Professional Master's Degree
Electronic Systems Engineering

tech global university

Professional Master's Degree
Electronic Systems Engineering

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/engineering/professional-master-degree/master-electronic-systems-engineering**

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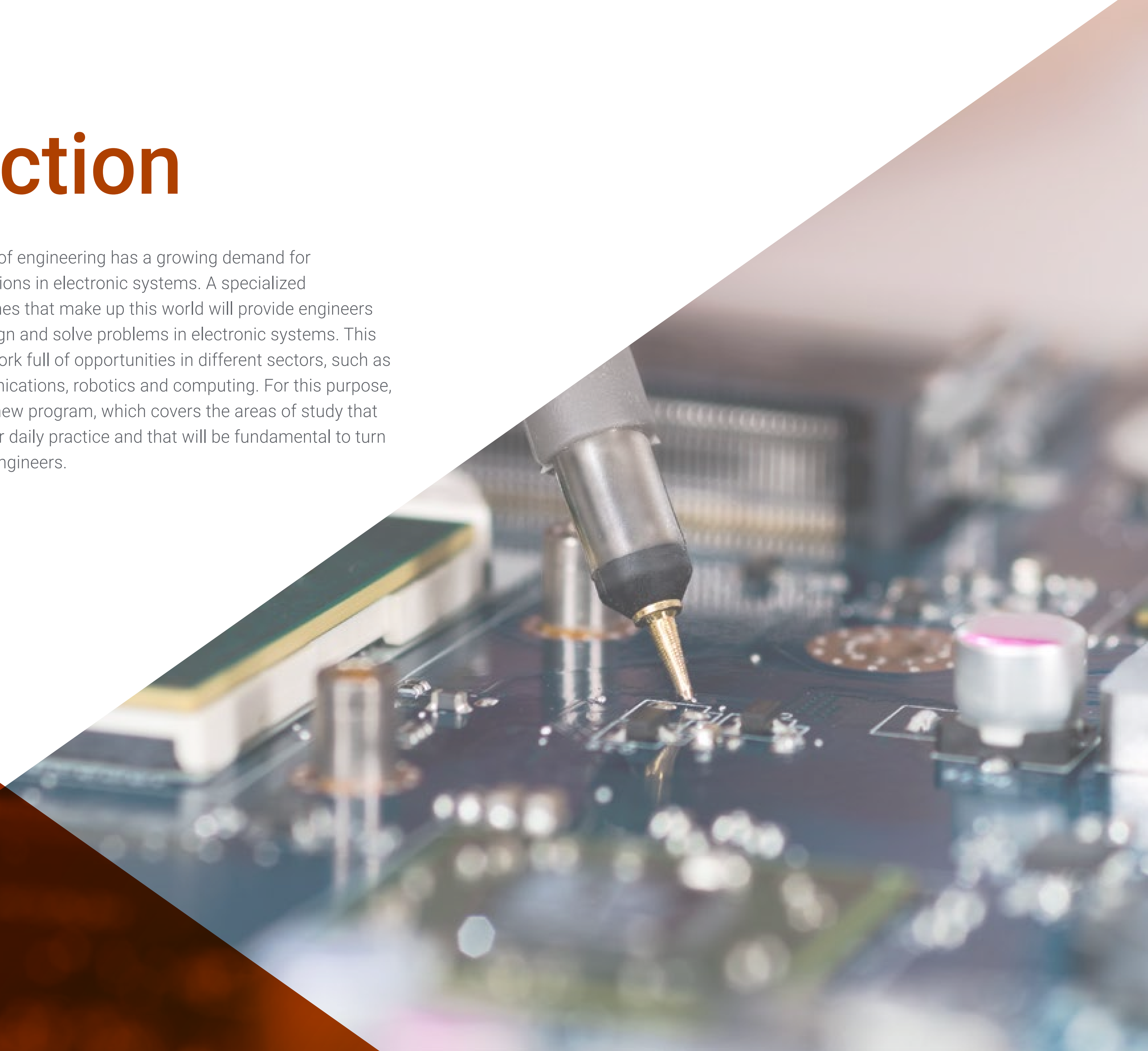
01
Introduction

The current job market in the field of engineering has a growing demand for professionals with broad qualifications in electronic systems. A specialized knowledge of the fields and branches that make up this world will provide engineers with the fundamental tools to design and solve problems in electronic systems. This will open the doors to a world of work full of opportunities in different sectors, such as industry, construction, telecommunications, robotics and computing. For this purpose, TECH has designed a completely new program, which covers the areas of study that students will have to handle in their daily practice and that will be fundamental to turn students into top-level electronic engineers.



This Professional Master's Degree will give you the keys to know how to implement prototypes of electronic systems that will revolutionize electronic engineering"

Electronics are an essential part of today's economy and are also present in many everyday actions that are performed almost without thinking. The products and services that are used every day make use of them, so it is essential to address the storage of the energy that is generated and consumed, and its distribution and sale, in order to achieve top-level expertise. Certainly, this is an essential area for society, which, in addition, is involved in various sectors to provide them with innovative tools that facilitate their execution.

Engineers who decide to work in this field are aware of the importance of looking for highly specialized programs with which to obtain advanced, useful and quality knowledge that can be of great help for their professional development. For this reason, TECH offers you this Professional Master's Degree in Electronic Systems Engineering, a first level program that has been developed by a large group of teachers with extensive experience in the sector.

This Professional Master's Degree will provide specialized knowledge on the new lines of the labor market in an increasingly dynamic world, from embedded systems, real time systems, energy, health, transportation, distribution, communication and marketing. In this way, students will become professionals of the future, capable of tackling jobs related to sustainable energy, IoT, autonomous cars, smart buildings, satellite communications, energy generation, distribution and storage, medical electronics, robotics, control, security. Specifically, all the elements of society that have an electronic component associated with them.

A 100% online Postgraduate Certificate that will allow students to distribute their study time, not being conditioned by fixed schedules or the need 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 **Professional Master's Degree in Electronic Systems Engineering** contains the most complete and up-to-date program on the market. The most important features include:

- Case studies presented by experts in Electronics Engineering
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Special emphasis on innovative methodologies in Electronic Systems Engineering
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

Knowing how to design, analyze and control electronic systems will position you as a reference professional in the industry"

This program will help you to boost your qualifications and enhance your professional growth"

TECH proposes a didactic methodology focused on practical cases to reinforce theoretical knowledge, which favors the learning process.

A top-level program, designed with the most up-to-date material on the market.

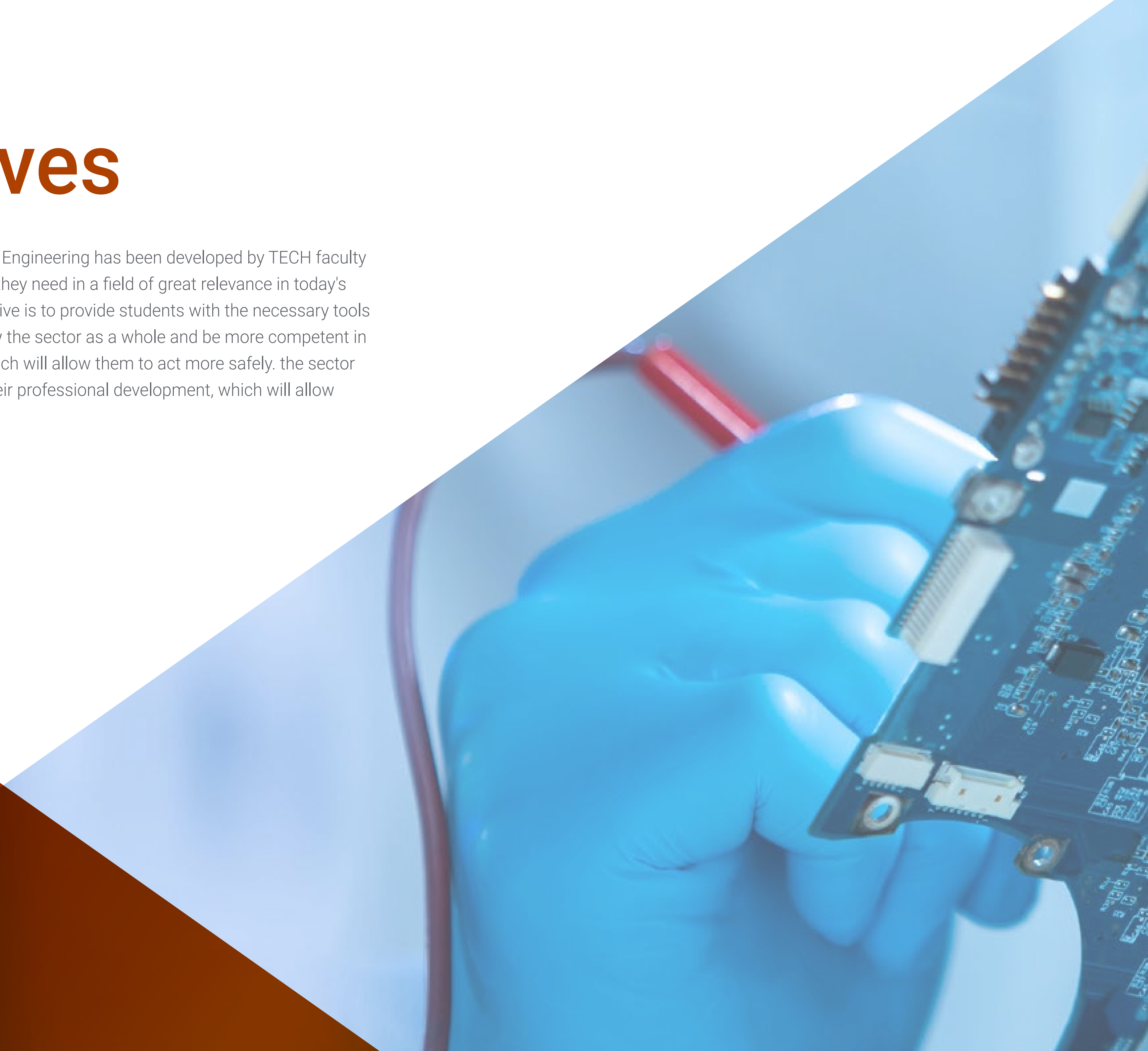
Its teaching staff includes professionals from the field of engineering, who contribute their work experience to this program, as well as renowned specialists from leading companies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide an immersive learning experience designed to prepare for 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

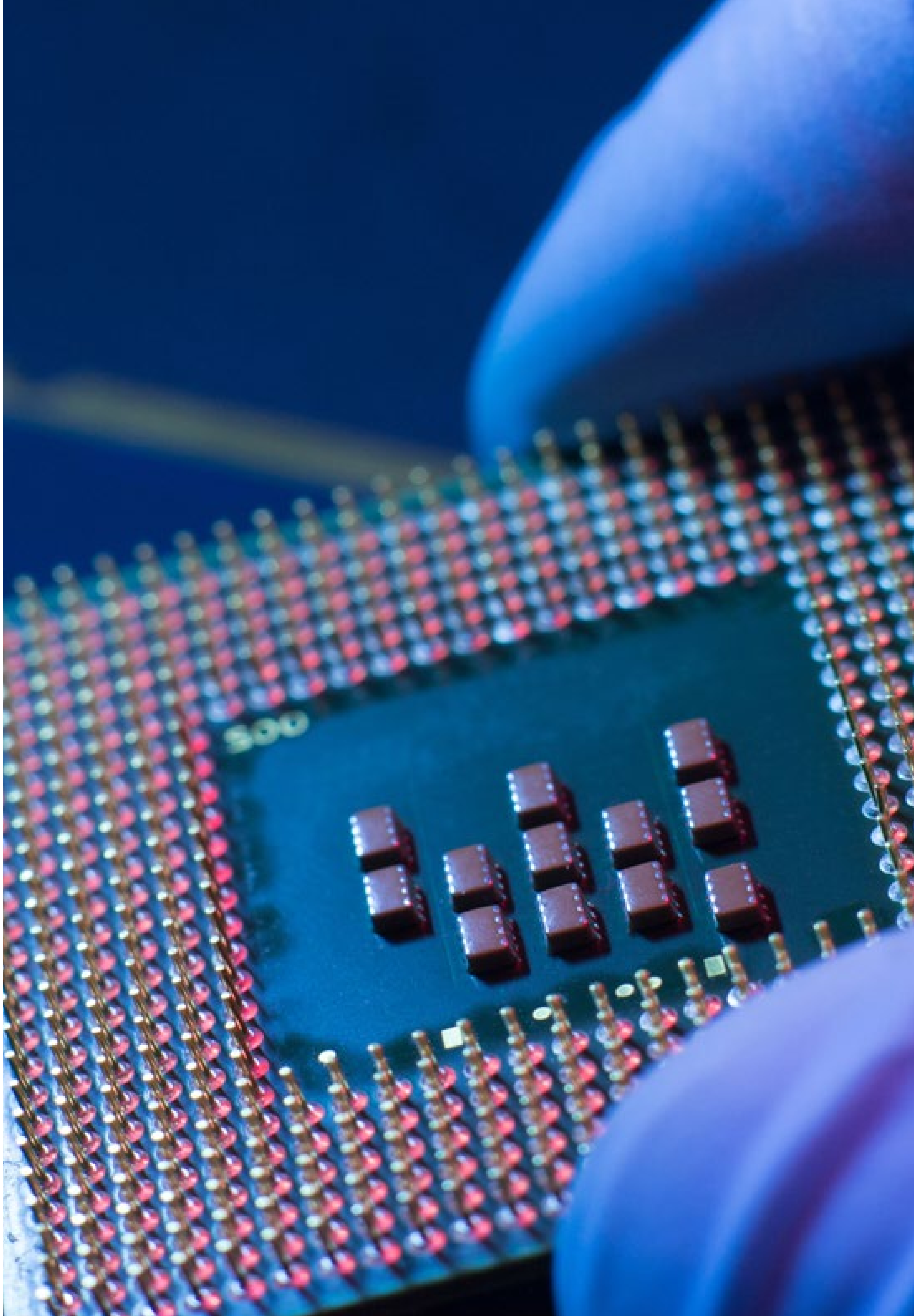
The program in Electronic Systems Engineering has been developed by TECH faculty to offer engineers the qualification they need in a field of great relevance in today's society. In this way, the main objective is to provide students with the necessary tools with which they will be able to know the sector as a whole and be more competent in their professional development, which will allow them to act more safely. the sector and become more competent in their professional development, which will allow them to act with greater security.



If you are interested in developing your professional career in Electronic Systems Engineering, this Professional Master's Degree will be essential to improve your qualification"

General Objectives

- Analyze current techniques to implement sensor networks
- Determine real-time requirements for embedded systems
- Evaluate microprocessor processing times
- Propose solutions adapted to the specific requirements of IoT
- Determine the stages of an electronic system
- Analyze the schematics of an electronic system
- Develop the schematics of an electronic system by virtually simulating its behavior
- Examine the behavior of an electronic system
- Design the implementation support of an electronic system
- Implement a prototype electronic system
- Test and validate the prototype
- Propose the prototype for commercialization
- Compile the main materials involved in microelectronics, properties and applications
- Identify the operation of the fundamental structures of microelectronic devices
- Understand the mathematical principles that govern microelectronics
- Analyze signals and modify them
- Analyze technical documentation by examining the characteristics of different types of projects in order to determine the data necessary for their development
- Identify standardized symbology and plotting techniques in order to analyze drawings and diagrams of automatic systems and installations
- Identify breakdowns and malfunctions in order to supervise and/or maintain installations and associated equipment
- Determine quality parameters in the work carried out in order to develop the culture of evaluation and quality, and to be able to assess the quality management procedures
- Determine the need for power electronic converters in most real-world applications
- Analyze the different types of converters that can be found, based on their function
- Design and implement power electronic converters according to the need of use
- Analyze and simulate the behavior of the most commonly used electronic converters in electronic circuits
- Examine the current techniques in digital processing
- Implement solutions for the processing of digital signals (images and audio)
- Simulating digital signals and devices capable of processing them
- Program elements for signal processing
- Design filters for digital processing
- Operate with mathematical tools for digital processing
- Value the different options for signal processing
- Identify and evaluate bioelectrical signals involved in a biomedical application
- Determine a design protocol of a biomedical application
- Analyze and evaluate biomedical instruments designs
- Identify and define the interferences and noise of a biomedical application
- Evaluate and apply electrical safety regulations
- Determine the advantages of Smart grids deployment
- Analyze each one of the technologies on which Smart grids are based
- Examine the standards and safety mechanisms valid for the Smart grids



- Determine the characteristics of real type systems and recognize the complexity of programming these types of systems
- Analyze the different types of communication networks available
- Assess which type of communications network is the most suitable in certain scenarios
- Determine the keys to effective marketing in the industrial marketplace
- Develop commercial management to create profitable and long-lasting relationships with customers
- Generate specialized knowledge to compete in a globalized and increasingly complex environment

If you are looking for a program to specialize in electronic systems, this is the place for you. Don't miss the opportunity to enroll at TECH"

Specific Objectives

Module 1. Embedded Systems
- Analyze current embedded system platforms focused on signal analysis and IoT management
- Analyze the diversity of simulators for configuring distributed embedded systems
- Generate wireless sensor networks
- Verify and assess risks of violation of sensor networks
- Process and analyze data using distributed systems platforms
- Programming microprocessors
- Identify and correct errors in a real or simulated system

Module 2. Electronic Systems Design
- Identify possible problems in the distribution of circuit elements
- Establish the necessary stages for an electronic circuit
- Evaluate the electronic components to be used in the design
- Simulate the behavior of the electronic components as a whole
- Show the correct operation of an electronic system
- Transfer the design to a Printed Circuit Board (PCB)
- Implement the electronic system by compiling those modules that require it
- Identify potential weak points in the design

Module 3. Microelectronics
- Generate specialized knowledge on microelectronics
- Examine analog and digital circuits
- Determine the fundamental characteristics and uses of a diode
- Determine how an amplifier works
- Develop proficiency in the design of transistors and amplifiers according to the desired use
- Demonstrate the mathematics behind the most common components in electronics
- Analyze signals from their frequency response
- Evaluating the stability of a control
- Identify the main lines of technology development

Module 4. Instruments and Sensors
- Determine measuring and control devices according to their functionality
- Evaluate the different technical characteristics of measurement and control systems
- Develop and propose measurement and regulation systems
- Specify the variables that intervene in a process
- Justify the type of sensor involved in a process according to the physical or chemical parameter to be measured
- Establish appropriate control system performance requirements in accordance with system requirements
- Analyze the operation of typical measurement and control systems in industries

Module 5. Power Electronic Converters

- Analyze the converter function, classification and characteristic parameters
- Identify real applications that justify the use of power electronic converters
- Approach the analysis and study of the main converter circuits: rectifiers, inverters, switched-mode converters, voltage regulators and cycloconverters
- Analyze the different figures of merit as a measure of quality in a converter system
- Determine the different control strategies and the improvements provided by each of them
- Examine the basic structure and components of each of the converter circuits
- Develop performance requirements for generating specialized knowledge in order to be able to select the appropriate electronic circuit according to the system requirements
- Propose solutions to the design of power converters

Module 6. Digital Processing

- Convert an analog signal into a digital one
- Differentiate between the types of digital systems and their properties
- Analyze the frequency behavior of a digital system
- Process, code and de-code images
- Simulate digital processors for voice recognition

Module 7. Biomedical Electronics

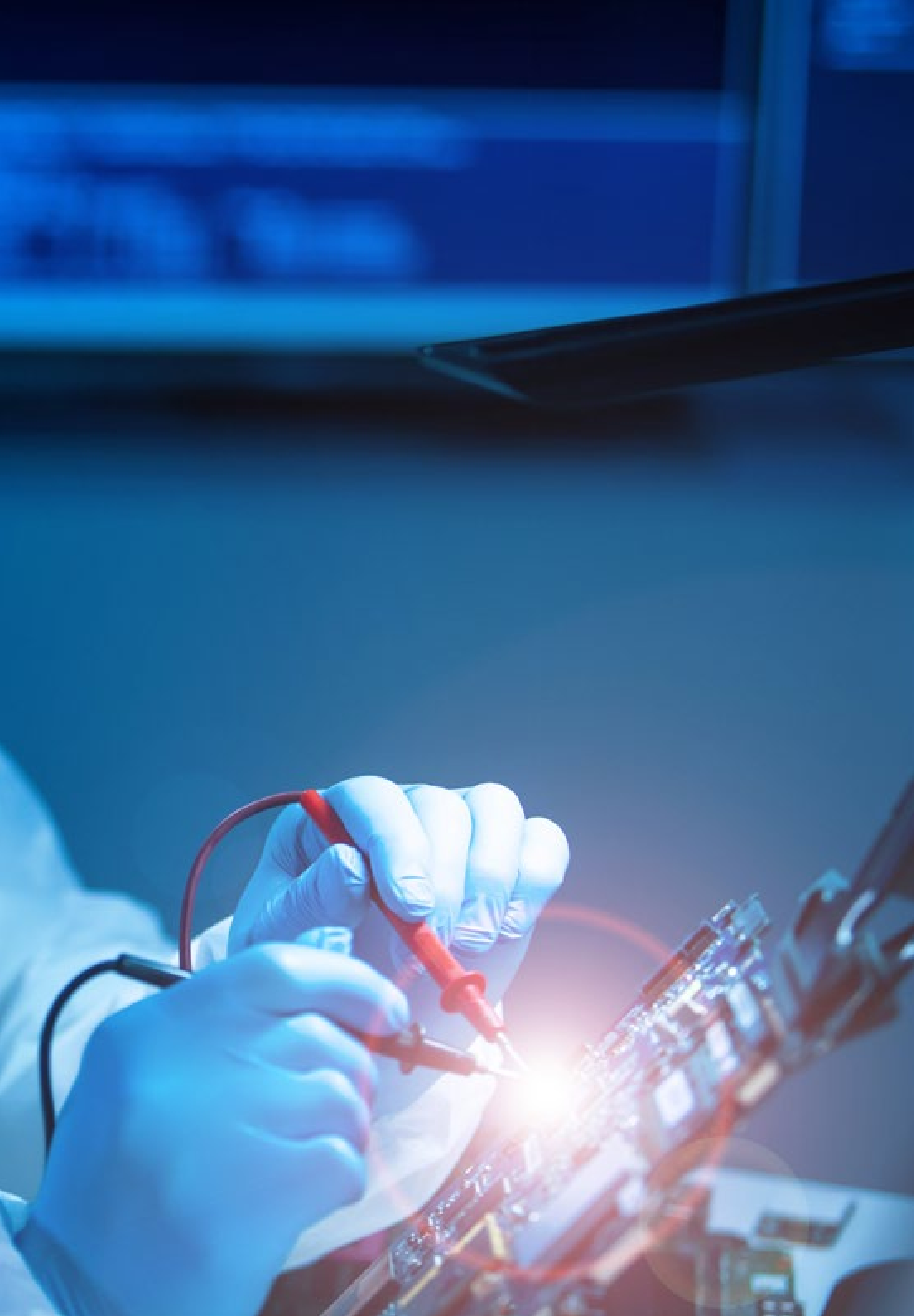
- Analyze the signals, direct or indirect, that can be measured with non-implantable devices
- Apply the acquired knowledge of sensors and transduction in biomedical applications
- Determine the use of electrodes in bioelectrical signal measurements
- Develop the use of signal amplification, separation and filtering systems
- Examine the different physiological systems of the human body and signals for behavioral analysis
- Carry out a practical application of the knowledge of physiological systems in the measurement instrumentation of the most important systems: ECG, EEG, EMG, spirometry, and oximetry
- Establish the necessary electrical safety of biomedical instruments

Module 8. Energy Efficiency. Smart Grid

- Develop specialized knowledge on energy efficiency and smart grids
- Establish the need for the deployment of Smart grids
- Analyze the functioning of a Smart Meter and its requirement in Smart grids
- Determine the importance of power electronics in different network architectures
- Assess the advantages and disadvantages of integrating renewable sources and energy storage systems
- Study automation and control tools required in smart grids
- Evaluate the security mechanisms that allow Smart grids to become reliable grids

Module 9. Industrial Communications

- Establish the basis of real-time systems and their main characteristics Cone relation to industrial communications
- Examine the need for distributed systems and their programming
- Determine the specific characteristics of industrial communications networks
- Analyze the different solutions for the implementation of a communications network in an industrial environment
- Gain in-depth knowledge of the OSI communications model and the TCP protocol
- Develop the different mechanisms to convert this type of networks into reliable networks
- Address the basic protocols on which the different mechanisms of information transmission in industrial communication networks are based



Module 10. Industrial Marketing

- Determine the particularities of marketing in the industrial sector
- Analyze what a marketing plan is, the importance of planning, setting objectives and developing strategies
- Examine the different techniques to obtain information and learn from the market in the industrial environment
- Manage positioning and segmentation strategies
- Assess the value of services and customer loyalty
- Establish the differences between transactional marketing and relationship marketing in industrial markets
- Value the power of the brand as a strategic asset in a globalized market
- Apply industrial communication tools
- Determine the different distribution channels of industrial companies in order to design an optimal distribution strategy
- Address the importance of the sales force in industrial markets

03
Skills

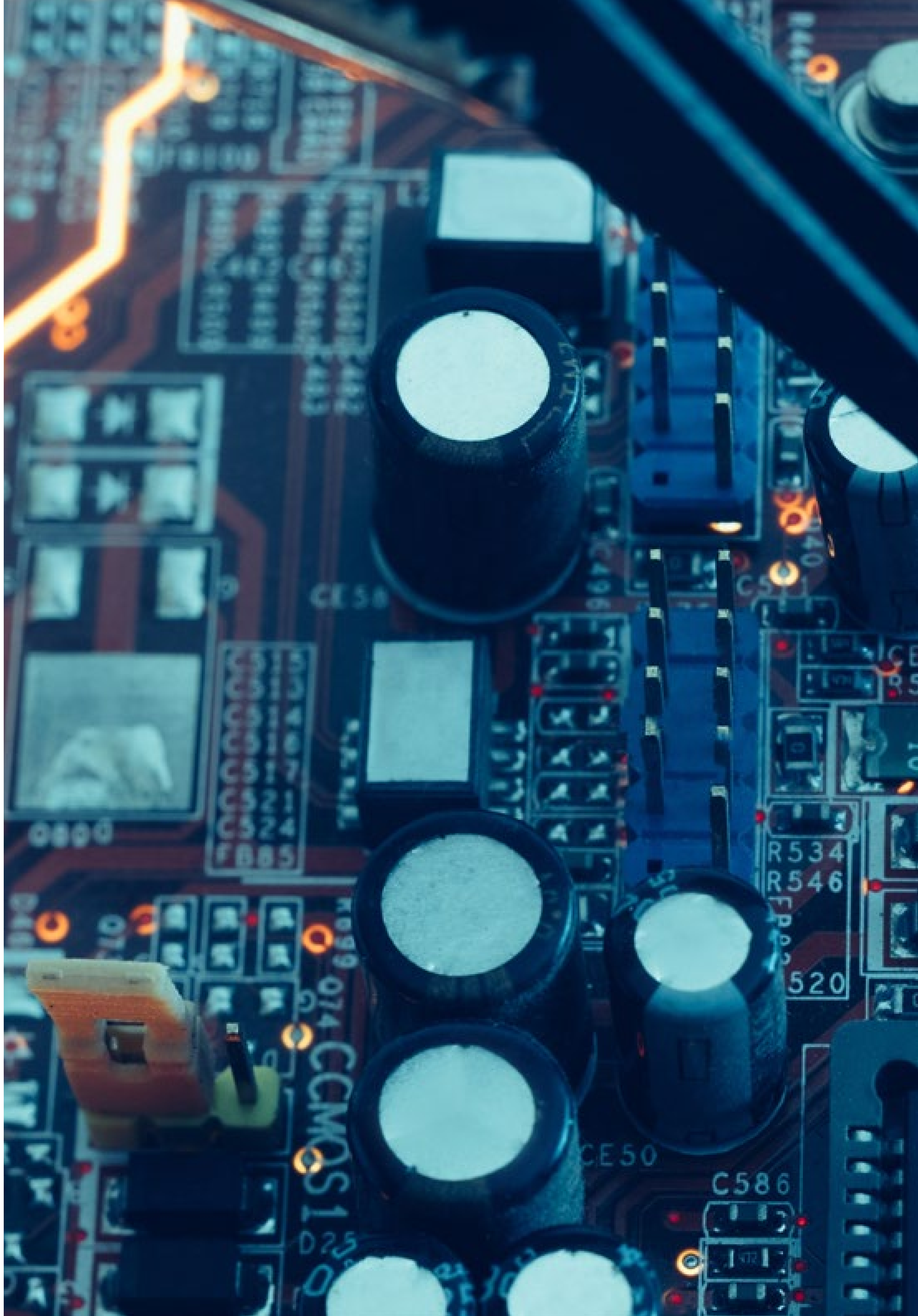
The completion of this Professional Master's Degree in Electronic Systems Engineering of TECH will allow engineers to acquire that higher level of qualification demanded by today's companies, becoming true specialists in the field and being able to innovate in an area as competitive as this one. A 100% online program that will be a before and after in the qualification of the students, by providing them with that level of training that is essential for a successful working future.

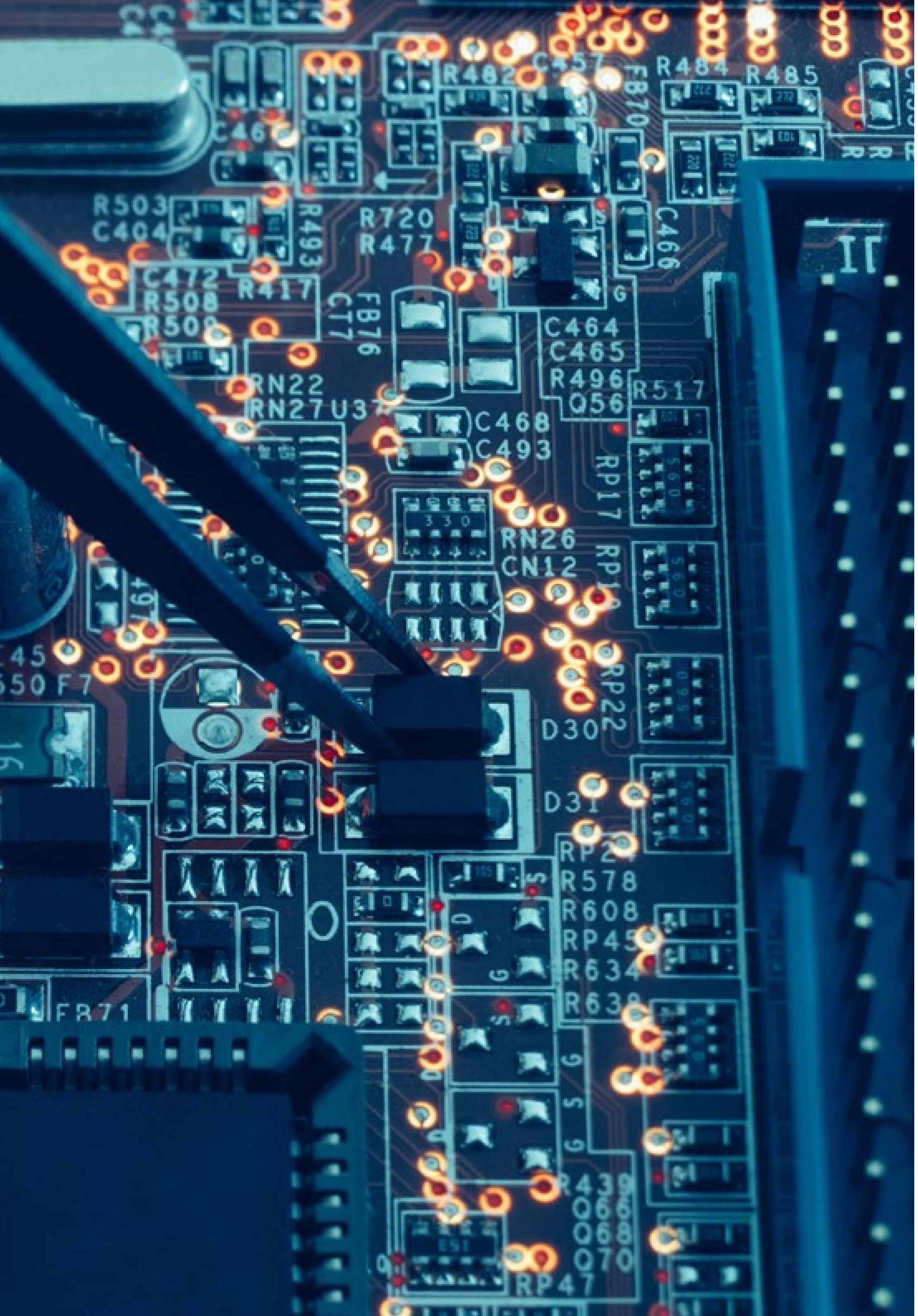
Develops the necessary skills to create quality electronic systems that facilitate the daily life of citizens and companies"

General Skills

- Generate specialized knowledge in the new lines of the labor market in an increasingly dynamic world, from embedded systems, real time systems, energy, health, transportation, distribution, communication and marketing
- Address future electronic projects: sustainable energy, IoT, autonomous cars, smart buildings, satellite communications, energy generation, distribution and storage, medical electronics, robotics, control, security, etc
- Be part of a new generation of Electronics engineers, specialized in the latest technologies and research trends in

"This program will ensure you the level of qualification that will be essential to enter a highly competitive sector"





Specific Skills

- Apply current techniques from software and hardware to solve problems requiring real-time signal processing
- Design Electronic Systems adapted to the needs of today's society
- Work in detail in the field of microelectronics
- Know in depth and know how to apply the different types of sensors and actuators found in industrial processes
- Use simulation software to analyze and estimate the behavior of electronic circuits
- Apply advanced techniques for digital signal processing
- Analyzes the most important biomedical systems, such as ECG, EEG, EMG, spirometry and oximetry
- Gain in-depth knowledge of smart grids for efficient management of energy flows
- Evaluate the different communications systems, gaining insight into industrial network standards
- Develop a global perspective of industrial marketing and know how to apply the most effective market tools in this field

04
Course Management

This Professional Master's Degree in Electronic Systems Engineering of TECH is taught by professors with extensive experience in the sector, as well as in teaching and research. A team that has selected the most complete, up to date and accurate information on this subject to offer engineers the level of qualification demanded by today's market. Faculty who are aware of the specific academic needs in this field and have created a competitive syllabus.

Delve into the most relevant aspects of Electronic Systems Engineering with the help of a first-class teaching team"

Management

Ms. Casares Andrés, María Gregoria

- Associate Professors, Carlos III University of Madrid
- Degree in IT Polytechnic University of Madrid
- Research Sufficiency Polytechnic University of Madrid
- Research Sufficiency, Carlos III University of Madrid
- Evaluator and Creator of OCW courses at Carloss III University of Madrid
- INTEF courses tutor
- Support Technician, Ministry of Education Directorate General of Bilingualism and Quality of Education of the Community of Madrid
- Secondary Education Professor with specialty in IT
- Associate professor at the Pontificia de Comillas University
- Postgraduate Diploma in Teaching Unit, Community of Madrid
- Analyst/ IT Project manager, Banco Urquijo
- IT Analyst at ERIA

Professors

Dr. García Vellisca, Mariano Alberto

- Professor of Vocational Training and Moratalaz Secondary School
- PhD's Degree in Biomedical Engineering from the Polytechnic University of Madrid
- Collaborator in the Discovery Research-CTB Program. Polytechnic University of Madrid
- Senior Research Officer in the BCI-NE research group at the University of Essex, UK
- Research Officer at the Biomedical Technology Center of the Polytechnic University of Madrid
- Electronics Engineer at Tecnologia GPS S.A
- Electronics Engineer at Relequick S.A
- Engineer in Electronics from the Complutense University of Madrid
- Master's Degree in Biomedical Engineering from the Polytechnic University of Madrid

Mr. Ruiz Díez, Carlos

- Researcher at the National Microelectronics Center of the CSIC
- Director of Competitive Engineering Training at ISC
- Volunteer trainer at Caritas Employment Classroom
- Research intern in the Composting Research Group of the Department of Chemical, Biological and Environmental Engineering of the UAB
- Founder and product development at NoTime Ecobrand, a fashion and recycling brand
- Development cooperation project manager for the NGO Future Child Africa in Zimbabwe
- ICAI Speed Club: motorcycle racing team
- Graduate in Industrial Technologies Engineering from Pontificia University de Comillas ICAI
- Master's Degree in Biological and Environmental Engineering from the Autonomous University of Barcelona
- Master's Degree in Environmental Management from the Spanish Distance Learning University

Mr. Jara Ivars, Luis

- Industrial Engineer -Sliding Ingenieros S.L
- Secondary Teacher of Electrotechnical and Automatic Systems Community of Madrid
- Secondary School Teacher Electronic Equipment Community of Madrid
- Secondary school Physics and Chemistry teacher
- Degree in Physical Sciences at UNED, Industrial Engineer UNED
- Master's Degree in Astronomy and Astrophysics, International University of Valencia
- Master's Degree in Occupational Risk Prevention, UNED
- Master's Degree in Teacher Training

Mr. De la Rosa Prada, Marcos

- Teacher of Vocational Training Cycles, Ministry of Education of the Community of Madrid
- Consultant at Santander Technology
- New Technologies Agent in Badajoz
- Author and content editor at CIDEAD (General Secretariat for Vocational Training - Ministry of Education and Vocational Training)
- Telecommunications Engineer from the University of Extremadura
- Scrum Foundation Expert Certificate by EuropeanScrum.org
- Certificate in Pedagogical Aptitude, University of Extremadura

Ms. Sánchez Fernández, Elena

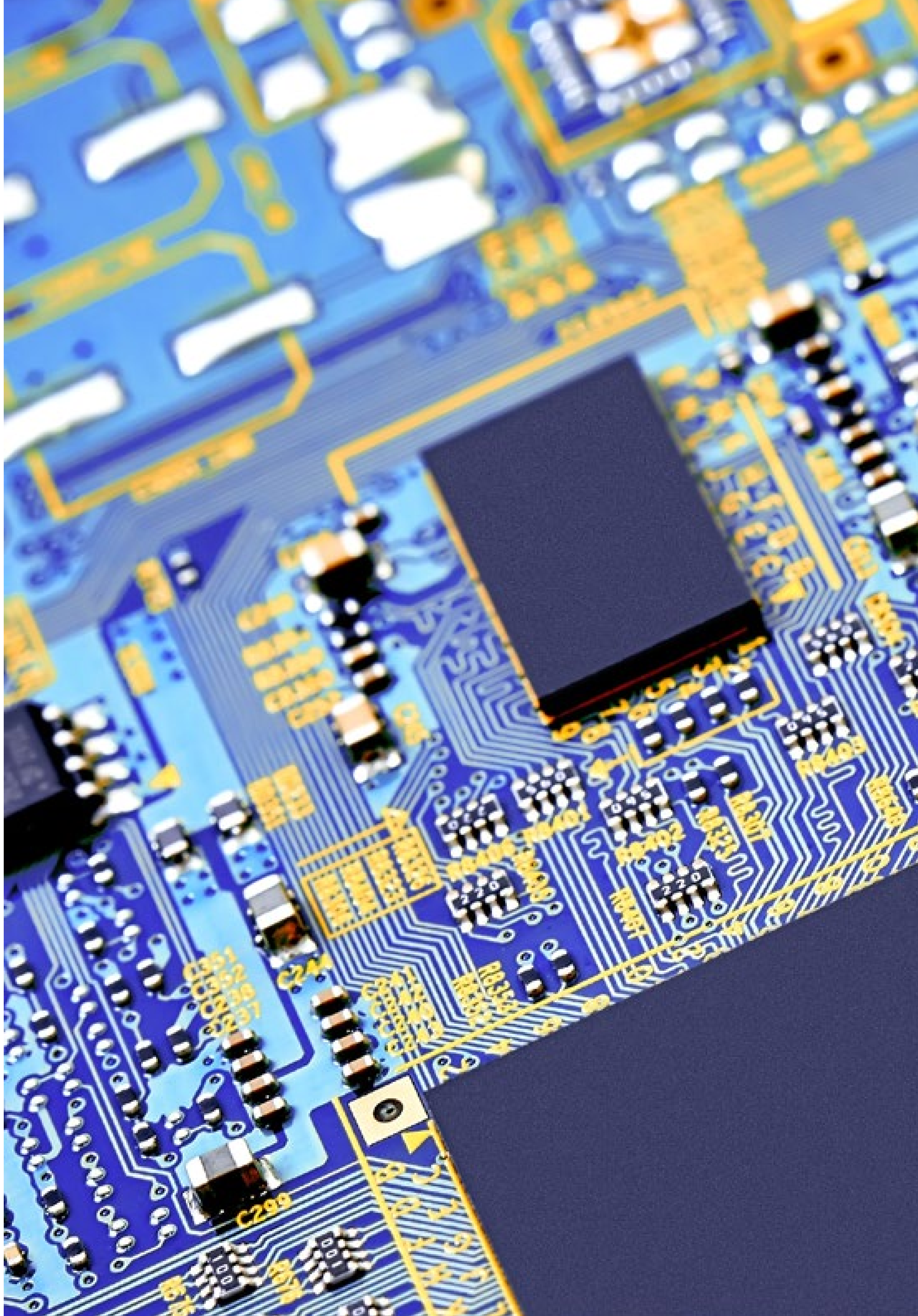
- Field Service Engineer at BD Medical, performing corrective tasks, installation and maintenance of microbiology equipment
- Degree in Biomedical Engineering from the Carlos III University of Madrid
- Master's Degree in Electronic Systems Engineering, Polytechnic University of Madrid
- Intern in the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

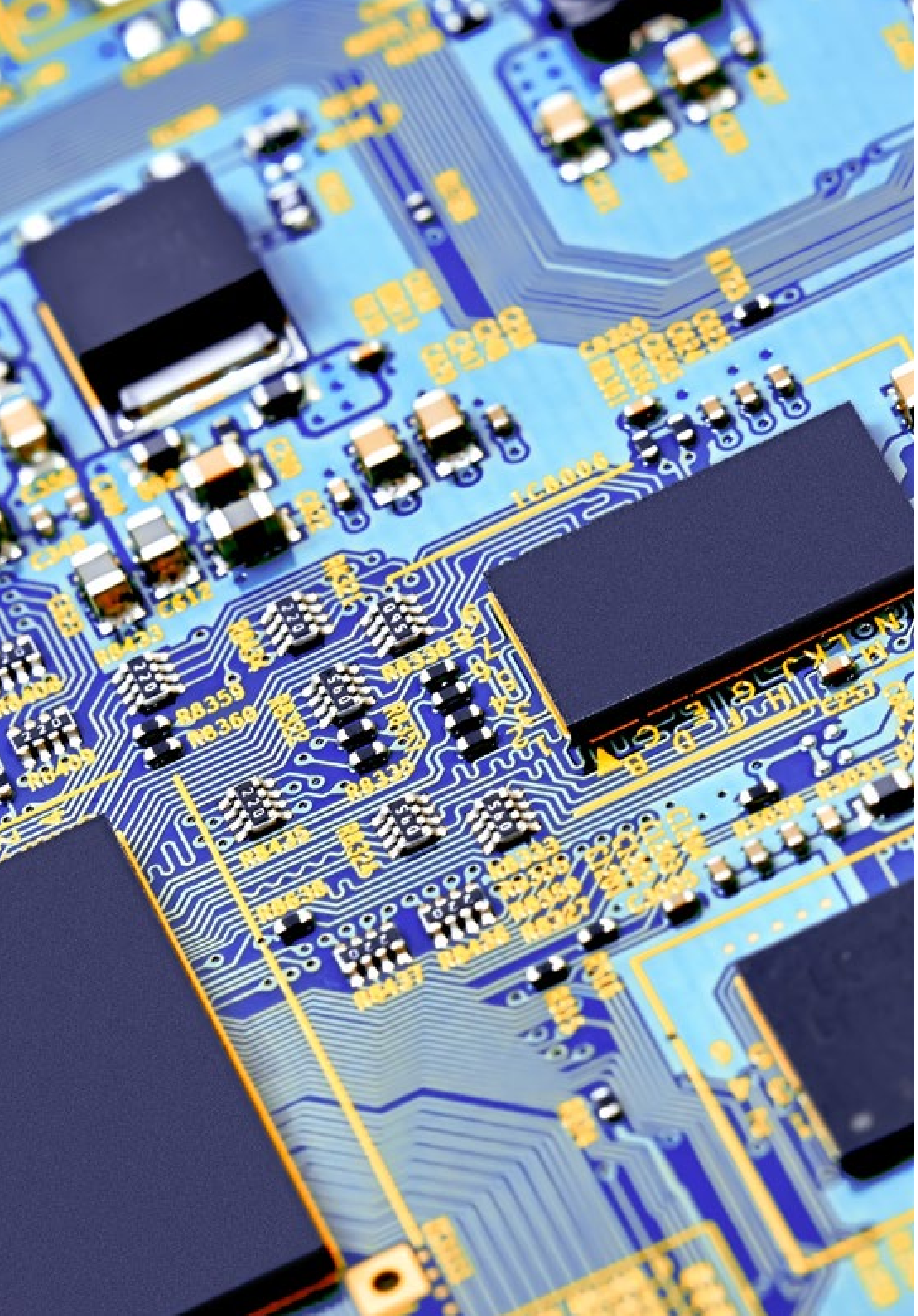
Dr. Fernández Muñoz, Javier

- University Professor. Carlos III University of Madrid
- Degree in IT specialist Engineering from the Carlos III University of Madrid
- Degree in IT from the Polytechnic University of Madrid

Mr. Torralbo Vecino, Manuel

- Electronic Engineer in UCAnFly Project
- Electronic Engineer in Airbus D&S
- Degree in Industrial Electronic Engineering from University of Cadiz
- IPMA Level Certification as Project Manager





Ms. Millán Varela, Lorena

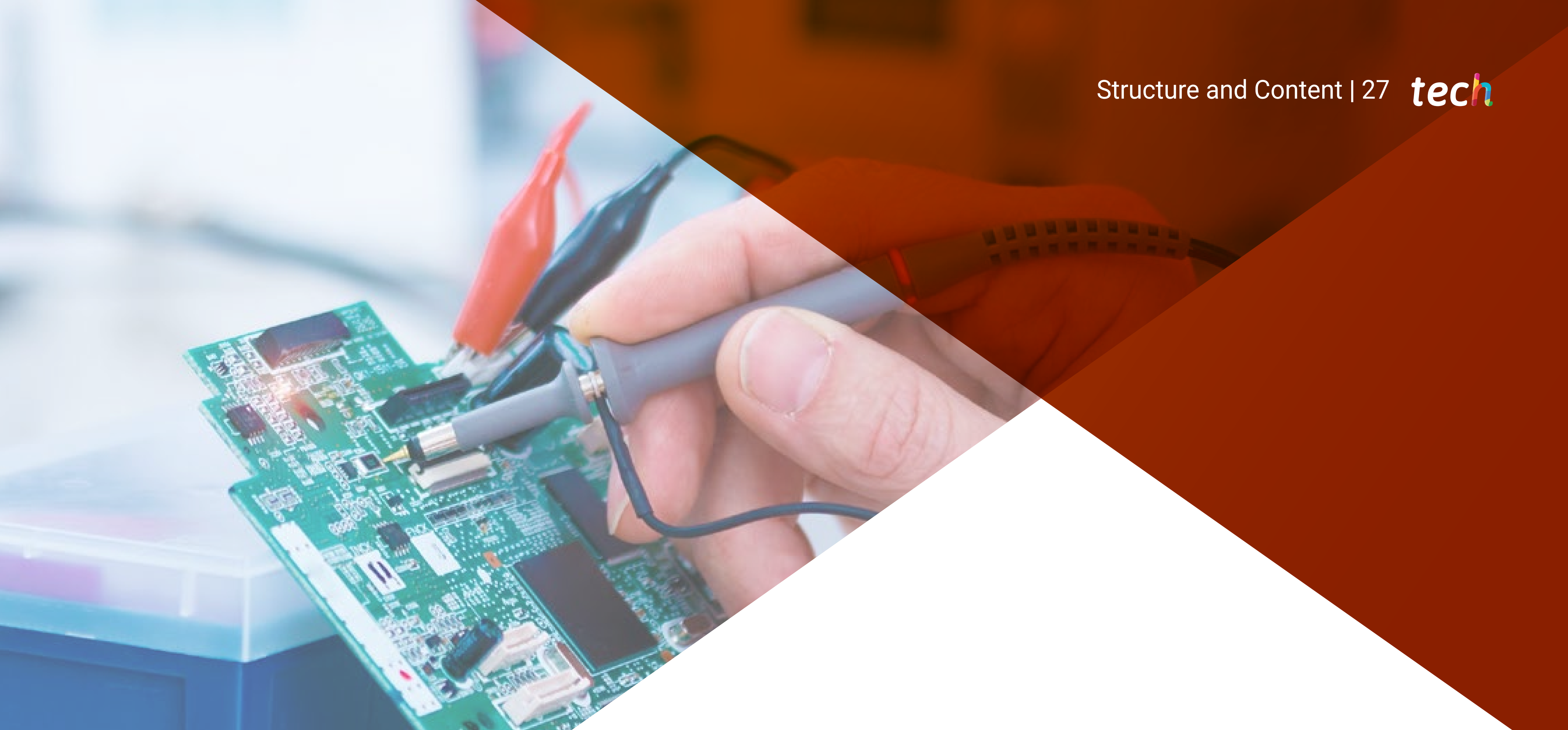
- Research Support Technician at the project as Learning from: "System for the provision and consumption of HD multimedia content in means of collective passenger transport based on Li-Fi technology for data transmission". Carlos University of Madrid
- Specialist in Computer Science, at Emprestur, Ministry of Tourism, Cuba
- Specialist in Computer Science at UNE, Empresa Eléctrica, Cuba
- IT and Communications Specialist, Almacenes Universales S.A., Cuba
- Radio Communications Specialist at Santa Clara Air Base, Cuba
- Telecommunications and Electronics Engineering at Universidad Central "Marta Abreu" de las Villas, Santa Clara, Cuba
- Master's Degree in Political and Electoral Analysis from the Carlos III University, Madrid: Leganés Campus, Madrid
- PhD student in Electrical, Electronic and Automation Engineering, Department of Electronic Technology. Carlos III University of Madrid: Leganés Campus

A path to achieve education and professional growth that will propel you towards a greater level of competitiveness in the employment market"

05

Structure and Content

This program in Electronic Systems Engineering at TECH has been designed to raise the qualification of engineering professionals to the highest quality standards. To this end, an exhaustive review of relevant subjects such as embedded systems, microelectronics, power converters, biomedical electronics and energy efficiency, among others, is proposed. Issues of great importance to achieve the level of competitiveness in students demanded by today's companies.



The syllabus of this Professional Master's Degree includes relevant information on different fields of electronic systems"

Module 1. Embedded Systems

1.1. Embedded Systems
    1.1.1. Embedded System
    1.1.2. Requirements for Embedded Systems and Benefits
    1.1.3. Evolution of Embedded Systems
1.2. Microprocessors
    1.2.1. Evolution of Microprocessors
    1.2.2. Families of Microprocessors
    1.2.3. Future Trend
    1.2.4. Commercial Operating System
1.3. Structure of a Microprocessor
    1.3.1. Basic Structure of a Microprocessor
    1.3.2. Central Processing Unit
    1.3.3. Input and Output
    1.3.4. Buses and Logical Levels
    1.3.5. Structure of a System Based on Microprocessors
1.4. Processing Platforms
    1.4.1. Cyclic Executive Operation
    1.4.2. Events and Interruptions
    1.4.3. Hardware Management
    1.4.4. Distributed Systems
1.5. Analysis and Design of Programs for Embedded Systems
    1.5.1. Requirements Analysis
    1.5.2. Design and Integration
    1.5.3. Implementation, Tests and Maintenance
1.6. Operating Systems in Real Time
    1.6.1. Real Time, Types
    1.6.2. Operating Systems in Real Time. Requirements
    1.6.3. Microkernel Architecture
    1.6.4. Planning
    1.6.5. Task Management and Interruptions
    1.6.6. Advanced Operating System
1.7. Design Technique of Embedded Systems
    1.7.1. Sensors and Magnitudes
    1.7.2. Low Power Modes
    1.7.3. Embedded Systems Languages
    1.7.4. Peripherals
1.8. Networks and Multiprocessors in Embedded Systems
    1.8.1. Types of Networks
    1.8.2. Distributed Embedded Systems Networks
    1.8.3. Multiprocessors
1.9. Embedded Systems Simulators
    1.9.1. Commercial Simulators
    1.9.2. Simulation Parameters
    1.9.3. Error Checking and Error Handling
1.10. Embedded Systems for the Internet of Things (IoT)
    1.10.1. IoT
    1.10.2. Wireless Sensor Networks
    1.10.3. Attacks and Protective Measures
    1.10.4. Resources Management
    1.10.5. Commercial Platforms

Module 2. Electronic Systems Design

2.1. Electronic Design
    2.1.1. Resources for the Design
    2.1.2. Simulation and Prototype
    2.1.3. Testing and Measurements
2.2. Circuit Design Techniques
    2.2.1. Schematic Drawing
    2.2.2. Current Limiting Resistors
    2.2.3. Voltage Dividers
    2.2.4. Special Resistance
    2.2.5. Transistors
    2.2.6. Errors and Precision

2.3. Power Supply Design
- 2.3.1. Choice of Power Supply
  - 2.3.1.1. Common Voltage
  - 2.3.1.2. Design of a Battery
- 2.3.2. Switch-Mode Power Supplies
  - 2.3.2.1. Types
  - 2.3.2.2. Pulse Width Modulation
  - 2.3.2.3. Components

2.4. Amplifier Design
- 2.4.1. Types
- 2.4.2. Specifications
- 2.4.3. Gain and Attenuation
  - 2.4.3.1. Input and Output Impedances
  - 2.4.3.2. Maximum Power Transfer
- 2.4.4. Design with Operational Amplifiers (OP AMP)
  - 2.4.4.1. DC Connection
  - 2.4.4.2. Open Loop Operation
  - 2.4.4.3. Frequency Response
  - 2.4.4.4. Upload Speed
- 2.4.5. OP AMP Applications
  - 2.4.5.1. Inverters
  - 2.4.5.2. Buffer
  - 2.4.5.3. Adder
  - 2.4.5.4. Integrator
  - 2.4.5.5. Restorer
  - 2.4.5.6. Instrumentation Amplification
  - 2.4.5.7. Error Source Compensator
  - 2.4.5.8. Comparator
- 2.4.6. Power Amplifier

2.5. Oscillator Design
- 2.5.1. Specifications
- 2.5.2. Sinusoidal Oscillators
  - 2.5.2.1. Vienna Bridge
  - 2.5.2.2. Colpitts
  - 2.5.2.3. Quartz Crystal
- 2.5.3. Clock Signal
- 2.5.4. Multivibrators
  - 2.5.4.1. Schmitt Trigger
  - 2.5.4.2. 555
  - 2.5.4.3. XR2206
  - 2.5.4.4. LTC6900
- 2.5.6. Frequency Synthesizers
  - 2.5.6.1. Phase Tracking Loop (PTL)
  - 2.5.6.2. Direct Digital Synthesizer (DDS)

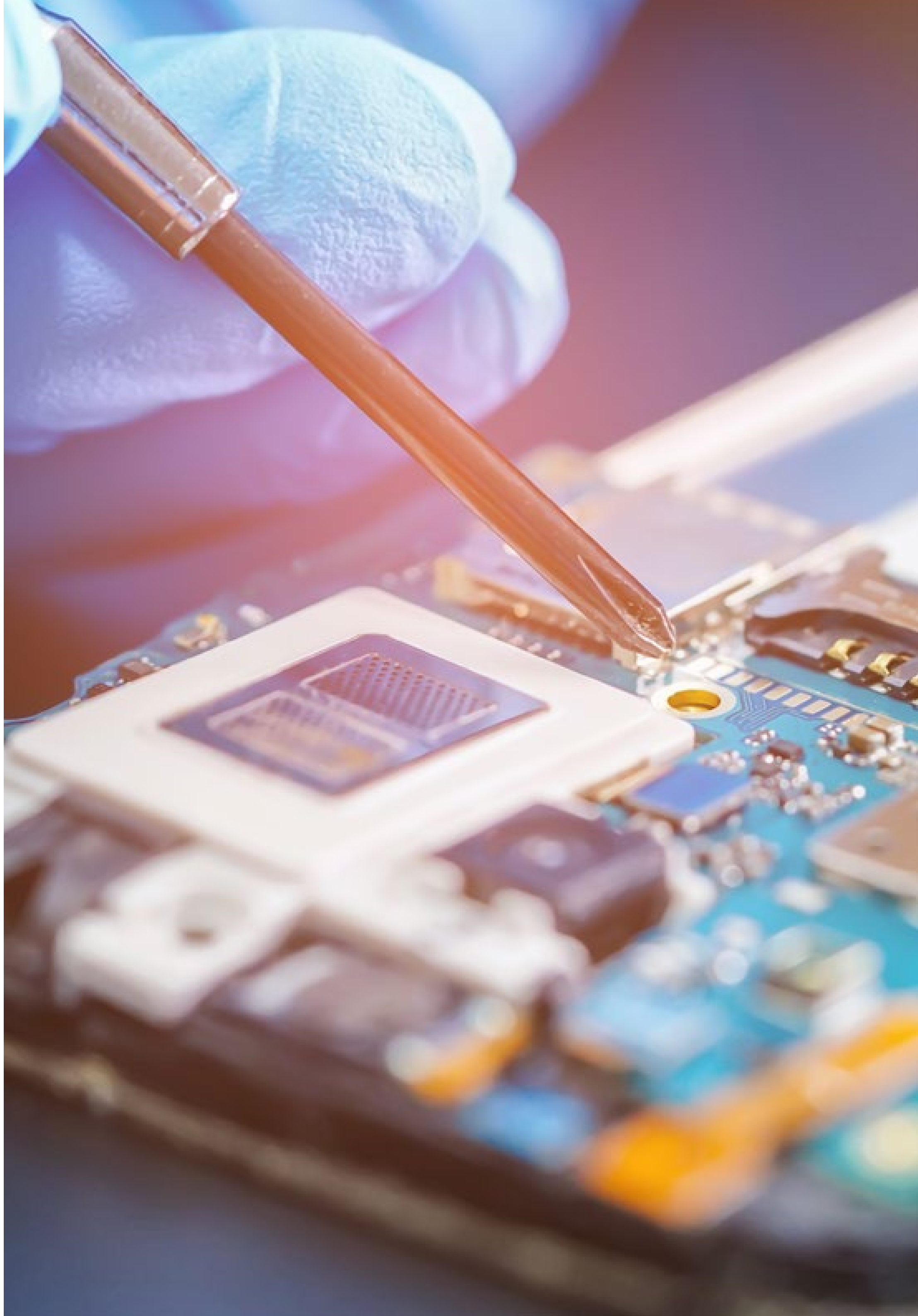
2.6. Design of Filters
- 2.6.1. Types
  - 2.6.1.1. Low Pass
  - 2.6.1.2. High Pass
  - 2.6.1.3. Band Pass
  - 2.6.1.4. Band Eliminator
- 2.6.2. Specifications
- 2.6.3. Behavior Models
  - 2.6.3.1. Butterworth
  - 2.6.3.2. Bessel
  - 2.6.3.3. Chebyshev
  - 2.6.3.4. Elliptical
- 2.6.4. RC Filters
- 2.6.5. LC Filters Band Pass
- 2.6.6. Band-Stop Filter
  - 2.6.6.1. Twin-T
  - 2.6.6.2. LC Notch
- 2.6.7. Active RC Filters

2.7. Electromechanical Design
- 2.7.1. Contact Switch
- 2.7.2. Electromechanical Relays
- 2.7.3. Solid State Relays (SSR)
- 2.7.4. Coils
- 2.7.5. Engines
  - 2.7.5.1. Ordinary
  - 2.7.5.2. Servomotors

2.8. Digital Design
- 2.8.1. Basic Logic of Integrated Circuits (ICs)
- 2.8.2. Programmable Logic
- 2.8.3. Microcontrollers
- 2.8.4. DeMorgan's Theorems
- 2.8.5. Functional Integrated Circuits
  - 2.8.5.1. Decoders
  - 2.8.5.2. Multiplexers
  - 2.8.5.3. Demultiplexers
  - 2.8.5.4. Comparators

2.9. Programmable Logic Devices and Microcontrollers
- 2.9.1. Programmable Logic Device (PLD)
  - 2.9.1.1. Programming
- 2.9.2. Field Programmable Logic Gate Array (FPGA)
  - 2.9.2.1. VHDL and Verilog Language
- 2.9.3. Designing with Microcontrollers
  - 2.9.3.1. Embedded Microcontroller Design

2.10. Choosing Components
- 2.10.1. Resistance
  - 2.10.1.1. Resistor Encapsulation
  - 2.10.1.2. Manufacturing Materials
  - 2.10.1.3. Standard Values
- 2.10.2. Capacitors
  - 2.10.2.1. Capacitor Packages
  - 2.10.2.2. Manufacturing Materials
  - 2.10.2.3. Code of Values
- 2.10.3. Coils
- 2.10.4. Diodes
- 2.10.5. Transistors
- 2.10.6. Integrated Circuits



Module 3. Microelectronics

3.1. Microelectronics vs. Electronics
- 3.1.1. Analog Circuits
- 3.1.2. Digital Circuits
- 3.1.3. Signals and Waves
- 3.1.4. Semiconductor Materials

3.2. Semiconductor Properties
- 3.2.1. PN Joint Structure
- 3.2.2. Reverse Breakdown
  - 3.2.2.1. Zener Breakdown
  - 3.2.2.2. Avalanche Breakdown

3.3. Diodes
- 3.3.1. Ideal Diode
- 3.3.2. Rectifier
- 3.3.3. Diode Junction Characteristics
  - 3.3.3.1. Direct Polarization Current
  - 3.3.3.2. Inverse Polarization Current
- 3.3.4. Applications

3.4. Transistors
- 3.4.1. Structure and Physics of a Bipolar Transistor
- 3.4.2. Operation of a Transistor
  - 3.4.2.1. Active Mode
  - 3.4.2.2. Saturation Mode

3.5. MOS Field-Effect Transistors (MOSFETs)
- 3.5.1. Structure
- 3.5.2. I-V Features
- 3.5.3. DC MOSFET Circuits
- 3.5.4. The Body Effect

3.6. Operational Amplifier
- 3.6.1. Ideal Amplifier
- 3.6.2. Settings
- 3.6.3. Differential Amplifiers
- 3.6.4. Integrators and Differentiators

3.7. Operational Amplifiers. Uses
 3.7.1. Bipolar Amplifiers
 3.7.2. CMOS
 3.7.3. Amplifiers as Black Boxes
3.8. Frequency Response
 3.8.1. Analysis of Frequency Response
 3.8.2. High-Frequency Response
 3.8.3. Low-Frequency Response
 3.8.4. Examples:
3.9. Feedback
 3.9.1. General Structure of Feedback
 3.9.2. Properties and Methodology of Feedback Analysis
 3.9.3. Stability: Bode Method
 3.9.4. Frequency Compensation
3.10. Sustainable Microelectronics and Future Trends
 3.10.1. Sustainable Energy Sources
 3.10.2. Biocompatible Sensors
 3.10.3. Future Trends in Microelectronics

Module 4. Instruments and Sensors

4.1. Measurement
 4.1.1. Measurement and Control Characteristics
  4.1.1.1. Accuracy
  4.1.1.2. Loyalty
  4.1.1.3. Repeatability
  4.1.1.4. Reproducibility
  4.1.1.5. Derivatives
  4.1.1.6. Linearity
  4.1.1.7. Hysteresis
  4.1.1.8. Resolution
  4.1.1.9. Scope
  4.1.1.10. Errors
 4.1.2. Classification of Instruments
  4.1.2.1. According to its Functionality
  4.1.2.2. According to the Variable to Control
4.2. Regulation
 4.2.1. Regulatory Systems
  4.2.1.1. Open Loop Systems
  4.2.1.2. Closed Loop Systems
 4.2.2. Types of Industrial Processes
  4.2.2.1. Continuous Processes
  4.2.2.2. Discrete Processes
4.3. Caudal Sensors
 4.3.1. Flow Rate
 4.3.2. Units Used for Caudal Measurement
 4.3.3. Types of Caudal Sensors
  4.3.3.1. Volume Flow Measurement
  4.3.3.2. Flow Measurement by Mass
4.4. Pressure Sensors
 4.4.1. Pressure
 4.4.2. Units Used for Pressure Measurement
 4.4.3. Types of Pressure Sensors
  4.4.3.1. Pressure Measurement via Mechanical Elements
  4.4.3.2. Pressure Measurement via Electromechanical Elements
  4.4.3.3. Pressure Measurement via Electronic Elements
4.5. Temperature Sensors
 4.5.1. Temperature
 4.5.2. Units Used for Temperature Measurement
 4.5.3. Types of Temperature Sensors
  4.5.3.1. Bimetallic Thermometer
  4.5.3.2. Glass Thermometer
  4.5.3.3. Resistance Thermometer
  4.5.3.4. Thermistors
  4.5.3.5. Thermocouples
  4.5.3.6. Radiation Pyrometers

4.6. Level Sensors
- 4.6.1. Liquids and Solids Level
- 4.6.2. Units Used for Temperature Measurement
- 4.6.3. Types of Level Sensors
  - 4.6.3.1. Liquid Level Gauges
  - 4.6.3.2. Solid Level Gauges

4.7. Sensors for Other Physical and Chemical Variables
- 4.7.1. Sensors for Other Physical Variables
  - 4.7.1.1. Weight Sensors
  - 4.7.1.2. Speed Sensors
  - 4.7.1.3. Density Sensors
  - 4.7.1.4. Humidity Sensors
  - 4.7.1.5. Flame Sensors
  - 4.7.1.6. Solar Radiation Sensors
- 4.7.2. Sensors for Other Chemical Variables
  - 4.7.2.1. Conduction Sensors
  - 4.7.2.2. pH Sensors
  - 4.7.2.3. Gas Concentration Sensors

4.8. Actuators
- 4.8.1. Actuators
- 4.8.2. Engines
- 4.8.3. Servo-Valves

4.9. Automatic Control
- 4.9.1. Automatic Regulation
- 4.9.2. Types of Regulators
  - 4.9.2.1. Two-Step Controller
  - 4.9.2.2. Provider Controller
  - 4.9.2.3. Differential Controller
  - 4.9.2.4. Proportional-Differential Controller
  - 4.9.2.5. Integral Controller
  - 4.9.2.6. Proportional-Integral Controller
  - 4.9.2.7. Proportional-Integral-Differential Controller
  - 4.9.2.8. Digital Electronic Controller

4.10. Control Applications in Industry
- 4.10.1. Selection Criteria of a Control System
- 4.10.2. Examples of Typical Controls in Industry
  - 4.10.2.1. Ovens
  - 4.10.2.2. Dryer
  - 4.10.2.3. Combustion Control
  - 4.10.2.4. Level Control
  - 4.10.2.5. Heat Exchangers
  - 4.10.2.6. Central Nuclear Reactor

Module 5. Power Electronic Converters

5.1. Power Converter
- 5.1.1. Power Electronics
- 5.1.2. Applications of Power Electronics
- 5.1.3. Power Conversion Systems

5.2. Converters
- 5.2.1. Converters
- 5.2.2. Types of Converters
- 5.2.3. Characteristic Parameters
- 5.2.4. Fourier Series

5.3. AC/DC Conversion. Single-Phase Uncontrolled Rectifiers
- 5.3.1. AC/DC Converters
- 5.3.2. Diode
- 5.3.3. Uncontrolled Half-Wave Rectifier
- 5.3.4. Full-Wave Uncontrolled Rectifier

5.4. AC/DC Conversion. Single-Phase Uncontrolled Rectifiers
- 5.4.1. Thyristor
- 5.4.2. Half-Wave Controlled Rectifier
- 5.4.3. Full-Wave Controlled Rectifier

5.5. Three-Phase Rectifiers
- 5.5.1. Three-Phase Rectifiers
- 5.5.2. Three-Phase Controlled Rectifiers
- 5.5.3. Three-Phase Uncontrolled Rectifiers

Module 6. Digital Processing

6.9. Voice Digital Processing
- 6.9.1. Voice Digital Processing Model
- 6.9.2. Representation of the Voice Signal
- 6.9.3. Voice Codification

6.10. Advanced Voice Processing
- 6.10.1. Voice Recognition
- 6.10.2. Speech Signal Processing for Diction
- 6.10.3. Digital Speech Therapy Diagnosis

Module 7. Biomedical Electronics

7.1. Biomedical Electronics
- 7.1.1. Biomedical Electronics
- 7.1.2. Characteristics of Biomedical Electronics
- 7.1.3. Biomedical Instrument Systems
- 7.1.4. Structure of a Biomedical Instrumentation System

7.2. Bioelectrical Signals
- 7.2.1. Origin of Bioelectrical Signals
- 7.2.2. Conduction
- 7.2.3. Potential
- 7.2.4. Propagation of Potentials

7.3. Bioelectrical Signal Processing
- 7.3.1. Bioelectrical Signal Acquisition
- 7.3.2. Amplification Techniques
- 7.3.3. Safety and Insulation

7.4. Bioelectrical Signal Filter
- 7.4.1. Noise
- 7.4.2. Noise Detection
- 7.4.3. Noise Filtering

7.5. Electrocardiogram
- 7.5.1. Cardiovascular System
  - 7.5.1.1. Action Potentials
- 7.5.2. ECG Waveform Nomenclature
- 7.5.3. Cardiac Electric Activity
- 7.5.4. Electrocardiography Module Instrumentation

7.6. Electroencephalogram
- 7.6.1. Neurological System
- 7.6.2. Electrical Brain Activity
  - 7.6.2.1. Brain Waves
- 7.6.3. Electroencephalography Module Instrumentation

7.7. Electromyogram
- 7.7.1. The Muscular System
- 7.7.2. Electrical Muscular Activity
- 7.7.3. Electromyography Module Instrumentation

7.8. Spirometry
- 7.8.1. Respiratory System
- 7.8.2. Spirometric Parameters
  - 7.8.2.1. Interpretation of the Spirometric Test
- 7.8.3. Spirometry Module Instrumentation

7.9. Oximetry
- 7.9.1. Circulatory System
- 7.9.2. Operation Principle
- 7.9.3. Accuracy of Measurements
- 7.9.4. Oximetry Module Instrumentation

7.10. Electrical Safety and Regulations
- 7.10.1. Effects of Electric Currents on Living Things
- 7.10.2. Electrical Accidents
- 7.10.3. Electrical Safety of Electromedical Equipment
- 7.10.4. Classification of Electromedical Equipment

Module 8. Energy Efficiency. Smart Grid

8.1. Smart Grids and Microgrids
- 8.1.1. Smart Grid
- 8.1.2. Benefits
- 8.1.3. Obstacles for its Implementation
- 8.1.4. Microgrids

8.2. Measuring Equipment
- 8.2.1. Architecture
- 8.2.2. Smart Meters
- 8.2.3. Sensor Networks
- 8.2.4. Phasor Measurement Units

8.3. Advanced Measuring Infrastructure (AMI)
- 8.3.1. Benefits
- 8.3.2. Services
- 8.3.3. Protocols and Standards
- 8.3.4. Security/Safety

8.4. Distributed Generation and Energy Storage
- 8.4.1. Generation Technologies
- 8.4.2. Storage Systems
- 8.4.3. Electric Vehicle
- 8.4.4. Microgrids

8.5. Power Electronics in the Energy Field
- 8.5.1. Smart Grid Requirements
- 8.5.2. Technologies
- 8.5.3. Applications

8.6. Demand Response
- 8.6.1. Objectives
- 8.6.2. Applications
- 8.6.3. Models

8.7. General Architecture of Smart Grid
- 8.7.1. Models
- 8.7.2. Local Networks: HAN, BAN, IAN
- 8.7.3. Neighborhood Area Network and Field Area Network
- 8.7.4. Wide Area Network

8.8. Smart Grid Communications
- 8.8.1. Requirements
- 8.8.2. Technologies
- 8.8.3. Communications Standards and Protocols

8.9. Interoperability, Standards and Security in Smart Grids
- 8.9.1. Interoperability
- 8.9.2. Standards
- 8.9.3. Security/Safety

8.10. Big Data for Smart Grids
- 8.10.1. Analytical Models
- 8.10.2. Scope of Application
- 8.10.3. Data Sources
- 8.10.4. Storage Systems
- 8.10.5. Frameworks

Module 9. Industrial Communications

9.1. The Systems in Real Time
- 9.1.1. Classification
- 9.1.2. Programming
- 9.1.3. Planning

9.2. Communication Networks
- 9.2.1. Transmission of medium
- 9.2.2. Basic Configurations
- 9.2.3. CIM Pyramid
- 9.2.4. Classification
- 9.2.5. OSI Model
- 9.2.6. TCP/IP Model

9.3. Fieldbuses
- 9.3.1. Classification
- 9.3.2. Distributed and Centralized Systems
- 9.3.3. Distributed Control Systems

9.4. BUS AS-i
- 9.4.1. Physical Level
- 9.4.2. Level of Scope
- 9.4.3. Error Control
- 9.4.4. Components

9.5. CANopen
- 9.5.1. Physical Level
- 9.5.2. Level of Scope
- 9.5.3. Error Control
- 9.5.4. DeviceNet
- 9.5.5. ControlNet

9.6. Profibus
- 9.6.1. Physical Level
- 9.6.2. Level of Scope
- 9.6.3. Level of Application
- 9.6.4. Communication Model
- 9.6.5. Operation System
- 9.6.6. ProfiNet

9.7. Modbus
- 9.7.1. Physical Media
- 9.7.2. Access to the Media
- 9.7.3. Series Transmission Modes
- 9.7.4. Protocol
- 9.7.5. TCP Modbus

9.8. Industrial Ethernet
- 9.8.1. ProfiNet
- 9.8.2. TCP Modbus
- 9.8.3. Ethernet/IP
- 9.8.4. EtherCAT

9.9. Wireless Communication
- 9.9.1. 802.11. Networks (Wi-Fi)
- 9.9.2. 802.15.1. Networks (Bluetooth)
- 9.9.3. 802.15.4. Networks (ZigBee)
- 9.9.4. WirelessHART
- 9.9.5. WiMAX
- 9.9.6. Mobile Phone-Based Networks
- 9.9.7. Satellite Communications

9.10. IoT in Industrial Environments
- 9.10.1. The Internet of Things
- 9.10.2. IoT Device Characteristics
- 9.10.3. Application of IoT in Industrial Environments
- 9.10.4. Security Requirements
- 9.10.5. Communication Protocols MQTT and CoAP

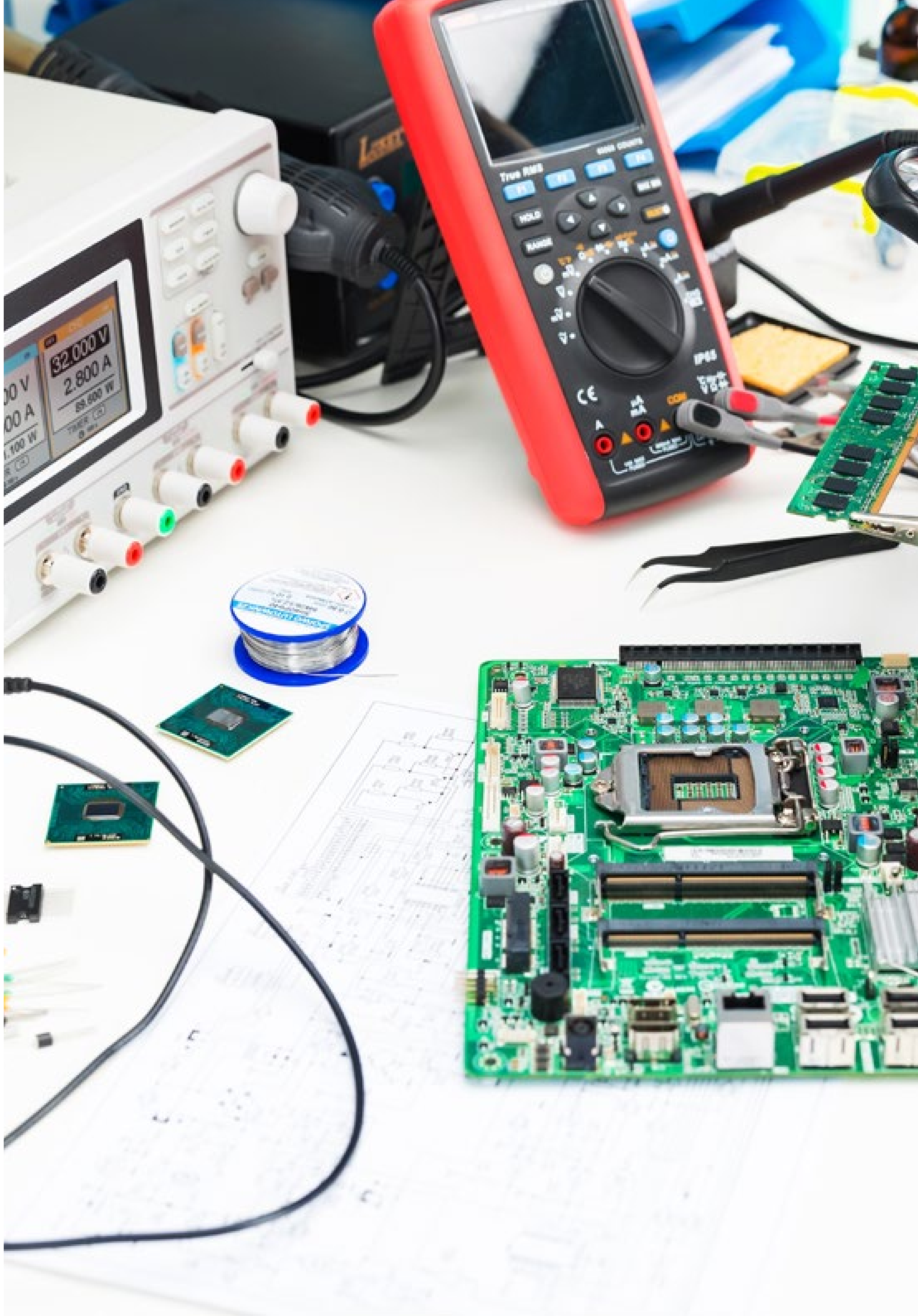
Module 10. Industrial Marketing

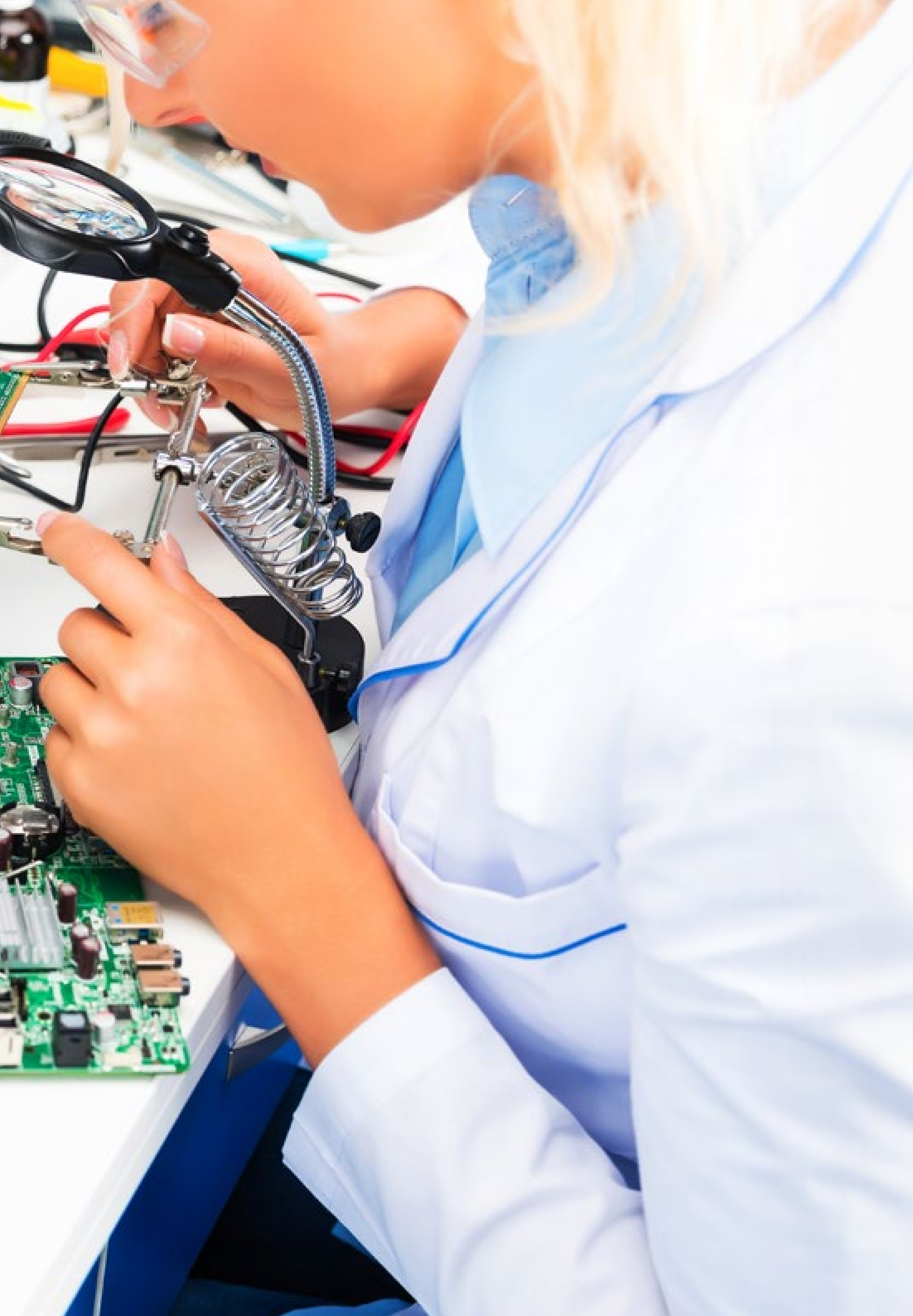
10.1. Marketing and Analysis of the Industrial Market
- 10.1.1. Marketing
- 10.1.2. Understanding the Market and Customer Guidance
- 10.1.3. Differences Between Industrial Marketing and Consumer Marketing
- 10.1.4. Industrial Market

10.2. Marketing Planning
- 10.2.1. Strategic Planning
- 10.2.2. Analysis of the environment
- 10.2.3. Business Mission and Objectives
- 10.2.4. The Marketing Plan in Industrial Companies

10.3. Managing the Marketing Information
- 10.3.1. Knowledge of the Client in the Industrial Sector
- 10.3.2. Learning from the Market
- 10.3.3. MIS (Marketing Information System)
- 10.3.4. Commercial Research

10.4. Marketing Strategies
 10.4.1. Segmentation
 10.4.2. Evaluation and Choice of Target Market
 10.4.3. Differentiation and Positioning
10.5. Marketing Relations in the Industrial sector
 10.5.1. Creating Relationships
 10.5.2. From Transactional Marketing to Relationship Marketing
 10.5.3. Design and Implementation of an Industrial Relational Marketing Strategy
10.6. Value Creation in the Industrial Market
 10.6.1. Marketing Mix and Offering
 10.6.2. Advantages of Inbound Marketing in the Industrial Sector
 10.6.3. Value Proposal in the Industrial Market
 10.6.4. Industrial Purchasing Process
10.7. Pricing Policies
 10.7.1. Pricing Policies
 10.7.2. Objectives of Pricing Policies
 10.7.3. Pricing Strategies
10.8. Communication and Branding in the Industrial Sector
 10.8.1. Branding
 10.8.2. Building a Brand in the Industrial Market
 10.8.3. Stages in Communication Development
10.9. Commercial Function and Sales in Industrial Markets
 10.9.1. Importance of Commercial Management in the Industrial Company
 10.9.2. Sales Force Strategy
 10.9.3. Commercial Figure in the Industrial Market
 10.9.4. Commercial Negotiation
10.10. Distribution in Industrial Environments
 10.10.1. Nature of Distribution Channels
 10.10.2. Distribution in the Industrial Sector: Competitive Factor
 10.10.3. Types of Distribution Channels
 10.10.4. Choosing the Distribution Channel





This program is designed to meet the demand from engineers for specific programs on electronic systems"

06
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 is the most widely used learning system in the best faculties in the world. 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 program, the studies 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

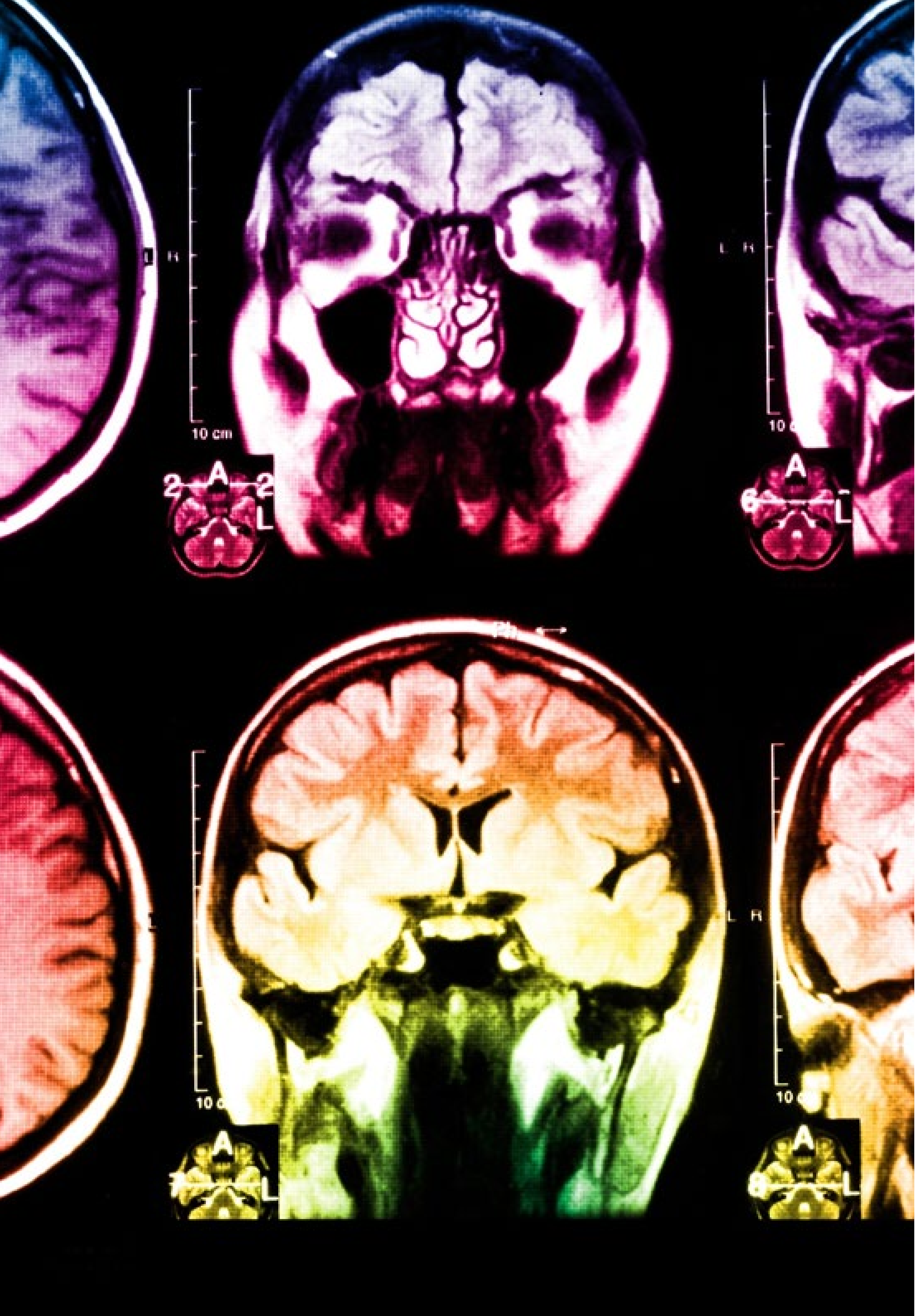
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.



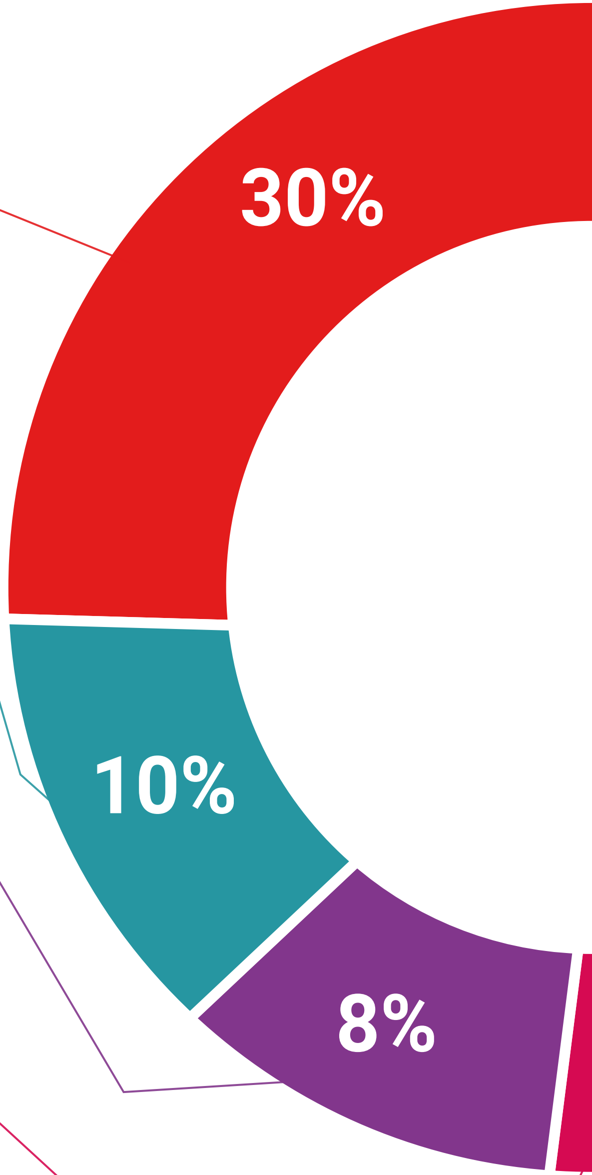
In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, 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.

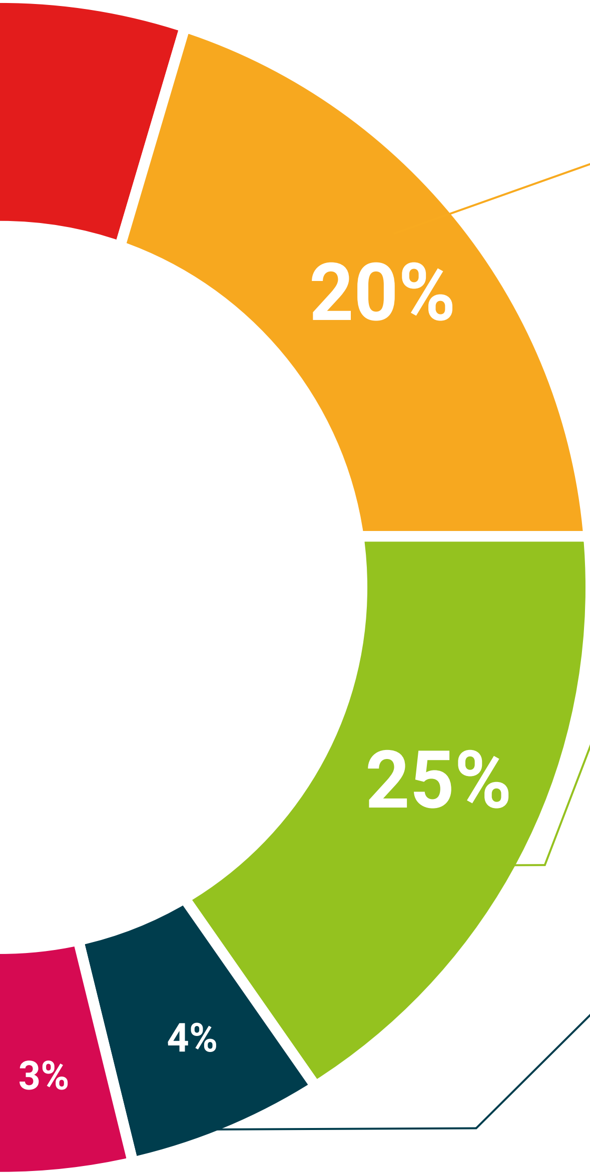
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

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.

07
Certificate

The Professional Master's Degree in Electronic Systems Engineering guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree diploma issued by TECH Global University.

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

This program will allow you to obtain your **Professional Master's Degree diploma in Electronic Systems Engineering** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University is an official European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Professional Master's Degree in Electronic Systems Engineering**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**

tech global university

Mr./Ms. _______________, with identification document ___________
has successfully passed and obtained the title of:

Professional Master's Degree in Electronic Systems Engineering

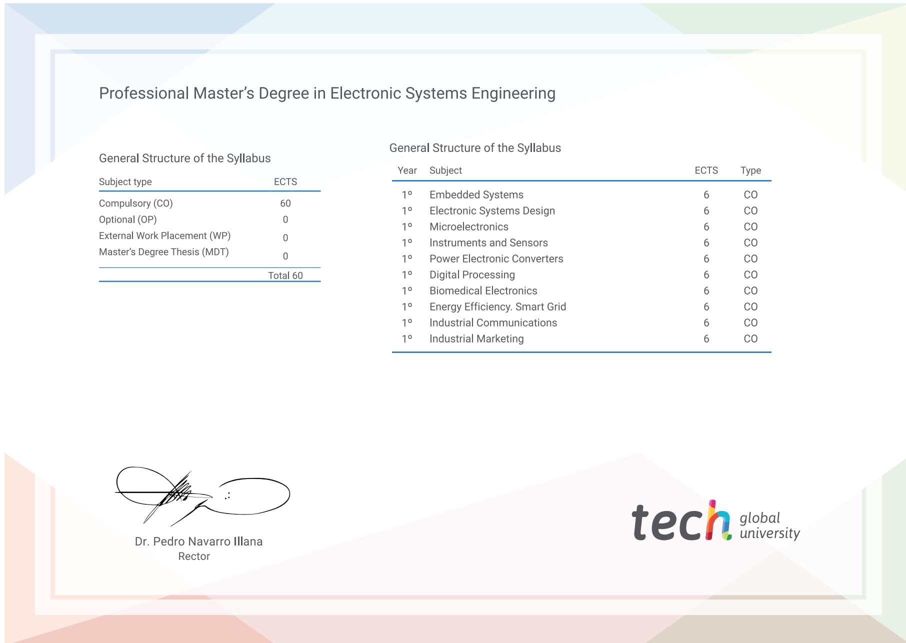
This is a program of 1,500 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Rector

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates



Professional Master's Degree in Electronic Systems Engineering

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Embedded Systems	6	CO
1º	Electronic Systems Design	6	CO
1º	Microelectronics	6	CO
1º	Instruments and Sensors	6	CO
1º	Power Electronic Converters	6	CO
1º	Digital Processing	6	CO
1º	Biomedical Electronics	6	CO
1º	Energy Efficiency. Smart Grid	6	CO
1º	Industrial Communications	6	CO
1º	Industrial Marketing	6	CO

Dr. Pedro Navarro Illana
Rector

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

tech global university

Professional Master's Degree
Electronic Systems Engineering

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree
Electronic Systems Engineering