

Course Code: 0542-324 (Stat-324) Course Title: Environmental Statistics
Marks: 50 Credits: 02 Number of Class: 26-28

Rationale:

This course is designed to introduce students to the basic statistical methods necessary to conduct and understand statistical analyses of environmental issues and problems.

Objectives:

The objectives of this course are to-

- Apply statistical methods to important problems in environmental sciences, with a focus on understanding and quantifying change in environmental sciences or problems of this nature.
- Provide intensive ideas of applying different statistical tools in the field of environmental sectors
- Teach the essential theory like deterministic and stochastic process, sampling techniques, dilution theory and statistical rollback alongside the practical components to analyze real environmental data.

Learning Outcomes:

Upon successful completion of the course, students will be able to:

CLO1	Make sense of the statistical terms that appear in scientific papers and the media of environmental sectors.
CLO2	Summarize environmental data using graphs, tables, and numerical summaries
CLO3	Choose appropriate statistical methods to answer research questions
CLO4	Use statistical software to apply these methods, and interpret the output.

PLOs CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		3			3		3	2
CLO2	2		3		1		3	
CLO3		1			3	3	1	
CLO4	1		3	3	1		3	3

Course Content, Teaching and Assessment Strategy

CLOs	Course Content	Teaching Strategy	Assessment Strategy	No. of Lec.
CLO1 CLO3 CLO4	Introduction: Concept of environmental statistics, uses and importance of environmental statistics. Environmental Pollution: Pollution and its importance, why does pollution happen? Pollutant sources, detail study of air and water pollution, global climate change and global warming. Stochastic process in Environment: Applications of Bernoulli. Poisson and normal processes to environmental problems.	Interactive Class, Open Discussion, Participatory Q/A Session, Online resources and Practical	Assignments, Class Tests, Presentation, Attendance and Final Examination.	13
CLO2 CLO3 CLO4	Environmental sampling: Network Sampling, composite sampling, ranked-set-sampling, Finite population sampling, Inaccessible and sensitive data, sampling in the wild. Detectability of Sampling: Basic Concept of Detectability, constant detectability over region, estimating detectability, effect of estimated detectability, detectability with simple random sampling.			8
CLO2 CLO3 CLO4	Diffusion and Dispersion of Pollutants: Wedge Machine, Particle Frame machine, Plume model. Dilution of Pollutants: Deterministic dilution, stochastic dilution. Theory of successive random dilution (SRD), application of SRD to Environmental phenomena: Air quality, indoor air quality, water quality, concentrations			10

	of pollutants in soils, plants and animals. Concentration in food and human tissue.			
CLO2 CLO3	Statistical Theory of Rollback: Predicting concentrations after source control, correlation, previous rollback concepts, environmental transport models in air and water.			4
CLO2 CLO3	Spatial Methods for Environmental process: Spatial Point Process Models and methods, General Spatial Process, More about Spatial Models, and Spatial Sampling and Spatial Design, Spatial Temporal models and methods.			4

Mapping of Course Learning Outcomes (CLOs) with the Teaching – Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Classroom Discussion	Class Test, Mid Term, Quiz
CLO2	Problem-solving activities.	Mid Term, Assignment, Presentation and Summative Measure (Final Exam.)
CLO3	Lecture and Reflective Discussion	Summative Measure (Final Exam.)
CLO4	Discussion and Slide Show	Summative Measure (Final Exam.)

Text Book

1. Barnett, V. and Turkman, K.F (1993): *Statistics for the Environment*, John Wiley and Sons, Chichester.

Reference Books

1. Bryan, F. J.: *Statistics for Environment Science and Management*, 1st Ed. CRC Press.
2. Wayner.R. Ott, (2002): *Environmental Statistics and Data analysis*, Lewis Publishers, England.