

**Subject Code: 02EN0106**

**Subject Name: Environmental Statistics**

**M. Tech Year – I (Semester I)**

**Objective:** Prepare students to apply basic statistical concepts in their research/professional activities

- Improve the understanding and reasoning of statistical results
- Build experience in data visualization

**Credits Earned:** 2 Credits

**Course Outcomes:** After completion of this course, student will be able to:

1. Apply statistical methods in the interpretation of collected experimental data.

**Pre-requisite of course:** Basic understanding of statistics

#### Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
0	4	0	2	50	30	20	25	25	150

#### Contents:

Unit	Topics	Contact Hours
1	<p><b>Statistics and statistical thinking</b> - An introduction, Planning and executing the survey.</p> <p><b>Collecting data and survey design:</b> Types of data- Primary and Secondary data, Primary data collection methods, Drafting and Pre-testing the Questionnaire (or Pilot Survey), Secondary data sources, Editing primary and secondary data, Precautions in the use of secondary data.</p> <p><b>Sampling and sample designs:</b> Sampling methods, Size of sample, Merits and Limitations of sampling, Sampling and Non-sampling errors.</p>	20

	<p>Summarizing qualitative data, Classification and tabulation of data, Graphical techniques for describing data</p> <p><b>Measures of central value:</b> Concept, arithmetic mean, mode, median for data.</p> <p><b>Measures of Dispersion:</b> Significance of measuring variation, Mean deviation, Standard deviation, Combining the mean and standard deviation.</p>	
2	<p>Correlation analysis, Regression analysis, Probability and Expected value.</p> <p><b>Theoretical Distributions:</b> Binomial, Poisson and normal distribution</p> <p><b>Statistical Inference- Tests of Hypothesis:</b> Procedure, standard error and sampling distribution, tests of significance for small and large samples, Application of the t-distribution, the Chi-square distribution.</p> <p><b>Analysis of variance:</b> The F-test or the variance ratio test, Application of F-test, technique of analysis of variance- one way and two way classification model.</p>	16
3	<p><b>Fate and Transport of Contaminants</b></p> <p>Review of Chemical transformations, Sorption/desorption, biological transformations, brief review of mass and energy balance.</p> <p>Advection, molecular diffusion, dispersion: application in modeling of rivers and lakes.</p> <p>Subsurface flow and transport.</p> <p>Issues of real environmental responsibility</p>	20
	<b>Total Hours</b>	<b>56</b>

**Reference Books:**

1. Gupta, S.C., and Kapoor, V.K., "*Fundamentals of mathematical statistics*", Sultan Chand and sons, Reprint 2003.
2. Ramaswami, A, Milford, J B, Small, M. J. *Integrated Environmental Modeling - Pollutant Transport, Fate, and Risk in the Environment* John Wiley & Sons, 2005.
3. Chapra S C, *Surface Water Quality Modeling*, McGraw-Hil, Inc., New York, 1997.



**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	40%	30%	10%	-

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board, may also use any of tools such as collaborative learning, demonstration, role play, Quiz, brainstorming, MOOCs, Active Learning Assignments etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.