

## **B.Sc. Forestry**

**Programme Code: 103**

### **Programme Summary**

Duration: 4 years

### **Eligibility**

10+2 with at least 45% marks in PCB/PCM.

### **Program outcomes:**

- To get acquainted with basics & principles of Plant Biochemistry, Biotechnology, Physiology, Botany, Cytology-genetics, Computers, Statistics and English.
- To understand the fundamentals of Hydrology, Geology and Soil science like chemistry and fertility of Forest soils, Sericulture, Environmental Science and Horticulture.
- To learn the ethnobotany along with medicinal and aromatic Plants and their uses and impacts on the tribal communities and remote villages using extension education concepts.
- To understand the effect of meteorology on crops production and weather forecasting models to cope up with the uncertainty of Indian weather conditions.
- To gain the preliminary knowledge on geographical distribution of grasslands, forests and their classification in the India and in the world. Critical examination of the world forest sources, productivity potential and increment of world forests.
- To learn the principles and practices of Silviculture, silvicultural and dendrological knowledge i.e. origin, distribution, general description, phenology, silvicultural characters, regeneration methods, silvicultural systems, tending operations and economic importance of important conifer and broad leaved tree species of India & also the nursery techniques of these tree species.
- To learn the Forest management skills for best growth of any forest and also to get acquainted with the Forest policies and the laws.
- To develop the skills to take-up forest mensuration exercises and ecological studies in the forested areas.
- To explore the anatomical studies of tree/woody perennials including monocot and dicot.
- The skills on tree-seed collection, seed storage, seed testing for purity, viability, moisture, germination etc will be developed in this program.
- To learn the principles & techniques of tree improvement i.e. selecting superior trees in natural stands and plantation, controlled crossing techniques, Vegetative propagation techniques, Pollen viability determination.
- It provides in depth information on logging operations in the forests, develop basic knowledge on chemical, physical, mechanical, electrical as well as sound related properties of timber, various treatments like seasoning of wood, preservation of wood and the utilization of the timber/wood collected in various industries.
- It imparts general idea about the use of wood as an engineering material for bridges, roads and building material.
- It also provides basic knowledge on the role and use of Remote Sensing in Forestry.
- To develop knowledge on methods of collection, extraction, classification, storage, uses, management and importance of Non-Timber Forest Products (NTFP) viz.- Fodder (grasses and tree leaves), canes and bamboos, essential Oils, non-essential oils, Gums and resins, Tans and dyes.

- To gain the knowledge on traditional & well designed Agroforestry systems, techniques, management and their advantages over sole cropping landuse systems.
- To develop the skills to identify and cure the diseases, insects, pests of the Forest trees.
- To explore about the wildlife and its management including habit & habitat of different wildlife, scientific names, behavior and adaptations of important wild species.
- To know about the basic concept of entrepreneurship and its development in forestry. Project planning, evaluation, Swot analysis.
- To become familiar with basic economic and business principles and how they can be applied to forestry. Utilize economic principles to address private and public policy issues related to allocating natural resources and environmental amenities.
- To develop skills to conduct various field based activities of forestry aspects.
- To develop aptitude for formulating research problem and experimental planning, data collection and statistical planning.
- To provide hands-on-trainings or Forestry work experience on Socio-economic surveys in villages, Forest Department attachments, Forest-based-Industrial attachment and Production and marketing of quality planting material.

**Course outcomes:**

S.no.	Course code	Course name	Credits	Course outcomes
<b>1<sup>st</sup> Semester</b>				
1	SOA/FC101T	Fundamentals of Geology & Soil science	2	<p>To explore about Composition of earth's crust, soil as a natural body major components by volume pedology rocks types Igneous sedimentary and metamorphic classification soil forming minerals. Definition classification – silicates, oxides, carbonates, sulphides, phosphates occurrence. Weathering of rocks and minerals, weathering factors: physical, chemical, biological agents involved, weathering indices, factors of soil formation, land forms parent, material climate organism, relief time soil forming processes eluviations and illuviation formation of various soils.</p> <p>To study about problem soils: salted soils, permeable, flooded, sandy soils properties. Physical parameters texture definition methods of textural analysis textural classes, absolute specific gravity definition apparent specific gravity/bulk density factors influencing field bulk density. Relation between BD. Pore space definition, factors affecting capillary and noncapillary porosity, soil colour definition, its significance, colour variable hue, value, chroma, Munsell colour chart, factors influencing parent material soil moisture organic matter, soil structure, types of structure, factors influencing genesis of soil structure. Soil air-air composition, amount of air space, soil air renewal, soil temperature sources and distribution of heat, chemical properties humus inorganic secondary silicate clay hydrous oxides.</p> <p>To Acquire knowledge about Soil organic matter decomposition, pH nutrient availability, soil buffering capacity, soil water forms, hygroscopic, capillary and gravitational, soil moisture constants, hygroscopic coefficient, wilting point, field capacity, moisture equivalent, maximum water holding capacity, energy concepts, pF scale measurement-gravimetric, electric and tensiometer methods. Soil water movement, saturated and unsaturated infiltration and percolation. Soils of different eco-systems and their properties.</p>
2	SOA/FC101P	Fundamentals of Geology & Soil science- Practical	1	<p>To have a knowledge about Identification of rocks and minerals; Collection and preparation of soil samples; Soil analyses for moisture, color, bulk density, organic matter, pH, EC; textural analysis; study of soil profile I &amp; II.</p> <p>To have field experience by excursions/ tours for identification of rocks and minerals and profile studies; practical introduction to tensiometer, pressure plate and neutron probe etc.</p>
3	SOA/FC102T	Plant Biochemistry and Biotechnology	2	<p>To understand the significance of Biochemistry.</p> <p>Describe the chemistry of carbohydrates, lipids, proteins and amino acids.</p> <p>Describe the classification and structural organization of proteins.</p> <p>Describe the mechanism of enzyme action and identify the classes of enzymes and factors affecting action.</p> <p>Describe the catabolic reactions of carbohydrates, lipids and amino acids.</p> <p>Understand Concepts, principles and processes in plant biotechnology.</p> <p>Identify the class and functions of secondary metabolites</p>

4	SOA/FC102P	Plant Biochemistry and Biotechnology- Practical	1	Students will be able to assay the compound qualitatively or quantitatively Determination of unknown compound. Develop skills for application of tissue culture techniques in tree improvement. To get knowledge about the plant tissue culture.
5	SOA/FC103T	Principles of Plant Physiology	2	To know about the metabolic activity and life, cycle of the plant from germination through growth and development. To know importance and scope of plant physiology. To understand the plants and plant cells in relation to water-osmosis, imbibitions, diffusion and water potential and the movement of sap and absorption of water in plant body, structure and function of stomata, opening and closing of stomata, different types of stresses- water, cold, heat, plant nutrition and essentiality and mechanism of absorption. To understand the process of photosynthesis particular light and dark reaction, respiration particular emphasis on aerobic and anaerobic respiration, photo-hormones.
6	SOA/FC103P	Principles of Plant Physiology- Practical	1	To learn about measurement of water potential by osmosis and plasmolysis method. To demonstrate the rate of transpiration by using Potometer. To learn demonstrate the importance of photosynthesis by the help of wilmonnt bubbler and inverted funnel exp. To study plant movement by the help of clinostat. To study separation of leaf pigments by paper strip chromatography. To study structure of stomata and role of stomata in transpiration by using four leaves exp.
7	SOA/FC104T	Statistics & Computer Application	2	Statistics: Basic Statistical concept. Average and measures of location, mean, mode, median, geometric mean, harmonic mean, percentiles and quadrilles, for raw and grouped data. Dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. Probability concepts. Correlation & Regression. Test of significance. Computer Application: Introduction to computers and personal computers given. Basic concepts of hardware and software discussed. Input and output devices demonstrated. Operating system and its importance elaborated. Exposure to MS Office , MS word, MS PowerPoint and MS Excel have been provided.
8	SOA/FC104P	Statistics & Computer Application-Practical	1	As per the SOA/FC104T Practical case studies on MS Office practiced.
9	SOA/FAECC101T	Structural Grammer and Spoken English	1	Introduction to word classes; structure of the verb in English. Uses of tenses. Study of voice. Use of conjunctions and prepositions. Sentence patterns in English. Spoken English: conversations of different situations in everyday life. The concept of

				stress, stress shift in words and sentences.
10	SOA/FAECC101P	Structural Grammar and Spoken English- Practical	1	As per the SOA/FC101T
11	SOA/FE101T	Chemistry & fertility of Forest Soils	1	To explore the knowledge of Chemistry & fertility of Forest Soils and their importance. Scope, opportunities and constraints of soil and its chemistry. Introduction to Forest soils and cultivated soils. Properties of soils under different forest ecosystems. And also know the Essential nutrient elements-occurrence, availability and their functions.
12	SOA/FE101P	Chemistry & fertility of Forest Soils- Practical	1	To identify and study forest soil profile and Determination of available N, P & K content of soil.
13	SOA/FE103T	Introductory Botany	1	Introduction to Botany and general classification of plants. Structure and types of plant tissues. Internal Structure of Dicot and Monocot Stems, roots and leaf. Significance of life cycle with special reference to alternation of generations in <i>Chlamydomonas</i> , <i>Rhizopus</i> , <i>Funaria</i> , <i>Adiantum</i> , <i>Pinus</i> and a flowering plant.
14	SOA/FE103P	Introductory Botany- Practical	1	Studies of permanent slides of anatomy of stem root and leaf. Study of various plant parts. Survey to local area to study local vegetation.
15	SOA/FE104T	Sericulture	1	It provides exposure to the history of sericulture development and future scopes. Detailed study of mulberry and its cultivation practices in different climatic zones of country.
16	SOA/FE104P	Sericulture- Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FE104T.
<b>2<sup>nd</sup> Semester</b>				
17	SOA/FC105T	Principles of Hydrology, Soil- Water Conservation and wasteland	2	Students know basic terms used in hydrology. Students comprehend the hydrologic cycle and related major water quantity and quality challenges and their relevance to human health and well-being, ecosystems, and the food supply. Students understand the role of hydrology, water resources management. Students understand the principle of water flow in the nature. Students understand the structure and activities of various types of aquifers. Students know basic methods for measuring and analysing hydrologic parameters. Students understand the importance of water sources and know how to adequately protect them. Students understand the importance of soil and know how to conserve that. Students understand the concept of Wasteland and reclamation of wasteland.
18	SOA/FC105P	Principles of Hydrology, Soil- Water Conservation and	1	To impart practical knowledge and hands-on-training based on Course SOA/FC105T.

		wasteland- Practical		
19	SOA/FC106T	Principles of Cytology and Genetics	2	History of genetics and hypothesis-theories. Physical basis of heredity, cell reproduction mitosis-meiosis and their significance. Gametogenesis and syngamy in plants. Mendel's principles of heredity, deviation from Mendelian inheritance, Chromosome theory of inheritance, gene interaction: modification of monohybrid and dihybrid ratios. Multiple alleles, quantitative inheritance, linkage and crossing over, sex determination - theories, sex linked inheritance and characters. Cytoplasmic inheritance and maternal effects. Chemical basis of heredity: Structure of DNA and its replication. Evidences to prove DNA as genetic material. Mutation and its classification. Chromosomal aberrations: Changes in chromosome structure and number
20	SOA/FC106P	Principles of Cytology and Genetics-Practical	1	As per the SOA/FC106T
21	SOA/FC107T	Ethnobotany	2	Traditional ecological knowledge of wild plant to the society. To communicate and describes the healing uses of local plants. To experience the cultural contact of the healing and food local food production process. To describes and observe the use and role and importance of psycho active plant within their traditional contact. To identify local plants and scientific names and mythology of syllabus related families. Bring out the relevance of ethnobotany in the present context. Know about the major and minor ethnic groups or Tribal's of India, and their lifestyles. Learn about the methodology of Ethnobotanical studies. Gain knowledge on the role of role of ethnobotany in modern medicine. Get awareness on the conservation practices of medicinal plants.
22	SOA/FC107P	Ethnobotany-Practical	1	To learn about traditional local plants used as traditional medicine, as food, as fodder, as fiber etc. by local people. To visit various local places to collect information regarding traditional uses of plants. To study about identification of plants associated with mentioned families in syllabus. To study mythology of some common local plants.
23	SOA/FC108T	Medicinal and Aromatic Plants	2	To excel the knowledge of Medicinal and aromatic plants and their importance. Scope, opportunities and constraints of medicinal and aromatic plants. Origin, importance, distribution, production, climate, soil, water, plant protection, harvesting and use of important medicinal and aromatic plants. Endangered medicinal and aromatic plants of India and their conservation.
24	SOA/FC108P	Medicinal and Aromatic Plants- Practical	1	To identify different types of plants including tree, shrub and herbs in surrounding forest areas. Different processing methods of medicinal and aromatic plant products through industrial/ institute visits.
25	SOA/FC109P	Technique / field tour	1	Field tours to study the forestry field techniques.
26	SOA/FAECC102T	Environmental Science	1	Environment: introduction, definition and importance.

				<p>Components of environment -interactions with organisms. Global and Indian environment - past and present status.</p> <p>Environmental pollution and pollutants.</p> <p>Smog, acid rain, global warming, ozone hole, eutrophication, sewage and hazardous waste management.</p> <p>Impact of different pollutions on humans, organisms and environment.</p> <p>Introduction to biological magnification of toxins.</p> <p>Deforestation - forms and causes relation to environment.</p> <p>Prevention and control of pollution - technological and sociological measures and solutions - Indian and global efforts.</p> <p>India, international and voluntary agencies for environmental conservation - mandates and activities.</p> <p>International conventions and summits - major achievements.</p> <p>Environmental policy and legislation in India.</p> <p>Introduction to environmental impact assessment. Causes of environmental degradation - socio-economic factors.</p> <p>Human population growth and lifestyle.</p>
27	SOA/FAECC102P	Environmental Science- Practical	1	As per paper SOA/FAECC102P
28	SOA/FE105T	Fundamental of Extension Education	1	To explore about of extension forestry can be expressions of the end towards which our efforts are directed. And also with the help of extension education is the development of the rural people, and also to improve all aspects rural people lives within the framework of the national development policies and people's need for development.
29	SOA/FE105P	Fundamental of Extension	1	To learn about the structure, functions, linkages and extension programmes of ICFRE institutes/voluntary organizations/ Mahila Mandal, Village Panchayat, State Dept. of Forests/All India Radio (AIR).
30	SOA/FE106T	Fundamentals of Horticulture	1	<p>To study the Economic importance and classification of horticultural crops.</p> <p>To learn about the nutritive value of fruits and vegetables.</p> <p>To learn about the area and production of horticultural crops.</p> <p>To understand about the exports and imports of horticultural crops.</p> <p>To learn about fruit and vegetable zones of India and of different states.</p> <p>To understand the nursery management practices, soil and climate.</p> <p>To gain knowledge about vegetable gardens, nutrition and kitchen garden and other types of gardens.</p> <p>To understand the principles, planning and layout.</p> <p>To learn about the management of orchards.</p> <p>To understand the planting systems and planting densities.</p> <p>To gain knowledge about production and practices for fruit, vegetables and floriculture crops.</p> <p>To gain knowledge about nursery techniques and their management.</p>

				<p>To understand the principles and methods of pruning and training of fruit crops.          To learn about the types and use of growth regulators in horticulture.          To learn about water management, weed management and fertility management in horticultural crops.          To study about bearing habit and factors influencing fruitfulness and unfruitfulness.          To learn about the rejuvenation of old orchards, top working, frame working.          To understand about the principles of organic farming</p>
31	SOA/FE106P	Fundamentals of Horticulture-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC106T
32	SOA/FE107T	Agrometeorology	1	<p>Students understand the role of meteorology for crop production.          Students understand concepts of Weather &amp; Climate and their significance for atmosphere.          Students get the knowledge of different type of clouds.          Students understand the science behind formation of cyclones and anticyclones.          Students comprehend effect of Solar radiation on plant growth.          Students know the concept of agroclimatic zones.          Students get to know about global warming and impact on climate change.          Students get to know the use of remote sensing in Agrometeorology.</p>
33	SOA/FE107P	Agrometeorology-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC107T
<b>3<sup>rd</sup> Semester</b>				
34	SOA/FC110T	Logging and Ergonomics	2	<p>To learn about and scope of logging, study of logging plan and execution.          Study of Location and demarcation of the area for logging and estimation of produce available for extraction.          Study of Implements used in logging operation- traditional and improved tools.          Study of Felling rules and methods. Conversion.          Study about various means of transport of timber- carts, dragging, skidding, overhead transport, ropeways, and skylines.          Transport by road and railways. Transport by water- floating, rafting and concept of booms.          Study of Grading and Storage of timber in the depots for display and disposal. Timber Depots- types, lay out and management.          Study of Systems of disposal of timber.          Study of Ergonomics, components and provision of energy.          Requirement of energy and rest periods. Effect of heavy work, posture, weather and nutrition.          Study of Personal protective equipments, safety helmets, ear and eye protections.          Accidents: causes, safety rules and first aids.</p>
35	SOA/FC110P	Logging and Ergonomics-Practical	1	Field study of Survey and demarcation of area intended for logging and listing of permanent boundary marks; Marking of trees for logging operation and preparation of marking list.



				<p>Study of Equipments and tools used in logging operations and their uses.</p> <p>Study of Planning and execution of different logging operation in a phase wise manner;</p> <p>Study of Application of felling rules in the forests for felling of standing trees at different localities.</p> <p>Study of Instructions regarding maintenance of various records and registers in logging operations.</p> <p>Study of Conversion of felled trees into logs, poles, firewood, pulpwood etc.</p> <p>Measurement of logs, poles and firewood in forests and maintenance of records in relevant registers.</p> <p>Minor and other types of transport practicable at felling sites;</p> <p>Study of Final transport, information regarding transit permits for various types of forest produce;</p> <p>Visit to local dumping yard (timber depot) to trace the logs delivered from different forest sites;</p> <p>Study of Sorting of logs, poles and firewood in the depots according to species, quality, length and girth classes; Study of Stacking and stock checking of different logs, poles and firewood in the depots so as to confirm that all the converted materials in the forests have reached their destination.</p> <p>Study of Recording of the lots for auction sale. Final disposal of the material; Visit during the auction sale in the government timber depots;</p> <p>Study of Preparation of ergonomic check lists.</p>
36	SOA/FC111T	Soil Survey, Remote Sensing	2	<p>Scope and objective; soil survey, sampling methods; planning, inventory, permanent sample plots; sample size allocation, landuse classes and planning.</p> <p>Soil survey – classification–aerial photography–satellite–their interpretation, land-capability-classification.</p> <p>Aerial photography and remote sensing–definition, meaning, scope, merits and brief history.</p> <p>Electromagnetic spectrum; radiations, differential reflections by surfaces, active and passive remote sensing, earth observation satellites. Equipment and materials-aerial bases, cameras, filters, stereoscopes, computers, radars.</p> <p>Photogrammetry: Vertical and oblique photography. Photographs and images, scales, resolution, photo interpretation, photogrammetry, image analysis, mapping.</p> <p>Agencies involved in remote sensing and acquiring information from them.</p> <p>Remote sensing; principles, uses in forestry, vegetation / cover classification and mapping, species identification, height and volume – estimation. Identification of tree species and their form stand delineation.</p> <p>Interpretation of land forms and soils; use of micro-level survey of farm forests, large scale photos in forest inventory, site selection. Imagery and image analysis – video satellite, computer and radars. Geographic Information systems- Computer softwares used.</p>
37	SOA/FC111P	Soil Survey, Remote Sensing -Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC111T
38	SOA/FC112T	Forest Mensuration	2	To understand different techniques to calculate parameters of tree like diameter, girth, age

				etc; Understanding and use of instruments used in forest mensuration. To prepare volume table concept of forest inventory and sampling techniques. <u>Application of Remote Sensing</u>
39	SOA/FC112P	Forest Mensuration- Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC112T
40	SOA/FC113T	Forest Engineering & Survey	2	Basic knowledge of types of survey and related instruments. Concept and design of forest roads and building materials. Design of bridges.
41	SOA/FC113P	Forest Engineering & Survey-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC113T
42	SOA/FC114P	Technique / field tour	1	Field tours to study the forestry field techniques.
43	SOA/FSEC101T	Tree Seed Technology	1	To learn about Seed and its importance. Study of Role of seed technology in nursery stock production. Study of Production of quality seed, identification of seed collection areas-seed orchards – maintenance of genetic purity-isolation and rouging, seed study of source (provenance and stands). Study of Selection of seed tree (genotypic and phenotypic selection), plus tree (pure stands, elite seed tree, isolated tree and their location). Study of Seed Collection – Planning and Organization, Collection methods, Factors affecting seed collection, Study of Seed maturity and tests. Seed Study of processing – Seed extraction, drying, blending, cleaning, grading, treating, bagging, labeling and storage. Study of seed Storage – orthodox, intermediate and recalcitrant seeds, precautions of handling of recalcitrant seeds, natural longevity of tree seeds, factors affecting longevity. Study of Seed testing (sampling, mixing and dividing, determination of genuineness, germination, moisture, purity, vigour, viability). Seed Study of seed dormancy, classification and breaking of seed dormancy. Study of Different viability and vigour tests, seed pelleting, seed health. Classes of tree seeds, study of seed certification and procedures of tree seeds certification.
44	SOA/FSEC101P	Tree Seed Technology- Practical	1	Identification of seeds of tree species; Seed Study of maturity tests; Physical purity analysis; Determination of seed moisture; Seed germination test; Hydrogen peroxide test; Study of Tetrazolium test for viability; Seed vigour and its measurements; Identification of seed dormancy and methods of breaking dormancy in tree seeds; Testing membrane permeability; Study of seed collection and equipments; Study of Planning of seed collection; Seed collection; Seed extraction; Visit to seed production area and seed orchard;

				Visit to seed processing unit/testing laboratory; Study of seed sampling equipments.
45	SOA/FE109T	Wood Anatomy	1	To explore the anatomical studies of tree including monocot and dicot. Plant cell and tissue and types. Stem root and leaf anatomical studies. Mechanism of secondary growth and its importance. Early wood and late wood formation. Sapwood and heart wood and abnormal secondary growth in plants. Micro- and macro properties of wood.
46	SOA/FE109P	Wood Anatomy- Practical	1	To learn Microscopic studies of meristem, simple and complex tissue. Anatomical features of stem root and leaf.
47	SOA/FE110T	Tree Physiology	1	To learn about tree structure, growth, development, differentiation and reproduction. Plant growth functions and growth kinetics, will increase their identification skill. To explore about Physiological functions and processes in trees. To study the role of environmental effects on growth and development. To highlight the students about light use efficiency in forest species, canopy structure, plant phyllotaxis and its importance in translocation. Plant light relationship. LAI, Photosynthetic efficiency and respiratory losses, source sink relationship, Factors affecting photosynthesis. Radiation interception. The content will definitely help the forestry students to know the forest environment and conducive conditions for the same. To study transport processes with special reference to long distance transport in trees and its impact on plant water relations and photosynthesis. Biocides and growth regulators in forest ecosystems. Senescence and abscission. Role of trees in pollution control.
48	SOA/FE110P	Tree Physiology- Practical	1	To study about various physiological process of tree like growth, translocation of food, source and sink, effect of growth hormones and senescence in trees.
49	SOA/FE111T	Introductory Forest Economics	2	The students will be able to understand Nature and scope of economics and also its relationship with other sciences. The students will be able to state the various theories related to consumer behavior such as equi-marginal utility, indifference curve, diminishing marginal utility. The students will be able to define law of demand and understand the concept of price, income and cross elasticity's. The students will be able to explain factors of production i.e. land, labour, capital and enterprise. The students will be able to describe Law of diminishing marginal returns. The students will be able to explain the Law of supply. The students will be able to explain the theories of rent, wage, interest and profit. The students will be able to understand the concepts of Price determination and forecasting under various market structures. The students will be able to understand the concepts of National Income. The students will be able to describe the concept and types of inflation.
<b>4<sup>th</sup> Semester</b>				
50	SOA/FC115T	Principles and Practices of Silviculture	2	To learn about forestry and silviculture by studying definition of forest and forestry. Classification of forest and forestry, branches of forestry and their relationships.

				<p>Definition, objectives and scope of Silviculture.  Status of forests in India and their role.  History of forestry development in India.  Site factors - climatic, edaphic, physiographic, biotic and their interactions. Classification of these factors and their influence on Forest Production.  Impacts of controlled burning and grazing. Influence of forests on environment.  To acquire knowledge about Trees and their distinguishing features. Growth and development. Forest reproduction - flowering, fruiting and seeding behaviour. Natural, artificial and mixed regeneration. Natural regeneration - seed production, seed dispersal, germination and establishment. Requirement for natural regeneration.  Dieback in seedling with examples.  Plant succession, competition and tolerance.  Forest types of India and their distribution.</p>
51	SOA/FC115P	Principles and Practices of Silviculture-Practical	1	To learn about forest composition, phenotypic characters of the trees, growth rings and forest succession in different forest types of Dehradun.
52	SOA/FC116T	Wood Science and Technology	2	<p>To study kinds of wood and its properties as a raw material.  To get knowledge of physical, strength, electrical, acoustic and thermal properties.  To understand the relation between use of wood and the properties of wood.  To study wood-water relationship.  Detailed study of the treatments can be given to wood to increase its life for different uses.  To study the timber classification on the basis of durability and refractory nature.  To study the processing defects and its effect in woods utilization.</p>
53	SOA/FC116P	Wood Science and Technology- Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FC116T
54	SOA/FC117T	Silviculture of Indian Trees	2	<p>Study of Origin, distribution, general description, phenology, silvicultural characters, regeneration methods, silvicultural systems and economic importance of the following conifer and broad leaved tree species of India. Conifers: <i>Abies pindrow</i>, <i>Picea smithiana</i>, <i>Cedrus deodara</i>, <i>Pinus roxburghii</i>, <i>Pinus wallichiana</i>, <i>P. gerardiana</i> and <i>Juniperus spp.</i> Broad leaved species: <i>Tectona grandis</i>, <i>Shorea robusta</i>, <i>Acacia spp.</i>, <i>Dalbergia sissoo</i>, <i>D.latifolia</i>, <i>Quercus spp.</i>, <i>Robinia pseudoacacia</i>, <i>Alnus spp.</i>, <i>Anogeissus spp.</i>, <i>Populus spp.</i>, <i>Eucalyptus spp.</i>, <i>Casuarina equisetifolia</i>, <i>Terminalia spp.</i>, <i>Santalum album</i>, <i>Swietenia mahagony</i>, <i>Albizzia spp.</i>, <i>Prosopis spp.</i>, <i>Pterocarpus santalinus</i>, <i>Azardirachta indica</i>, <i>Diospyros melanoxylon</i>, <i>Madhuca indica</i>, <i>Leucaena leucocephala</i> and Bamboos.</p>
55	SOA/FC117P	Silviculture of Indian Trees-Practical	1	<p>Study of species composition in surrounding areas.  Study of morphology and phenology of tree species growing in the area.  Study of artificial regeneration of Pines, Bamboo, Oak, <i>Dalbergia sissoo</i> and <i>Acacia catechu</i>, etc.  Practicing thinning in Bamboo clumps. Study on tree responses to the abiotic and biotic</p>

				factors viz., light, fire, drought, frost, root suckering, coppicing and pollarding, etc. To study quality characters of nursery planting stock.
56	SOA/FC118T	Forest Pathology	2	History and importance of forest pathology in India and the world. Relation of plant pathology with forest pathology and other sciences, classification of tree diseases. Role of microbes and fungi in a natural forest ecosystem. Broad classification of different pathogens causing tree diseases. General characteristics of fungi, bacteria, viruses, mycoplasma and phanerogames. Important characters of ascomycetes and basidiomycetes. Growth and reproduction of plant pathogens, infection and factors influencing disease development. Dissemination and survival of plant pathogens. Distribution, economic importance, symptoms, etiology and management of the following. Diseases of important tree species like teak, <i>Dalbergia</i> spp., <i>Acacia</i> spp., neem, <i>Cassia</i> , sal, <i>Albizia</i> , <i>Terminalia</i> , mango, jack, pines, deodar, eucalyptus, bamboo, casuarina, rubber, sandal wood, medicinal and aromatic plants grown in different Agroforestry systems. Biodegradation of wood in use. Types of wood decay, gross characters of decay, sapstain, different types of rots in hardwoods, softwoods and their prevention. Graveyard test and decay resistant woods. Principles, definition and scope of forest disease management in forestry. Importance of disease cycle and economic threshold in disease management. Principles of disease management. Nature of disease resistance. Nursery diseases of important forest species. Fungicides and their use in nurseries and plantations. Integration of cultural, chemical, biological and host resistance in disease management.
57	SOA/FC118P	Forest Pathology- Practical	1	To impart practical knowledge as per the course SOA/FC118T
58	SOA/FC119P	Technique/ Field tour	1	Field tours to study the forestry field techniques.
59	SOA/FSEC102T	Nursery Management & Commercial Forestry	1	To explore about the nursery site, its selection and layout. Different types of nurseries and the intercultural operation. Macro and micro propagation. Plant protection measures in nursery. Important tree species and their nursery practices.
60	SOA/FSEC102P	Nursery Management & Commercial Forestry- Practical	1	To explore about the nursery site, preparation of beds, sowing methods, treatment of seeds, intermediate operations for management of nursery. Study of vegetative propagation methods.
61	SOA/FE112T	Forest Ecology	1	To impart knowledge about ecology and the components of ecology, energy flow in ecology and parameters of population and community.
62	SOA/FE112P	Forest Ecology-Practical	1	To learn about the methods of studying the ecology at population and community levels by visiting different ecosystem.
63	SOA/FE113T	Fundamentals of Wild	1	To explore about the wildlife and its management. Different habitat type of wildlife.

		Life		Biological basis of wildlife. Different agencies involved in wildlife sector. Wildlife ecology. Basic requirements of wildlife. Importance of wildlife in existing biodiversity globally and in India.
64	SOA/FE113P	Fundamentals of Wild Life-Practical	1	To learn about the habit of different wildlife regarding to their food and habitat. Scientific names of important wild species. Wildlife behavior and adaptations.
65	SOA/FE114T	Wood Products & Utilization	1	To explore the knowledge of paper industry, pulp and paper making, different types of papers, types of paper boards and plywood industry to study the manufacturing processes. To learn about the wood based industries, wood distillation unit.
66	SOA/FE114P	Wood Products & Utilization-Practical	1	Visits to various wood based industries to demonstrate various wood products manufacturing process.
<b>5<sup>th</sup> Semester</b>				
67	SOA/FC120T	Rangeland Management	2	To explore about the Key management components seek to optimize such goods and services through the protection and enhancement of soils, riparian zones, watersheds, and vegetation complexes, sustainably improving outputs of consumable range products such as red meat, wildlife, water, wood, fiber, leather, energy resource extraction,
68	SOA/FC120P	Rangeland Management-Practical	1	To learn about identification of grasses, forbs and legumes and fodder trees; Rangeland inventory – ground cover, plant height, relative dominance, etc.; Assessing nutrient; Estimating range condition from plant composition; Determine range utilization, carrying capacity of rangelands;
69	SOA/FC121T	Silvicultural Systems	2	To understand scope/need of silvicultural systems Detailed study of creation and management of various silvicultural systems.
70	SOA/FC122T	Experimental techniques in Forestry	2	Introduction to scientific methodology. Measurement and scaling techniques. Measures of central tendency and dispersion, introduction to distributions. Tests of Significance -'z' test,'t' test and 'F' test. Principles of field experimentation. Comparison between field and forestry experimentation. Design and analysis: Completely randomized design, Randomized complete block design, Latin square design and split-plot design, normalization of data. Concept of factorial experiments. Sampling - Concept of population and sample, advantages of sampling and methods of sampling. Models in Agroforestry research. Site selection, size, layout and shape of the plot, arrangement of blocks in traditional forestry and Agroforestry. Instrumentation in forestry research (for soil analyses, plant analyses). Development of a research plan. Research planning in Forestry in India. Scientific literature search / retrieval and scientific writing.
71	SOA/FC122P	Experimental techniques in Forestry-Practical	1	As per the Paper SOA/FC122T

72	SOA/FC123T	Dendrology	2	<p>Introduction – importance and scope of dendrology.</p> <p>Classification of plants-Bentham and Hooker’s, Engler and Prantles, and Hutchinson’s Systems.</p> <p>Plant Nomenclature – objectives, principles and International Code of Botanical Nomenclature.</p> <p>Herbarium techniques, collection, processing and preservation of plant material. General study of herbarium, arboretum and Xylarium.</p> <p>Description of the plant in scientific terms, study of sport characteristics of plants, naming and classifying based on adopted system.</p> <p>Study of families, as survey of forest resources: Magnoliaceae, Rhizophoraceae, Ebenaceae, Sapotaceae, Fabaceae, Santalaceae, Elaeagnaceae, Meliaceae, Salicaceae, Apocynaceae, Betulaceae, Verbenaceae, Fagaceae, Asteraceae, Moraceae, Poaceae, Tiliaceae, Liliaceae, Euphorbiaceae, Myrtaceae, Glusiaceae, Dipterocarpaceae, Cupressaceae, Guttiferae, Taxaceae, Pinaceae and Combretaceae.</p> <p>Geographical distribution of important Indian trees, native trees, exotic trees, endemism.</p>
73	SOA/FC123P	Dendrology-Practical	1	Study of woody flora of families mentioned in theory.
74	SOA/FC124T	Wild life Management	2	To extend the view of wildlife regarding to management and wildlife survey. Wildlife population dynamics. Prey predators relationships. Management of basic requirements. Conservation of biodiversity at national and international level. Political role
75	SOA/FC124P	Wild life Management-Practical	1	To exercise of wildlife study in captivity and nature. Visit learning at different protected areas.
76	SOA/FSEC103T	Plantation Forestry	1	To explore about the plantation needs and its significance. Preparation of plantation site, tools used for different preparation of plantation area. Different methods of planting practices. Industrial plantation. Wastelands and their reclamation.
77	SOA/FSEC103P	Plantation Forestry-Practical	1	To study of tools used for preparation of plantation. Layout of plantation sites. Protection measures for established plantation. Planting design.
78	SOA/FE115T	Fundamental Forest Business Managements	1	<p>Farm management-scope and approaches discussed.</p> <p>Cost-concept, principles and functions its relevance to business demonstrated.</p> <p>Basic laws of production explained.</p> <p>Principles involved in farm management decision making decision as to what, how, when and how much to produce described.</p> <p>Factor- factor-product and product-product relationships displayed.</p> <p>Cost of cultivation and production calculated.</p> <p>Break-even analysis discussed.</p> <p>How to do decision making under risk and uncertainty discussed.</p> <p>Farm business efficiency measures elaborated.</p> <p>Economic order quality and ABC analysis done.</p> <p>Management of resources-land, labour, capital and machinery described.</p>

79	SOA/FE115P	Fundamental Forest Business Managements- Practical	1	To study: Principles involved in farm management decision making decision as to what, how, when and how much to produce. Factor- factor-product and product-product relationships. Cost of cultivation and production. Break-even analysis. Principles involved in farm management decision making decision as to what, how, when and how much to produce. Factor- factor-product and product-product relationships. Cost of cultivation and production. Break-even analysis.
80	SOA/FE116T	World Forestry Systems	2	To study about Geographical distribution of forests and their classification. Critical examination of the world forest sources, productivity potential and increment of world forests. To learn about Forest resources and forestry practices in different regions of the world – North and South America, Europe, Africa, China, Japan, Russia, South-East Asia and Australia. To study about Forest development and economy – forest based industries of the world. To learn about Recent trends in forestry development in the world. To study about International forestry organizations.
81	SOA/FE117T	Forest Entomology & Nematology	1	To understand classification, biology, natural history and diversity of insects affecting forest ecosystems. To identify insects common to forests and recognize their damage. To appreciate insect sampling in forest ecosystems, with particular attention paid to monitoring, forecasting and assessing the risk of insect outbreaks. To illustrate the importance of silvicultural practices and management of natural enemies in preventing insect outbreaks. To recognize the importance of cultural, physical, biological, and chemical strategies for preventing, controlling and managing forest pests. To foster an appreciation for the significance of research on insect pests of forests. To understand the morphology of nematodes as it relates to their taxonomic position, their ability to cause diseases of plants and the principles of controlling nematode diseases of plants.
82	SOA/FE117P	Forest Entomology & Nematology-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FE117T
<b>6<sup>th</sup> Semester</b>				
83	SOA/FC125T	Forest Management, Policy and Legislation	2	To study about the management aspects of forestry, yield regulations, rotation, legal aspects related to forestry and working plan. Sustained yield and normality in forestry.
84	SOA/FC125P	Forest Management,	1	To acquire knowledge by visiting forest departments and learning about the records they



		Policy and Legislation- Practical		maintain in the department, formation of working plan and legal aspects they use
85	SOA/FC126T	Principles and Methods of Tree Improvement	2	<p>Introductory study about forest genetics, tree breeding and improvement, Study of history of tree improvement, justification for tree improvement programme, its relation with other disciplines of forest management; activities, advantage and limitation of tree improvement.</p> <p>To learn about Forest reproduction and natural variation: sexual and asexual reproduction and their consequences.</p> <p>Study about Causes and kinds of variability, variation in natural stands, concepts, evolutionary forces that force variations and level of genetic variation; conservation and utilization of forest tree genetic resources- principle &amp; strategies.</p> <p>Learn about quantitative genetics and importance of statistical methods in it, study about selection procedures and techniques in tree improvement, species and provenance selection, Plus tree selection and progeny trials. Study about Introduction to exotic forestry. Learn about seed production areas and seed orchards.</p> <p>Study about Hybrid in tree improvement; mutation and polyploidy breeding. Study about recent techniques in tree improvement, Learn about vegetative propagation and tree improvement.</p>
86	SOA/FC126P	Principles and Methods of Tree Improvement- Practical	1	<p>Study about Seed collection and handling of forest seeds.</p> <p>Learn about Techniques of selecting superior trees in natural stands and plantation. Floral biology and controlled crossing techniques.</p> <p>Study about Vegetative propagation techniques.</p> <p>Learn about Pollen viability determination. Visit to seed production areas and seed orchards.</p> <p>Study about Numerical exercises and statistical analysis.</p>
87	SOA/FC127T	Utilization of Non- timber Forest Products	2	<p>Learn about various methods of collection, management and importance of Non-Timber Forest Products (NTFP) viz.- Fodder (grasses and tree leaves), canes and bamboos. Essential Oils - methods of extraction, classification, storage and uses. Non-essential oils – nature, occurrence, methods of extraction, classification and uses. Important fixed oil yielding trees. Gums and resins –definition, classification, sources, collection and uses. Factors affecting gum formation. Important gum yielding plants. Resins and Oleoresins, their formation in plants and classification of resins. Tans-nature, classification, uses and important tannin yielding plants. Dyes – classification and sources of dyes. Beedi leaves – sources, collection and processing. Fibers and flosses. Katha and Cutch –sources, extraction and uses. Drugs, wild fruits, spices, poisons and bio-pesticides.</p>
88	SOA/FC127P	Utilization of Non- timber Forest Products- Practical	1	<p>Visit to nearby forests to study important NTFP yielding plants. Study of fodder: grasses and tree leaves. Study of canes and bamboos and their sources. Study of essential oils and their sources.</p> <p>Study of non-essential oils and their sources. Study of gums and resins and their collection.</p>

				Study of tans and dyes and their sources. Study of fibers, flosses and their collection from nearby forests. Visit to Herbal Gardens and herbaria to study medicinal plants. Study of plants yielding drugs, spices, wild fruits, poisons and bio-pesticides and their collection from nearby forests. Visit to nearby extraction units.
89	SOA/FC128T	Agroforestry Systems and Management	2	Introduction and classification of Agroforestry system. To learn about various traditional as well as modern agroforestry systems. To know the characteristic and role of various components of agroforestry systems. Impact of argoforestry practices in society, industries and environment.
90	SOA/FC128P	Agroforestry Systems and Management- Practical	1	To conduct the Agroforestry surveys. To identify various Agroforestry systems. To measure volume, biomass, tree dimensions of Agroforestry interest. To do soil analysis.
91	SOA/FC129P	Technique / field tour	1	Field tours to study the forestry field techniques.
92	SOA/FSEC104T	Entrepreneurship Development and Communication Skills	1	Assessing overall business environment in the Indian and managerial economy done. Concept of entrepreneurship and entrepreneurial characteristics discussed. Managing an enterprise and its skills displayed. Motivation and its types. Importance of planning, monitoring, evaluation and follow up discussed. Managing competition is an art and discussed how? Entrepreneurship development programs conducted. SWOT analysis explained. Government schemes and incentives for promotion of entrepreneurship discussed. Government policy on Small and Medium Enterprises (SMEs) / SSIs displayed. Export and Import Policies relevant to forestry sector and its case studies discussed.
93	SOA/FSEC104P	Entrepreneurship Development and Communication Skills- Practical	1	Field surveys. Market case studies. Interviews.
94	SOA/FE118T	Principles of Forest Economics, Project Planning and Evaluation	1	To become familiar with <i>economics</i> and business principles and how they can be applied to <i>forestry</i> . Utilize economic principles to address private and public policy issues related to allocating natural resources and environmental amenities.
95	SOA/FE118P	Principles of Forest Economics, project Planning and Evaluation-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FE118T
96	SOA/FE119T	Marketing and Trade of Forest Produce	1	Demonstrate a basic knowledge of the role of markets and market failure with regards to the allocation of natural resources and environmental amenities.

				To familiar with the role of market channels for distribution of forest resources. To understand the concept of different types of market Students get to know about WTO & IPR.
97	SOA/FE119P	Marketing and Trade of Forest Produce-Practical	1	To impart practical knowledge and hands-on-training based on Course SOA/FE119T
98	SOA/FE120T	Biodiversity & Conservation	1	To explore about the biodiversity and its conservation at local as well as global level. Basic terms about biodiversity and its conservation. Diversity and its analytical features, different life forms under diversity. Conservation biology and its principles. Methods of conservation. Conservation efforts by India and worldwide.
99	SOA/FE120P	Biodiversity & Conservation-Practical	1	To exercise of diversity indices computation , visit of protected areas, case study regarding conservation.
<b>7<sup>th</sup> Semester</b>				
100	SOA/FC130P	Socio-economic surveys -village Attachment (28 working days)	4	To prepare survey questionnaire for socio-economic survey. To conduct the socio-economic surveys for data collection of relevance.
101	SOA/FC131P	Attachment with State Forest Department (70 working days)	10	To understand the construction of modern forest nurseries, herbal gardens and watersheds. To see and understand the procedure of the felling and logging operations, timber lots and important industrial products extraction with the use of Forestry equipments/ instruments. To see the working plan document of various Forest divisions and get to know enumeration, volume and yield calculation & compartment history To study the 'CAT' (Catchment Area Treatment Plan) and FDA (Forest Development Agencies) To study the regeneration and management of important forestry tree species. To conduct layout studies, stump analysis, preparation of local volume table.
102	SOA/FC132P	Industrial Placement (28 working days)	4	To get acquainted with the nature, working environment, production and management process and Marketing & financial management various of wood-based industries.
103	SOA/FSEC105T	Report Writing and Presentation of FWE (14 Working days)	2	To learn the compilation of the workdone/skills gained. To learn the data processing/ analysis. To develop the skill of Presentation of the report.
<b>8<sup>th</sup> Semester</b>				
104	SOA/FC133P	Project Development (2 weeks)	2	To develop the skill of project development to carry out any research activity.
105	SOA/FC134P	Collection, Handling, Processing and Storage of planting material (3 weeks)	2	To identify the superior seed sources. To use various seed collection methods for different species on field. To put seeds under various seed treatments to document their quality and regeneration potential. To understand the methods of storage of collected planting materials.
106	SOA/FC135P	Vegetative Propagation under controlled and	3	To apply vegetative propagation methods like cutting, grafting for propagation of forest trees, medicinal plants and fruit trees.

		ambient conditions (3weeks)		Production of bare root and containerized seedlings.
107	SOA/FC136P	Nursery Management (11 Weeks)	9	Practical application of the nursery management practices like seedbed preparation, sowing, planting, irrigation, polyhouse management, various intercultural operation.
	SOA/FSEC106P	Marketing of seeds and seedlings (2weeks)	2	To understand the marketing channels and links. To grade the planting stocks on the basis of quality and do pricing for them
108	SOA/FSEC107P	Cost Benefit analysis, Project Report & Presentation (1 week)	2	To get acquainted with the economic analysis of projects. To sharpen the skills of documentation of the field studies. To sharpen the skill of Presentation of research projects.