Lesson-Plan

School: Science
Department: Environmental Science
Course Code: ES 552
Course Name: Statistical Methods and Environmental Application
Credits: 2 0 1 3

Instructors: Dr. Amit Prakash & Dr. S. S. Bhattacharya
Course coordinator: Dr. S. S. Bhattacharya

1. Abstract:

The students would be introduced to various aspects of computational statistics. Moreover, a wide exposure to methods and techniques of data collection and handling through practical exercises will be provided to the students. The students are also expected to develop basic aptitude to apply statistical tools in the domain environmental research.

2. Objective:

The prime objective of the course is to provide the students with basic knowledge of statistics with special reference to biological and environmental research problems. With successful completion of the course the students are expected to develop an aptitude to plan environmental experimentations, apply appropriate statistical tool for different problems. Furthermore, the students should develop skills to deal with modern statistical programmes and interpret datasets confidently.

3. Prerequisites of the course:
Basic knowledge in mathematics would be helpful for understanding the course.

4. Course outline + suggested reading:

The course will start with lessons on basics of statistics such as definitions, frequency distribution, measures of central tendency, dispersion, and Skewness. This part will be covered by 4-5 lectures and 1-2 practical classes. 1st type 'A' test will be conducted after covering these subjects. The next part will start with correlation, scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank correlation, regression equation analysis and probability models. This part will be completed in 6-7 lectures & 1-2 practical exercises and 2nd type 'A' test will be conducted. This will be followed by test of significance which includes 't' test, 'z' test and chi-square analysis in next 4-5 lectures and 2 practical exercises. After this the major-1 test will be held. In the next phase, principles of sampling, sampling units and frame, random, stratified random, systematic and cluster sampling will be covered in 5-6 lecture and 1-2 practical exercises. The 4th type 'A' test will be held at this stage. Finally, different experimental designs such as RBD, factorial experiment, split plot etc will be taught along with one-way and two-way analysis of variance, LSD, DMRT analysis in 6-7 lectures including 3-4 practical

exercises and the last type 'A' test will be conducted. Moreover, assignments and papers for students will be given as type 'B' tests apart from the semester end examination.

Reference/Text books:

Text books:
1. *J.Medhi Statistical methods: An introductory text, New Age, 1995*
2. *I.A. Khan and A. Khanam Fundamentals of Biostatistics, Ukaaz Publications , Hyderabad, 1994*
3. *R. D. Stem, R. Coe, E F Allan and IC Dale Good Statistical Practice for Natural Resources Research, CABI publishing, 2004.*
4. *Preben Blaesild and Jorgen Granfeldt, Statistics with Application in Biology and geology, Taylor and Francis, 2002.*
5. *B. Rosner, Fundamentals of Biostatistics, Duxbury Press 1999.*
6. *V.G. Panse and P.B. Sukhatme Statistical Methods for Agricultural Workers, ICAR,1978.*
7. K. A. Gomez and A.A. Gomez Statistical Procedures for Agricultural Research, John Wiley and Sons 1984.

4. (a) Lesson Plan:

Chapter/Topic	Hours (including practical)
Introduction to statistics, need, scope & definitions	1
Frequency distribution, measures of central tendency,	3
Dispersion, Skewness and Kurtosis	3
TEST I	30 min.
Principles of sampling, sampling units and frame	1
Random, stratified random, systematic and cluster sampling	1
Probability, Conditional probability, Bayes' theorem & Probability models	5
TEST II (Mid term)	**2 hrs.**
Test of significance: 't' test, 'z' test and chi-square analysis	5
Correlation, scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank correlation	6
Regression equation analysis	2
Test III	30 min
Designs of experiment: CRD, RBD	3
Factorial experiment, Split plot	5
One-way and two-way analysis of variance, LSD, DMRT	4
Handling statistical programme: Minitab, origin	2
Final discussion & recapitulation	1
End term	**--**

TOTAL (Theory+practical)	43

(b) Evaluation plan:

Performance of the student is evaluated on the basis of the following continuous assessment
      Two Tests (Test I & III) will carry 25 marks each, hence total = 50 marks and
      Test II (mid term) will carry 40 marks & Test IV will carry 60 marks respectively

6. Pedagogy:

- Lecture presentations: Blackboard supplemented by power point presentation
- On-field demonstration of statistical tools & designs

7. Expected outcome:

On completion of the course, the students are expected to develop expertise on statistical application in environmental problems with special emphasis on test of hypothesis and sampling techniques. They should be well acquainted with the basic concepts and definitions along with guiding principles of data interpretation.