Course: From design of experiments to data analysis using statistical tools

Teacher: Prof. Dr. Theodore Henry, Institute of Life and Earth Sciences (ILES) Heriot-Watt University, Edinburgh, Scotland

https://researchportal.hw.ac.uk/en/persons/theodore-b-henry

Summary of the course:

The development of skills in experimental design, analysis of experimental data, and reporting in scientific manuscripts is essential for the evolution of independent scientists. The theme of the proposed teaching program aims to develop ability and competence of students through a balanced delivery of practical theory and applied skill development in statistical analyses with real data. Students will emerge from the program with enhanced understanding of the rationale behind statistical analyses, insight on designing experiments with an understanding of implementation of statistical analyses, an improved ability to evaluate critically the methods of statistics reported in published scientific articles, and to be better able to write about data analyses and interpretation for preparation of scientific manuscripts.

Audience: Undergrad, Grad students, Technicians and Faculty team

Date: March 2nd to 12th 2020

Hours: 9 am to 1 pm, 32h – **LP01 and LP04**

Language: English

Maximum number of participants: 30

Certificate: A certificate will be issued for the students with more than 75% of presence and considered approved by the teacher based on completion of assignments.

Program:

Monday, 2 March- Lecture topics: formation of hypotheses, sample/population, independent/dependent variables, purpose of statistical analyses, practical session/discussion of experimental design in context of statistical analyses, sampling and power analyses

Tuesday 3 March - Lecture topics: data distributions, assessing raw data, preparation of figures with Excel, demonstration to introduce use of R software for statistical analyses; Practical session with Excel and R

Wednesday 4 March- Lecture topics: statistical assessment of data distributions, overview of parametric and non-parametric statistical analyses, use of R for statistical analyses of data distributions (tests of normality), t-tests, analysis of variance; practical session: use of R for analysis of data by t-test and analysis of variance

Thursday 5 March - Lecture topic: writing the statistical analysis section for a manuscript and examination of examples from the literature, practical session and opportunity for one-on-one meetings between students and instructor for discussion of student research data sets

Friday 6 March: no activities

Monday 9 March- Lecture topic: simple linear, practical session: use of R software for simple linear regression, preparation of figures for manuscript and presentation of results

Tuesday 10 March- Lecture topic: multiple linear regression, practical session: use of R software for multiple linear regression, interpretation of results and preparation for manuscript

Wednesday 11 March- Lecture topic: logistic regression, practical session: use of R software for logistic regression, interpretation of results and preparation for manuscript.

Thursday 12 March- Wrap-up session, one-on-one discussion between instructor and students regarding specific datasets, analyses and experimental design and evaluation.