Syllabus of the PhD Course work

I - Basic Forestry

1. Overview of Forestry in India

History of management and development of system of management of forest in recent years. Historical evolution of forest policy; Tangible/ Intangible benefits, forestry resources.

Lecture session - 2

2. Forest Ecology

Basic principles and concept of forest ecology, Major abiotic and biotic components, food webs, ecological pyramids and energy flow, ecological successions, forest community concepts; Forest types in India, Conservation of forest ecosystems.

Lecture session - 5

3. Systematic Forest Botany and Ethno botany

Importance of Systematic botany in forestry; concept of species, genus; dendrological approach on classification of forest species; herbarium, arboretum; Ethno botany of forest flora of economic importance; plant nomenclature; Identification of species.

Lecture session - 5

4. Forest Biotechnology

Aims and objectives of Tissue Culture for genetic improvement through clonal propagation, production of in vitro variability, transgenics, somaclonal variation, genetic fusion of cells.

Lecture session - 6

5. Soil Science & Soil Conservation

Forests Soils, classification, factors affecting soil formation; physical, chemical and biological properties. Soil reaction – soil p^H and its relation to nutrient availability.

Soil conservation - definition, causes for erosion; types- wind and water erosion; conservation and management of eroded soils/ areas, wind breaks, shelter belts; Role of forests in conserving soils.

Lecture session - 5

6. Forest Hydrology & Watershed Management

Introduction, Hydrological cycle, Rainfall – runoff process, Interception, forest & water, run-off, water holding capacity of soils, free water, field capacity, capillary water, hydroscopic water, ground water, Watershed Management – approach and concepts of watershed; watershed management, its objectives;

Lecture session - 4

7. Silvicultural Practices

Definition of silvics and silviculture, Study of locality factors like climatic, edaphic, Forest regeneration, natural and artificial regeneration of forests (plantation forests) and mixed regeneration; methods of propagation, grafting techniques; site factors; nursery and planting techniques – nursery beds, polybags and maintenance, water budgeting, grading and hardening of seedlings, pruning and lopping. Thinning – thinning of irregular crops, increments felling, improvement felling.

Silvicultural system – definition, classification and detailed study of the following systems: Clear felling system; uniform system; the group system; coppice with standard system;

Lecture session – 5

8. Forest Management, Forest Mensuration and Remote Sensing

Forest Management – Objective and principles; techniques; management of forest plantations. Forest Mensuration and Remote Sensing: Introduction – definition, objectives and scope. Measurement of single tree – object, place of measurement, Methods of measuring – diameter, girth, height, crown and volume of trees; form – factor; volume estimation of stand, current annual increment; Forest cover monitoring through remote sensing; Geographic Information System for management and modeling.

Lecture session - 5

9. Forest Protection and Forest Economics

Agencies causing forest damage viz. man, fire, cattle, wildlife, insects and pathogens nature of their damages, cause, prevention, remedial measures and benefits. General forest protection against fire, equipment and methods, controlled use of fire. Grazing regulations; effect of wild animals on forest regeneration.

Forest economics: - fundamental principles, cost – benefit analyses; estimation of demand and supply; Socio – economic analyses of forest productivity and attitudes; valuation of forest goods and service. Basic knowledge of forest pathology and forest entomology – definition, scope and damage.

Lecture session - 6

10. Wood Technology

Anatomical structure of wood, defects and abnormalities of wood, timber identification – general principles. Different types of Wood seasoning and preservation; Pulp-paper and rayon; Wood substitution.

Lecture session - 4

11. Non- Wood Forest Products

i. NWFP – Definition, Importance, Diversity / Types, their distribution, Role in rural livelihood and industry, present utilization and future scope.
ii. Introduction about natural products chemistry; General procedures for isolation of extractives, and other secondary metabolites from wood and NWFP; Value addition chemical from forest plants.

Lecture session - 4

12. Biodiversity and Environmental Conservation:

Forest Biodiversity, its protection, components and principles of conservation, Climate Change, Clean development Mechanism, Carbon Trading, Pollution types, global warming, green house effects, ozone layer depletion, Forest and environment impact assessment and control measures. National conservation strategies. I. F. A. Overview on national strategies and international conventions related to forest conservation and management (CBD, UNFCCC, NBA, CITES etc.)

Lecture session – 6

13. Forest Genetics and Tree Improvement

Forest Genetics and its applications. Concept of tree improvement, methods and techniques. Variation and its use, provenance trials. Quality seed production through seed production area and seed orchards. Establishment and management of seed orchards. Genetic testing through progeny tests. Selection and breeding for resistance to diseases, insects and adverse environment; the genetic base, forest genetic resources and gene conservation in situ and ex- situ. Essential of seed testing, seed quality evaluation, seed dormancy, seed storage, seed classification and seed certification.

Lecture session - 6

14. Extension Forestry

Extension Education – meaning, definition, objectives, principles, and characteristics. Extension programmes of ICFRE. Major elements involved in forest extension.

Lecture session - 2

15. Agroforestry

Agroforestry – scope and necessity; Agro forestry systems under different agro – ecological zones;

Lecture session – 2

II - Computer Application

1. **Fundamentals**
Fundamentals (Theory), Fundamentals (Discussion/ Practical)
2. **MSWindows**
Introduction/ Desktop/ Start menu, Windows XP(Task bar/Control Panel/ Search Command), Windows Explorer – Files/ Folders/ Shortcuts Windows XP Workshop, System Tools/ Add Remove/ System Restore, Open Discussion/ Practical Test, Internet/ Email, about virus and its protection(Open Discussion/ Practical Test)
3. **MS Word**
Introducing – Word Application Window/ Toolbars/ Menu bars/ Horizontal ruler, The Status Bar/ Creating a WORD document/ To start a new paragraph / Saving a document, Moving and Scrolling through a document/ Selecting Text & Graphics/ Making selection using mouse/ Correcting & Deleting, Moving & Copying Text and Graphics/ Formatting Text Characters/ Inserting Symbols, Formatting paragraphs/ Page setup/ Inserting a page numbers, Previewing a document before printing/ Printing a document / Auto correct, working with tables/ Working with images, Mail merge, Open Discussion/ Practical Test
4. **MS Excel**
Starting Excel / The Excel screen elements, Creating workbook/ Worksheet/ Entering Data, Moving the active cell pointer/ Editing data, Working with date/ time, Formatting data, cells, rows and columns, Previewing/ Printer the worksheets, Working with formulas, Working with functions, Working with charts, Open Discussion/ Practical Test
5. **MS Power Point**
Creating basis presentation using the auto- content wizard/ Power point environment/ Creating a presentation using a template / saving a document for the first time, Inserting a new slide/ Editing the layout template/ Inserting text/ Editing text, Using a blank presentation/ Creating a slide master, Inserting a chart/ Creating tables/ Organizational charts, The drawing tool bar, Animating text and objects on a slide, Updating a presentation/ Opening a presentation/ Printing a presentation/ Printing slides as needed/ Running a presentation, Open Discussion/ Practical Test
6. **Adobe Page Maker**
Page Maker's Introduction/ Palettes/ Creating & Opening Publications/ Publication from Templates/ Naming & Saving Publications/ Closing Publications/ Printing Publications/ Page Maker's Introduction/ Creating Text objects/ Text frames & blocks/ Text flow/ Jump lines/ Formatting Text/ Guides/Drawing objects & Graphics/ Grouping & Ungrouping/ Adding colours/ Cropping Graphics/ Arranging text & graphics/ Non- printing objects/ Layers/ Format characters/ Control character spacing/ Format paragraphs
7. **Adobe Photoshop**
Basic file types/ Photoshop's introduction/ Selection techniques/ Other tools/ Cerate layers/ Modify layers/ Using type layers/ Add layer effects/ Models/ Image modes/ Image canvas sizes

III - Statistical Data Analysis and Research Methodology

1. Basic Statistics (Compulsory)
Graphical data analysis, Central tendency and dispersion, Skewness and Kurtosis, Correlation and Regression. Concept of probability and probability distributions, important distributions – Binomial, Poisson, and Normal

2. Estimation and testing of hypotheses (Compulsory)
Estimating means and variances, Errors in testing a hypothesis, t, F, Z, and chi- square tests, Non-parametric tests and their uses, Analysis of variance (One way and two way models)

3. Basic designs of experiments (Compulsory)
Principles of designing experiments, Completely Randomized Design, Randomized block design, Latin square design, Factorial experiments, Confounding.

4. Advance design of experiments (Elective) (Directed towards field experiments and complex lab experiments in chemistry, tissue culture, etc.)
Row – column designs, Lattice designs, Balanced incomplete block designs, Partially balanced incomplete block designs, Designs for obtaining optimal solutions, Response surfaces, Orthogonal Arrays.

5. Basic sampling techniques (Compulsory)
Sample versus complete enumeration, Properties of a sample, simple random sampling, stratified random sampling, systematic random sampling, Point (variable plot) sampling.

6. Advance sampling techniques (Elective) (Directed towards ecological and environmental studies)
Two – stage and multi – stage sampling, Double sampling plots.

7. Multivariate analysis (Compulsory)
Multivariate analysis of variance, Factor analysis, Principal components, Analysis, Cluster analysis, Multiple regression

8. Analysis of time series(Elective)
Time series, decomposition of time series into various components, Moving averages, ARIMA and Box- Jenkins model, Auto – correlation and regression, Correlogram and periodogram.

9. Statistical quality control (Elective) (Directed towards industrial applications of wood science)
Concepts of SQC, Product & process control, Acceptance sampling plans, Doge and Roaming sampling plans, Control charts, Single and Double sampling plans, sequential sampling plans, Operating characteristics, Sequential probability ratio test.