

# Postgraduate Certificate Robotics. Robot Design and Modeling



## Postgraduate Certificate Robotics. Robot Design and Modeling

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Global University
- » Credits: 6 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/information-technology/postgraduate-certificate/robotics-robot-design-modeling](http://www.techtute.com/us/information-technology/postgraduate-certificate/robotics-robot-design-modeling)

# Index

01

Introduction

---

*p. 4*

02

Objectives

---

*p. 8*

03

Course Management

---

*p. 12*

04

Structure and Content

---

*p. 18*

05

Methodology

---

*p. 22*

06

Certificate

---

*p. 30*

# 01

# Introduction

The presence of robots in the industrial sector is quite frequent, but, although it is not perceived, it is much more in the daily life of people in the cities where they live and even in their own homes. The reduction of time, load and the benefits they bring, especially in the business field, have boosted the Robotics field. This program was created in response to the high demand for IT professionals that are required in this field. The advanced multimedia content and the specialized teaching team will facilitate learning that will help students to progress in their career.





“

*A program where IT professionals  
will have access to intensive learning  
in Robot Design and Modeling”*

Robotics has had a great impulse in the last decades, beyond the process of industrialization, robots have reached people's homes, facilitating household chores. This Postgraduate Certificate, aimed at IT professionals, provides the most advanced and specialized knowledge for the professionals of the future in the field of Robot Design and Modeling.

An intensive online program in which the students will get into the mathematical models: kinematics and dynamics of robots, thanks to professionals with extensive experience and high qualifications in software engineering and robotics, who teach this program. Thus, the IT professionals will be able to program different types of robots: manipulator robots, aerial mobile robots and terrestrial mobile robots.

A program where the design will have great relevance in the different models of robots: Bio-inspired, Humanoid, Soft-Robots and Social Robots. A Postgraduate Certificate with a theoretical approach, but with an eminently practical part that will lead students to master the ROS Technologies and the Gazebo Simulator, currently used in Robot Design and Modeling.

TECH offers a quality program that students can access at any time comfortably from a Tablet or computer with internet connection. This will allow the IT professional to acquire useful knowledge, which will help them to prosper in the field of Robotics, while combining a high-level program with their work and/or personal responsibilities. All this, in addition to the most advanced and updated multimedia syllabus in the field of Robot Design and Modeling.

This **Postgraduate Certificate in Robotics. Robot Design and Modeling** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ Development of case studies presented by experts in robotic 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 self-assessment can be used to improve learning
- ◆ Its special emphasis on innovative methodologies
- ◆ 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



*Enroll in a Postgraduate Certificate that you can access without fixed schedules and from any tablet or computer with internet connection. TECH adapts to you"*

“

*Master the most used software and hardware in the robot industry, thanks to this Postgraduate Certificate. Enroll now”*

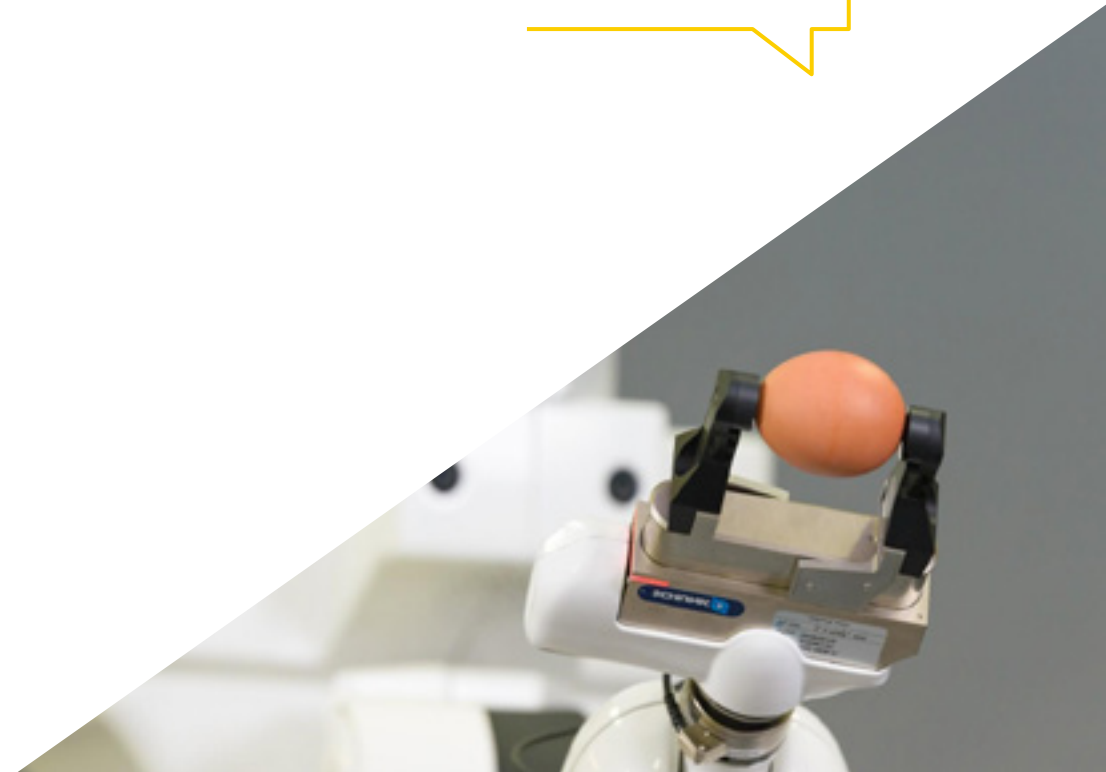
The program's teaching staff includes professionals from the sector who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

Its 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 education programmed to learn in real situations.

The design of this program focuses on Problem-Based Learning, by means of which the professional must try to solve the different professional practice situations that are presented throughout the academic course. This will be done with the help of an innovative system of interactive videos made by renowned experts.

*Thanks to the real cases presented in this program, you will gain the practical knowledge necessary to grow in the Robotics industry.*

*Gain specialized knowledge in the use of Robot Operating System technology.*



# 02 Objectives

The objective of this Postgraduate Certificate is that the IT professionals delve into the world of Robotics, acquiring advanced knowledge in the use of robot modeling language, technologies, techniques and tools currently used for the design of machines. All this learning will be provided by a teacher with extensive experience in the industry and who will guide you throughout the 6 weeks of duration of this Postgraduate Certificate.





“

*Would you like to be able to create aerial mobile robots? This Postgraduate Certificate is right for you. Enroll now”*



## General Objectives

---

- ◆ Develop the theoretical and practical foundations necessary to carry out a robot design and modeling project
- ◆ Provide the graduates with an exhaustive knowledge of the automation of industrial processes that will allow them to develop their own strategies
- ◆ Acquire the professional skills of an expert in automatic control systems in Robotics



*Achieve a high level in the field of modeling and simulation of manipulator robots”*





## Specific Objectives

---

- ◆ Delve into the use of Gazebo Simulation Technology
- ◆ Master the use of the URDF Robot Modeling language
- ◆ Develop specialized knowledge in the use of Robot Operating System technology
- ◆ Model and simulate manipulator robots, land mobile robots, air mobile robots and model and simulate aquatic mobile robots

03

# Course Management

The management of this course and the teaching staff have extensive experience in the field of Robotics. Their current activity in this industry allows the IT professionals taking this program to acquire the latest knowledge in the techniques and tools used in the industry of Robot Design and Modeling A teaching in which, in addition, students will have the tutoring of the teaching team to resolve any doubts they may have about the syllabus available from the first day of this Postgraduate Certificate.



“

*You will learn with the help of best specialists in the sector of Robotics. They will be allies during this 6-week online program”*

## International Guest Director

Seshu Motamarri is an expert in automation and robotics with more than 20 years of experience in various industries such as e-commerce, automotive, oil and gas, food and pharmaceutical. Throughout his career, he has specialized in engineering management and innovation and in the implementation of new technologies, always looking for scalable and efficient solutions. He has also made important contributions in the introduction of products and solutions that optimize both safety and productivity in complex industrial environments.

He has also held key positions, including Senior Director of Automation and Robotics at 3M, where he leads cross-functional teams to develop and implement advanced automation solutions. At Amazon, his role as Technical Lead led him to manage projects that significantly improved the global supply chain, such as the “SmartPac” semi-automated bagging system and the robotic smart picking and stowage solution. His skills in project management, operational planning and product development have enabled him to generate great results in large-scale projects.

Internationally, he is recognized for his achievements in IT. He has been awarded the prestigious Amazon Door Desk Award by Jeff Bezos, and has received the Excellence in Manufacturing Safety Award, reflecting his hands-on engineering approach. In addition, he has been a “Bar Raiser” at Amazon, participating in over 100 interviews as an objective evaluator in the hiring process.

In addition, he has several patents and publications in electrical engineering and functional safety, reinforcing his impact on the development of advanced technologies. His projects have been implemented globally, with highlights in regions such as North America, Europe, Japan and India, where he has driven the adoption of sustainable solutions in the industrial and e-commerce sectors.



## Mr. Motamarri, Seshu

---

- ♦ Senior Director of Global Manufacturing Technology at 3M, Arkansas, United States
- ♦ Director of Automation and Robotics at Tyson Foods
- ♦ Hardware Development Manager III at Amazon
- ♦ Automation Leader at Corning Incorporated
- ♦ Founder and member of Quest Automation LLC
- ♦ Master of Science (MS), Electrical and Electronics Engineering at University of Houston
- ♦ Bachelor of Engineering (B.E.), Electrical and Electronics Engineering, University of Andhra
- ♦ Certification in Machinery, TÜV Rheinland Group

“

*Thanks to TECH, you will be able to learn with the best professionals in the world”*

## Management



### Dr. Ramón Fabresse, Felipe

- ♦ Senior Software Engineer at Acurable
- ♦ NLP Software Engineer at Intel Corporation
- ♦ Software Engineer in CATEC, Indisys
- ♦ Researcher in Aerial Robotics at the University of Seville
- ♦ PhD Cum Laude in Robotics, Autonomous Systems and Telerobotics at the University of Seville
- ♦ Degree in Computer Engineering at the University of Seville
- ♦ Master's Degree in Robotics, Automation and Telematics at the University of Seville

## Professors

### Dr. Íñigo Blasco, Pablo

- ♦ Software Engineer at PlainConcepts
- ♦ Founder of Intelligent Behavior Robots
- ♦ Robotics Engineer at CATEC Advanced Center for Aerospace Technologies
- ♦ Developer and consultant at Syderis
- ♦ PhD in Industrial Informatics Engineering at the University of Seville
- ♦ Degree in Computer Engineering at the University of Seville
- ♦ Master's Degree in Software Engineering and Technology





# 04

# Structure and Content

This Postgraduate Certificate has a syllabus that has been designed by a specialized teaching team that will pour their extensive knowledge in the field of Robotics. Throughout the 180 teaching hours of this program, students will delve into the main postulates of mathematical modeling, kinematics and dynamics of robots, as well as the different types of existing robots. The practical cases provided by the teaching team, the video summaries and the specialized readings will facilitate the learning and the achievement of the objectives, especially for those students who wish to grow professionally in the field of Robotics.



“

*Increase your chances of growing in the field of Robotics with an Advanced Postgraduate Certificate in Industry 4.0”*

## Module 1. Robotics. Robot Design and Modeling

- 1.1. Robotics and Industry 4.0
  - 1.1.1. Robotics and Industry 4.0
  - 1.1.2. Application Fields and Use Cases
  - 1.1.3. Sub-Areas of Specialization in Robotics
- 1.2. Robot Hardware and Software Architectures
  - 1.2.1. Hardware Architectures and Real-Time
  - 1.2.2. Robot Software Architectures
  - 1.2.3. Communication Models and Middleware Technologies
  - 1.2.4. Robot Operating System (ROS) Software Integration
- 1.3. Mathematical Modeling of Robots
  - 1.3.1. Mathematical Representation of Rigid Solids
  - 1.3.2. Rotations and Translations
  - 1.3.3. Hierarchical State Representation
  - 1.3.4. Distributed Representation of the State in ROS (TF Library)
- 1.4. Robot Kinematics and Dynamics
  - 1.4.1. Kinematics
  - 1.4.2. Dynamics
  - 1.4.3. Underactuated Robots
  - 1.4.4. Redundant Robots
- 1.5. Robot Modeling and Simulation
  - 1.5.1. Robot Modeling Technologies
  - 1.5.2. Robot Modeling with URDF
  - 1.5.3. Robot Simulation
  - 1.5.4. Modeling with Gazebo Simulator
- 1.6. Robot Manipulators
  - 1.6.1. Types of Manipulator Robots
  - 1.6.2. Kinematics
  - 1.6.3. Dynamics
  - 1.6.4. Simulation





- 1.7. Terrestrial Mobile Robots
  - 1.7.1. Types of Terrestrial Mobile Robots
  - 1.7.2. Kinematics
  - 1.7.3. Dynamics
  - 1.7.4. Simulation
- 1.8. Aerial Mobile Robots
  - 1.8.1. Types of Aerial Mobile Robots
  - 1.8.2. Kinematics
  - 1.8.3. Dynamics
  - 1.8.4. Simulation
- 1.9. Aquatic Mobile Robots
  - 1.9.1. Types of Aquatic Mobile Robots
  - 1.9.2. Kinematics
  - 1.9.3. Dynamics
  - 1.9.4. Simulation
- 1.10. Bioinspired Robots
  - 1.10.1. Humanoids
  - 1.10.2. Robots with Four or More Legs
  - 1.10.3. Modular Robots
  - 1.10.4. Robots with Flexible Parts (Soft-Robotics)



*A Postgraduate Certificate for you to master Robot Dynamics and Kinematics. Enroll now”*

# 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 Diploma in Robotics. Robot Design and Modeling guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate 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 **Postgraduate Certificate in Robotics. Robot Design and Modeling** 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.

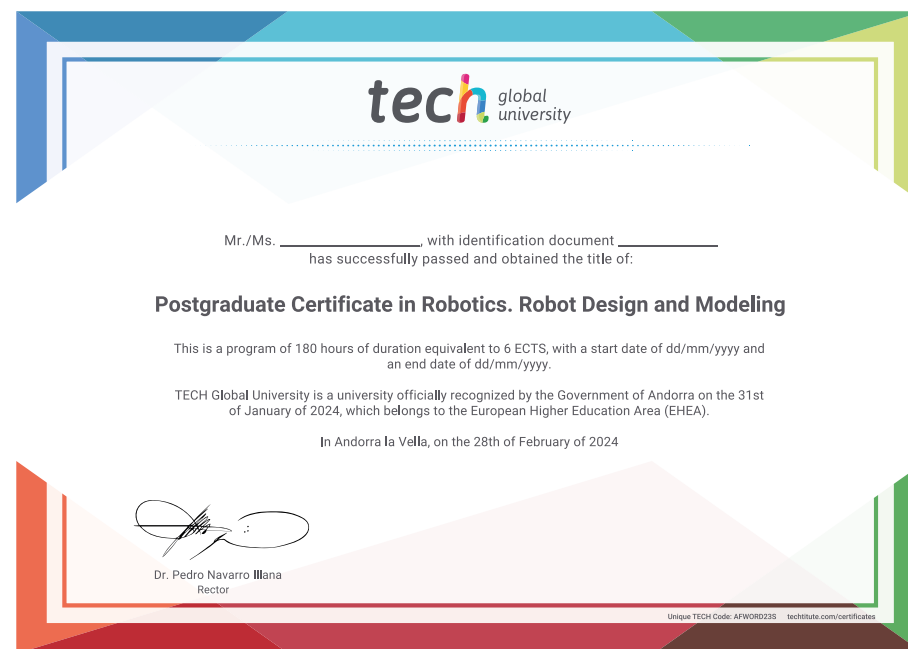
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Robotics. Robot Design and Modeling**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**





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



## Postgraduate Certificate Robotics. Robot Design and Modeling

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Global University
- » Credits: 6 ECTS
- » Schedule: at your own pace
- » Exams: online

# Postgraduate Certificate Robotics. Robot Design and Modeling