

## SUBJECT TEACHING GUIDE

G1484 - Fundamentals of Biomedical Engineering

Degree in Telecommunication Technologies Engineering

Academic year 2019-2020

| 1. IDENTIFYING DATA              |   |                  |                    |                  |                  |
|----------------------------------|---|------------------|--------------------|------------------|------------------|
| Degree                           | Degree in Telecommunication Technologies Engineering    |                  |                    | Type and Year    | Optional. Year 4 |
| Faculty                          | School of Industrial Engineering and Telecommunications |                  |                    |                  |                  |
| Discipline                       | Speciality Optional Subjects                            |                  |                    |                  |                  |
| Course unit title and code       | G1484 - Fundamentals of Biomedical Engineering          |                  |                    |                  |                  |
| Number of ECTS credits allocated | 6   | Term             | Semester based (1) |                  |                  |
| Web                              |   |                  |                    |                  |                  |
| Language of instruction          | Spanish   | English Friendly | Yes                | Mode of delivery | Face-to-face     |

|                  |   |  |  |  |  |
|------------------|---|--|--|--|--|
| Department       | DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA                              |  |  |  |  |
| Name of lecturer | JOSE LUIS ARCE DIEGO  |  |  |  |  |
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| Other lecturers  | JOSE RAMON LLATA GARCIA<br>JESUS ANTONIO ARCE HERNANDO<br>FELIX FANJUL VELEZ                    |  |  |  |  |

### 3.1 LEARNING OUTCOMES

- Knowledge of the field of biomedical engineering and its main applications
- Knowledge of the major ethical issues involved in biomedical applications
- Knowledge of basic biomedical signals that can be used in medical device applications
- Ability to design basic medical instrumentation systems
- Knowledge of most relevant instrumentation systems.  
Knowledge of the fundamentals of robotics applied in biomedicine.
- Knowledge of the principles of current medical imaging
- Knowledge of advanced principles of medical imaging
- Ability to select a priori the appropriate technique for a specific application
- Knowledge of optical sources applications in treatment and diagnosis of diseases
- Ability to select a priori the appropriate optical source for an application.
- Knowledge of ICT applications in the medical field
- Ability to design basic telemedicine systems

### 4. OBJECTIVES

- To know the applications of biomedical engineering
- To consider ethical issues in biomedical applications
- To know the most significant biosignals
- To design basic biomedical instrumentation systems
- To know the fundamentals of robotics applied in biomedicine .
- To know the principles of current medical imaging
- To understand the benefits and limitations of medical imaging equipment
- To know the applications of optical and medical diagnosis to treatment
- To know how to choose the basic features of a medical imaging or optical equipment
- To know the main applications of telemedicine
- To design basic systems telemedicine

### 6. COURSE ORGANIZATION

#### CONTENTS

|   |   |
|---|---|
| 1 | THEMATIC AREA 1: Introduction<br>1. Biomedical Engineering: general and ethical issues.   |
| 2 | THEMATIC AREA 2: Bioinstrumentation<br>2. Biomedical Signals<br>3. Biomedical instrumentation systems. Applications of robotics to biomedicine. |
| 3 | THEMATIC AREA 3: Diagnosis and Treatment Techniques<br>4. Medical imaging<br>5. Lasers for medical applications                                 |
| 4 | THEMATIC AREA 4: ICTs in the clinical setting<br>6. Telecommunications in the clinical setting  |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description  | Type                  | Final Eval. | Reassessn | %             |
|--|-----------------------|-------------|-----------|---------------|
| Reports of laboratory works (30%).   | Laboratory evaluation | No          | No        | 30,00         |
| The remaining 30% will be evaluated based on a written final test before the exam period.  | Written exam          | Yes         | Yes       | 30,00         |
| The evaluation of the subject is presented as continuous assessment with a final test. Ongoing evaluation consists of proposed classroom work for delivery in groups, with a weight of 40%.  | Work                  | No          | Yes       | 40,00         |
| <b>TOTAL</b>   |                       |             |           | <b>100,00</b> |
| <b>Observations</b>  |                       |             |           |               |
| Attendance at lab is mandatory, as well as delivery of reports of laboratory works. Non-attendance or non-delivery will lead to fail the subject. Failure to deliver the proposed classroom work will lead to a score of 0 on that part. In order to pass the course, the sum of scores should be at least 5 points. |                       |             |           |               |
| <b>Observations for part-time students</b>   |                       |             |           |               |
| Part-time students who are not eligible for the continuous assessment will get their final mark by the laboratory works, with a weight of 50% and compulsory attendance, and the final written exam, with a weight of 50%.   |                       |             |           |               |

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

J.D. Enderle, S.M. Blanchard, J.D. Bronzino, Introduction to Biomedical Engineering, Ed. Academic Press, 2005.  
 A.A. Bharath, Introductory Medical Imaging, Ed. Morgan&Claypool, 2009.  
 Ronald W. Waynant, Lasers in Medicine, Ed. CRC Press, 2002.