Syllabus for M.Sc Forestry / M.Sc Agriculture / MBA Entrance Examination
(For students having B.Sc (Forestry Degree)))
Forestry

UNIT- 1 Introductory Forest Economics

Concept and types of demand, laws of demand and factors affecting demand of commodities. Elasticity – its kinds, measurement and factors affecting it. Factors of production, their definition and characteristics, Law of diminishing marginal returns. Supply – definition, law and elasticity. Market – its classification and price determination under different market situation. Marginal Productivity theory, risk taking and uncertainty bearing theories of profit. Concept and types of inflation.

UNIT- 2 Principles of Cytology and Genetics

Physical basis of heredity, cell reproduction – mitosis - meiosis and its significance. Mendel's principles of heredity, deviation from Mendelian inheritance, pleiotropy, threshold characters, co-dominance pentrance and expressivity. Chromosome theory of inheritance, gene interaction: modification of monohybrid and dihybrid ratios.

UNIT- 3 Principles of Plant Physiology

Osmosis, imbibition, diffusion, absorption of water, mechanisms of absorption, ascent of sap. Stomata, structure, distribution, guttation, transpiration, Photosynthesis, importance of photosynthesis, Structure and function of chloroplast, dark and light reactions, CO2 fixation, C3, C4 and CAM, advantages of C4 pathway, photorespiration and its implications. Respiration, glycolysis, TCA cycle and Electron transport chain, ATP synthesis and factors affecting the respiration. Photohormones, physiological role in controlling plant process. Environmental stimuli for plant development.

UNIT- 4 Fundamentals of Geology and Soil Science

Composition of earth's crust, Igneous-sedimentary and metamorphic-classificationsoil forming minerals definition- classification-silicates-oxides carbonates – sulphides - phosphates-occurrence. Weathering of rocks and minerals-weathering factors-physicalchemical-
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. Problem soils: salted soils, permeable, flooded, sandy soils properties. Physical parameters texture, definition apparent specific gravity/bulk density-factors influencing-field bulk density. Pore space-definition, Munsell colour chart moisture-organic matter, soil structure-definition-classification-clay. Soil air-air capacitycomposition
factors, chemical properties-soil olloids organic- humus. Soil organic matter decomposition-pH-nutrient availability-soil buffering capacity, soil water-forms-hygroscopic capillary. Soil survey – classification–aerial photography, soil orders-land capabilityclassification,
water quality parameters and assessment.

UNIT- 5 Agrometeorology

Agrometeorology-definition, aim and scope. Factors and elements of weather and climate. Air and soil temperature regimes, atmospheric humidity, Precipitation, hails and frost. Solar radiations-components and effect on plant growth. Effect of weather and climate on the growth and development of crops. Climatic normals for crops. Evaporation and transpiration. Use of remote sensing techniques in agrometerology.

UNIT- 6 Introductory Botany

Introduction to Botany and general classification of plants. Parts of a typical flowering plant. Morphology of root, stem, leaf and flower. Structure and types of plant

tissues. Internal structure of Dicot and Monocot Stems, Roots and a typical Leaf. Significance of life cycle, Pinus and a flowering plant.

UNIT- 7 Plant Biochemistry and Biotechnology

Classification-structures of glucose, fructose, ribose, maltose, lactose, starch and cellulose, physical and chemical properties of carbohydrates-isomerism, optical activity, reducing property, reaction with acids and alkalis-osazone formation. Lipids classification

UNIT- 8 Tree Physiology

Tree structure, growth, development, differentiation and reproduction. Plant growth functions and growth kinetics, Physiological functions and processes in trees. Environmental effects on growth and development. Productivity of tropical deciduous and evergreen forests. Light use efficiency in forest species, canopy structure, plant phyllotaxis and its importance in translocation. Plant light relationship environment. Branching in isolated plants. Monoculture and mixed tree communities. LAI, Photosynthetic efficiency and respiratory losses, sources ink relationship, Factors affecting photosynthesis. Radiation interception, absorption of water, ascent of sap and water balance. Transport processes with special reference to long distance transport in trees and its impact on plant water relations and photosynthesis. Development of seeds and seedlings. Biocides and growth regulators in forest ecosystems. Senescence and abscission. Role of trees in pollution control.

UNIT- 9 Principle and Practices of Silviculture

Definition of forest and forestry. Classification of forest and forestry, branches of forestry and their relationships. 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 climatic factors. Role played by light, temperature, rainfall, snow, wind, humidity and evapo-transpiration in relation to forest vegetation. Bioclimate and micro climate effects. Edaphic factors - influence of biological agencies, parent rock, topography on the soil formation. Soil profile - physical and chemical properties, mineral nutrient and their role, soil moisture and its influence on forest production. Physiographic factors - influence of altitude, latitude, aspect and slope on vegetation. Biotic factors - influence of plants, insects, wild animals, man and domestic animals on vegetation. Impacts of controlled burning and grazing. Influence of forests on environment. 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.

UNIT- 10 Dendrology

Systems of classification of plants. Bentham and Hooker's, Engler and Prantles, and Hutchinson's Systems. Principles and International Code of Botanical Nomenclature. Peculiarities of tree stems, twigs, Morphology and description of barks of common trees. Morphology of leaf. Reproductive morphology of plants with reference to description and identification of reproductive parts. Study of families, Sapotaceae, Caesalpiniaceae, Santalaceae, Mimosaceae, Papilionaceae, Meliaceae, Compositae, Liliaceae, Euphorbiaceae,

and Combretaceae. Important Indian trees, native trees, exotic trees, endemism, allelopathy with respect to forest trees.

UNIT- 11 Forest Ecology and Biodiversity

Forest environment- Major abiotic and biotic components and their interaction, trophic levels, food webs, ecological pyramids and energy flow. Ecological succession, Autecology of important tree species. Biodiversity and conservation. Principles of conservation biology, Ex situ and In situ methods of conservation.

UNIT- 12 Chemistry and Fertility of Forest Soils

Soil exchange phenomenon. Essential nutrient elements, soil fertility evaluation methods. nutrient cycling in forest soils. Transformation-carbon cycle with reference to organic matter decomposition and humus formation, Microbial degradation of cellulose & lignin. Bio-fertilizers. Nitrogen fixation. Microbial transformation of phosphorous, sulphur and micro nutrients. Mycorrhizae. Rhizosphere.

UNIT- 13 Principles of Hydrology, Soil and Water Conservation

Definition and importance of Hydrology, Hydrological cycle, weather and hydrology, rainfall measurement and analysis, hydrologic properties, infiltration, runoff, water holding capacity of soils, free water, capillary water, hygroscopic water, ground water, evapotranspiration, water yield, interception by stemflow through fall, runoff, factors affecting runoff, stream flow. Sedimentation, factors affecting sedimentation. Soil erosion, universal soil loss equation, soil and water conservation practices and soil conservation structure like contour and graded bunding. Bench terracing and bench bank stabilization. Waterways. Water harvesting structures and farm ponds. Irrigation Source: Water wells, aquifers, water application methods; surface, subsurface, drip and sprinkler irrigation system. Drainage: types of drainage systems.

UNIT- 14 Forest botany & Ethnobotany

Terms employed in relation to ethnobotany. Ethnic - people and their contribution in therapeutic and ethnobotanical knowledge especially with respect to medicinal and allied aspects. Important plants and their folk uses for medicines, food, dyes, tans, etc. Mythology mainly from the following families, Malvaceae, Fabaceae, Mimosaceae, Palmaceae, Santalaceae.

UNIT- 15 Fundamentals of Horticulture

Economic importance, area and production, principles, planning and layout, planting densities, nursery techniques and their management. Principles and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, fertility management, multi-tier cropping, factors influencing the fruitfulness and unfruitfulness., principles of organic farming.

UNIT- 16 Wood Anatomy

Introduction to Wood Anatomy. The plant body – Cell and organelles, meristems, promeristem, primary meristem, secondary meristem, apical and intercalary meristems. Simple tissues- parenchyma, collenchyma, sclerenchyma. Complex and vascular tissues. Anatomy of stems and roots of dicots and monocots. The secondary growth in woody plants. Mechanism of wood formation. Formation of early and late wood, growth rings, transformation of sapwood to heartwood. The macroscopic features of wood, bark- sapwood, heartwood, pith, growth rings, wood rays, resin or gum-canals. Cell inclusions. Physical

properties of wood; colour, hardness, weight, texture, grain, lusture, etc. Abnormalities in wood — deviation from typical growth form (leaning, bending, crook, fork, buttress), grain deviation, false and discontinuous growth rings. Reaction wood-compression and tension wood. Disruption of continuity of inner wood, shakes, included bark, resin pockets, pith flecks, knots (live and dead).

UNIT- 17 Logging and Ergonomics

Definition and scope of logging, logging plan and execution. Location and demarcation of the area for logging and estimation of produce available for extraction. Implements used in logging operation- traditional and improved tools. Felling rules and methods. Conversion, measurement and description of converted material. Means of transport of timber- carts, dragging, skidding, overhead transport, ropeways, skylines. Transport by road and railways. Transport by water- floating, rafting and concept of booms. Grading and

Storage of timber in the depots for display and disposal, temporary and final storage. Timber Depots- types, lay out and management. Systems of disposal of timber. Size of material in logging operation. Ergonomics: definition, components and provision of energy. Requirement of energy and test periods. Effect of heavy work, posture, weather and nutrition. Personal protective equipments, safety helmets, ear and eye protections. Accidents: causes, statistics, safety rules and first aids. Plants, animals and insect infestations; diseases and their prevention.

UNIT- 18 Soil Survey, Remote Sensing and Wasteland Development

Soil survey, sampling methods, landuse classes and planning. Aerial photography and remote sensing-definition, meaning, scope, merits and brief history. Photogrammetry: Vertical and oblique photography. Agencies involved in remote sensing Remote sensing; principles, uses in forestry, status monitoring, fire, vegetation/cover classification and mapping, species identification, height and volume – estimation. Identification of tree species and their form stand delineation. Imagery and image analysis. Geographic Information systems. Salt affected soils, lateritic, marsh and swampy and rocky hills, rocky plains, murrammy and sandy soils, their characteristics and reclamation. Eroded ravines and gullies, various techniques of afforestation of adverse sites, trees suitable for adverse sites. Afforestation and reclamation of mine wastes.. Sewage water as source of tree nutrients.

UNIT- 19 Forest Mensuration

Introduction, definition, objectives. Units of measurement. Measurement of single tree - objectives, standard rules governing measurement at breast height. Measurement of tree diameter and girth, rulers, callipers and tapes. Bark measurements - objectives, thickness. Tree measurement instruments. Height measurements - direct and indirect methods. Height measurement employing geometric and trigonometric principles, height measuring instruments. Measurement of cross sectional area, basal area. The tree stem form, taper and classification of form factors and form quotient. Volume estimation of felled and standing trees and formulae involved. Volume tables-definition and their classification, (general, regional and local volume tables), merchantable volume tables. Tree growth measurements, objectives increment, determination of increment, stump analysis, stem analysis and increment boring. Measuring tree crops - objectives, diameter, diameter and girth classes, height measurement of crop, crop age and crop volume. Stand tables. Forest inventorydefinition,
objectives, kinds of enumeration. Sampling, advantages, kinds of sampling, random sampling: (simple, stratified, multistage and multiphase sampling).

UNIT- 20 Principles of Tree Improvement

Introduction, history and development of tree improvement, its relation to other disciplines for forest management. Reproduction in forest trees – anthesis and pollination – their importance in tree breeding. Quantitative inheritance, heritability, genetic advance, genetic gain, combining ability and their application. Genetic, environmental and phenotypic expression of trees. Genetic basis of tree breeding and selection practices in forest trees. Patterns of environmental variation- species and provenance trials in forest trees. Seed stands (seed production areas) Plus tree selection, progeny trials and establishment of seed orchard. Genetic consequences of hybridization. Back cross breeding, heterosis breeding, breeding for resistance to insect pest, diseases, air pollution and for wood properties. Conservation of forest tree germplasm. Recent techniques in tree improvement. Vegetative propagation and tree improvement.

UNIT- 21 Tree Seed Technology

Introduction – Seed and its importance – afforestation activity and seed requirements in India and HP. Role of seed technology in nursery stock production. Production of quality

seed, identification of seed collection areas-seed orchards – maintenance of genetic purityisolation
and roguing, seed source provenance and stands. Selection of seed tree, genotypic and phenotypic selection, plus tree – pure stands, elite seed tree, isolated tree and their location. Locality factors. Seed Collection – Planning and Organization, Collection methods, Factors affecting seed collection, Seed maturity and tests. Seed processing – Seed extraction, drying, blending, cleaning, grading, treating, bagging, labeling and storage. Storage – orthodox and recalcitrant seeds, precautions of handling of recalcitrant seeds, natural longevity of tree seeds, factors affecting longevity – storage conditions, methods and containers. Seed testing, sampling, mixing and dividing, determination of genuineness, germination, moisture, purity, vigour, viability, seed dormancy and breaking of seed dormancy. Different viability and vigour tests, seed pelleting, seed health. Classes of tree seeds, certification procedures of tree seeds.

UNIT- 22 Forest Tribology and Anthropology

Anthropology – definitions, nature and scope of Anthropology. Branches of Anthropology & methods of anthropological study, Concepts of Culture, Society, Community, Groups and Institutions. Social Institutions: Family – forms and functions, Marriage – forms and functions, Kinship – decent, residence. Meaning, definitions and characteristics of Tribes. Socio-cultural and socio-economic problems of tribes with special reference to indebtedness, land alienation, shifting cultivation, migration, depopulation, unemployment,
impact of urbanization and industrialization, education and forest problems.
Social and cultural change – its meaning and characteristics and difference between social & cultural change and recent changes among the tribals. Forest and Tribes – their relationship. Role of Tribals in Forest protection, development & conservation. The role of anthropology in tribal development.

UNIT- 23 Forest Engineering

Engineering survey, scope and types of surveying, chain surveying, types and instruments used; Traversing, triangulation, survey stations, base line, check and tie lines; ranging of survey lines; offsets and their types; chain of sloppy grounds, chaining across obstacles; compass surveying, chain and compass traversing, magnetic and true bearings, prismatic compass, local attraction. Plane table surveying; plane table and its accessories, methods of plane table surveying. Leveling: terms used, types of levels, dumpy level and its adjustments, booking of staff readings, calculation of reduced levels. Contour surveying.

Building materials – types, strength and characteristics, site selection for building construction. Forest roads – alignment, construction and drainage; retaining walls, breast walls, waterways and culverts; bridges – types, selection of site.

UNIT- 24 Livestock Management

Important breeds of cattle, buffalo, sheep and goat. Breeding and reproductive management for higher productivity – breeding systems, estrous cycle, heat detection and artificial insemination. Feeding management – types of feedstuffs available for feeding livestock. Feed nutrients and their functions in animal body. Principles of rationing. Milk – definition, composition and nutritive value. Factors affecting quantity and quality of milk. Prevention and control of diseases.

UNIT- 25 Wood Science and Technology

Wood as raw material, kinds of woods– hardwood, softwood; bamboos and canes. Merits and demerits of wood as raw material. The physical features of wood. Mechanical properties of wood like tension, compression, bending, shearing cleavage, hardness, impact resistance, nail and screw holding capacities. Suitability of wood for various uses based on

mechanical and physical properties. Electrical and acoustic properties of wood. Wood water relationship – shrinkage, swelling, movement, fibre saturation, equilibrium moisture contact. Wood seasoning – merits, principles and types – air seasoning, kiln seasoning and chemicals seasoning. Refractory classes of timbers, kiln schedules. Seasoning defects and their control. Wood preservation – principles, processes, need, types of wood preservatives (Water soluble, oil based, etc.), Classification of timbers based on durability. Non-pressure methods – steeping, dipping, soaking open tank process, Boucherie process. Pressure methods – full cell process, empty cell process Lowry and Rueping). Wood machining. Sawing – techniques, kinds of saws – cross cut, edging, cudless, hand, circular and bow saws, (parting, slicing, shaping, measuring and marking tools). Various stages in wood working. Dimensional stabilization of wood by surface coating method, bulking method, impregnation of resins and polymers.

UNIT- 26 Wood Products and Utilization

Pulp and paper industry. Introduction and raw material; pulping-mechanical, chemical, semichemical and semi-mechanical; pulp bleaching; stock preparation and sheet formation; types of paper; manufacture of rayon and other cellulose derived products. Manufacture, properties and uses of Composite wood- plywood, fiberboard, particleboard and hard board. Adhesives used in manufacture of composite wood. Impregnated wood, heat stabilized wood, compressed wood, and chemically modified wood). Destructive distillation of wood.. Production of wood molasses, alcohol and yeast.

UNIT- 27 Silviculture of Indian Trees

Origin, distribution, general description, phenology, silvicultural characters, regeneration methods, silvicultural systems and economic importance, *Cedrus deodara, Pinus roxburghii, Pinus wallichiana, Tectona grandis, Shorea robusta, Dalbergia sissoo, Eucalyptus spp. Terminalia spp., Santalum album,. Pterocarpus santalinus, , Diospyros melanoxylon.*

UNIT- 28 Nursery Management

Propagation concept. Site selection, planning and layout of nursery area. Methods of seed sowing. pricking. watering methods, weeding, hoeing, fertilization, shading, root culturing techniques, lifting windows, grading, packaging. Vegetative propagation

techniques. Study of important nursery pests and diseases and their control measures. Nursery practices for some important tree species.

UNIT- 29 Fundamentals of Wildlife

Justification of wildlife conservation, Biogeographic classification of India. Status and distribution of wildlife in India. Scientific and common names of important mammals, birds and reptiles. Rare, endangered and threatened species of mammals, birds and reptiles of India. Indian Board for wildlife, CITES. Biological basis of wildlife management. Wildlife ecology.

UNIT- 30 Fundamentals of Extension Education

Extension education: meaning, definition, nature, scope, objectives, principles, approaches and history. Rural Development: meaning, definition, objectives and genesis. Transfer of technology programmes like lab to land programme (LLP) national demonstration (ND), front line demonstration (FLD) Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme (TARP) etc. of ICAR. Communication: meaning, definition, elements and selected models. Audio – visual aids: importance, classification and selection. Programming planning process – meaning, scope, principles and steps. Evaluation: meaning, importance and methods. Scope and importance of Participatory Rural Appraisal (PRA). Management and administration: meaning, definition, principles. Concepts of human resource development (HRD), rural leadership.

UNIT- 31 Forest Pathology

History and importance of forest pathology in India and the world, Classification of tree diseases. Broad classification of different pathogens causing tree diseases. General characteristics of fungi, bacteria, viruses, phytoplasma and phanerogames. Important characters of ascomycetes and basidiomycetes. Important orders and families of Hymenomycetes with a special reference to Aphyllophoraeae and Agaricaceae that contain members causing tree diseases. 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, *Dalbergia* sp., *Acacia* spp., neem, C*assia*, sal, *Albizia, Terminalia*, mango, jack, pines, deodar, eucalyptus, bamboo, C*asuarina*, 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. Definition and scope of disease management in forestry. Principles of disease management such as exclusion, cultural, chemical, biological and immunization. Nursery diseases of important forest species.

UNIT- 32 Forest Business Management

Forest / agro forest business

Importance nature, scope (input and product sector Forest Policies)

UNIT- 33 Forest business Management

Distinctive features, importance of good management Definition of management. Management functions - (1) Planning - Meaning, definition types of plan, characteristics of sound plan. Steps in planning. (2) Organization -definition, meaning importance (3) Staffing - means definition and importance (4) Directing, Motivation ordering Leading supervision, communication control.

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UNIT- 34 Capital Management

Financial Management of forest business / agro forestry, Business, Importance of financial statements Balance sheet, Profile and loss statement - Analysis of financial statements.

UNIT- 35 Agro forest based and forest based industries

Definition, classification: importance and need types of agro forestry / forest business industries constraints in establishing forest / Agro forest product based industries

UNIT- 36 Marketing Management

Meaning: Definition, Marketing mix 4Ps of marketing mix, Market segmentation. Product life cycle marketing channels.

UNIT- 37 Agro forestry / forest product price policies Definition, importance, need.

Project Meaning, Definition project cycle and concepts Types, Phases in project cycle - conception or identification, (ii) formulation or preparation (iii) Appraisal (iv) Implementation (v) monitoring, and, Evaluation - Appraisal and evaluation techniques - NPW, BCR,IRR sensitivity analysis, criteria for selection of Agro forest projects. Characteristics of forest / agro forest based projects, and constraints

UNIT- 38 Elementary Statistics and Computer Application

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: Basic concept, additive and multiplicative laws. Theoretical distributions, binominal, poison and normal distributions, sampling, basic concepts, sampling vs. complete enumeration parameter and statistic, sampling methods, simple random sampling and stratified random sampling. Tests

of Significance: Basic concepts, tests for equality of means, and independent and paired ttests,
chi-square test for application of attributes and test for goodness of fit of Mendalian ratios. Correlation: Scatter diagram, correlation co-efficient and its properties, regression, fitting of simple linear regression, test of significance of correlation and regression coefficient. Experimental Designs: Basic concepts, completely randomized design, randomized block design, latin square designs, factorial experiments, basic concepts, analysis of factorial experiments up to 3 factors. Computer application: Introduction to computers and personal computers, basic concepts, operating system, DOS and Windows 95, introduction to programming languages, BASIC language, concepts, basic and programming techniques, MS Office, Win Word, Excel, Power Point, introduction to Multi-Media and its application. VISUAL BASIC-concepts, basic and programming techniques, introduction to Internet.

UNIT- 39 Rangeland Management

Range inventory – mapping, methods of sampling and evaluation, purposes and principles, Carrying capacity. Range utilization. Intensity and frequency of use. Range management – topography, animal species, forage preference, density. Grazing – grazing intensity, season of grazing, types – their merits and demerits. Animal unit (A.U.). Fire – controlled burning, effect of fire on vegetation and fauna. Weed control – types, their characteristics, chemical and biological control. Range improvement – range seeding, introduction of grasses and legumes, fertilization, soil and water conservation strategies. ultiple use.

UNIT- 40 Silvicultural Systems

Silvicultural system - definition, scope and classification. Even aged and uneven aged forests and their crown classes. Detailed study of the silvicultural systems: Clear felling systems including clear strip, alternate and progressive strip systems. Shelterwood system - Uniform system, Group system, Shelterwood strip system, Wedge system, Strip and group system, Irregular shelterwood system, Indian irregular shelterwood system. Seed tree method. Selection system and its modifications. Accessory systems. Coppice system - Simple coppice system, Coppice of the two rotation system, Shelterwood coppice system, Coppice with standard system, Coppice-with-reserve, Coppice selection system, Pollard system. Choice of silvicultural system. Dauerwald concept. Culm selection system in Bamboo. Tending operations - weeding, cleaning, thinnings, definitions, objectives and methods, increment felling and improvement felling. Prunning and lopping. Control of climbers and undesirable plants

UNIT- 41 Plantation Forestry

Definition, scope and impediments. Plantation forests - planting plan, plantation records, maps. Site selection. Site preparation - purpose and methods. Planting - layout, time of planting, planting pattern, spacing, gap filling, planting methods, direct seedling. Choice of species on ecological aspects - afforestation of dry land, wet land, other adverse sites and taungya. Intercultural operations. Weed control, climber cutting, staking, singling and pruning. Thinning - definition, objectives. Effects of thinning. Energy and industrial plantation - definition, scope, species, establishment, management and impact on environment. Site selection and site preparation. Use of fertilizers, weedicides for plantation management.

UNIT- 42 World Forestry Systems

Geographical distribution of forests and their classification. Productivity potential and increment of world forests. 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. Recent trends in forestry development in the world. International forestry

organizations.

UNIT- 43 Wild Life Management

Wildlife management and conservation in India. Habitat management. Wildlife census : Purpose, techniques. Direct and indirect methods of population estimation. Sample and total counts, indices, encounter rates and densities. Wildlife (Protection) Act, 1972. Sanctuary, National Park and Biosphere Reserves. Special projects for wildlife conservation. Project Tiger and Musk Deer Project. Wildlife corridors. MAB, Red Data Book, Category of threat, CITES. Conservation.

UNIT- 44 Principles of Forest Economics, Project Planning and Evaluation

Nature and scope of forest economics, importance of forestry in economic development. Concepts of demand, derived demand and supply with special reference forestry outputs. Basics of marginal analysis and its applications in economic analysis of forestry production systems. Basics of Linear Programming. Financial and economic rotations. Fundamentals of project planning and evaluation and network scheduling techniques. Valuation of timber and non-timber forest products.

UNIT- 45 Environmental Science

Components of environment - interactions with organisms. Global and Indian environment - past and present status. Smog, acid rain, global warming, ozone hole, eutrophication,. Impact of different pollutions on humans, organisms and environment. India, international and voluntary agencies for environmental conservation - mandates and activities. International conferences, conventions and summits.

UNIT- 46 Forest Management, Policy and Legislation

Introduction: definition and scope. Peculiarities of forest management. Principles of forest management and their applications. Objects of management, purpose and policy. Sustained and progressive yield concept and meaning. General definitions – management and administrative units, felling cycle, cutting section. Rotations: definition, kinds of rotations, choice of rotations, length of rotations and conversion period. Normal forest: definition and concept. Evenaged and unevenaged models. Yield regulation – general principles of even aged and unevenaged forest crop. Working Plan – definition, objects and necessity. Forest Policy: definition, necessity and scope. National Forest Policies. Forest Law: legal definition. Objects of special forest law. Indian Forest Act.Detailed study of IFA, 1927.

UNIT- 47 Utilization of on-Timber Forest Products

Introduction, methods of collection, management and importance of Non-Timber Forest Products (NTFP). Fodder (grasses and tree leaves), canes and bamboos. Essential Oils and non-essential oils. Gums and resins –definition, classification, sources, collection and uses. Resins and Oleoresins, their formation. Beedi leaves – sources, collection and processing.. Katha and Cutch – sources, extraction and uses. Spices, poisons.

UNIT- 48 Agroforestry System and Management

Indian agriculture - its structure and constraints. Land use definition, classification and planning. Agroforestry - definition, aims, objectives and need. Traditional agroforestry systems: Taungya system, Shifting cultivation, wind break, shelterbelts, Homestead gardens'. Alley cropping, high density short rotation plantation systems, silvicultural woodlots/energy plantations. Classification of agroforestry system -structural, functional, socio-economic and ecological basis. Multipurpose tree species and their characteristics. Tree architecture, canopy management - lopping, prunning, pollarding and hedging. Diagnosis and design. Agroforestry systems in different agroclimatic zones, components, production and management techniques. Nutrient cycling, soil conservation, watershed management and climate change mitigation. Economics of agroforestry systems. People participation, rural entrepreneurship through agroforestry and industrial linkages. Analysis of fodder and fuel

characteristics of tree/shrubs. Financial and socio-economic analysis of agroforestry systems.

UNIT- 49 Medicinal and Aromatic Plants

Opportunities and constraints in the cultivation and utilization of medicinal and aromatic plants in India. Importance, production, climatic and soil requirements, propagation and nursery techniques, nutritional and water requirements. Plant protection, harvesting, processing and economics of under mentioned important medicinal and aromatic plants. Medicinal Plants ginger, turmeric, *Rauvolfia*, isabgol. Aromatic Plants : *Citronella* grass, khus grass, *Mentha*, muskdana (musk mallow), *Ocimum*. Endangered medicinal and aromatic plants of India and their conservation.

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UNIT- 50 Forest Entomology

Taxonomic classification of class Insecta, diagnostic characters of the orders and major families of economic importance. Methods and principles of pest control. Principles and techniques of Integrated Pest Management in forests. Classification of forest pests. Insect pests of forest seeds, forest nursery and standing trees of timber yielding species of natural forest.

UNIT- 51 Entrepreneurship Development and Communication Skills

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to forestry sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of forestry inputs industry. Characteristics of Indian forestry processing and export industry. Social Responsibility of Business. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

UNIT- 52 Marketing and Trade of Forest Produce

Nature and scope of marketing. Approaches to marketing and the study of marketing functions with special reference to forestry. Classification of market, market structure and conduct of important timber and non-timber markets. Marketing channels, costs, margins and price spread – concepts and applications. Concepts of market integration and marketing efficiency. Role of public and private agencies in marketing of forest produce. Market inefficiencies in the trade of forest produce and measures to check the same. Fundamentals of international trade. Domestic and international trade in timber and non-timber forestry outputs. Demand forecasts – concept and methods. WTO – background, structure, functions and decision making process. IPRs and their implications for forestry and allied sectors in the country.