Teaching guide

IDENTIFICATION DETAILS

Degree:	Biomedical Engineering
Field of Knowledge:	Engineering and Architecture
Faculty/School:	Experimental Science
Course:	Experimental Methods I
Type:	Compulsory
ECTS credits:	4,50
Year:	2
Code:	2492
Teaching period:	Fourth semester
Area:	Experimental Methods
Module:	Disciplinary Training
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	112,50

Teaching staff	E-mail
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SUBJECT DESCRIPTION

The Experimental Methods I course aims to solidly train the student in the laboratory work in order to consolidate the degree's theoretical contents, as well as to facilitate the student's access to the job market.

Experimental Methods I is a compulsory, 150 hours semester course that is taught during the second year of the Biomedical Engineering Degree. This course is part of the Practicum subject, which belongs to the Experimental Methods in Bioengineering basics module.

Experimental Methods I will be performed in the University laboratories and has been designed as real-life, professional experimental situations, from the different subjects coursed during the 2nd year. The course is intended to provide the students not only with the basic laboratory skills needed in a biotechnology or bioscience lab but also to develop other personal aptitudes such as critical thinking, accuracy or teamwork, which are essential in research practice.

GOAL

To develop competence in the management and development of basic laboratory techniques, acquiring the necessary skills in results assessment, organization and the practical application of theoretical concepts which cover various subjects.

The specific aims of the subject are:

Integrate all the techniques in the context of a scientific project

Critical analysis of the results

Presentation and public defense of the results

PRIOR KNOWLEDGE

The knowledge acquired during both current and previous degree courses is required.

COURSE SYLLABUS

Methodologies for experimental design and analysis: laboratory notebook, tabulation and analysis of data, reporting. Use of basic laboratory materials: Identification and utility of laboratory materials, measuring devices, etc. Use of techniques for fabrication, characterization, diagnostics and monitoring studied in the Degree both independent and interrelational. Conduct of biological testing in biomedical engineering which are related to teaching methods studied in the Bioengineering basics module.

EDUCATION ACTIVITIES

Both theory and practical sessions (experimental work in the laboratory).

Autonomous work (lab manual, study and preparation of the activities).

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
45 hours	67,50 hours

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

General Skills

to understand, apply, adapt and develop tools, techniques and experimental protocols with methodological rigour and safety, understanding the limitations of the experimental approach.

Specific skills

To know the fundamentals and applications of the principal experimental techniques and clinical equipment used in monitoring, diagnosis and treatment in biomedicine, as well as employing and analysing the results with scientific rigour and a humanistic perspective.

To know the fundamentals of the design, control, optimisation, simulation, installation and maintenance of biomedical devices, equipment, systems and processes.

LEARNING RESULTS

To know the basics of the matter-radiation interaction. Description of the electron and photon spectroscopy methods.

To understand the physic principles of biomedical signal acquisition.

To know the working principles of the main techniques used for monitoring the physiological functions and diagnosis in pathology treatment.

To identify the materials and use of the main equipment used in basic experimental science laboratories.

To understand correctly and with scientific rigor the experimental results obtained in the laboratory.

To communicate adequately the procedures and results obtained in experiments related with the Biomedical Engineering field both in a written and oral way.

To get a global vision on the different knowledge areas which conform the Biomedical Engineering field, identifying the link between them.

Apply the main fabrication and characterization techniques in tissue and biomaterial engineering.

Being able to use helping tools in design and adjustment control systems with applications in biological systems and biomedical devices.

To have fluency with basic analysis tools, signal interpretation and enhancement, frequency domain systems in Biomedical Engineering applications.

To learn the basics for prototype design and improvement with the goal of product, device and equipment implementation in the biomedicine area under economic viability criteria.

Analyze and apply strategies for improving products continuously.

LEARNING APPRAISAL SYSTEM

Attendance to all practical sessions and seminars are both mandatory and indispensable so as to be eligible for the practical and theoretical examinations. Non-attendance to any of these sessions without corresponding valid justification will result in failing the course. Arriving two days more than 15 minutes or one day more than 30 minutes late to class, will count as a non-justified absence, implying not passing the course.

Ordinary evaluation system:
-Exam 40 % (A minimum grade of 5 out of 10 will be necessary to consider the exam for the global average.)
-Lab session work 40 % (A minimum grade of 5 out of 10 will be necessary to consider the lab work for the global average.)
-Preparation and presentation of the work 15%
-Involvement in class and debates 5%

The exams will be face-to-face as long as the health situation allows it.
Plagiarism as well as the use of illegitimate methods in the exams will be penalized as written in the Normativa de Evaluación y la Normativa de Convivencia of the university.

Alternative evaluation system:
The subject is classroom-based and attendance to the lab sessions is mandatory thus, the alternative system doesn't apply.

Alternative evaluation system COVID:
-Exam 45 % (A minimum grade of 5 out of 10 will be necessary to consider the exam for the global average.)
-Lab session work 40 % (A minimum grade of 5 out of 10 will be necessary to consider the lab work for the global average.)
-Preparation and presentation of the work 15%

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

REDWOOD, B., SCÖFFER, F., GARRET, B (2017) The 3D Printing Handbook, 3D Hubs, Amsterdam.

Practical Physics. G.L. Squires. Ed. Cambridge University Press., (2001)