

Unit 1: Forests and Forest Policy

Forests-extent, basis for classification and distribution in India; Geographical distribution and salient features of major world forest types; Phylogeographical regions and vegetation of India; Role of forests in national economy - productive, protective and ameliorative, tribal and rural livelihoods; Forest types of India: distribution and types; Succession, climax and retrogression; Concepts of biomass, productivity, energy flow and nutrient cycling in forest ecosystem; Migration and dispersal mechanism.

National Forest Policy 1894, 1952 and 1988 ; Indian Forest Act, 1927; Forest Conservation Act, 1980 and Wildlife Protection Act, 1972; Amendments 1991, 2003 and 2006, Biological Diversity Act, 2002, The Scheduled Tribes and Other traditional forest dwellers (Recognition of Forest Rights) Act, 2006. National Agroforestry Policy, 2014

Unit 2: Silviculture

Definition, object and scope of silviculture; Site factors - climatic, edaphic, physiographic, biotic and their influence on forest vegetation; Forest regeneration: natural and artificial; Silvicultural systems - high forest and coppice systems; Seed collection, processing, storage, viability and pre-treatment; Seed dormancy and methods for breaking dormancy; Seed testing and germination tests; Seed certification and ISTA Rules; Forest nursery - need, selection and preparation of site, layout and design of nursery beds; Types of containers; Root trainers; Growing media and sowing methods; Management of nursery-shading, watering, manuring, fertilizer application, weed control, insect pest and diseases control; Planting techniques: site selection, evaluation and protection; Soil working techniques for various edaphic and climatic conditions; Planting patterns; Plant spacing, manure and fertilizer application, irrigation/moisture conservation techniques; Choice of species. Afforestation on difficult sites: saline-alkaline soils, coastal sands, lateritic soils, wetlands, ravines and sand dunes, dry and rocky areas, cold desert; Tending operations - weeding, cleaning, climber cutting, thinning - mechanical, ordinary, crown and selection thinning, improvement felling, pruning and girdling; Silviculture of important tree species- *Populus*, *Eucalyptus*, *Dalbergia*, *Acacia*, *Tectona*, *Shorea*, *Prosopis*, *Casuarina*, *Pinus*, *Gmelina*, *Azadirachta*, *Diospyros*, *Pterocarpus*, *Anogeissus*, *Santalum*, *Quercus* and *Albizia*, bamboos, *Melia dubia*, *Ailanthus excelsa*, *Simarouba* and *Karanja*. Plantation forestry – industrial and energy plantations

Unit 3: Forest Biology and Tree improvement

Tree improvement: nature and extent of variations in natural population; Natural selection; Concept of seed source/ provenance; Selection of superior trees; Seed production areas, exotic trees, land races; Collection, evaluation and maintenance of germplasm; Provenance testing. Genetic gains; Tree breeding: general principles, mode of pollination and floral structure; Basics of forest genetics - inheritance, Hardy weinberg Law, genetic drift; Aims and methods of tree

breeding. Seed orchard: types, establishment, planning and management, progeny test and designs; Clonal forestry - merits and demerits; Techniques of vegetative propagation, tissue culture; Role of growth substances in vegetative propagation.

Unit 4: Forest Mensuration

Forest mensuration - definition, object and scope; Measurement of diameter, girth, height, stem form, bark thickness, crown width and crown length; Measurement methods and their principles. Measurement and computation of volume of logs and felled/standing trees; Construction and application of volume tables; Biomass measurement; Growth and increment; Measurement of crops; Forest inventory: kinds of enumeration, sampling methods, sample plots and aerial photo interpretation; Geographic information systems and remote sensing - concept and scope.

Unit 5: Social forestry and Agroforestry

Social forestry, community forestry and farm forestry; Concept and definition of agroforestry, Benefits and constraints of agroforestry; Historical development of agroforestry and overview of global agroforestry systems. Classification of agroforestry systems: structural, functional, socio-economic and ecological; Diagnosis and design of agroforestry system; Land capability classification and land use; Criteria of an ideal agroforestry design, productivity, sustainability and adoptability; Multipurpose tree species and their characteristics suitable for agroforestry.

Unit 6: Agroforestry management

Plant management practices in agroforestry; Tree-crop interactions: ecological and economic; Concept of complementarity, supplementarity and competition; Productivity, nutrient cycling and light, water and nutrient competition in agroforestry; Concept of allelopathy and its impact on agroforestry; Agroforestry practices and systems in different agro - ecological zones of India..

Unit 7: Wood Science and Forest Products

Logging and ergonomics- wood anatomy, wood seasoning and preservation techniques; Forest Products and utilization- Manufacturing and utilization of wood products (timber and composite wood)and non-wood forest products such as fibres, flosses, dyes, gums, resins & tannins, medicinal plants, essential oils, edible fruits, spices, bamboo and canes.

Unit 8: Forest Degradation and Protection

Extent and causes of land denudation; Effects of deforestation on soil erosion,land degradation. Wastelands: their extent, characteristics and reclamation; Watershed management and its role in social, economic and ecological development; Forest fires: causes, types, impacts and control measures; Major forest pests, **diseases**and weeds and **its management**.

Unit 9: Forest Management and Forest Economics

Forest management: definition and scope; Concept of sustained yield and normal forest; Rotation; Estimation of growing stock, density and site quality; Management of even aged and uneven aged forest; Regulation of yield in regular and irregular forests by area, volume, increment and number of trees; land equivalent ratio; Working plan; Joint forest management; Conservation and management of natural resources including wildlife; Forest evaluation; Internal rate of return, present net worth and cost benefit analysis. Ecosystem services. Economic evaluation of agroforestry systems: cost benefit analysis and land equivalent ratio

Unit 10 : Wildlife

Wildlife biology, ornithology, herpetology, wild life management - Population estimation in wildlife – census methods, Man-animal conflicts and management strategies.

Unit 11 : Forest Genetic Resources and Ecotourism

Role of green revolution in forest conservation in India. *In situ* and *ex situ* conservation of forest genetic resources – Sacred groves; Urban forestry – Choice of species, design, development and management, Eco-tourism.

Unit 12 Climate change and mitigation

Climate change: greenhouse effect, sources and sinks of greenhouse gases, major greenhouses gases; Global climate change – its history and future predictions; Impact of climate change on agriculture, forestry, wildlife, water resources, sea level; Livestock, fishery and coastal ecosystems; International conventions on climate change; Global warming: effect of enhanced CO₂ on productivity; Ozone layer depletion; Disaster management, floods, droughts, earthquakes; Tsunami, cyclones and landslides; Agroforestry - environmental conservation- carbon sequestration.

Unit 13 : Statistics

Statistics: definition, object and scope; frequency distribution; mean, median, mode and standard deviation, introduction to correlation and regression; Experimental designs: basic principles, completely randomized, randomized block, latin square and split plot designs.