

# Postgraduate Certificate Robot Planning Algorithms



## Postgraduate Certificate Robot Planning Algorithms

- » 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/robot-planning-algorithms](http://www.techtute.com/us/information-technology/postgraduate-certificate/robot-planning-algorithms)

# 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 basis for performing any task with a robot is in the planning and monitoring of the routes that we want it to perform. An exhaustive work that requires an advanced algorithmic knowledge, where the role of the IT professional is outstanding. In a booming sector with a high demand for specialized job profiles, it is becoming increasingly urgent to improve technology and broaden knowledge. For this reason, this 100% online teaching has been created, whose main objective is that the students reach a progression in the Robotics sector. The multimedia content and the teachers with extensive experience in this area, who teach this program, will favor the most up-to-date learning.



“

*Do you want to solve the main problems of movements and trajectories in robots? This Postgraduate Certificate will give you the keys. Enroll now”*



This Postgraduate Certificate is aimed at Computer Science professionals who wish to acquire specialized and specific knowledge in the field of Robotics. For this purpose, you will have a specialized team of teachers, who will provide all their knowledge in this course, which will be taught entirely online.

A program focused on Robot Planning Algorithms, where the students will be introduced to the classical planning algorithms and then, with a theoretical-practical approach, they will be able to solve problems that affect the autonomy of robots in different environments. Motion planning will be a key part of this program, where the students will also be introduced to the collaborative work of a group of robots.

Definition of strategies to assign tasks, creation of algorithms to plan coordinated movements, machine learning techniques, all in an education that will allow the IT professionals to acquire advanced knowledge, which will boost their careers in a growing Robotics sector.

An excellent opportunity offered by TECH to professionals who wish to advance in their careers while acquiring advanced learning. For this purpose, it has a university program with no fixed schedules and multimedia content that can be accessed 24 hours a day. They only need a cell phone, a computer or laptop with an Internet connection to view the syllabus or download the content to be able to consult it whenever they want.

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

- ♦ 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



*Combine your professional career with a quality university program. Enroll now"*

“

*This Postgraduate Certificate will allow you to delve into the algorithms responsible for coordination in multi-robot systems. Enroll now”*

*Progress in the Robotics sector with a highly qualified and experienced teacher team in this area.*

*A 100% online training that will allow you to master the technique of robot control. 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.

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 immersive education programmed to learn in real situations.

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



# 02 Objectives

During the 6 weeks of duration of this Postgraduate Certificate, the Computer Science professional will be able to obtain specialized knowledge in Robot Planning Algorithms. An education that will allow you to safely develop the movements and routes that you want a robot or set of machines to perform. Furthermore, the student will be able to correctly identify the different elements in decision theory and to solve any problem by means of learning algorithms. The case studies provided by the teachers of this program will be of great application and usefulness in your professional field.





“

*Reduce the long hours of study with the Relearning system and the multimedia content of this Postgraduate Certificate"*



## 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

“

*In 6 weeks you will acquire the advanced knowledge necessary to analyze the algorithms needed to solve robot decision problems”*





## Specific Objectives

---

- ◆ Establish the different types of planning algorithms
- ◆ Analyze the complexity of motion planning in robotics
- ◆ Develop techniques for environment modeling
- ◆ Examine the pros and cons of different planning techniques
- ◆ Analyze centralized and distributed algorithms for robot coordination
- ◆ Identify the different elements in decision theory
- ◆ Propose learning algorithms for solving decision problems



# 03

## Course Management

TECH remains committed to offering its students an elite education that is accessible to all. To continue with this philosophy, it carefully selects the teachers that make up each of its programs. In this Postgraduate Certificate, the Computer Science professional has a management and teaching professional with extensive experience in Robotics and Engineering projects, as well as teaching at the highest level. Their profound knowledge will be poured into this program. Furthermore, their human quality and closeness will facilitate the resolution of any doubts that the students may have during the course of this teaching.



“

*It advances hand in hand with experts in the area of Robotics. They will pour all their knowledge into this Postgraduate Certificate so that you can reach your goals”*



## 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

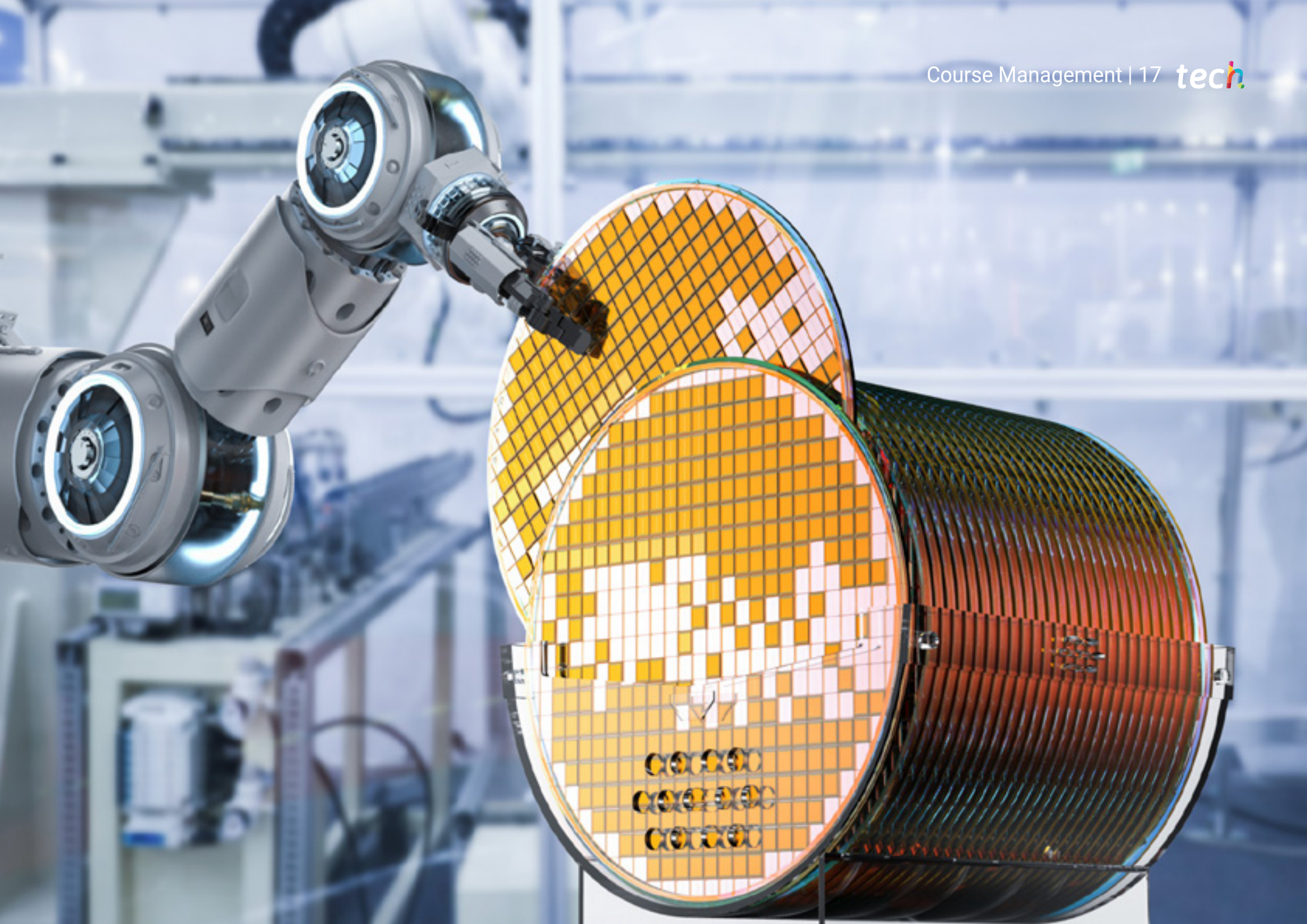
- Senior Software Engineer at Acurable
- NLP Software Engineer at Intel Corporation
- Software Engineer in CATEC, Indisys
- Researcher in Aerial Robotics at the University of Seville
- PhD Cum Laude in Robotics, Autonomous Systems and Telerobotics at the University of Seville
- Degree in Computer Engineering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

## Professors

### Dr. Alejo Teissière, David

- ♦ Telecommunications Engineer with Specialization in Robotics
- ♦ Postdoctoral researcher in the European projects SIAR and Nix ATEX at Pablo de Olavide University
- ♦ Systems developer at Aertec
- ♦ PhD in Automation, Robotics and Telematics at the University of Seville
- ♦ Graduated in Telecommunication Engineering at the University of Seville
- ♦ Master's Degree in Automation, Robotics and Telematics from the University of Seville





# 04

## Structure and Content

This Postgraduate Certificate has a syllabus composed of multimedia teaching material (video summaries, specialized readings, and simulations of real cases) to which the IT professional will have full access from the first day. With this extensive content, the students will delve into the main trajectory problems in mobile robots, planning in high dimensional robots, robot coordination, planning by decision and reinforcement learning. The Relearning learning system applied by TECH in all its programs will favor a more natural and progressive learning process.



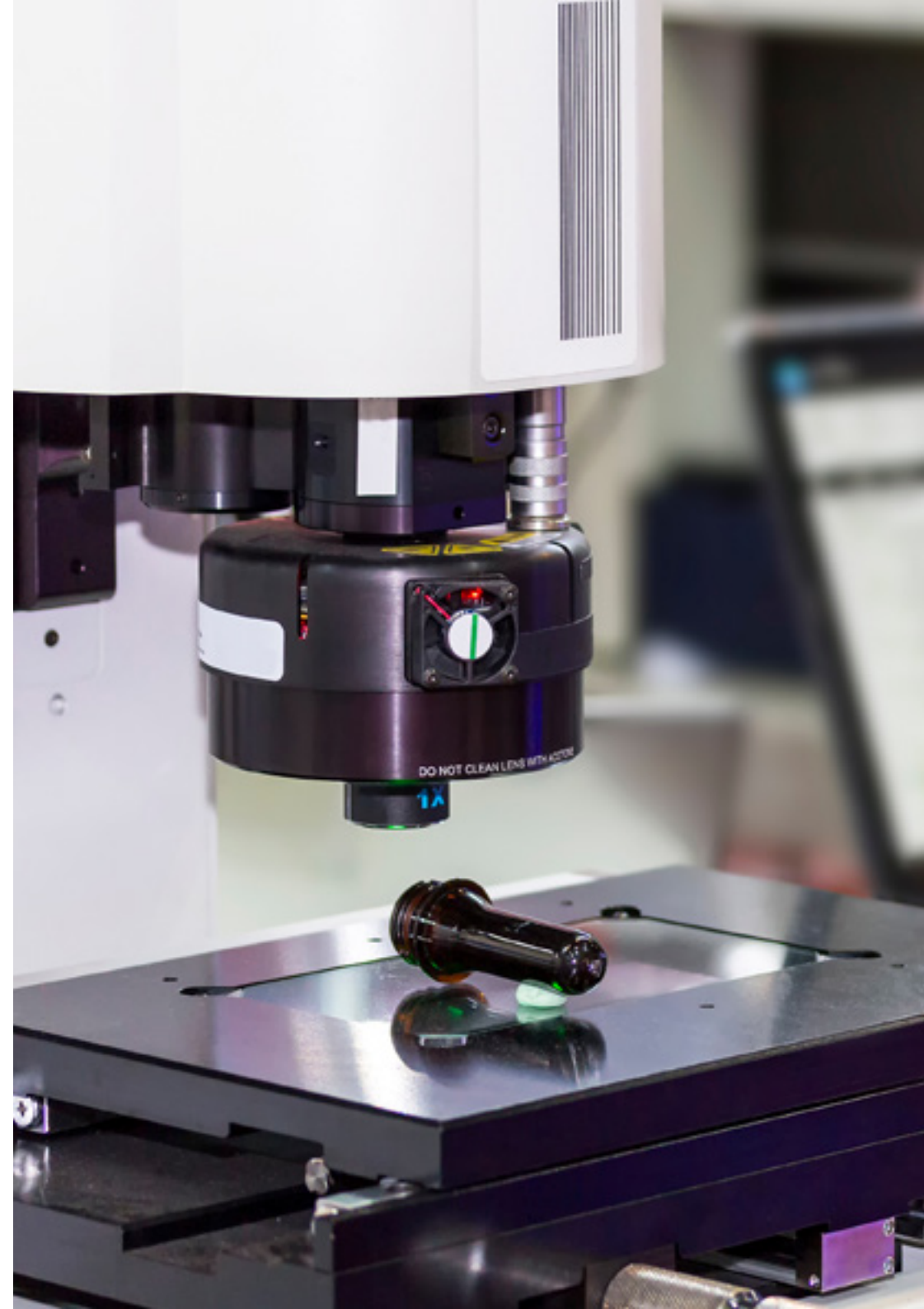


“

*This Postgraduate Certificate will allow you to plan High Dimensional Robotic Systems and to face real problems that you will have to solve”*

## Module 1. Planning Algorithms in Robots

- 1.1. Classical Planning Algorithms
  - 1.1.1. Discrete Planning: State Space
  - 1.1.2. Planning Problems in Robotics: Robotic Systems Models
  - 1.1.3. Classification of Planners
- 1.2. The Trajectory Planning Problem in Mobile Robots
  - 1.2.1. Forms of Environment Representation: Graphs
  - 1.2.2. Search Algorithms in Graphs
  - 1.2.3. Introduction of Costs in Networks
  - 1.2.4. Search Algorithms in Heavy Networks
  - 1.2.5. Algorithms with any Angle Approach
- 1.3. Planning in High Dimensional Robotic Systems
  - 1.3.1. High Dimensionality Robotics Problems: Manipulators
  - 1.3.2. Direct/Inverse Kinematic Model
  - 1.3.3. Sampling Planning Algorithms PRM and RRT
  - 1.3.4. Planning Under Dynamic Constraints
- 1.4. Optimal Sampling Planning
  - 1.4.1. Problem of Sampling-Based Planners
  - 1.4.2. RRT\* Probabilistic Optimality Concept
  - 1.4.3. Reconnection Step: Dynamic Constraints
  - 1.4.4. CForest. Parallelizing Planning
- 1.5. Real Implementation of a Motion Planning System
  - 1.5.1. Global Planning Problem. Dynamic Environments
  - 1.5.2. Cycle of Action, Sensorization. Acquisition of Information from the Environment
  - 1.5.3. Local and Global Planning
- 1.6. Coordination in Multi-Robot Systems I: Centralized System
  - 1.6.1. Multirobot Coordination Problem
  - 1.6.2. Collision Detection and Resolution: Trajectory Modification with Genetic Algorithms
  - 1.6.3. Other Bio-Inspired Algorithms: Particle Swarm and Fireworks
  - 1.6.4. Collision Avoidance by Choice of Maneuver Algorithm



- 1.7. Coordination in Multi-Robot Systems II: Distributed Approaches I
  - 1.7.1. Use of Complex Objective Functions
  - 1.7.2. Pareto Front
  - 1.7.3. Multi-Objective Evolutionary Algorithms
- 1.8. Coordination in Multirobot Systems III: Distributed Approaches II
  - 1.8.1. Order 1 Planning Systems
  - 1.8.2. ORCA Algorithm
  - 1.8.3. Addition of Kinematic and Dynamic Constraints in ORCA
- 1.9. Decision Planning Theory
  - 1.9.1. Decision Theory
  - 1.9.2. Sequential Decision Systems
  - 1.9.3. Sensors and Information Spaces
  - 1.9.4. Planning for Uncertainty in Sensing and Actuation
- 1.10. Reinforcement Learning Planning Systems
  - 1.10.1. Obtaining the Expected Reward of a System
  - 1.10.2. Mean Reward Learning Techniques
  - 1.10.3. Inverse Reinforcement Learning



*Enroll now and access a university program that will allow you to take a step further into the Robotics industry"*



# 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.

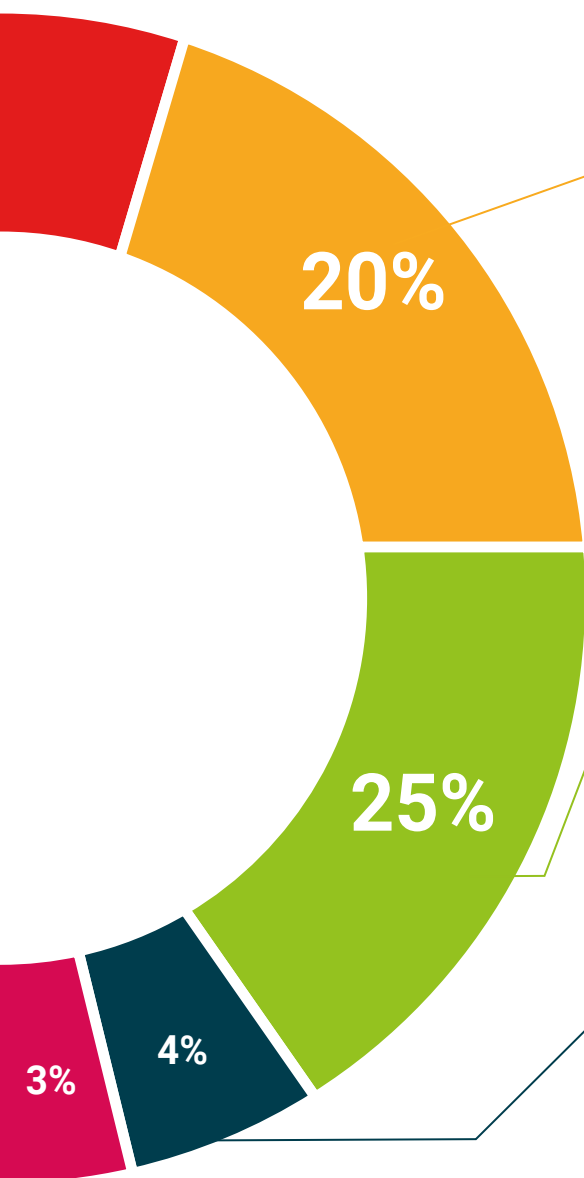


#### Additional Reading

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 of Robot Planning Algorithms guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



“

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

This **Postgraduate Certificate in Robot Planning Algorithms** 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 Robot Planning Algorithms**

Official N° of Hours: **150 h.**





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



## Postgraduate Certificate Robot Planning Algorithms

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

# Postgraduate Certificate Robot Planning Algorithms

