

M.Sc. Forestry

Programme Code: 333

Programme Summary

Duration: 2 years

Eligibility

B.Sc.(Agri.) / B.Sc.(Horti.) / B.Sc. (Forestry) degree or equivalent degree with four years duration.

Program outcome

- To study the concepts and methods of growth & development of forest tree species along with their modern nursery techniques .
- To learn about various methods to measure various dimensions of forest trees, area etc using different advanced tools along with modern remote sensing techniques.
- To study about various wood based raw materials, their physico-chemical analysis, wood based industries, finished products, non-timber forest products and their industries.
- To learn about different ecological aspects of forest, resources, productivity, forest ecosystems and biodiversity.
- To study about the usefulness of various statistical methods & tools in forestry researches, thesis, technical bulletins etc.
- To learn about forest based economics, tools techniques, tangible/intangible services, their market values and eco-development planning.
- To study about various diseases, insect -pest of forest tree species nursery, forest fire, adverse climatic factors, biological control of disease-insect -pest and other modern techniques.
- To study about different forest policies, laws, procedures, conservation acts, wild life act, forest rules.
- To learn about various concepts/aspects of forest genetics, breeding, tree improvement, resources, improvement techniques, polyploidy, GMOs etc.
- To study remote sensing, its use, tools, techniques for assessment of forest, resources, disease, fire, natural calamities, distribution of species.
- To learn about various Agroforestry systems, concepts, importance, implications and researches at national/international level.
- To study of concepts of soil and water management in Agroforestry, interpretation of meteorological data and bio-geochemical cycling with productivity.
- To study about different crops, inter-crops, agroclimatic/ecological zones in India, cropping patterns, designs, productivity etc.
- To learn about various economic aspects of Agroforestry schemes /projects, their socio-economic analysis, budgeting, marketing, enterprize, pre-post harvesting techniques, benefits in Agroforestry.
- To Study about different fruit, trees, woody elements and shrubs, their importance, agro-climatic distribution, improvement aspects and productivity.

- Study of eco-zonation and choice of Agroforestry systems, their components, integration and management techniques along with modern research tools.
- To study about concept, distribution, development & planning of watershed.
- To learn about various aspects and concepts of wood, water relations, physico-chemical aspects, seasoning & preservation techniques, factors affecting utilization etc.
- To Study about various aspects of forests, their importance, interaction with humans, livestock, farming systems, forest rights, climate change, biodiversity management etc.
- To know about history/future aspects of global climate change w.r.t. forests, agriculture, aquatic and other biotic ecosystems.
- To study about planning establishment, resources, importance and management of seed orchards, their types, genetic and silvicultural aspects.
- To acquire detailed knowledge about specific subject and topic and discipline.

Course outcome:

	Course code	Course name	Credits	Course outcome
1st Semester				
1	SAS/For/C001	Advanced Silviculture	3	To explore the silviculture in advanced form. Expend the way of treating the forest crop by improved and advanced techniques. To understand the ecosystem concepts, forest composition and forest structure. Productivity and vegetation forms of India, major forest division of world, regeneration of species in even and uneven aged stand. Silviculture of important trees. Expand the knowledgeable of modern nursery techniques and tools.
2	SAS/For/C002	Forest Biometry	3	The aims of the Biometry to Measurement of trees and stand; diameter (crops), girth, height, volume, tree form, taper equations, bark thickness, crown width and crown length determination of age and volume of felled as well as standing tree. This module is designed to introduce statistical ideas for data collection and analysis that are suitable for the modern biological scientist. Biometry is the application of mathematics and statistics to problems in the agricultural, environmental, and biological sciences. Knowledge to design efficient experiments and surveys, to identify appropriate statistical techniques for the analysis of the data collected, to complete simpler analyses using a common statistical computing package, to interpret the output produced by these analyses, and to evaluate the results from statistical analyses presented in scientific papers.
3	SAS/For/C003	Advanced Forest Management	3	Knowledge of forest ecology and silviculture principles to understand how forests and forested watersheds respond to natural disturbances or management activities. Understanding of the social and political context of forestry and be able to describe current policies, laws, and regulations governing the management of forest lands. Understanding valuation of Forest products.
4	SAS/For/C004	Forest Industries & Forest Products Chemistry	3	To study Wood based industries relation to Indian economy. To study wood chemistry and details about wood's extreneous components. An idea about types of wood based industries in India. For example Pulp & paper, rayon, composite wood etc. To study the wood saccharification and destructive distillation process and their products as well as by-products.
	SAS/For/C005	Forest Ecology & Biodiversity Conservation	2	To Acquire knowledge of forest ecosystems through - Forest population Estimating abundance based on counts, Estimation of demographic parameters- delectability and demographic rate parameters, analysis of age frequencies. Estimating survival, movement.

			<p>Population viability analysis (PVA). Help the students to amass the knowledge about forest community and level of disturbances and their impact on ecology - through Forest community dynamics, structure and analysis: Estimation of community parameters- estimation of species richness, estimating parameters of community dynamics. Modern methods of data acquisition and summary classification and description, vegetation- environment relations, and successional processes. Predictability of vegetation pattern. Spatial and temporal scale of community based analysis. Multivariate data analysis with applications to plant community. Forest Productivity and Ecology of Forest landscapes: Will help the students to acquire knowledge about patents and international rules regarding IPR through - Spatial heterogeneity and hierarchy issues in ecology, Concept of biodiversity, Biodiversity zones species richness and endemism, state of biodiversity in India. Conservation of natural resources (hotspot areas, wildlife sanctuaries, national parks, biosphere reserves). Global warming and forests. Green House Effect and its consequences. Ozone depletion. Conservation laws and acts. Forest genetics resources of India: timber and non timber species. Survey-exploration and sampling techniques. Documentation and evaluation of forests genetical resources (FGR), Conservation, in situ and ex situ of gene resources. Biological diversity and its significance to sustainable use. Handling and storage of FGR. Intellectual property rights. Quarantine laws and FGR</p>
	Practical		<p>1</p> <p>Students will learn the tool to explore and dimensions of ecology through - Study of forest community structure and its successional status; estimation of productivity of forest ecosystem; trip to different regions of the state to study forest vegetation; collection and preservation of specimen. Methods of vegetation analysis. Measurement of biomass and productivity. Quantification of litter production and decomposition. Visit to national parks, wildlife sanctuaries, botanical gardens and arboreta.</p>
	SAS/For/C006	General Statistical Methods & Research Methodology	<p>2</p> <p>Linear and non-linear regressions, parabolic, exponential, power and logarithmic functions. Estimation and Testing of Hypotheses Concept of point and interval estimation, estimators and estimates, properties of good estimators- unbiasedness and minimum variance, testing significance of correlation and regression coefficients, analysis of variance (ANOVA) –one way and two way classification with single and more than one cell frequency.</p>

				<p>Design of Experiments: Principles of experimental designs.</p> <p>Sampling-Theory and Applications: Why sample? Simple Random Sampling (with and without replacement), Stratified Random Sampling, Double sampling, Multistage sampling, Cluster sampling, Multivariate Statistical Techniques, Multivariate Analysis of Variance, Principal Component Analysis, Factor Analysis, Cluster Analysis, Selection of research problems considering National Forestry Policy- Writing project proposal, Generation of Research questions, Stating objectives of research study, Proposing hypotheses.</p> <p>Planning for literature survey, Use of computer based literature, Planning for field work, Sampling and Enumeration exercises in the field and recording of the data and use of statistical tools. Interpretation of data and deriving inference and conclusions.</p> <p>Preparation of thesis/ dissertation/research project report.</p> <p>Writing of scientific articles and technical bulletin, Monitoring and evaluation methods.</p>
	Practical		1	<p>Fitting of probability distributions, Computation of correlations and regressions, Tests of significance –t,F,z, X², Exposure to statistical packages SPSS and GENSTAT for ANOVA, multivariate analysis. Laying out of designs in the field (i) Fan design (ii) Latin Square, (iii) Randomized block design, (iv) Split plot design, (v) Row-Column designs and (vi) Scattered block. Data analysis of the above designs.</p>
2nd Semester				
	SAS/For/C007	Forest Resource Management & Economics	3	<p>Understand the concept of microeconomics related to forest Demand – Supply analysis of Forest Product Analyses the method for valuation of Non-market product Method and implementation of Forest certification SWOT Analysis Use of Operation Research Tools.</p>
	Practical		1	<p>Application demand -supply concept Evaluation of ecosystem services use of computer programming technique for evaluation.</p>
	SAS/For/C008	Forest Protection	2	<p>To study about Important diseases and insect pests of nurseries, plantations, standing trees and their management. Assessment of losses due to diseases, insect pests, vertebrate pests, adverse weather, forest fires and weeds.</p> <p>Insect pests and mycoflora of seeds of forest trees and their management, Biodegradation of wood- microscopic and chemical effects of white rot, brown rot, soft rot and wood discoloration Heart rots- factors affecting heart rots, damage caused, compartmentalization of decay in trees and management of heart rots.</p> <p>Role of mycorrhiza in tree health.</p> <p>Theories of natural regulation of insect populations.</p> <p>Wildlife damage in nurseries, plantations and their management.</p> <p>Weed problems in nurseries, plantations and their control.</p> <p>Adverse climatic factors, acid rains and air pollutants in relation to forest tree health.</p>

				Biological control of insect pests and diseases of forest trees. Molecular tools for developing disease resistance in trees.
	Practical		1	Collection, identification and preservation of important insect pests and disease specimens of forest plants Detection of insect infestation and seed borne mycoflora. Assessment of losses due to diseases, insect pests etc. Habitat management of vertebrate pests. Laboratory tests for estimating decay resistance in wood. Fire control methods and devices. Familiarization with the meteorological and plant protection equipments. Application of pesticides and bio-control agents in the management of insect pests, weeds, diseases in nurseries and plantations. Extraction of spores of arbuscular mycorrhizal (AM) fungi from soil and assessment of mycorrhizal root colonization.
	SAS/For/C009	Forest Policy, Law & International Convention	3	Will help the students to study the legal aspect of forestry through- Forest policy- Relevance and scope; National Forest Policy- 1894, 1952 and 1988; General principles of criminal law; Indian Penal Code, criminal procedure code; Indian evidence act as applied to forestry matters; Forest laws; Indian Forest Act- 1927, general provision and detailed study; Forest Conservation Act 1980, Wildlife Protection Act 1972, To understand the Important Forest Rules and Guidelines, Important case studies and landmark judgments.
	SAS/For/C010	Forest Genetics and Tree Improvement	3	To study Population Genetics- Selection definitions, Hardy Weinberg equilibrium, complete elimination of homozygous recessive trees, partial selection against recessives, selection favouring recessive (against dominants), selection for genes with additive effects, "Fitness and Fisher's Fundamental Theorem". Selection for and against heterozygotes, selection in small populations, how to increase selection pressure, mutation, migration and isolation. To learn about Tree Breeding- Variation in trees, importance and its causes. Natural variation as a basis for tree improvement. Geographic variation, ecotype, clinal races and land races. To study Selection and management, selection of forest trees – selection criteria; plus tree selection, breeding methods selection and genetic gains species and provenance selection. To study Quantitative genetics – General principles and practical application in forest tree improvement, heritability, general and specific combining ability. To learn about Controlled crossing systems and designs- purpose, self pollination, crossing system with unknown father, crossing system with known father, crossing plans, complete diallel, modified diallel, partial diallel, factorial. To study about Seed orchards- Types of seed orchards, planning and design, establishment, management,

				<p>harvesting.</p> <p>To study Progeny trials – Definitions and importance types of progeny, crossing systems, experimental designs, cultivation techniques, evaluation, records etc.</p> <p>To learn Genotype – environment interaction.</p> <p>Planning and strategies of a tree improvement programme. Breeding trees for specific purpose (Pest, disease and adverse environment). To explore Species and racial hybridization and its application.</p>
2	SAS/For/C010	Forest Genetics and Tree Improvement-Practical	1	<p>To study Numerical analysis of population genetics questions, To study Plus tree selection, variation analysis in a forest population. Numerical questions on quantitative genetics.</p> <p>To explore pollen viability, végétative propagation techniques, clonal experiments.</p>
	SAS/For/C011	Remote Sensing & Geographic Information System	3	<p>The use of aerial photography, satellite imagery and geographic information system for the collection, storage and spatial analysis for geo-referenced forest resources data and information. Acquisition and interpretation of satellite data for forestry purpose. The integration of spatial data analysis system with knowledge-based systems and/ or simulation systems for the development of information/ decision support systems for forest management; satellite system; satellite imageries- techniques, uses and limitation; future prospects of remote sensing in India; software used in remote sensing; GIS versus remote sensing.</p>
	Practical		1	<p>Uses of various photogrammetry instruments; recognition and identification of objects on photography; compilation of maps and interpretation. Hands on practice on remote sensing and GIS, software. Digital and visual interpretation of satellite image.</p>
3rd Semester				
	Practical		1	<p>Identification of Agroforestry systems using the classification of Agroforestry.</p> <p>Application of Diagnosis & Design methodology in nearby area to understand need of improvement in existing landuse systems.</p>
	SAS/For/C021	Soil and Water Management in Agroforestry	1	<p>Will help to understand Soil and water management- objectives and scope in relation to agroforestry system. Soil and water conservation, land classification and carrying capacity. Irrigation potential and methods. Optimization of waters use in agroforestry systems and dry land farming. Will acquire knowledge about Interpretation of agro-meteorological data for water management. Problem soils and their management, soil organisms and nitrogen fixation. Biogeochemical cycling of nutrients including organic matter decomposition. Nutrients budgeting and soil productivity under different agro-forestry systems.</p>

	Practical		1	To acquire knowledge about the practical aspect of Calculation of water storage and fluxes in the soil. Determination of “in-situ infiltration rate of soils. Measurement and estimation of run-off. To study about Mineral nutrient analysis of soil and plants. Study of biogeochemical cycles in agro-forestry systems.
3	SAS/For/C022 (Theory)	Principles of Crop Production in Agroforestry	1	To study about Choice of inter-crops for different tree species, sowing and planting techniques. Planting patterns, crop geometry, nutrient requirements irrigation scheduling, and weed management of field crops pulses, oil seeds, fodders, vegetables, medicinal plants and ornamentals seed production. To learn about Production potentials in multiple cropping in relation to agro climatic conditions. crop combination interactions in crop mixtures. To learn Allelopathy canopy management & Plant protection.
4	SAS/For/C022 (Practical)	Principles of Crop Production in Agroforestry	1	To learn about Measurement of crop growth rates. Study of crop weed association and fertilizer response. Quantitative evaluation of multiple and inter-cropping preparation and application of herbicides field visits.
5	SAS/For/C023 (Theory)	Economics of Agroforestry Systems	1	To know Basic principles of economics applied to agro-forestry. To explore Optimization techniques –Planning, budgeting and functional analysis. Role of time, risk and uncertainty in decision making. To study Financial and socio-economic analysis of agro-forestry projects. To study Principles of financial management and harvesting, post harvest handling marketing of agro-forestry products including benefit sharing.
6	SAS/For/C023 (Practical)	Economics of Agroforestry Systems	1	To conduct Exercises on agro-forestry production relationships. Preparation of enterprise, partial and complete budgets. Application of various methods in formulation and appraisal of agro-forestry projects. To prepare Case studies on harvesting, post harvest management and marketing of agroforestry products.
	SAS/For/E010	Fruit Trees and Shrubs for Agroforestry	2	To access the role of fruit tree and shrub species in different agroforestry system. Specific features of multipurpose tree species and their use in agroforestry. Role of woody elements in agroforestry systems. Fruit trees role and relevance in agroforestry. Management of soil fertility, yield and quality under different agroforestry systems. Nitrogen fixing trees and shrubs, specific and generic characters of tree and shrub species used in agroforestry systems.
	SAS/For/E010	Practical	1	To excel the field studies for special features of tree, shrub and fruit species for agroforestry.
	SAS/For/E011	Management & Productivity in Agroforestry Systems	3	To extend the knowledge of Management and Agro-forestry Systems for Enhancing Resource Use Efficiency and Crop Productivity. Soil and water management is the key to sustainable crop production and food security. Nuclear and isotopic techniques were used to provide crucial information on nutrient and

				water dynamics in agroforestry systems.
	SAS/For/E013	Watershed Management	3	Understand the concepts of watershed management and its effect on land, water and ecosystem resources. Analyze public policies and practices of watershed planning. Assess the impact of watershed planning through case studies Develop control and mitigation techniques for watershed problems.
	SAS/For/E013	Watershed Management Practical	1	In- field case study and application of engineering to protect and preserve watershed to improve the livelihood.
4th Semester				
1	SAS/For/E018	Wood Seasoning & Preservation	2	To understand Wood water relationship and Refractory & non refractory behavior of wood so that best utilization of wood can be done. To study various Wood seasoning methods in detail. To study the different kind of defects of timber and their effect in its utilization. To understand the effect of decaying agencies- fungi, insects, borer etc in wood properties. Detailed study of wood preservation.
2	Practical		1	Hands-on exercises based on course SAS/For/EO18
3	SAS/For/E020	Forest and People	3	To understand the forest and its importance, interaction between forest and people, forests and economy of livestock, forest management and its social and cultural factors, human-wildlife conflicts, gender dimension of forest management, forest and tribal community, common property resource, important right of forests, biodiversity and ethno-botany.
4	SAS/For/E021	Global Climatic Changes	3	To study about History and future of Earth's climate system. To study the effect & interaction of Ozone depletion and UV radiation with weather. To understand the vulnerability and adaptability of agriculture, forests, aquatic and biotic ecosystems to climatic change. To understand the responses of biotic communities and changes in reproductive biology of flora and fauna.
5	SAS/For/S001	Tree Seed Orchards Self Study Course	3	To study Importance of genetically improved seed in plantation. Status of seed production among major plantation species. Short term supply of superior seed. To learn about Selection and delineation of seed stands, seed production areas, seed zones, seed ecological zones. Seed orchard: need, evolving seed orchards, containerized seed, hybrid and research seed orchards: first, second and advanced generation seed. Seed orchard genetics: random mating, gamete exchange and parental balance. Estimation of genetic parameters from seed orchards data. Ortet age and its effect on seed production. Importance of progeny testing. Establishment of seed orchards, selection and preparation of orchard site, isolation,

				orchard size, and design. To know about Seed orchard management: roughing, silvicultural practices to increase seed yield. Pest and disease management. Seed collection and record keeping, seed orchard registration and documentation. Importance of seed orchards in gene conservation.
6	SAS/FOR/C028	M.Sc. Thesis (Field Based Work)	9	To acquire detailed knowledge about specific subject and topic and discipline.