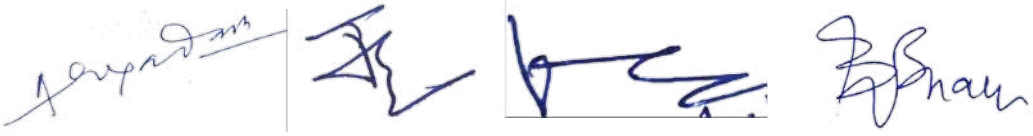
Unit	Topic	No. of Hours
Unit I	Nature and types of research, selection of research problem considering National Forest Policy. Formulation of research problem, objectives, sources of identifying a problem, definition of the problem, and hypothesis. Estimation and testing of hypotheses, concept of point and interval estimation, estimators and estimates	**15**
Unit II	Properties of good estimators- unbiasedness and minimum variance. Interpretation of data and deriving inferences and conclusions, Generation of research questions, planning for literature survey, planning for field work, collection, and recording of data and use of statistical tools, writing of project proposal and preparation of research project report, thesis, and dissertation.	**15**
Unit III	Writing scientific articles and technical bulletins, monitoring and evolution methods, Sampling and designing Random stratified cluster and systematic sampling.	**15**
Unit IV	Principles of experimental designs, types of experimental designs CRD, RBD, LSD, row-column (alpha) designs, Split plot, and strip plot Designs.	**15**

Recommended Readings:

1. Statistical Tools for Agroforestry by K. B. G. Dear, R. Mead and J. Relay.
2. Research- Bivariate Analysis for Intercropping Experiments. ICRAF, Nairobi
3. Principles of database management by J. Matin. Prentice Hall
4. Research Methods by R. Ahuja

Practical:

1. Fitting of probability distribution.
2. Computation of correlations and regressions.
3. Exercise on tests of significance- t. F, z and x^2
4. Layingout of designs in the field (i) Latin square, (ii) Randomized block design, (iii) Split plot design, (iv) Row-Column design and (v) Scattered block.
5. Data analysis of the above designs.
6. Data entry operation and database design.
7. Exposure to statistical packages SPSS.



Semester-X

Master's in Forestry

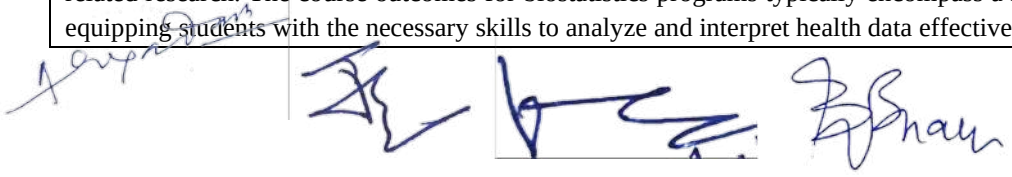
DISCIPLINE SPECIFIC ELECTIVES (DSE 2)- Biostatistics

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: Biostatistics	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: ***Master's in Forestry***	**Year: V**	**Semester: X** **Paper : DSE2**
Subject: Forestry		
Course: DSE2	**CourseTitle: Biostatistics**	
Course Outcomes: Biostatistics is a vital field that applies statistical methods of biological, medical, and health-related research. The course outcomes for biostatistics programs typically encompass a range of competencies aimed at equipping students with the necessary skills to analyze and interpret health data effectively.		



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

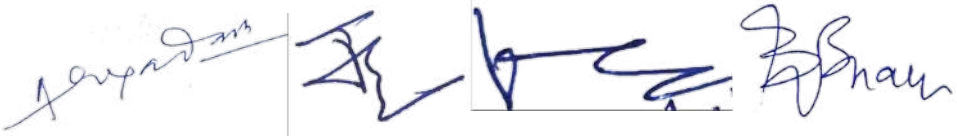
Unit	Topic	No. of Hours
Unit I	Introduction to biostatistics, collection of data, sampling, classification of data and frequency distribution, Central tendency: Mean, median and mode,	15
Unit II	Statical means, mean deviation, standard deviation, and standard error. Sampling correlation and leaner regression. Numerical measures of variability of dispersion	15
Unit III	The elementary idea of probability- normal, binormal, and poison distribution	15
Unit IV	Test of significance, based on normal, Fisher's't test' and Chi-square test, experimental design CRD, RBD, LSD, Split plot designing and strip plot.	15

Recommended Readings

1. Fundamentals of Biostatistics by Veer Bala Rastogi
2. Statistical Theory in Research by R.L Anderson and Bancroft
3. Experimental designs by W.G Cochran and G.M. Cox
4. Design and Analysis of Experiments by M.N. Das and N.C Giri
5. Experimental Design by W.T. Federer and Macmillan
6. Statistical Procedures for Agricultural Research by K.A. Gomez and A.A Gomez
7. The design and analysis of experiments by O. Kempthorne

Practical

1. Calculate mean, median, and mode
2. To calculate the statical mean, mean deviation, standard error
3. Sampling correlation and leaner regression
4. Fisher's 't test' and Chi-square test



Semester-X

Master's in Forestry

DISCIPLINE SPECIFIC ELECTIVES (DSE 3) Forest Genetics and Tree Improvement

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		
DSE3: Forest Genetics and Tree Improvement	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: X** **Paper: DSE3**
Subject: Forestry		
Course: DSE3	**CourseTitle: Forest Genetics and Tree Improvement**	
Course Outcomes: To impart knowledge in the field of biometry as applied to breeding, population, and gene flow of forest trees through pollen, seed, and gene flow development of hybrids, provinces, and making experiments in forest genetics and tree breeding with examples of important trees.		
Credits: 4	**Discipline Specific Elective**	
Max. Marks: As per Univ. rules	**Min. Passing Marks: As per Univ. rules**	

Unit	Topic	No. of Hours

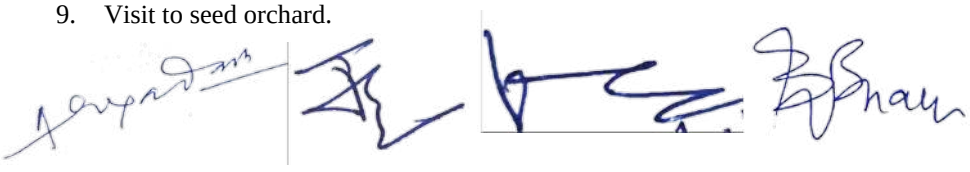
Unit I	General concept of forest genetics and tree breeding; Importance of forest genetics in tree breeding; Basic principles of genetics: Mendal's Law, gene interaction; Selective breeding methods: Mass, family, within family, family plus within family.	**15**
Unit II	Variations- Geographic variations: Ecotypes, clines, races and landraces; Genetic variations: Environment variation, genetic into environmental variation; Breeding methods: Selective breeding methods, mass, family, within family; Plus tree; Selection strategies and choice of breeding methods; Breeding methods for wood quality, agroforestry, diseases and pest resistance, drought and salt resistance; Tree improvement case histories; Hardy-Weinberg law, null hypothesis, Wohlund's principle; Mutation breeding and Economics of tree breeding.	**15**
Unit III	Seed orchards: Types, functions and importance; Estimating genetic parameters and genetic gain; Heterosis breeding: Inbreeding and hybrid vigor; Manifestation and fixation of heterosis; Species and racial hybridization; Indian examples: Teak, sal, shisham, eucalyptus, acacias, pines and poplars; Polyploidy, aneuploidy and haploidy in soft and hardwood species; Induction of polyploidy.	**15**
Unit IV	Assessment of genetic diversity; Gene conservation; Breeding populations; Taxonomy and phylogenetic studies; Pollen collection, storage, and extension; Theories of pollen dispersal, mating designs; Marker-assisted selection.	**15**

Suggested Readings:

1. Forest Genetics by T.L. White, W.T. Adams and D.B. Neale.
2. Textbook of Forest Tree Breeding by C. Surendran, R.N. Sehgal and M. Parmathma.
3. Introduction to Forest Genetics by Wright.
4. Applied Forest Tree Improvement by B. Zobel and J. Talbert.
5. Principles of Genetics by E.J. Garner, M.J. Simmons and P.D. Sunstad.
6. Cytogenetics by P.K. Gupta.
7. Genetics by M.W. Strickberger.
8. Principles of Genetic by R. Tamarin

Practical

1. Observation of modes pollination and reproduction in forest trees.
2. Estimation pollen viability and controlled pollination experiment.
3. Field practice in emasculation, crossing and selfing in local plants.
4. Manipulation of flowering through hormonal application.
5. Identification of ecotypes, races and land-races in natural forest.
6. Marking of candidate trees, plus trees and elite trees.
7. Induction of polyploidy through colchicines treatment.
8. Successful case studies of tree breeding.
9. Visit to seed orchard.



Semester-X

Master'sin Forestry

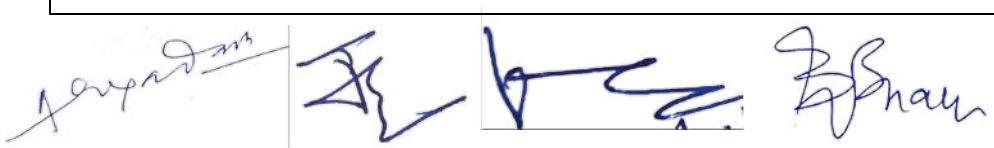
GENERIC ELECTIVES (GE 1)- Climate Change and Mitigation

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 1: Climate Change and Mitigation	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: *Master's inForestry*	**Year: V**	**Semester: X** **Paper : GE1**
Subject: Forestry		
Course: GE1	**CourseTitle: Climate Change and Mitigation**	
Course Outcomes: Courses on climate change and mitigation typically aim to equip students with a comprehensive understanding of climate science, its impacts, and strategies for adaptation and mitigation.		



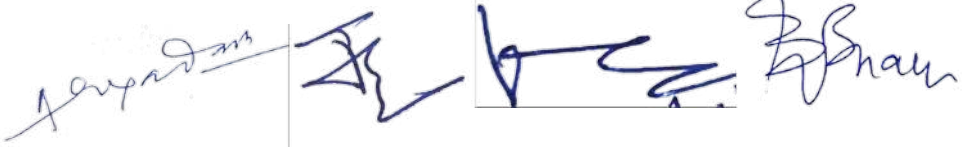
Credits: 4		**Generic Elective**
Max. Marks: As per univ. rules		**Min. Passing Marks: As per Univ. rules**
Unit	**Topic**	**No. of Hours**
Unit I	Introduction to Climate Change Science, Introduction to the International Legal and Policy Framework to Address Climate Change, Introduction to Climate Change Adaptation,	**15**
Unit II	Introduction to Climate Change Adaptation: Introduces the concept of climate change adaptation, highlights ways to measure vulnerability, introduces examples of adaptation solutions and summarizes how to prepare a planned response.	**15**
Unit III	Introduction to Climate Change Mitigation: Introduces the political context to greenhouse gas emissions, which the key emitters are and what strategies can be applied to bring down emissions to safe levels. International mechanisms created to assist countries in planning and implementing mitigation actions	**15**
Unit IV	Policy issues: Kyoto Protocol, carboan trading mechanism, montreal aggrement. Climate aberrations and its relationship to climate change: ozone depletation, ENSO, etc. Indias stands on climate change: recent development in the strategies, green Indian mission, CAMPA, millennium goal and other policy initiatives to mitigate climate change	**15**

Recommended Readings:

1. Making sense of climate change by R. Saika
2. Global climate change by A. N. S
3. Global climate change by J. Kaur
4. Climate change: Science, Strategies and Solutions by E. Claussen, V. A. Cochran and D. P. Davis

Practical:

1. Carbon foot print calculation of a given area
2. Estimation of carbon sequestration rate of different Himalayas trees
3. Comments on different tools used in climate change study
4. Soil carbon assessment and soil carbon dynamics
5. Atmospheric Co_2 measurement methods



Semester-X

Master'sin Forestry

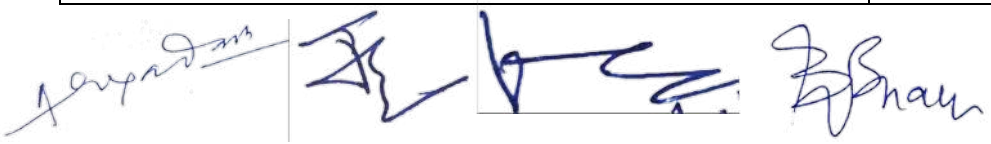
GENERIC ELECTIVES (GE 2)-Fundamentals of Soil Science

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: Fundamentals of Soil Science	4	3	0	1	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: ***Master's in Forestry***	**Year: V**	**Semester: X** **Paper: GE2**
Subject: Forestry		
Course: GE2	**Course Title: Fundamentals of Soil Science**	
Course Outcomes: The "Fundamentals of Soil Science" course provides students with a comprehensive understanding of soil properties, formation, classification, and their role in plant growth and environmental sustainability.		
Credits: 4	**Generic Elective**	



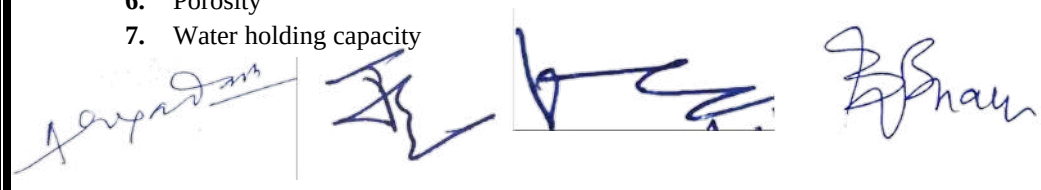
Max. Marks: As per univ. rules		Min. Passing Marks: As per Univ. rules
Unit	**Topic**	**No. of Hours**
Unit I	Forest soils – distinguishing features – soils and vegetation development, Parent materials and soil formation, soil profile, classification of soil, Physical and chemical properties- Types and properties of soils under different forests. Forest floor: Organic horizons and litter dynamics.	**15**
Unit II	Humus – types- organic matter decomposition-mineralization and immobilization of organic matter, Nutrient cycling, significance of C:N ratio, soil pH,	**15**
Unit III	Forest soil biology, soil fauna, nitrogen fixation. Rhizobium-tree legume symbiosis. Frankia x non-legume symbiosis, Nitrification and denitrification in forest ecosystems. Mycorrhizal associations in forest soils, Nursery soils, problem soils, mineral nutrition, acidic deposition effects	**15**
Unit IV	Soil water and plant nutrients. Soil amendment and structural management of soils, saline and alkaline soil, soil erosion and conservation.	**15**

Recommended Readings:

1. Forest soil by S. S. Negi
2. Hand Book on soils and manures by E. J. Russel
3. Soil and Soil Fertility by F. R. Troch and L. M. Thompson
4. Manual for soil and water Analysis by P. Buuman, B. Van Lagen and E. J. Vethorst

Practical:

1. Study of the soil profile
2. Classification of soil
3. Collection and preparation of soil sample
4. Determination of soil texture
5. Moisture content
6. Porosity
7. Water holding capacity



Semester-X

Master's in Forestry

DISSERTATION

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/Fieldwork/ Practical/Practice		
DISSERTATION	6	2	4	Honours Degree in Forestry	Nil

MASTER'S IN FORESTRY		
Programme: Master's in Forestry	**Year: V**	**Semester: X** **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.
- 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.

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**

