Syllabus for Core Subjects

Group A Subjects

1.0 Overview – Forestry, Wildlife Preservation and Environmental Protection (1 Course)

Course I – Overview of Forestry

1.1 Introduction to Forest Service
1.2 The history of forest management in India
1.3 Forests as a multiple-function natural resource
1.4 Global and Indian perspectives of forests & wildlife – long-term chall
1.5 Environment Protection – Issues and Perspectives
1.6 The interface of forestry and environment protection with other sector
1.7 Forest Governance, Administration & Management
1.8 Introduction to forest laws and policies
1.9 Forestry research and training

2.0 Life Sciences and Ecology of Forests and Other Ecosystems (3 Courses)

Course I- Elementary Biology / Elementary Mathematics

1. Elementary Biology:

a. Botany:

1.1 Classification of plant kingdom
1.2 Morphology-parts of an angiosperm plant
1.3 Seed germination
1.4 Root, stem, the cell, the tissues
1.5 Cell division; physiology-absorption, conduction of water and mineral salts; metabolism-photosynthesis, respiration; nitrogen fixation; reproduction
1.6 Laboratory work - terminology related to morphology, description of stem, leaves and inflorescence, description of a flower and its different parts, use of flora for field identification of tree species

b. Zoology:

1.7 Classification of animal kingdom – distinguishing features of different classes

2. Elementary Mathematics: Fundamentals of algebra, arithmetic, use of logarithms and graphs, statistics, probability

Course II – Systematic Botany

1.1 Systematic botany of Indian forest plants following Bentham and Hooker's system
1.2 Salient features of the following families viz. Magnoliaceae, Dipterocarpaceae, Meliaceae, Sterculiaceae, Leguminosae, Rosaceae, Lythraceae, Myrtaceae, Rhizophoraceae, Asteraceae, Rubiaceae,

Lauraceae, Anacardiaceae, Cupuliferae, Verbenaceae, Euphorbiaceae, Poaceae, Orchidaceae, & Coniferaceae

1.3 Ethno-botany and its importance in forest and protected areas and their management.

1.4 Laboratory work: Floral parts, dissection and characteristics of one specimen each of five families with identification of species

Course III – Forest Ecology

1.1 Ecology – definition and concepts; mass and energy flows through ecological systems; Ecological indicators; Communities, populations, groups and individuals; Population ecology

1.2 Overview of ecological classification of flora and fauna; classification, distribution and status of forest in India with emphasis on Champion and Seth classification; phytogeographical zones and zoogeographical zones of India

1.3 Forest ecology - biotic and abiotic factors; ecosystems, components of ecosystem, major ecosystems-terrestrial and aquatic; forest ecosystem services and management

1.4 Forest biomes, deserts, cold and hot deserts, grasslands, tidal forests, wetlands

1.5 Forest productivity - soil and edaphic factors

1.6 Ecological succession, kinds of succession; climax- mono-climax and poly-climax theories

1.7 Landscape ecology – definition and concept; application in forest management

1.8 Invasive alien species (IAS): status of major forest IAS in India; effectiveness of management response to propagation and abundance of IAS; global advances in dealing with IAS

3.0 Biophysical, environmental aspects of forests, and other ecosystems; science and technology of environmental protection and management and climate change (2 Courses (2 Courses)

Course I- Soil and Land Management

1.1 Geology: Geological structures and their topographic expressions. Mineral constituents for various rocks and their effect on soil properties.

1.2 Laboratory work: Identification of important rocks and field excursion to get an idea about different rocks.

1.3 Soil science: Physicochemical and biological properties of forest soils. Classification and survey of forest soils, improvement of problem soils (Acidic, alkaline and sodic soils).

1.4 Laboratory work: Soil analysis in laboratory; study and description of forest soil profile; collection of soils samples and analysis of important physio-chemical properties.

1.5 Soil conservation: Soil conservation, erosion- agencies, extent, causes, effects and controlling measures; land use classification; watershed development, spring shed management, fresh water resources management

1.6 Land management: Introduction; historical review of land use pattern and degradation; rational land use policy; cattle and their fodder requirement; grass lands in India-distribution, management and improvement and carrying capacity; fodder resources of India, forest grazing and its management.

1.7 Wasteland management: Identification and classification of wastelands; reclamation and afforestation techniques; National Perspective Plan

Course II- Environmental Conservation

1.1 Ecosystems – Conservation of terrestrial and freshwater & marine ecosystem integrity and service flows

1.2 Environmental Health - Environmental biotechnology and Genomics; Environmental Virology

1.3 Air - Air Quality Monitoring, Modelling Analysis, Interpretation and Reporting; Cleaner technologies and modelling

1.4 Land - Soil Quality – Monitoring, Analysis, Interpretation and Reporting

1.5 Water – surface & ground availability and quality; water discharge & pollution;

1.6 Noise and Vibration – Monitoring, Modelling and Management

1.7 Solid & Hazardous Waste Management; Urban environment Management; Mining Impacts

1.8 Energy - Green Energy; Bio Energy; Energy and Resource management

1.9 EIA methodologies

Group B Subjects

4.0 Human-Social Aspects of Forestry, Wildlife and Environment (2 courses)

Course I – Social Dimensions in Forest & Environment Sectors

1.1 Common Property Resources - Alternative approaches for management of CPR; peoples perspective in developmental works;

1.2 Wildlife PAs – declaration, rights settlement, relocation and resettlement from PAs: historical developments, experience, and social discourse; coexistence and future direction

1.3 Gender Issues: Gender in forest & society interface; gender roles and equity; availability of disaggregated data for mainstreaming gender and enabling policies and laws; promoting gender equality in forest enterprises and institutions; gender composition of work force in SFDs – opportunity for efficacious job allocation

1.4 Participatory Forest Management – JFMCs, EDCs & other village-level institutions; scope, issues, challenges, planning, evaluation and conflict resolution; experience and future direction

1.5 Sustainability goals - environmental, ecological and forestry linkages of SDGs

1.6 Role of Non-Governmental Organizations in evolving narratives/discourses in forest & environment sector

1.7 Intersectoral socio-economic linkage – Mutual impact of governance in forestry and Agriculture, Rural Development, Panchayati Raj and Poverty Alleviation sectors

Course II – Political economy of Forest landscapes

1.1 Forest-dependent communities: tribals and OTFD communities – forest rights; collaborative forest governance, administration and management mechanisms; status and future of dependencies

1.2 Forest-fringe villages: characterization, socio-economics, and future of dependency on natural resources

1.3 Changes in the proximate landscape outside forest areas and its implications for political economy of forests

1.4 Valuation of ecosystem services obtained by society from forests and its role in the economy

1.5 Ecosystem linkages and dependencies of forest dwelling and dependent communities – sustainability concerns

1.6 Traditional Knowledge & Cultural Associations for dynamic conservation

1.7 Empowerment and inclusion in mainstream economy - MNREGS and other initiatives/strategies for reducing unsustainable dependencies on forest resources

5.0 Governance, Policy and Law of forests, Wildlife, Biodiversity and Environment and Other Sector Policy and Laws interfacing with forestry, environment and natural resource management (3 Courses)

Course I – Forest Policy and Law

1.1 General criminal and civil laws applicable to forest administration
1.2 Core Acts - IFA, WPA, VSSA, FRA, BDA, CAFA
1.3 Landmark Judgments, Case studies on IFA, WLPA, FCA, FRA, BDA
1.4 Handling court cases
1.5 VSSA 2023 - PARIVESH 2.0
1.6 International treaties, conventions and programs: UNFCCC, CBD, CCD, UNFF & others

Courses II & III – Law Course (NLSIU, Bengaluru)

Module 1: Introduction to law and legal system

1.1 Understanding law and legal system in general
1.2 Legal system
1.3 How to find appropriate law?
1.4 Indian legal system
1.5 Few representative laws e.g., law of frauds, principles of liability
1.6 Law of contract
1.7 Criminal law
1.8 Law of property
1.9 Service law
1.10 Miscellaneous e.g., international law, its nature, custom, treaties, public interest litigation, adjudication etc

Module 2: Philosophy, Principles, Environmental Justice and Pollution Control

1.1 Environmental policies, philosophies, and movements
1.2 Right to environment
1.3 Environmental principles of governance e.g., polluter pays
1.4 Tradition, common and criminal law remedies for environment
1.5 Environmental justice: Role and Policy
1.6 Water pollution and control laws
1.7 Air (Prevention and Control of Pollution) Act 1981
1.8 Law relating to waste management

Module 3: International Environmental Law

1.1 Customary international law and environmental summits
1.2 Common heritage: oceans and seas
1.3 Biodiversity and species conservation
1.4 Ecosystem and Conservation
1.5 Common concern: ozone and climate change
1.6 Trade and waste management regime
1.7 International principles for conservation and protection of environment

1.8 International legal developments on sharing natural resources, environmental ability regime and environmental conflict resolution

Module 4: NRM Laws and Environment & Development

1.1 Common property resources and the law
1.2 Environmental safeguards relating to development
1.3 Forest management and conservation law and policy
1.4 Law relating to wildlife strategy and protection
1.5 Law relating to biodiversity and its interface with intellectual property rights
1.6 Land conservation and management
1.7 Law relating to forest management in India
1.8 Environmental decision making process in India

6.0 Trans-sectoral Subjects, Themes and Topics (2 Courses)

Course I – Trans-Sectoral Topics I

1.1 Socio-economic Progress and Dynamics
- 1.1.1. Economic progress in the post-industrialization era
- 1.1.2. Emergence of geo-political world order(s) since WWII
- 1.1.3. Environmental Policy Paradigm Shifts in India in post-1990 period

1.2 SDGs – Strategies and Policies
- 1.2.1. Sustainability concept - origin, utility & application
- 1.2.2. Sustainability construct in the contemporary world
- 1.2.3. Agenda 2030 – SDGs, targets & indicators, and UN-SDG Reports
- 1.2.4. National and state-level Agencies for Monitoring the Implementation of SDGs in India
- 1.2.5. SDG Implementation by State Forest Departments

1.3 Technology-driven Progress and Disruptive Transformation
- 1.3.1. Database Systems & Big data in NRM Sectors – collection, storage, retrieval, and usage
- 1.3.2. Internet-of-things and AI for supplementing the management capacity
- 1.3.3. Block chain Technology & its applications
- 1.3.4. Cyber security – Provisions, agencies, and systems

1.4 Economic and Market Changes and Dynamics impinging on Forestry, Environment Protection, and NRM
- 1.4.1. Markets and Environmental goods & services
- 1.4.2. Implications of growing market penetration for maintenance of forests & other NRs
- 1.4.3. Environmental carrying capacity of economic development
- 1.4.4. SEBI & Business Sustainability and Responsibility Reporting
- 1.4.5. Environmental subsidy in cost of production
- 1.4.6. Market-linked approaches to offset environmental Footprint including biodiversity

1.4.7. Market Mechanisms under the Paris Agreement
1.4.8. India at WTO & World Economic Forum

Course II – Trans-Sectoral Topics II

2.1 Intersectoral dimension & implications of ongoing & prospective growth & development for the NRM sector:
- 2.1.1 The environmental centrality of development
- 2.1.2 Urbanization
- 2.1.3 Infrastructure development
- 2.1.4 Mining
- 2.1.5 Energy Transition
- 2.1.6 Industrial sectors

2.2 Intersectoral policy and program synergy and conflicts with forests, WL and Biodiversity with the following sector policies and programs
- 2.2.1 Agriculture
- 2.2.2 Horticulture
- 2.2.3 Animal Husbandry
- 2.2.4 Fisheries

7.0 Management & Administration

Course I – Management for Public Services

1.1 General Management
1.2 Human Resource Management
1.3 Motivation
1.4 Leadership, Group Dynamics, Goal setting theory
1.5 Communication Skills including use of social media
1.6 Financial Management and Marketing
1.7 Strategic management
1.8 Conflict management

Course II – Management of Forest Administration and Accounts

1.1 Range inspection: forms, records and registers
1.2 Manuals of office procedure
1.3 Performance appraisals, writing the appraisal (ACR); Service book
1.4 Disciplinary Rules and Disciplinary Cases including authorities and procedural steps
1.5 Legal matters, election process, Assembly and Parliamentary questions, committees etc.
1.6 E-governance policy and guidelines
1.7 Forestry planning and budgeting; forest assets management
1.8 Forest Accounts: Accounts Code; accounting system; budget, revenue receipts, Control of expenditure and reconciliation; personal deposit account, Drawing-cum-disbursing officers (DDOs)

1.9 Custody and payment of government money
1.10 Administrative and financial powers, delegation of powers
1.11 Audit: AG and internal audit
1.12 Stores - purchase, maintenance, write-off
1.13 General instructions: Withdrawal from government account, personal claims, contingent charges; disbursements; income tax, procedure for cheque-drawing; general provident fund

Group C Subjects

8.0 Scientific & Technological Applications and Skills (4 Courses)

Course I – Forest Survey

Theory:

1.1 Introduction, object, scope, scales and errors
1.2 Measurement of angles & distance – chain & compass survey
1.3 Plane table survey
1.4 Levelling and topographic survey
1.5 Area calculation, enlargement and reduction
1.6 Maps and map reading - geodesics and projection systems

Practical:

1.7 Chain survey - field work and plotting
1.8 Chain and compass survey- field work and plotting
1.9 Plane table survey - field work and survey plotting
1.10 Map reading in field to locate points from a map on the ground and from ground to map

Course II – Remote Sensing, GIS & other Technologies

1.1 Concepts and principles applied in Remote Sensing & GIS technologies
1.2 Methods, measurement units, data capture and storage, data processing and presentation
1.3 Aerial platforms-based data collection including LIDAR and Drones
1.4 Cloud-based data storage and access
1.5 IT-based mobile Apps
1.6 Emerging technologies like ML, V&AR, AI
1.7 Power Point technology – text to figures presentations
1.8 Excel for statistical analysis
1.9 Exposure to coding skills

Course III- Forest Mensuration & Biometry

1.1 Objective and accuracy; tree diameter measurement- measuring instruments and methods of use; tree height measurement – methods – ocular, instrumental, non-instrumental, Hypsometer, topographical level-theory and demonstration; Haga Altimeter; Spiegel Relascope; height of

leaning tree, problem solving; tree stem form – Metgzer's theory; form factors

1.2 Volume measurement of felled trees, stacked logs, standing trees; volume tables and preparation of volume tables; derivation of local volume table from general volume table

1.3 Concept of growth rings and other methods for growth and increment estimation; stump and stem analysis; basal area, canopy area, crown cover, density, diversity etc

1.4 Measurement of forest crop – Average diameter, height, age and volume; calculation of current annual increment and mean annual increment of stand

1.5 Yield tables and mathematical models

1.6 Stand biometry: Stand characteristics - even aged and uneven aged; estimation methods for stand growth and production

1.7 Forest inventory planning and design alternatives, sampling, execution, compilation and reporting; forest sites classification and evaluation, quality classes and site index models; management of sample plots

1.8 Biomass estimation: basic concepts and simple indices of biomass; estimators for actual biomass estimation, sample counts; animal biomass density in forests; plant biomass estimation for carbon content

Course IV- Application of Technology in Forestry

1.1 Survey and Mapping (use of DGPS)

a) Forest boundary rectification/reconciliation and detection of unauthorised possession of forest land
b) Plantation Area measurement and Monitoring
c) Application in Forest, Wildlife and Environmental Clearance

1.2 Forest, tree & biodiversity survey, assessment & inventorying using GIS-RS techniques including LIDAR and Drone Technology

1.3 Forest Fire detection, mapping, monitoring & control with FIRMS3.0

1.4 DSS, E-Green Watch, Use of Mobile Apps for Plantation Monitoring and Wildlife Management

1.5 GIS-RS applications for Green Urban Environment

1.6 Forest Engineering: Forest Buildings, Roads and other structures, Promoting use of Bamboo and Wood in engineering structures

1.7 Wood science and technology – sawn wood and engineered wood production systems, promotion of wood-based products for timber-import substitution and carbon storage

10.0 Conservation, Development and Management of Forests, Tree Cover, Wildlife, Landscapes & Ecosystems (7 courses)

Course I – Silviculture Practices and Tree improvement

1.1 Silviculture - Foundation and practices

1.2 Relationship between silvicultural practices and forest environment

1.3 Regeneration: natural and artificial, objectives, principles, methods and alternatives; Costing and records of regeneration operations

1.4 Basic principles of nursery and afforestation techniques (trees and bamboo both); techniques of production and out planting of bare root and container seedlings

1.5 Silviculture of some important Indian trees and their regeneration methods including site treatment

1.6 Concepts of normal forest - rotation, increment, yield and sustained yield

1.7 Tree improvement tools: seedling selection in nurseries; seed selection, quality, testing & certification; plus trees-based improvement; laying of seed orchards

1.8 Forest genetics and tree breeding – genetics and its application for planting stock improvement; clonal technologies

Course II - Silvicultural Management Systems

1.1 Systems - clear felling, shelter wood, selection, coppice, pollarding, Indian modification and applications; Conversion from one to other system

1.2 Silviculture systems for management of bamboos, canes and rattans

1.3 Ecosystem-based approach to management

1.4 Production forestry

1.5 Afforestation in problematic sites e.g., saline, polluted soil, soil-deficient areas, etc

Course III – Biodiversity and WL Management

1.1 Biodiversity concept, bio-geographic classification of India and status of conservation; prioritizing native biodiversity in forestry operations with thrust on RET species; biodiversity governance – ABS & BRs; Global Biodiversity Framework

1.2 Forest health and its indicators - common forest insect pests, diseases and their control

1.3 Biodiversity and one-health; emerging infectious diseases (EIDs) of zoonotic importance, human health risks from global environmental changes, biowarfare, bioterrorism, and animal diseases as weapons

1.4 Ecotourism tool for biodiversity conservation - concept, principles, impacts & tools for addressing impacts, case studies; interpretive planning

1.5 Concept of habitat, habitats and habitat use patterns, habitat preference, critical habitats, edge effect, niche, limiting factors, fire, grazing, invasive and natural calamities like floods in habitat modification; landscape approach to management; Protected Area (PA) Network, population viability analysis (PVA), carrying capacity, meta-population and evolutionary significant units (ESU); monitoring and estimation of wild animals: case study of tiger; principles & practices of reintroduction, restocking & species recovery plans; ex-situ conservation; CZA & National Zoo Policy; collaborative governance for sustainability of conservation under climate change, institutional measures, awareness, outreach, citizen science, CSR, ecotourism & ecodevelopment

1.6 Management of animal in distress and their rehabilitation - Physiology of stress, shock and trauma, safe capture of wild animals (techniques, equipment, drugs, legal aspects); immobilization of ungulates, carnivores and mega herbivores; elephants in musth; rescue & transport of wild animals, design of transport cages, rehabilitation and monitoring

1.7 Human wildlife conflict & mitigation: Nature, causes including changes outside forests, and mitigation; wild animal barriers, use of technology & case studies; role of communities in management of conflict situations, crowd control, role of district administration; anticipatory & long-term planning for conflict management

Course IV– Ecological and Forest Economics

1.1 Ecological economics: neo-classical economics, GDP growth and contemporary environmental crises; development of the concept and approach of ecological economics and status of its adoption

1.2 National environmental accounting: policy, approach, purpose and process of accounting

1.3 Forest economics including evaluation of intensive management decisions - spacing and thinning, and, economics of thinning and rotation

1.4 Forest-based enterprises: cooperatives and collectives; processing, technology and value addition; market linkages and opportunities including forest produce chain-of-custody and e-commerce; integration and convergence with programs and projects of other sectors

Course V – Management of TOF

1.1 Multifunctional land use and production system planning & management

1.2 Forest and Tree Cover in Urban & Peri-urban landscapes; Urban biodiversity; Urban greening models; Relocation of trees; Integration with urban planning – Green zone development and conservation enforcement

1.3 Practices, techniques and models for forestry of trees outside forests in agriculture, horticulture, agroforestry, aquatic and other Bio-systems, and in lands with industrial, mining and infrastructure projects for restoration and economic viability

1.4 Agroforestry - definition, purpose and benefits; models and practices; livelihood and biophysical resilience under climate change; economics and trends; tool for tree cover enhancement

1.5 Massive episodic plantation drive by states – models, involvement of whole-of-government, status, learnings & strategies

Course VI- Contemporary Forest Management

1.1 Forest management: classical and contemporary practices and operational aspects; raising forest plantations to enable conservation of remnant natural forests

1.2 Management for ecosystem and environmental services and functions: forests as good global commons, ecosystems-homogenising forces and implications for biodiversity; Carbon stocks and flows; hydrology, water supply and yield; heat island effect; air pollution mitigation; REDD+ and Safeguards Information System

1.3 Management for timber production: production and demand for timber in 2030; yield from natural forests; JFM assigned areas as production forestry zone; promoting trees in non-forest lands including farm forestry/agroforestry; firewood availability - production & demand;

1.4 Management for non-wood forest products (NWFP): resource availability and assessment - Sal seeds, Chir pine needles, Mahua flowers, Tendu leaves, Chironji, Kusum, Bamboo, wild mushrooms, honey, lac, silk etc; medicinal plants from forests (ethnobotany, harvesting, value addition and marketing) – status and potential; management and marketing of NWFPs; conservation and enrichment of NWFPs

1.5 Management for disturbances: grazing, encroachment, quarrying & mining, infrastructure during construction phase & thereafter etc

Course VII – Operationalizing Forest Management

1.1 Forest working plans: operationalizing NWP Code and Forest Management Standards; Forest Certification – provision, adoption; Government of India guidelines on harvesting and regeneration; administrative mechanism for implementation of WP; deviations from prescribed management

1.2 Integrated Wildlife Management Plans (terrestrial, aquatic, wetland, and coast landscapes): NWL Action Plan 2017-31; authority of Chief Wildlife Warden and administrative, logistical and financial mechanism for implementation of management plan;
1.3 Plantations in non-forest landscapes: Management (exploitation and renewal) schemes
1.4 Tree growth in urban and peri-urban areas: selection of species; Planting and maintenance mechanisms; dangerous trees identification in human-inhabited areas and institution of authorised officer for their removal
1.5 Processing of proposals for forest, wildlife and environmental clearance
1.6 Implementation of CAMPA scheme
1.7 Information and decision support systems and their application in forest management and planning

******

NOTES

Indira Gandhi National Forest Academy
P.O. - New Forest Dehradun - 248006
www.ignfa.gov.in