

# Postgraduate Certificate Biomedical Electronics





## Postgraduate Certificate Biomedical Electronics

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/information-technology/postgraduate-certificate/biomedical-electronics](http://www.techtute.com/us/information-technology/postgraduate-certificate/biomedical-electronics)

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# 01 Introduction

The future of medicine and electronics are clearly linked. The use of electronics to create medical instruments to improve people's quality of life and increase life expectancy is growing, and its remarkable benefits are driving investment in this area to increase steadily. However, in order to have positive development in this field, it is essential to have highly qualified professionals, which is why TECH has designed this very complete academic program.



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*The benefits that electronics brings to medicine make it a relevant sector in society, which also demands highly qualified professionals”*

The advances in Biomedical Electronics in recent decades have been absolutely amazing, with the appearance of new devices that favor the diagnosis and treatment of patients, resulting in a better quality of life. Thinking about the academic needs of IT professionals in this field, TECH has designed this very complete program, which covers essential issues to improve students' training.

The objective of this Postgraduate Certificate in Biomedical Electronics is to develop specific knowledge in students that will help them become experts in the field, allowing them to access high-level jobs, in which they will be able to develop and grow professionally. Specifically, the program deals with electrophysiology, the origin, conduction and acquisition of bioelectrical signals, as well as their filtering and amplification. It also analyzes the most important biomedical systems, such as ECG, EEG, EMG, spirometry and oximetry.

In this way, the importance of electrical safety of biomedical instrumentation is established, presenting the damage caused by electricity when it passes through the human body, especially when the purpose of biomedical instrumentation is to measure, and even electro-stimulate, vital organs such as the heart.

In short, this is a 100% online Postgraduate Certificate that will allow students to distribute their study time, not being restricted by fixed schedules or having to move to another physical location, being able to access all the contents at any time of the day, balancing their work and personal life with their academic life.

This **Postgraduate Certificate in Biomedical Electronics** contains the most complete and up-to-date educational program on the market. The most important features of the program include:

- ◆ Practical cases presented by experts in information technology
- ◆ The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional development
- ◆ Practical exercises where the self-assessment process can be carried out to improve learning
- ◆ Its special emphasis on innovative methodologies in Biomedical Electronics
- ◆ Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ◆ Access to content from any fixed or portable device with an Internet connection.



*Completing multiple case studies will allow students to easily reinforce the theoretical contents they have learned"*

“*Electronics has favored the advancement of biomedicine, bringing remarkable benefits to patients*”

*TECH is a prestigious university that is situated at the forefront of technology.*

*A first class program for professionals seeking excellence.*

Its teaching staff includes professionals from the field of IT, who bring to this program the experience of their work, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will provide professionals with situated and contextualized learning, that is, a simulated environment that will provide immersive study set up to train them in real-life situations.

This program is designed around Problem-Based Learning, whereby the student must try to solve the different professional practice situations that arise throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.



# 02 Objectives

TECH has devised this Postgraduate Certificate in Biomedical Electronics with the main objective of offering computer scientists a unique study opportunity with which to understand the specifics of electronic systems applied to the medical field, and to be able to carry out the design of new devices for this professional area. A program that includes the main innovations of the sector and that will be fundamental to increase the employability opportunities of students in this field.





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*Specialize in Biomedical Electronics and acquire the skills needed to stand out in the sector”*



## General Objectives

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- ◆ Identify and evaluate the bioelectric signals involved in a biomedical application
- ◆ Determine the design protocol of a biomedical application
- ◆ Analyze and evaluate designs of biomedical instruments
- ◆ Identify and define the interferences and noise of a biomedical application
- ◆ Evaluate and apply electrical safety regulations

“A program that will be essential  
in order to turn your career around”





## Specific Objectives

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- ◆ Analyze direct or indirect signals that can be measured with non-implantable devices
- ◆ Apply acquired knowledge on sensors and transduction in biomedical applications
- ◆ Determine the use of electrodes in bioelectric signal measurements
- ◆ Develop the use of amplification systems, separation and signal filtering
- ◆ Examine the different physiological systems of the human body and the signals for the analysis of their behavior
- ◆ Apply, in a practical way, knowledge of physiological systems in the measurement tools of the most important systems: ECG, EEG, EMG, Spirometry and Oximetry
- ◆ Establish the necessary electric safety of biomedical instruments

# 03

## Course Management

The teachers of this Postgraduate Certificate in Biomedical Electronics are professionals with extensive qualifications and experience in the sector, who have understood the importance of the application of electronic systems in the healthcare field, and have therefore sought to provide computer scientists with a higher qualification in this field. A first class teaching team with great prestige in the sector who will help students to gain access to new professional paths.





“

*First class teachers will help you to specialize in Biomedical Electronics”*

## Management



### Ms. Casares Andrés, María Gregoria

- ◆ Associate professor at Carlos III University of Madrid
- ◆ Degree in IT from the Polytechnic University of Madrid
- ◆ Researcher at Polytechnic University of Madrid
- ◆ Researcher at Carlos III University of Madrid
- ◆ Evaluator and creator of OCW courses at Carlos III University of Madrid
- ◆ Tutor of courses at INTEF (National Agency for Educational Technology and Teacher Development)
- ◆ Support Technician at the Ministry of Education Directorate General of Bilingualism and Quality of Education of the Community of Madrid
- ◆ Middle and high school teacher specializing in IT
- ◆ Associate professor off the Pontificia de Cimillas University
- ◆ Teaching Expert in the Community of Madrid
- ◆ Analyst / Project Manager at Banco Urquijo Computer Systems
- ◆ ERIA Computer Analyst

## Professors

### Ms. Sánchez Fernández, Elena

- ◆ Field Service Engineer at BD Medical, performing corrective tasks, installation and maintenance of microbiology equipment
- ◆ Degree in Computer Engineering from Carlos III University de Madrid
- ◆ Master's Degree in Electronic Systems from the Polytechnic University of Madrid
- ◆ Intern at the Microelectronics Department of the UPM, designing and simulating temperature sensors for biomedical applications
- ◆ Intern at the Microelectronics Department of the UC3M, designing and characterization of low voltage CMOS ASIC for medical equipment
- ◆ Intern in the movement analysis laboratory EUF-ONCE | ONCE-UAM, Madrid



# 04

## Structure and Content

This TECH Postgraduate Certificate in Biomedical Electronics has been structured in such a way that students can carry out self-guided and contextualized learning. They will learn everything from the most basic concepts to the most complex ones, which will allow them to specialize in a new sector that is bringing significant benefits to healthcare. Undoubtedly, a very complete theoretical-practical syllabus that will mark a before and after in your training and way of working.





“A very well-structured syllabus that will be a great support for the students' learning”

## Module 1. Biomedical Electronics

- 1.1. Biomedical Electronics
  - 1.1.1. Biomedical Electronics
  - 1.1.2. Characteristics of Biomedical Electronics
  - 1.1.3. Biomedical Instruments Systems
  - 1.1.4. Structure of a Biomedical Instrument System
- 1.2. Bioelectrical Signals
  - 1.2.1. Origin of Biomedical Signals
  - 1.2.2. Conduction
  - 1.2.3. Potentials
  - 1.2.4. Propagation of Potentials
- 1.3. Treatment of Bioelectrical Signals
  - 1.3.1. Collecting Bioelectrical Signals
  - 1.3.2. Amplification Techniques
  - 1.3.3. Safety and Isolating
- 1.4. Filtering Bioelectrical Signals
  - 1.4.1. Noise
  - 1.4.2. Noise Detection
  - 1.4.3. Noise Filtering
- 1.5. Electrocardiogram
  - 1.5.1. The Cardiovascular System
    - 1.5.1.1. Action Potentials
  - 1.5.2. ECG Waveform Nomenclature
  - 1.5.3. Cardiac Electrical Activity
  - 1.5.4. Electrocardiography Module Instrumentation
- 1.6. Electroencephalogram
  - 1.6.1. Neurological System
  - 1.6.2. Brain Electrical Activity
    - 1.6.2.1. Cerebral Waves
  - 1.6.3. Electroencephalography Module Instruments





- 1.7. Electromyogram
  - 1.7.1. The Muscular System
  - 1.7.2. Muscular Electrical Activity
  - 1.7.3. Electromyography Module Instrumentation
- 1.8. Spirometry
  - 1.8.1. Respiratory System
  - 1.8.2. Spirometric Parameters
    - 1.8.2.1. Interpretation of the Spirometric Test
  - 1.8.3. Spirometry Module Instrumentation
- 1.9. Oximetry
  - 1.9.1. Circulatory System
  - 1.9.2. Operation Principle
  - 1.9.3. Accuracy of Measurements
  - 1.9.4. Oximetry Module Instrumentation
- 1.10. Safety and Electric Regulations
  - 1.10.1. Effects of Electrical Currents in Living Beings
  - 1.10.2. Electrical Accidents
  - 1.10.3. Electromedical Equipment Electrical Safety
  - 1.10.4. Classification of the Electromedical Equipment

“Broaden your options of employability with a higher qualification that this program offers you”

# 05 Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.





*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

“

*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world”*



*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*



*The student will learn to solve complex situations in real business environments through collaborative activities and real cases.*

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the course, students will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

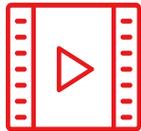
*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.



This program offers the best educational material, prepared with professionals in mind:



### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



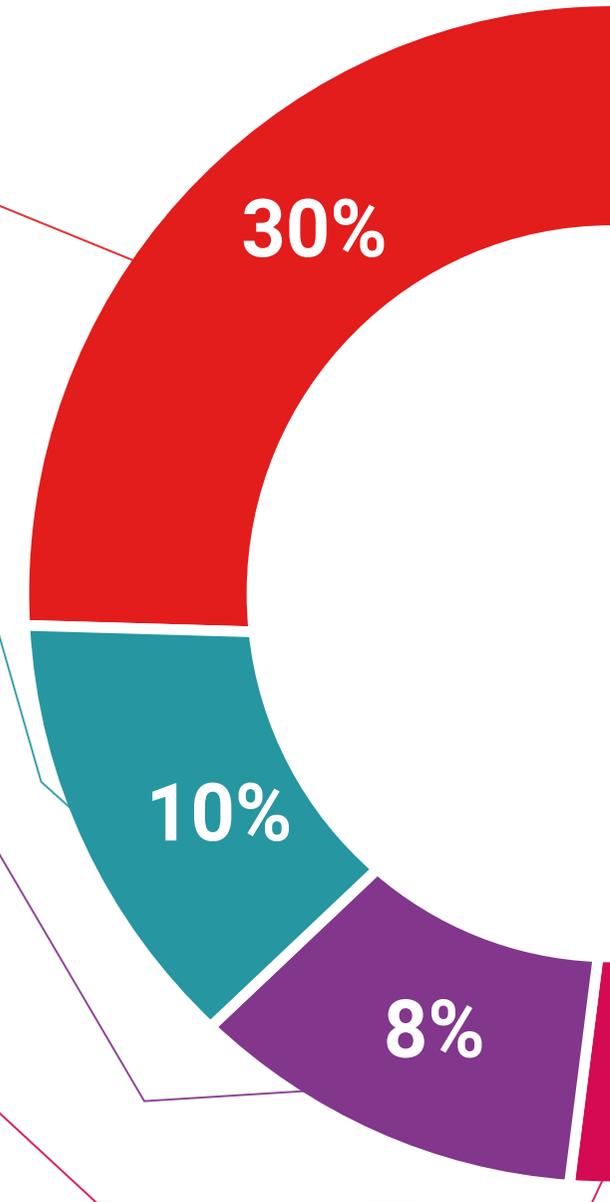
### Practising Skills and Abilities

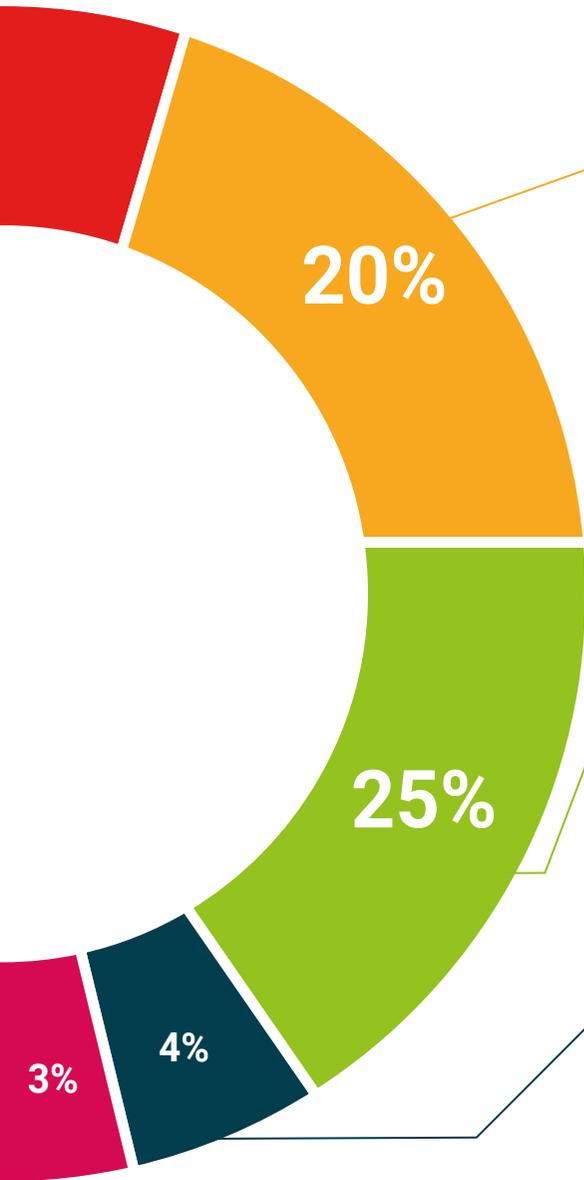
They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





#### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.



#### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



# 06 Certificate

The Postgraduate Certificate in Biomedical Electronics guarantees, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



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*Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"*

This **Postgraduate Certificate in Biomedical Electronics** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by **TECH Technological University** via tracked delivery\*.

The diploma issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Certificate, and meets the requirements commonly demanded by labor exchanges, competitive examinations and professional career evaluation committees.

Title: **Postgraduate Certificate in Biomedical Electronics**

Official N° of Hours: **150 h.**



\*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present quality  
development languages  
classroom



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