Universitat Autònoma de Barcelona

2019/2020

Laboratory Methodology and Scientific Communication

Code: 42908
ECTS Credits: 12

Degree	Type	Year	Semester
4313792 Neurosciences	OB	0	1

Contact

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Use of Languages

Principal working language: english (eng)

Teachers

Enrique Claro Izaguirre

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Prerequisites

There is no special requirement for this module, other than those that apply to the master program. By the time classes start, the student should have been accepted in a research group and given a temptative project.

Objectives and Contextualisation

The primary objectives of this course are i) provide with transversal abilities to communicate science efficiently, ii) acquire some fundamental competences in statistical analysis, and iii) become familiar with a real research environment.

Competences

- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Conceive, design, develop and synthesise scientific projects in the field of neurosciences.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.

Learning Outcomes

1. Adapt to working in multidisciplinary teams in varying cultural and scientific contexts, creating and fostering a climate of open collaboration and team spirit.
2. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
3. Devise an alternative work plan in case the hypothesis is not supported by the experiments.

4. Efficiently present research work and findings in neurosciences, orally and in writing, using English.
5. Formulate a hypothesis that will further knowledge of a particular problem, design a series of experiments to test it and propose a specific, realistic work plan.
6. Formulate the current state of a major problem in neurosciences in writing.
7. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
8. Know the structure of an application for research funding and the procedure used for evaluating it.
9. Recognise the need for statistical analysis and use it with ease in real contexts.
10. Seek out information in the scientific literature using appropriate channels, and use this information to formulate and contextualise a research topic.
11. Show responsibility in information and knowledge management.
12. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
13. Use the experimental techniques formulated for the development of the research project

Content

1. Communication in Science.

A scientist generates products that need to be marketed conveniently. This part of Module #1 leads the student to realize that the development of skills to communicate scientific results in an effective manner is, at least, as important as generating them. Being English the *lingua franca* among scientists, all activities will be conducted in this language. Continued evaluation will emphasize the progress of each student throughout the teaching period. The final mark in this submodule will combine class attendance and timely completion of assignments.

In essence, the course consists of:

Paper writing: What to publish, where, and how. We will emphasize abstract (summary) writing. Abstracts, unlike most beginners may think, is one of the trickiest parts of scientific writing. Most potential readers of your paper will only devote a few seconds to read your abstract from scientific databases. If you don't catch their attention, you have failed. Within this paper writing part, we will get into the peer-review system.

Poster design: Effective poster design is much more than merely putting your figures together and fitting some text in between. Consider yourself in the middle of a 400-poster session, competing with every one to attract the attention of that important scientist coming down the hall, with whom you want to talk. Just passing by, the big guy may ask you, *"hum, what have you done here?"* Unless you say something captivating within 15 seconds, his eyes might be already on the next poster.

Lecturing: Speaking to an audience about your research is a privilege and a great occasion to know and be known. However your product (your science) may not reach the customer (the audience). Beware of Power Point-induced sleep, make the simplest possible slides, use body language wisely, make eye contact with the audience, respect your time limits, and much more.

Additionally, depending on the enrollment number, we will discuss some science ethics and the science and art of fundraising

2. Statistical Analysis of Experimental Data.

Introduction. Statistics is a central issue for experimentalists, both before and after the experiments are performed. In the former case because careful experimental design is needed if we want the experiment yields right answers to the questions we are asking for and in the latter case because data sets resulting from experiments need systematic and accurate analyses in order to produce unbiased and reproducible conclusions. Variability is inherently linked to biology and statistics is responsible for variability modeling, that is, for separating the diverse sources of error to identify trends, associations, correlations helpful for exploring the intricate jungle of life sciences.

Objectives. The subject comprises a basic course on statistics. The fundamental objective is to qualify the students for accurate analysis and interpretation of experimental data.

Contents. 1. An introduction to the statistical package. 2. Working with data in a project. 3. Monovariate and bivariate descriptive statistics. 4. Random variables and probability distributions. 5. Statistical inference: Estimation and hypothesis testing. 6. Analysis of the differences between two groups or conditions: (a) two independent samples and paired data; (b) parametric and non-parametric tests. 7. Analysis of the differences between two or more groups: Analysis of variance (ANOVA).

3. Research Laboratory

Getting familiar with the theoretical background of the partcular research project proposed by your tutor.

Elaboration of your working hypothesis and work plan.

Learning the techniques needed to carry out your research project.

Methodology

Lectures

Classroom practices

Presentations in class

Hands-on laboratory (supervised and autonomous work at the lab where the student is preparing his/her final master dissertation)

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	37.5	1.5	4, 8, 5, 7, 12, 2, 9, 6
Type: Supervised			
Oral presentation of assignments	54.25	2.17	4, 11, 5, 7, 12, 2, 6
Supervised training at the laboratory	75	3	10, 4, 11, 5, 1, 3, 7, 12, 9, 6, 13
Type: Autonomous			
Completion of assignments	56.25	2.25	10, 11, 5, 1, 3, 7, 12, 6, 13
Laboratory work	75	3	10, 11, 5, 1, 3, 12, 2, 9, 6, 13

Assessment

There is a continuous assessment based on class atendance and attitude, timely completion of assignments, performance in oral presentations, an exam on statistics, and a report from the research tutor.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Completion of assignments	17%	0	0	10, 4, 8, 11, 5, 3, 7, 12, 2, 6

Exam	36%	2	0.08	11, 9
Oral presentation of assignments	17%	0	0	4, 11, 5, 1, 3, 7, 12, 2, 6
Tutor report	30%	0	0	10, 4, 11, 5, 1, 3, 7, 12, 2, 9, 6, 13

Bibliography

George M. Hall: How to write a paper. BMJ Books, 2008

Jenny Freeman: How to display data. BMJ Books, 2008

George M. Hall: How to present at meetings. BMJ Books, 2007

Elizabeth Wager: How to survive peer review. BMJ Books, 2002

Ivan Valiela: Doing Science. Design, Analysis, and Communication of Scientific Research. Oxforf U.P., 2001