**II.2.16 DATA TREATMENT**

**A. Course description**

**1. Credit points: 2 ECTS**

**2. Time commitment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Items | Lecture | Tutorial/Exercise | Practice/Assignment | Lab-work | Total |
| No. of hours | 12 | 0 | 8 |  | 20 |

**3. Prerequisites**

Probability and Statistics; Analytical chemistry; Ecology and biodiversity

**4. Recommended background knowledge**

N/A

**5. Subject description**

Through this subject, students will learn how to apply the statistics for further researches in environmental studies.

**6. Objectives & Outcome**

The aim of this subject is to introduce students the basics of statistics in general and procedures and techniques required for processing and analyzing research data in particular. After studying the subject, students will be able to (i) appreciate the importance of statistical techniques in environmental research (ii) how to collect data (iii) understand and apply the statistical methods to process and analyze data.

**7. Assessment/ Evaluation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Component | Attendance | Exercises | Practicals | Midterm | Final |
| Percentage % | 10 |  | 40 | 0 | 50 |

**8. Prescribed Textbook(s)**

[1]. Bryan F.J. Manly. Statistics for Environmental Science and Management, Second Edition. Chapman and Hall/CRC -, 2008.

[2]. Crawley, M.J., 2009. The R book. Wiley, Chichester, England

**B. Course content**

1. Introduction

1.1. Analytical process. Quantitative and Quantitative Data

1.2. Collecting environmental data: sampling and monitoring

1.3. Basic concepts:

- Data type

- Variable, Experiment and Hypothesis

- Theoretical distributions

2. Analysis of Data

2.1. Population and samples

2.2. Descriptive Statistics

- Central Tendency Measure- Range, Mean, median, Mode

- Dispersion measure: Range, Bias, Standard deviation, relative standard deviation, Quartiles.

- Measure of Asymmetry

2.3. The distributions of repeated measurements (normal and log- normal distributions)

2.4. Data expressing using plot, box plot.

2.5. Confidence limits of mean and the geometrics mean

3. Significance tests

3.1. Introduction

3.2. Outliers; testing of normality of distribution

3.3. F- test for the comparison of 2 variances

3.4. Comparison of an experimental mean with a known value and comparison of 2 experimental means.

3.5. Analysis of means and ANOVA, MANOVA.

4. Relationship: regression – type model and methods

4.1. Correlation analysis

- Pearson’s Product moment correlation, Spearman’s rank order correlation.

4.2.Linear Regression analysis

4.2.1. The least squares method and weighted regression method.

4.2.2. Comparison of bivariate

4.2.4. Transformations

4.2.5. Generalized Linear Model

**C. Reference Literature**

[1]. J. Einax. Chemometrics in environmental chemistry—statistical methods. Berlin, Springer, 1995, ISBN 0-387-58941-4, xvi+330 pp, DM 198.

[2]. Micheal J. Crawley, 2007. The R Book. John Wiley & Sons, Ltd, England.

[3]. Paul Murrell, R Graphics. The University of Auckland, New Zealand, 2005. ISBN 978-1584884866

[4]. Clemens Reimann, Peter Filzmoser, Robert Garrett, and Rudolf Dutter. Statistical Data Analysis Explained: Applied Environmental Statistics with R. Wiley, Chichester, UK, 2008. ISBN 978-0-470-98581-6