Teaching guide

IDENTIFICATION DETAILS

Degree:	Biomedical Engineering
Field of Knowledge:	Science
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
Beatriz Loreto Rodilla González	beatriz.rodilla@ufv.es
Víctor Martín Domínguez	victor.martin@ufv.es
César García Lozano	cesar.garcialozano@ufv.es

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 and knowledge previously adquired in the context of a scientific project

Ellaboration of well-presented reports

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. **It is of special importance having acquired the electronic knowledges in the “Ingeniería Electrónica” subject**.

COURSE SYLLABUS

This course represents an initial approach to various experimental methodologies for the diagnosis, analysis, treatment, and understanding of human physiology and pathologies. Therefore, this course is divided into different sections that explore those aspects and conditions.

The content related to this course includes:

- FabLab for equipment design
- Equipment and electronic devices in Biomedical Engineering, particularly those that contain electronic circuits and that measure body electrical activity (EXG)
- Cellular biology and Microbiology for biological response
- And simulated clinical environments and simulated scenarios in the Clinical Simulation Center.

Students will learn about techniques for fabrication, circuit design and signal acquisition, laboratory notebook,

tabulation, analysis of data and results reporting, and simulated clinical training environments. All these together will establish the foundations of the experimental methods series in the Bioengineering basics module of the Biomedical Engineering undergraduate program.

EDUCATION ACTIVITIES

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

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.

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

Analyze and apply strategies for improving products continuously.

To understand the physic principles of biomedical signal acquisition.

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

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

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.

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

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

LEARNING APPRAISAL SYSTEM

Attendance at all sessions is compulsory (regardless of the place where they are held: laboratory, computer room, etc.). Absences must be duly justified to the Professor in Charge of the Course (PEC). Unjustified non-attendance at any of these sessions will result in failure of the course in the ordinary exam.

ORDINARY EVALUATION SYSTEM

The evaluation system of Experimental Methods I includes the assessment of all the activities carried out in the teaching-learning process of the course. A minimum grade of 5 (out of 10) is required to pass the course. Also, the student must obtain a minimum grade equal to 5 (out of 10) in each module of each evaluation activity to pass the course. Final grade will be calculated with the percentages corresponding to each evaluation activity:

- EV1 - Exams (SE1) and Assignments (SE2): 60%. Its objective is to evaluate the global learning of the contents exposed in class. The student will demonstrate the assimilation, comprehension, and ability to relate the contents exposed; as well as the analysis, calculation and resolution of problems framed in the subject. To pass the course, the student must obtain a minimum grade equal to 5 (out of 10) in each module of EV1.
- EV2 - Lab Reports (SE3): 40%. The aim of this activity will be to determine the student's degree of understanding of the experimental procedures and techniques applied in the laboratory sessions, their connection with the theoretical concepts covered in the subject, the calculations required to carry out the experimental work, the interpretation and discussion of the experimental results obtained, as well as the clarity and presentation of the report and the correctness of the written expression. To pass the course, the student must obtain a minimum grade equal to 5 (out of 10) in each module of EV2.

From the above contributions, the grades that will be kept to the extraordinary exam will be those with a minimum grade of 5 (out of 10).

ALTERNATIVE EVALUATION SYSTEM
Due to classroom-based nature of the course, alternative evaluation system does not apply.

Plagiarism, fabrication, falsification, or the use of illegitimate methods for presenting data, documents, reports, or any task related to the course, will be penalized as written in the Normativa de Evaluación and the Normativa de Convivencia of the University.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

REDWOOD, B., SCFFER, F., GARRET, B The 3D Printing Handbook 2017 3D Hubs, Amsterdam

Gordon Leslie Squires Practical Physics 2001 Ed. Cambridge University Press