

Discipline Specific Elective (DSE) Course 4e: Forestry and Environmental Statistics

**Structure 1: PG Curricular Structure with only Course Work
Structure 2: PG Curricular Structure with Course Work + Research
Structure 3: PG Curricular Structure with Research only**

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Prerequisite of the course (if any)
		Lecture (45 Hours)	Tutorial (15 Hours)	Practical (00 Hours)		
DSE 4e: Forestry and Environmental Statistics	4	3	1	0	NIL	NIL

Course Objectives:

- To provide students with understanding of forestry and environmental statistics.
- Explore national and state data sources, data collection mechanisms, experimental design, and statistical analysis tools.
- Emphasizes the role of institutions, forest resource assessment, biodiversity evaluation, and the economic contributions of the forestry sector, including trade and ecosystem services.

Course Learning Outcomes: Upon successful completion of this course, students will be able to:

- Describe the structure of the forestry sector of India (State Forest Departments (SFDs) and State Forest Development Corporations and forest based industry) in generating forestry statistics.
- Identify key national and state-level forestry and environmental data sources along with their major publications.
- Explain methodologies for tree growth measurement, forest classification, and data collection mechanisms including working plans and afforestation statistics.
- Apply knowledge of vegetation sampling techniques and biodiversity assessment, including sampling unit design and biodiversity indices.
- Understand yield estimation techniques for forest resources using non-destructive methods and volume equations.
- Analyze statistics related to forest land diversion, production of timber and non-timber forest products, and their relation to other land parameters.
- Evaluate the economic contribution of forestry to India's GDP, including the valuation of tangible and intangible ecosystem services.
- Examine trends and data related to international trade in the forestry and environmental sector.

Unit I (11 Hours)

Important parameters to assess the health of forests (growth parameters of trees, soil characteristics, regeneration). Methodologies to assess regeneration, modeling growth of trees forest cover. Assessing recorded forest area; reserved and protected forest cover. Forestry Statistics related to State Forest Departments (SFDs) and Forest Development Corporations. Statistical applications in preparation of working plans of SFDs. Sample surveys to assess afforestation programmes. Preparation of volume and yield tables.

Unit II (11 Hours)

National Forest Inventory. Volume and yield allometric equations, yield estimation of trees using non-destructive methods (Newton, Huber, Smalian methods). Vegetation sampling: sampling units (point frame transect and quadrat); size and shape of sampling unit. Sample size calculations for biodiversity assessments; various biodiversity indices and their roles. Species Area Curves.

Unit III (11 Hours)

Estimation of biomass and carbon stocks, Concept of default values. UNFCCC methodologies for carbon assessment and REDD plus activities. Statistical methods for the estimation of parameters pertaining to the scopes of Green House Gas (GHG) Emissions.

Unit IV (12 Hours)

Statistics available on diversion of forest land for non-forestry purposes, estimating production of timber, non-timber forest products and bamboo. Relationship building with the other parameters like geographical area, forest area etc. Gross Domestic Products on Forestry Sector and its estimation. Forestry and Logging sector in National Industrial Classification (NIC). Concept of Green GDP and its assessment. Analyzing international trade in forest products, the ITC HS system and the data available with the DGCIS. Forest based industries.

Tutorial:

Tutorial sessions will include at least one activity such as group discussion/presentation/problem solving exercise based on the material covered in the lectures along with scholastic work related to the conceptual understanding of the subject.

Essential Readings:

1. *Forest Sector Report India (2019)*. Indian Council of Forestry Research and Education, Ministry of Environment, Forest and Climate Change, Government of India.

2. *Forest Statistics India (2021)*. Indian Council of Forestry Research and Education, Ministry of Environment, Forest and Climate Change, Government of India.
3. *India State of Forest Reports (2019-25)*. Forest Survey of India, Ministry of Environment, Forest & Climate Change, Government of India, Dehradun.

Suggested Readings

1. Chandra, G., Nautiyal, R. and Chandra, H. (Eds.) (2020). *Statistical Methods and Applications in Forestry and Environmental Sciences*. Forum for Interdisciplinary Mathematics. Springer.
2. Directorate General of Commercial Intelligence and Statistics. *DGCI&S - Government of India*. Available at: <https://www.dgciskol.gov.in>.
3. Gelfand, A. E. (2019). *Handbook of Environmental and Ecological Statistics*. United States: CRC Press.
4. Kant, P. and Nautiyal, R. (2021). *India Timber Supply and Demand 2010–2030*, International Tropical Timber Organization, Japan.
5. Official reports of various Ministries, Government of India and State Forest Departments.