Silviculture: Forests - definitions, role, benefits - direct and indirect. History of Forestry - definitions, divisions and interrelationships. Classification of forests - High forests, coppice forests, virgin forest and second growth forests, pure and mixed forests - even and uneven aged stands. Forest types of India- classification; Silviculture objectives and scope of silviculture-relation with other branches of Forestry Silvics. Site factors - climatic, edaphic, physiographic, biotic and their interactions. Silvicultural systems-definition, scope and classification. Systems of concentrated regeneration- systems of diffused regeneration- accessory systems- Clear felling systems- Shelterwood system - Selection system and its modifications- Coppice systems; Regeneration of forests – objectives - ecology of regeneration- natural, and artificial regeneration. Natural regeneration- seed production, seed dispersal, germination and establishment, requirement for natural regeneration, advance growth, coppice, root sucker, regeneration survey, natural regeneration supplemented by artificial regeneration. Artificial regeneration - object of artificial regeneration - advantages. Factors governing the choice of regeneration techniques. Tree planting- Sowing v/s planting different kinds of pits- tending and cultural operations- weeding- kinds of weeding- release operations- singling, cleaning– liberation cutting. Silviculture of inmportant Indian tree species, bamboos, reeds and rattan.

Agroforestry: Agroforestry – definition and scope – rising demands of fuel wood, fodder and timber. Social, ecological, and economic reasons for agroforestry. History of agroforestry. Components of Agroforestry- Provisioning and regulator services of agroforestry- Nutrient cycling, Soil improvement, Increased production and productivity, Microclimate amelioration and carbon sequestration – Tree-crop interaction in agroforestry– Definition, kind of interaction – Positive interactions- complimentarity - compatibility - mutualism, commensalism - Negative interactions – allelopathy and competition-Interaction management - Aboveground and belowground interactions- Manipulation of density, space, crown and roots. Tree Management – structure and growth of trees, crown and root architecture, agroforestry practices to minimize negative interaction – coppicing, thinning, pollarding and pruning – crop planning and management –selection of suitable crops –management of nutrients, water and weeds – Classification of agroforestry systems – National Agroforestry Policy 2014—National and International organizations in Agroforestry, D & D, Major Agroforestry practices in different agroecological zones of India- arid and semi arid regions-agroforestry practices for wasteland reclamation. Agroforestry practices for salt affected soils – Agroforestry practices for wetlands and waterlogged areas. Non-wood forest products based agroforestry – Soil fertility improvement and water conservation through agroforestry. Socio-economic analysis of various agroforestry systems.

Forest Mensuration: Diameter and girth measurements- Breast height measurements instruments used- Measurement of height-Definitions- Methods of measurement of height-occular-non instrumental and instrumental methods- Sources of error in height measurements-leaning trees. Tree stem form-Metzgr's theory –form factor- types of form factor-form height for quotient-form class. Volume measurements of standing trees-logs-branch wood- formulae-involved Definitions - Volume tables preparation of volume tables-graphical method-regression method- Determination of growth of trees- Increment-CAI & MAI- increment percent-increment borer- Stump analysis- Stem analysis. Measurement of tree crops-objects-crop diameter-crop height-crop age-crop volume.

Forest Management: Definition, scope, objective and principles of forest management, organization of state forests-sustained yield-definition, principles and limitations. Sustainable

forest management-criteria and indicators-Increasing and progressive yields-Rotation - definitions-various types of rotations-length of rotations-choice of type and kind of rotation. Normal forest-definitions basic factors of normality. Factors governing the yield and growth of forest stands-Working plan-preparations-objectives and uses-forest maps and their uses. Joint forest management-concept and principles- Modern tools in forest management. Introduction to the concept of forestry as a common property resource– Definition, Scope and necessity of community forestry- Forests and man- Forestry in support to agriculture, animal husbandry and horticulture – development of cottage industry in rural environment-NFP 1988 and the importance of people in forest conservation. Community forest management, Community forest development, social economical and environmental aspects, Social Forestry- definition –NCA report of 1976- need and purpose- Social Forestry for – fodder production – fuel wood – leaf manure –timber production. Integrated rural development approach – with proper marketing facility – employment generation in raising, tending and harvesting of tree crops. Place of social forestry in the national forest policy of India-role of forest department.

Tree Improvement: Reproduction in forest trees. Anthesis and pollination – their importance in tree breeding. Incompatibility and sterility. Quantitative inheritance. Relevance in forestry. Genetic, environmental and interaction components of varitation - heritability and genetic advance. Genetic basis of tree breeding. Natural variability in trees – types and importance.- forces that change variability. Exotic forestry. Provenance testing. Selection- seed production areas–seed orchards. Progeny trial and improvement of seed orchards. Combining ability and genetic gain – Hybridization in trees – back cross breeding, heterosis breeding. Breeding for resistance to insect pest's diseases, air pollution and for wood properties. Vegetative propagation and clonal forestry. Conservation of forest tree germplasm. Recent techniques in tree improvement.

Forest Ecology and Biodiversity: Historical development of ecology as a science. Levels of biological organization. Major forest Ecosystem. Forest environment- major abiotic and biotic components and their interaction, Nutrient cycling, trophic levels, food webs, ecological pyramids and energy flow. Population ecology - definition, population dynamics and carrying capacity, preparation of life table and its importance in forest management. Community ecology- species interactions, ecological succession, terminology, basic concepts, theories of succession- climax vegetation types, forest management and succession. Island Biogeography. Autecology of important tree species. Perturbation ecology- Biodiversity and conservation – definition, levels of study, distribution of diversity in life forms, hotspots of biodiversity, measurement of diversity and diversity indices. Principles of conservation biology, Ex-situ and In-situ methods of conservation, Genetic and evolutionary principles in conservation. Biosphere concept. Conservation – efforts in India and worldwide.

Forest Laws, Legislation and Policies: National forest policies-scope and importance-comparative analysis of all forest policies -Indian judicial system- Legal definitions, application of penal code to forests, general principles of criminal law, legal principles of punishment, criminal procedure code, the law of evidence and the Indian Evidence Act, 1872 as applied to forestry matters. Indian Forest Act, 1927 general provisions, Code of Civil procedure, 1908. Forest (Conservation) Act, 1980. Brief description about other major forest laws of regional, national and international significance. Detailed study of KFA

1961.Biological Diversity bill 2002-discussion of court verdicts on issues of utmost importance to conservation.

Forest Product Utilization: Wood anatomy, Comparative anatomy of gymnosperms and angiosperms. Anatomical features of common Indian timbers; classification into porous and non-porous woods, ring porous and diffuse porous woods. Effect of growth rate on wood properties. Juvenile wood and mature wood. wood as raw material for industries like pulp, paper, rayon, composite woods and improved woods. Description of different forest based industries. Structural uses of Timber. Decorative uses of wood. wood modification, its need and scope, chemical modification. Primary conversion; sawing and veneering. Composite wood; plywood, laminated wood, core board, sandwich board, fibre board, particle board; manufacturing process, uses and properties. Adhesives used in manufacture of composite wood. Improved wood; compressed wood, impregnated wood etc.; manufacturing process, uses and properties. Manufacture of rayon and match. Wood carving and handicrafts. Destructive distillation of wood. Saccharification of wood. Production of wood molasses, alcohol and yeast. Biochar, technology, bioenergy concepts - short rotation crops as raw materials. NTFPs; electrical, thermal and acoustic properties of wood. Mechanical properties of wood. Suitability of wood for various uses based on mechanical and physical properties. Wood water relationship. Wood seasoning. Refractory classes of timbers, kiln schedules. Seasoning defects and their control. Classification of timbers based on durability. Wood preservation. 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.

Statistical Methods & Experimental Designs: Dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. Probability, sampling, t ests of significance, correlation, regression, design of experiment, analysis of variance, comparisons based on means - critical difference, DMRT.