Item 19d

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BioCEP-621: Statistics And Environmental Modelling

(3 ECTS, 4 MC)

Course Description and Syllabus

Basic Information

Type of Course	Lecture with practical tutorials
Term	2nd semester
Expected no. of participants	< 20
Language	English
Hours per week in term	4 hr/week for lecture 2 hr/week for practical

Instructors

Khin Swe Oo (Coordinator)	
Zin Linn Khine	
Nay Myo Hlaing	

COURSE OBJECTIVE

Understanding experimental design and data analysis approaches are essential to successfully accomplish ecological research, environmental modeling and to critically evaluate research evidence presented in scientific papers. Consequently, professionals should know whether an experiment is properly conceived, correctly controlled, adequately analyzed, and correctly interpreted. The goal of this course is to develop the understanding of statistics for analyzing data in environmental protection. This will be accomplished by providing students with conceptual and practical understanding of experimental design and typical analytical approaches used in environmental studies. Discussion of specific designs and analyses will prepare students to understand typical statistical analysis presented in scientific papers and to undertake their own investigations. Examples and problem sets will utilize R (a free software environment for statistical computing and graphics) to analyze data.

LEARNING OUTCOMES

- Understand basic concepts of statistics
- Design appropriately experimental or observational studies
- Choose an appropriate statistical method
- Interpret and understand the data analysis
- Perform statistical analysis using R

COURSE STRUCTURE

- The course includes a theoretical and a practical component.
- The theory will take 4 hours per week and the practical will take 2 hours per week.
- Practical parts will emphasize using R to analyze the data and to perform the statistical analysis.

CLASS ATTENDANCE

Students are expected to attend regularly to the class. Students need 75% of total attendance for being able to take the final exam.

GRADING

Course performance will be noted. Students will be asked to do homework and at the end of the course before the final exam, there will be a practical exam worth 15%. Besides the final examp (70% of course grade), class performance and homework will be evaluated. Grades will be assigned based on:

5% class performance

10% homework

15% practical exam

70% final exam.

COURSE TOPICS & TENTATIVE SCHEDULE

Week	Topic
1	Preliminary concepts (population, sample) and Frequency distribution (normal, Poisson, binomial)
2	Descriptive statistics (measures of location and spread) and probability
3	Inferential statistics: framing statistical hypothesis (steps statistical test, p-value) I
4	Inferential statistics: framing statistical hypothesis (steps statistical test, p-value) II
5	First statistical test (one sample z-test / t-test)
6	Introduction to R and visualization of the data
7	Designing experiments and field studies I
8	Designing experiments and field studies II
9	Designing experiments and field studies III
10	Correlation

11	Regression
12	Analysis of variance (ANOVA) I
13	Analysis of variance (ANOVA) II
14	Mann-Whitney U Test and Kruskal-Wallis H test
15	Tabular data analysis (Chi-square)
	Final exam

RECOMMENDED READINGS

Fowler, J. 1996. Statistics for Ornithologists. BTO. 176 pp

Lohr, S. 2019. Sampling design and analysis. Chapman & Hall/CRC. 610 pp

Kuehl, R. 1994. Statistical principles of research design and analysis, Wadsworth. 736 pp

Gotelli, N. J. and Ellison, A. M. 2013. A Primer of Ecological Statistics. Oxford University Press. 640 pp

Zuur, A. F., Ieno, E. N., Walker, N. J., Saveliev, A. A. and Smith, G. M. 2009. Mixed effects models and extensions in ecology with R. Springer. 574 pp