

# FORESTRY

## (UG DEGREE STANDARD)

SUBJECT CODE: 283

### UNIT- I: SILVICULTURE

Forests - definition. Extent of forests in India and other countries. Forest types of India and Tamil Nadu - revised classification - pure and mixed stands - even and uneven aged stands. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Silviculture - objectives - scope - general principles. Regeneration - natural and artificial. Nursery techniques - containerised seedling production - techniques and methods. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques. Plantation forestry - reforestation and afforestation - maintenance of plantations - enrichment planting. Tending operations - weeding, cleaning, thinning, pruning, after care techniques; cultural operations - soil working. Silvicultural systems - clear felling, shelter wood, selection and coppice systems - improvement felling. Silviculture techniques for some important species - Tropical Species - *Acacia spp* (indigenous and exotics), *Albizia lebbeck*, *Albizia falcataria*, *Ailanthus excelsa*, *Azadirachta indica*, *Bambusa bambos*, *B. balcooa*, *B. vulgaris*, *Casuarina equisetifolia*, *C.junghuhniana*, *Ceiba pentandra*, *Dalbergia latifolia*, *D. sissoo*, *Dendrocalamus strictus*, *Eucalyptus spp* (*E. tereticornis*, *E.camaldulensis*, *E. grandis*, *E. globulus*), *Grevillea robusta*, *Hardwickia binata*, *Leucaena leucocephala*, *Melia dubia*, *Pongamia pinnata*, *Populus deltoides*, *Prosopis juliflora*, *Pterocarpus santalinus*, *Santalum album*, *Syzygium cuminii*, *Shorea robusta*, *Tectona grandis*, *Terminalia spp.*(*T.chebula*, *T.bellerica*, *T.paniculata*, *T.tomentosa*), *Tamarindus indica*. Temperate Species - *Alnus nepalensis*, *Cedrus deodara*, *Pinus roxburghii*, *P. wallichiana*, *P. patula*.

### UNIT - II: FOREST MENSURATION AND MANAGEMENT

Forest Mensuration - Definition and objectives. Measurement of diameter, girth, height, crown and volume of trees - methods and principles - tree stem form - form factor. Volume estimation of stand - age - basal area determinations Stem and

Stump Analysis. Forest inventory - sampling techniques and methods - measurement of crops - sample plots. Yield calculation - CAI and MAI - volume, yield and stand tables preparation. Forest management - objectives and principles. Forest organisation. Sustainable Forest Management (SFM) - criteria and indicators of SFM - sustained yield - concept and management - arguments for and against sustained yield - Forest Certification - Standards, Procedures and agencies. Rotation - normal forest - increment - growth stock determination. Yield regulation - principles and concepts - Von Montel's formula and its modifications - yield regulation in regular and irregular forests. Working plan - objectives and scope - constitution of working plan division. Enumeration and sampling. Regeneration survey - Plantation journal - divisional working plans - annual plan of operations. Joint forest management. Aerial photography and remote sensing - methods and techniques - GIS for forest management and modelling.

### **UNIT- III: FOREST UTILISATION AND WOOD TECHNOLOGY**

Logging - extraction of timber - felling rules and methods - conversion methods - conversion season. Implements used - cross cutting system - sawing - different types - extraction methods. Grading of timbers. Transportation of timbers - major and minor transportation methods Storage and sales of logs - sales depot - management of depots. Recent trends in logging - Ergonomics and RIL. Forest products - Timber - timber, fuel, pulp, paper, rayon and match. Wood Composites - plywood, particle board, fiber boards, MDF, hardboard, insulation boards - production technology. Non timber forest products (NTFP) - collection - processing and storage of NTFP - fibres and flosses - bamboos and canes - katha and bidi leaves - essential oils and oil seeds - gums and resins - tans and dyes - drugs - insecticides - lac and shellac - tassar silk - role of tribal co-operative societies. Wood Science - Macroscopic character of wood - three dimensional structures - structure of heartwood and sapwood - hard wood and soft wood. Composition and structure of wood - chemical components and cell wall structure and formation. Anatomical structures of heartwood and softwood - reaction wood - wood and water relations. Properties of wood - physical properties - specific gravity, density of wood - mechanical properties - gross features of wood. Defects in wood - natural defects. Seasoning of wood - principles and objectives of seasoning - seasoning methods - air and kiln seasoning - seasoning defects. Wood preservation - principles and methods - wood

preservatives - definition - kinds of preservatives - method of preservative application - pressure and non-pressure processes - classification of wood based on seasoning behaviour.

#### **UNIT- IV: FOREST SURVEYING AND ENGINEERING**

Surveying - principles of surveying - errors in surveying - scope of surveying in forestry. Scales - linear measurement. Different methods of surveying - chain, prismatic, compass, plain table and topographic survey. Area calculation - instruments and principles - maps and map reading. Principles of forest engineering - levelling instruments - building materials and construction. Forest roads - objectives - principles and types of forest roads. Causeways and culverts. Bridges - construction of bridges - construction of timber, RCC, steel and suspension bridges - cable roadways and winches.

#### **UNIT- V: FOREST SOILS AND SOIL CONSERVATION AND WATERSHED MANAGEMENT**

Forest soils - Classification - Factors affecting soil formation - podzolisation and laterization. Physical, chemical and biological properties of forest soils. Problem soils - classification of waste lands - extent of waste lands in India - reclamation of alkaline, saline, water logged and other waste lands - sand dune stabilisation - wind breaks and shelter belts. Soil conservation - definition - objectives - problems - programmes and achievements. Erosion - types and causes - wind, water - management of eroded region. Role of micro organisms in soil amelioration - Use of bio-inoculants Azospirillum, Azotobacter, Phosphobacteria, Rhizobium, VAM, Frankia, and Vermicompost. Soil and water conservation measures. Watershed management - concept and methods - forest treatments - stream flow - water harvesting and conservation - ground water recharge - impact on water yield and quality.

#### **UNIT- VI: FOREST ECONOMICS, POLICIES AND LEGISLATIONS**

Fundamental principles of forest economics - cost benefit analysis - NPV, IRR analysis - demand and supply estimation. Socio-economic analysis of forest productivity - attitudes and analysis of trends in national and international markets - assessment of market structure. Forest valuation - direct and indirect valuation -

stumpage valuing, price size gradients - devastation value - risk management. Project formulation - project monitoring - evaluation - elements of time series analysis and forecasting - role of corporate financing. Forest policies - Necessity - Formulation of National Forest Policy. History of forest development in India - Indian Forest Policy of 1894, 1952 and 1988. NCA report on forestry - role of ICAR and ICFRE in forest research and education. National Mission on Wasteland Development. Forest Organizations and Institutes - National - FRI, IGNFA, FSI, WII, IIFM, IWST, IFGTB, SACON etc. - International - ICRAF, ITTO. Forest laws - necessity - general principles - Indian Forest Act 1927, Forest Conservation Act 1980, Wildlife Protection Act, 1972, Tamil Nadu Forest Act, 1882, Tamil Nadu Timber Transit Rules, 1968, Tamil Nadu Hill Act, 1985 - application of IPC to forests. Recent Policies and Acts - Tribal Bill, 2007, Biodiversity Bill, 2002, National Agroforestry Policy 2014. ITTO, GATT and its relevance to timber export - Rio summit and Kyoto Protocol and its relevance to timber export.

### **UNIT- VII : FOREST BIOLOGY AND BOTANY**

Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity - nutrient cycling. Composition of forest types in India - classification of India's forests - species composition - association and diversity. Restoration ecology - global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism - Red Data Book. Biodiversity assessments - principles and methods. Forms of trees - structure and function - physiology and reproduction of trees - water relation - physiology in stress environments (drought, water logging, alkalinity and salinity). Seed and its importance. Characters of good quality seeds. Seed dormancy - types and causes - dormancy breaking. Seed collection- physiological maturity - Seed extraction - seed processing. Seed grading and upgrading of seed lots. Seed treatments - principles and methods - seed pelleting. Seed sampling - procedure. Seed testing - purity analysis - moisture estimation - seed germination test - quick viability test. Seed storage - orthodox and recalcitrant seeds - causes of deterioration - seed storage containers. Seed certification procedure - Seed Act and Rules - Quality control and legislation. Forest

Botany - Importance of botany - taxonomic classification of plant species - identification of species - composition and association. Dendrology - principles and establishment of herbaria and arboreta. Tree Improvement - Forest Genetics and Tree Breeding - Definition and concepts - Steps in tree improvement - Variation and selection - Progeny Evaluation Test (PET) - Candidate Tree, Plus Tree, Elite trees - use of provenances and seed sources - heritability and genetic gains - hybrids in tree improvement - heterosis exploitation. Seed production Area and seed orchards - types and establishment. *In situ* and *ex situ* gene conservation. Exotics - role of exotic forest trees in India - application of biotechnological methods in forestry.

### **UNIT -VIII: WILDLIFE BIOLOGY AND MANAGEMENT**

Wildlife and wild animals - food chain - prey and predator relationship. Introduction to wildlife management. Ecology and biology of wildlife - principles and techniques of management - Man and Biosphere (MAB) programme - wildlife habitats. Census - methods and application - land tenure system. Major wildlife species in India and their broad study. Wildlife conservation - policies and legal measures - sanctuaries - national parks - biosphere reserves. Ornithology - bird habitats - bird species of India - avian extinction - causes and management. Role of NGOs and others in avian fauna conservation - beneficial and harmful roles of birds. Herpatology - definition and uses. Man and animal interaction - Impact and management. Ecotourism and Recreation Forestry. Management of captive wildlife - captive breeding - diseases of wildlife and their management.

### **UNIT- IX: FOREST PROTECTION**

Role of forest protection in Indian forestry. Injuries caused by various agencies - by human beings, plants, animals, insects, birds, adverse climatic factors. Forest fire - beneficial and adverse causes - fire protection methods and rehabilitation. Pests and diseases of economic trees - control measures for pests and diseases for major tree species - biological, chemical and integrated pest and disease management methods. Termites - types and their management. Alien or invasive weeds and their management - forest encroachments and grazing.

## **UNIT - X: AGROFORESTRY AND SOCIAL FORESTRY**

Agroforestry - definition, concept and objectives. Classification of agroforestry systems - primary systems and subsystems - inheritance effects. Tree-crop interactions - above and below ground - competition for space, water, light and nutrients. Microclimatic modifications - nutrient cycling and soil fertility improvement - Allelopathy and allelochemicals. - Ecological aspects of agroforestry - benefits and limitations of agroforestry. Agroforestry practices for different agro-climatic zones of Tamil Nadu. Agroforestry practices for wasteland reclamation. Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation. JFM - principles, objectives and methodology - choice of species for agro forestry and social forestry. Urban Forestry - definition and scope - benefits - choice of tree species - planting techniques and management.