

**COURSE SYLLABUS**  
**FOR**  
**Ph. D FORESTRY & ENVIRONMENTAL SCIENCES**



**“SCHOOL OF NATURAL RESOURCES”**

**DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES**  
**GURU GHASIDAS VISHWAVIDYALAYA BILASPUR-495009, CHHATTISGARH**

(A Central University established by the Central University Act.2009 No. 25 of 2009)

## Course Structure of Ph.D. Program in Forestry and Environmental Sciences

Paper	CODE	Title of the Paper	Marks	Credit	Hours/Week
Paper I	FODAMT1	Research Methodology	100	04	04
Paper II	FODATT1	Forest Ecosystem Management	100	04	04
Paper III	FODAMTT2	Forest Measurements and Tree Improvement	100	04	04
	FODASS1	Seminar	-	Qualified/ Not qualified	-
		<b>Total</b>	<b>300</b>	<b>12</b>	<b>12</b>

### Programme Outcome:

**PO1: Fundamental knowledge:** The scholars will be able to apply knowledge of Forestry and Environmental Sciences for managing the forest resources and its development.

**PO 2: Research approach:** The scholars will identify the forest and environment related issues and investigate the possible solution through research, field trial, experimental designs, laboratory based research, corroboration with industrial and research institutes.

**PO 3: Practical application:** The scholars will implement the theoretical knowledge related to the subject into real life and experimental form. Real life problem solving approaches will be the outcome of research.

**PO4: Problem investigation and analysis:** The scholars will have the competence to investigate, and possess analytical skills to identify, formulate and solve real time Forestry and Environmental issues and provide a cutting edge solution.

**PO5: Society:** The scholars will apply the knowledge of Forestry to assess the resources for the benefits and wellbeing of forest dwellers and society.

**PO6: On site field trial:** The scholars will regularly visit field for their experimental research and experiential learning.

**PO7: Ethics:** The scholars will apply ethical principles and commit to professional ethics, responsibilities and norms of the forestry and environment protection, and conservation practice.

**PO8: Team work:** The scholars will function effectively as an individual member or as a leader in diverse teams and multidisciplinary activities

**PO9: Communication:** The scholars will be able to communicate effectively by presentations and writing reports of the activities related to forestry

**PO10: Management:** The scholars will be able to manage the forest resources for mitigating climate change and sustainable future.

**PO11: Life-long learning:** The scholars will be engaged in independent lifelong learning in the broadest context of forestry operation and management.

**Program Specific Outcomes:**

**PSO1:** Scholars will develop strong competencies in research in the field of Forestry and Environmental Sciences and its application in forestry and environmental sciences.

**PSO2:** Scholars will develop experimental design, forest survey & mapping, forest management planning, field investigation and environmental sustainability using conventional as well as recent tools and technologies.

**PSO3:** To prepare the scholars for employment in Forestry, Environmental Sciences and allied sectors and to meet the workforce demand of government and industries.

## **Syllabus**

### **Ph.D. Course Work of Forestry and Environmental Sciences**

#### **Paper I Research methodology**

##### **Course Objectives:**

1. To learn about bio statistics, experimental designs for the forest based experiments.
2. To develop understanding of the hypothesis, Literature review, data handling, tabulation and graphical representation.
3. To learn the uses of different statistical as well as GIS software's.

##### **Unit-I**

- Data entry and computation, statistical analysis (LSD, Correlation, regression, ANOVA), Statistical software (SPSS), RS & GIS software's (ERDAS, ArcGIS, QGIS, 21<sup>st</sup> Century).

##### **Unit-II**

- Types of survey, inventory making, sampling designs, Sampling Methods.
- Instrumentation- Working principles and functions of surveying and analytical instruments used in forestry and environmental sciences research, (CHNS, Spectrophotometer, Nitrogen Analyzer, Air pollution monitoring systems, Weather monitoring station) working plan and resources survey.

##### **Unit- III**

- Identification of research problems, preparation of synopsis, review of literature, research paper writing, study of scientific databases, citation index.
- Experimental designs, methods of data collection, tabulation, data analysis and interpretation.

##### **Unit-IV**

- Recent advancement in Forestry, Environmental impact assessment, Air pollution tolerance index assessment, Meteorological data collection, Wildlife census, tranquilizer drugs, radio collaring, and forensic test of parts of wildlife.

##### **Course Outcome:**

1. Student knowledge on the layout experimental designs.
2. Develop competency for data handling, graphical designing and test of experimental data statistically.
3. Students will be expertise on different statistical packages used for data analysis.

CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	3	2	2	3	3	3	2
CO2	3	3	2	3	2	2	3	3	2	2	3	3	3	3
CO3	3	3	2	3	3	3	2	3	2	2	3	3	3	3

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

## Paper – II Forest Eco-system management

### Course Objectives:

1. To develop knowledge of Indian and World Forestry systems.
2. To have knowledge of conservation forestry, forest services, wood formation and natural resources economics and policies.
3. To know about Forest protection- disease and pest in forest trees, forest fire and their control by implementing integrated pest management and bio-control methods.

### Unit-I

- Indian and world Forestry systems, evolution of forest and bio-diversity assessment and conservation techniques.
- Criteria and indicators of sustainable forest management, community forest management.
- Conservation forestry- National Parks, biosphere reserves, centuries, arboretum, arboretum management, animal census, wildlife crime mitigation measures, forensic problems in wildlife litigation cases, human animal conflicts mitigation measures.

### Unit-II

- Wood formation in trees, composite and improved wood, certification of wood.
- Natural resources economics and policy, value addition and marketing of important commercial non-wood forest products (Lemon grass, Khas grass, Tendu leaf, Lac and medicinal plants (*Psyllium*, *Raulwofia serpentina*, *Withania somnifera*, *Celastrus peniculata*, *Santalum album.*, *Pterocorpus antalinus*), National Ayush Mission

### Unit-III

- Forest services, environment and climate change, national action plan on climate change, green India mission, international negotiation and treaties on climate change, ISFR reports, carbon stocks in India's forest and soil, goals of sustainable development, soil, plant and litter analysis.
- Forest soils and tree growth, Nutrient Cycling and Dynamics in Forest Ecosystems, sustainable management of soil resources.

#### Unit-IV

- Forest protection- disease and pest in forest trees, forest fire, integrated pest management, bio-control methods.

#### Course Outcome:

1. Scholars will acquire the knowledge about the Indian and World Forestry systems.
2. Scholars will gain knowledge related to conservation forestry, forest services, wood formation and natural resources economics and policies.
3. To develop strategies for forest protection- disease and pest in forest trees, forest fire and their control by implementing integrated pest management and bio-control methods.

CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3	2	3	3	3	2	3	3	3
CO2	3	2	3	3	2	3	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

#### Paper - III Forest Measurements and Tree Improvement

#### Course Objectives:

1. To develop knowledge about forest genetics and tree breeding, quantitative analysis of genetic & phenotypic characteristics of forest resources.
2. To gain knowledge about forest measurements.
3. To study about seed viability of forest trees, rate of carbon fixation of different forest species.

#### Unit- I

- Forest genetics and tree breeding, selection and breeding for tree improvement, forest genetic resources of Chhattisgarh.
- Seed viability and its testing, cryopreservation, transgenic trees, molecular markers.

## Unit- II

- Carbon fixation water absorption and transport, ascent of sap, nitrogen fixation, water stress and mineral stress physiology.

## Unit-III

- Measurements of diameter, height, canopy, volume, biomass, mapping of vegetation, land use and land cover, and water bodies through RS & GIS, carbon stock assessment in soil and vegetation.

## Unit- IV

- Actonorhizal and mycorrizal technology, Nursery practices of Sal, Teak, Shisham, Eucalyptus, *Termanilia*, Bamboo, Lemon grass, Khas grass and medicinal plants (Ocimum, Alo-vera, Safedmusli).

### Course Outcome:

1. Scholars will be able to develop knowledge about forest genetics and tree breeding, quantitative analysis of genetic & phenotypic characteristics of forest resources.
2. The Scholars will be able to understand and implement the knowledge about forest measurements.
3. Scholars will be gain knowledge about the carbon fixation and seed viability of forest trees species.

CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	3	2	3	3	3	3	3
CO2	3	2	3	3	3	2	3	2	3	2	2	3	3	2
CO3	3	3	2	2	3	3	3	3	3	3	3	3	3	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly