

Postgraduate Certificate

Artificial Intelligence in Clinical Microbiology and Infectious Diseases





Postgraduate Certificate

Artificial Intelligence in Clinical Microbiology and Infectious Diseases

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

Website: www.techtute.com/us/medicine/postgraduate-certificate/artificial-intelligence-clinical-microbiology-infectious-diseases

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01

Introduction

Clinical microbiology faces unprecedented challenges due to the rise of infectious diseases and increasing antimicrobial resistance. In this regard, the ability to rapidly diagnose infections is crucial for effective treatment and outbreak management. In this situation, Artificial Intelligence emerges as a powerful tool to address these challenges. In this regard, the World Health Organization reveals that infectious diseases are responsible for more than 17 million deaths per year, many of which could be prevented with faster diagnostics. In this context, it is crucial for physicians to handle these technological tools to address infectious diseases. For this reason, TECH is launching a cutting-edge online program focused on this area.



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*Through this 100% online
Postgraduate Certificate, you will use
Artificial Intelligence to prevent and
control infections in clinical settings"*

The rapid identification of pathogens and the selection of appropriate treatments are fundamental pillars in the fight against infectious diseases. With the rise of antimicrobial resistance, these tasks have become increasingly complex. Artificial Intelligence has become an effective tool to address these problems, enabling more accurate identification of pathogens and their resistance profiles. Faced with this reality, practitioners need to acquire advanced skills to get the most out of tools such as Big Data, Machine Learning or Deep Learning.

Faced with this, TECH implements a pioneering Postgraduate Certificate in Artificial Intelligence in Clinical Microbiology and Infectious Diseases. Conceived by specialists in this field, the academic itinerary will delve into the emerging areas interrelated with this technology, among which data science and Big Data stand out. In this sense, the agenda will analyze how Machine Learning tools can be used to improve epidemiological surveillance and develop antimicrobial therapies that improve the quality of life of patients. In addition, the program will include a disruptive topic on the future of Artificial Intelligence in Microbiology and will encourage graduates to offer innovative solutions.

On the other hand, this program is based entirely on a 100% online modality, making it easy for physicians to plan their own study schedules to experience a fully efficient catch-up. In addition, professionals will enjoy a wide variety of multimedia resources designed to promote dynamic and natural teaching. To access the Virtual Campus, all professionals will need is a device with Internet access (including their own cell phone). They will also be supported at all times by an experienced teaching staff, who will resolve all the doubts that may arise during their academic itinerary.

This **Postgraduate Certificate in Artificial Intelligence in Clinical Microbiology and Infectious Diseases** contains the most complete and up-to-date scientific program on the market. The most important features include:

- ♦ The development of practical case studies presented by experts in Microbiology, Medicine and Parasitology.
- ♦ The graphic, schematic and eminently practical contents with which it is conceived gather scientific and practical information on those disciplines that are indispensable for professional practice
- ♦ Practical exercises where the self-assessment process can be carried out 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



Download all the contents of this Postgraduate Certificate, such as specialized readings and multimedia material, even after you have completed the program"

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*You will learn about the various treatment options to combat *Streptococcus pneumoniae* and optimize the well-being of your patients"*

The program's teaching staff includes professionals from the sector who contribute their work experience to this specializing 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 course. For this purpose, students will be assisted by an innovative interactive video system created by renowned and experienced experts.

Do you want to handle the most advanced predictive models of antimicrobial resistance evolution? Achieve it with this qualification.

Through TECH's Relearning methodology, you will be able to study all the contents of this program from the comfort of your own home and without the need to travel to a learning center.



02 Objectives

Thanks to this Postgraduate Certificate, doctors will have a solid understanding of the clinical applications of Artificial Intelligence in Clinical Microbiology and Infectious Diseases. Graduates will also develop advanced competences to individualize treatments based on clinical and microbiological data analysis. In line with this, professionals will master emerging technologies such as Big Data, Machine Learning or Deep Learning and use them to obtain more accurate diagnoses of infectious conditions.





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You will effectively manage Artificial Intelligence tools to improve accuracy and speed in the diagnosis of infectious diseases”



General Objectives

- ♦ Understand how bacterial resistance evolves as new antibiotics are introduced into clinical practice
- ♦ Understand the colonization and infection of patients in Intensive Care Units (ICUs), the different types and risk factors associated with infection
- ♦ Evaluate the impact of Nosocomial Infections on the critically ill patient, including the importance of risk factors and their impact on length of stay in the ICU
- ♦ Analyze the effectiveness of infection prevention strategies, including the use of quality indicators, evaluation tools and continuous improvement tools
- ♦ Understand the pathogenesis of Gram-negative Infections, including the factors related to these bacteria and patients themselves
- ♦ Examine the main infections by Gram Positive Bacteria, including their natural habitat, Nosocomial Infections and community-acquired infections
- ♦ Determine the clinical significance, resistance mechanisms and treatment options for different Gram-positive Bacteria
- ♦ Substantiate the importance of Proteomics and Genomics in the Microbiology laboratory including recent advances and technical and bioinformatics challenges
- ♦ Acquire knowledge on the dissemination of resistant bacteria in food production
- ♦ Study the presence of multidrug-resistant bacteria in the environment and wildlife, as well as to understand their potential impact on public health
- ♦ Acquire expertise on innovative antimicrobial molecules, including antimicrobial peptides and bacteriocins, bacteriophage enzymes and nanoparticles
- ♦ Develop expertise in the discovery methods for new antimicrobial molecules
- ♦ Gain specialized knowledge on Artificial Intelligence (AI) in Microbiology, including current expectations, emerging areas and its cross-cutting nature
- ♦ Understand the role that AI will play in Clinical Microbiology, including the technical lines and challenges for its implementation and deployment in laboratories



Specific Objectives

- Analyze the fundamentals of AI in Microbiology, including its history and evolution, technologies that can be used in Microbiology and research objectives
- Include AI algorithms and models for protein structure prediction, identification and understanding of resistance mechanisms, and analysis of genomic Big Data
- Apply AI in machine learning techniques for bacterial identification and its practical implementation in clinical and Microbiology research laboratories
- Explore synergy strategies with AI between Microbiology and Public Health, including infectious outbreak management, epidemiological surveillance, and personalized treatments

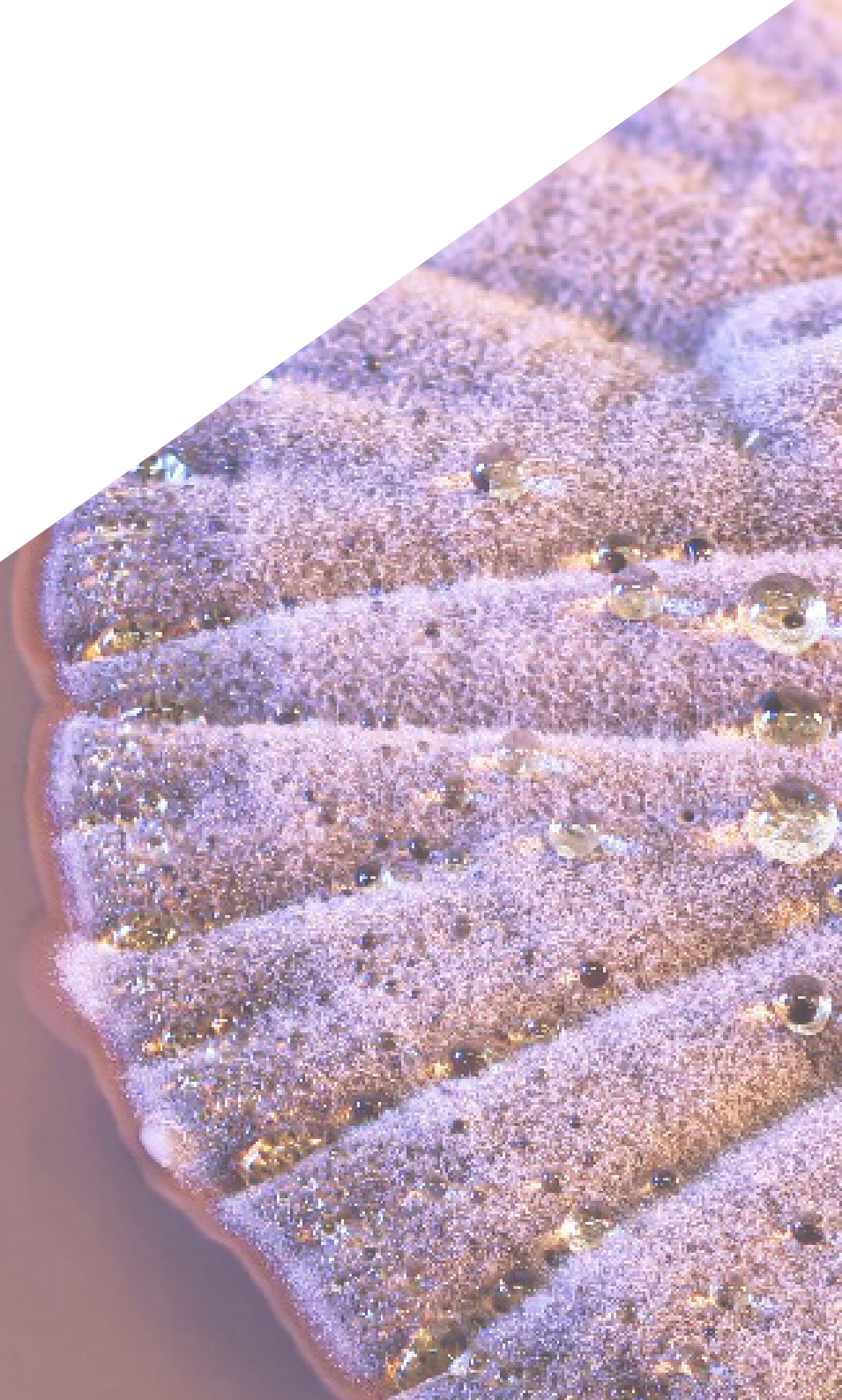


Clinical videos and case studies will bring you much closer to the methodologies used in Bacterial Genome Sequencing"

03

Course Management

In line with its philosophy of offering the most complete university programs, TECH carries out a rigorous process to constitute its teaching staff. For this Postgraduate Certificate, it has acquired the services of authentic references in the field of Artificial Intelligence in Clinical Microbiology and Infectious Diseases. In this way, they have created multiple didactic contents that stand out both for their high quality and for their adaptation to the demands of the current labor market. Undoubtedly, an immersive experience that will allow doctors to optimize their practice.



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You will have access to a syllabus designed by a reputable teaching staff, specialized in Artificial Intelligence in Clinical Microbiology and Infectious Diseases"

Management



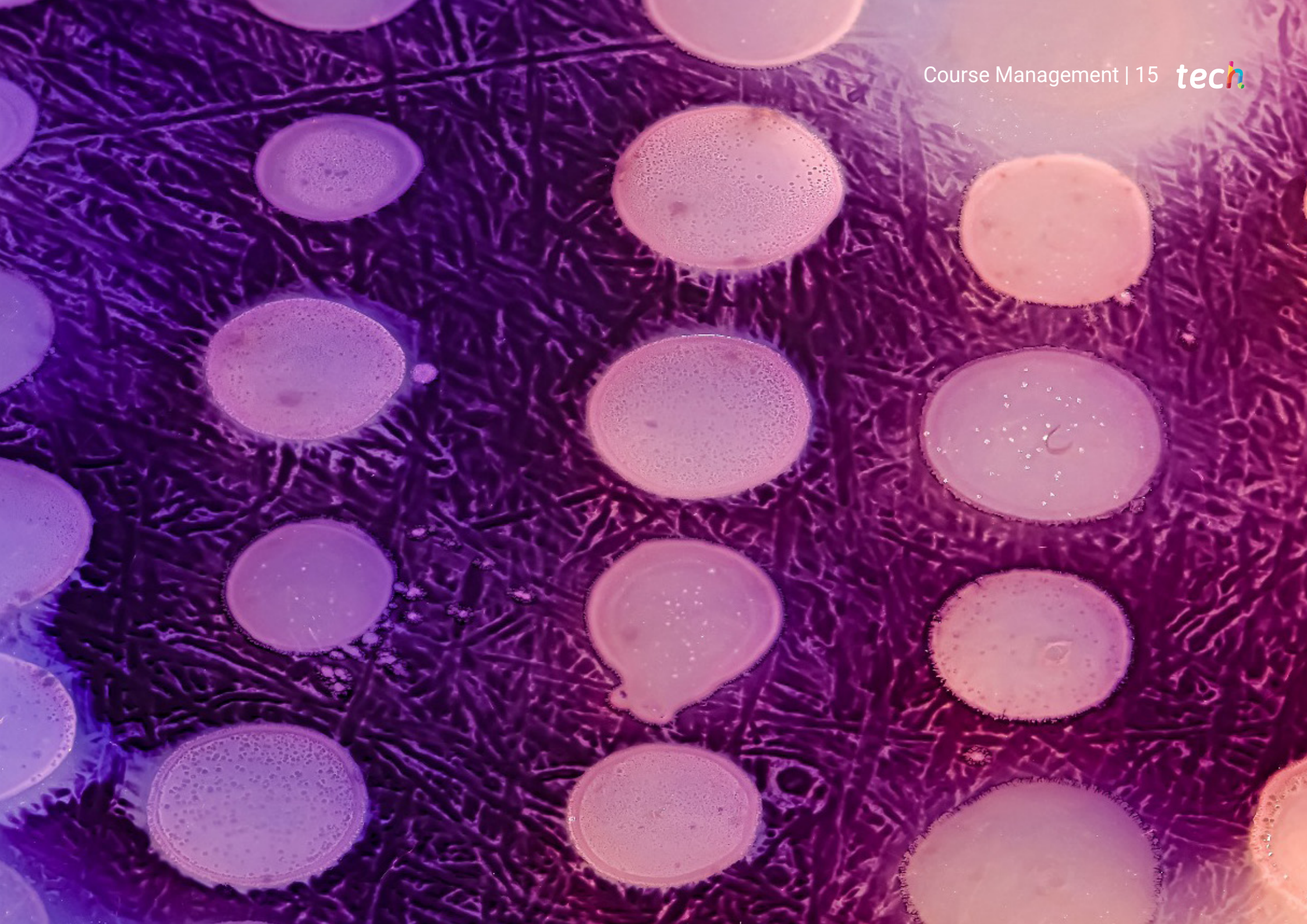
Dr. Ramos Vivas, José

- Director of the Banco Santander-Universidad Europea del Atlántico Chair in Innovation
- Researcher at the Center for Innovation and Technology of Cantabria (CITICAN)
- Academic of Microbiology and Parasitology at the European University of the Atlantic
- Founder and former director of the Cellular Microbiology Laboratory of the Valdecilla Research Institute (IDIVAL)
- PhD in Biology from the University of León
- Doctor in Sciences from the University of Las Palmas de Gran Canaria
- Degree in Biology from the University of Santiago de Compostela
- Master's Degree in Molecular Biology and Biomedicine from the University of Cantabria
- Member of: CIBERINFEC (MICINN-ISCIII), Member of the Spanish Society of Microbiology and Member of the Spanish Network of Research in Infectious Pathology

Professors

Dr. Breñosa Martínez, José Manuel

- Project Manager at the Cantabria Centre for Industrial Research and Technology (CITICAN)
- Academic of Artificial Intelligence at the European University of the Atlantic (UNEAT), Cantabria
- Programmer and Simulation Developer at Ingemotions, Cantabria
- Researcher at the Centre for Automation and Robotics (CAR: UPM-CSIC), Madrid
- PhD in Automatics and Robotics at the Polytechnic University of Madrid
- Master's Degree in Automatics and Robotics at the Polytechnic University of Madrid
- Degree in Industrial Engineering at the Polytechnic University of Madrid



04

Structure and Content

Thanks to this Postgraduate Certificate, doctors will have a comprehensive knowledge of the applications of Artificial Intelligence in Clinical Microbiology. To this end, the syllabus will explore the advantages of tools such as Machine Learning, Deep Learning and Big Data for the treatment of infectious pathologies. In addition, the program will delve into how algorithms can be used to predict protein structures and understand resistance mechanisms. In line with this, the program will provide graduates with the most innovative Machine Learning strategies to manage infectious outbreaks and develop individualized treatments.





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You will be able to use Artificial Intelligence to personalize and optimize treatments for infectious diseases"

Module 1. Artificial Intelligence in Clinical Microbiology and Infectious Diseases

- 1.1. Artificial Intelligence (AI) in Clinical Microbiology and Infectious Diseases
 - 1.1.1. Current Expectation of AI in Clinical Microbiology
 - 1.1.2. Emerging Areas Interrelated to AI
 - 1.1.3. Transversality of AI
- 1.2. Artificial Intelligence (AI) Techniques and other Complementary Technologies applied to Clinical Microbiology and Infectious Diseases
 - 1.2.1. AI Logic and Models
 - 1.2.2. Technologies for AI
 - 1.2.2.1. *Machine Learning*
 - 1.2.2.2. *Deep Learning*
 - 1.2.2.3. Data Science and Big Data
- 1.3. Artificial Intelligence (AI) in Microbiology
 - 1.3.1. AI in Microbiology: History and Evolution
 - 1.3.2. AI Technologies that can be Used in Microbiology
 - 1.3.3. Research Objectives of AI in Microbiology
 - 1.3.3.1. Understanding Bacterial Diversity
 - 1.3.3.2. Exploring Bacterial Physiology
 - 1.3.3.3. Investigation of Bacterial Pathogenicity
 - 1.3.3.4. Epidemiological Monitoring
 - 1.3.3.5. Development of Antimicrobial Therapies
 - 1.3.3.6. Microbiology in Industry and Biotechnology
- 1.4. Classification and Identification of Bacteria using Artificial Intelligence (AI)
 - 1.4.1. Machine Learning Techniques for Bacterial Identification
 - 1.4.2. Taxonomy of Multi-Resistant Bacteria using AI
 - 1.4.3. Practical Implementation of AI in Clinical and Research Laboratories in Microbiology
- 1.5. Bacterial Protein Decoding
 - 1.5.1. AI Algorithms and Models for Protein Structure Prediction
 - 1.5.2. Applications in the Identification and Understanding of Resistance Mechanisms
 - 1.5.3. Practical Application AlphaFold and Rosetta





- 1.6. Decoding the Genome of Multi-Resistant Bacteria
 - 1.6.1. Identification of Resistance Genes
 - 1.6.2. Genomic Big Data Analysis: AI-Assisted Sequencing of Bacterial Genomes
 - 1.6.3. Practical Application Identification of Resistance Genes
- 1.7. Artificial Intelligence (AI) Strategies in Microbiology and Public Health
 - 1.7.1. Infectious Outbreak Management
 - 1.7.2. Epidemiological Monitoring
 - 1.7.3. AI for Personalized Treatments
- 1.8. Artificial Intelligence (AI) to Combat Antibiotic Resistance in Bacteria
 - 1.8.1. Optimizing Antibiotic Use
 - 1.8.2. Predictive Models for the Evolution of Antimicrobial Resistance
 - 1.8.3. Targeted Therapy Based on Development of New Antibiotics by IA
- 1.9. Future of Artificial Intelligence in Microbiology
 - 1.9.1. Synergies between Microbiology and IA
 - 1.9.2. Lines of AI Implementation in Microbiology
 - 1.9.3. Long-Term Vision of the Impact of AI in the Fight against Multi-Drug Resistant Bacteria
- 1.10. Technical and Ethical Challenges in the Implementation of Artificial Intelligence (AI) in Microbiology
 - 1.10.1. Legal Considerations
 - 1.10.2. Ethical and Liability Considerations
 - 1.10.3. Barriers to AI Implementation
 - 1.10.3.1. Technical Barriers
 - 1.10.3.2. Social Barriers
 - 1.10.3.3. Economic Barriers
 - 1.10.3.4. Cybersecurity

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.



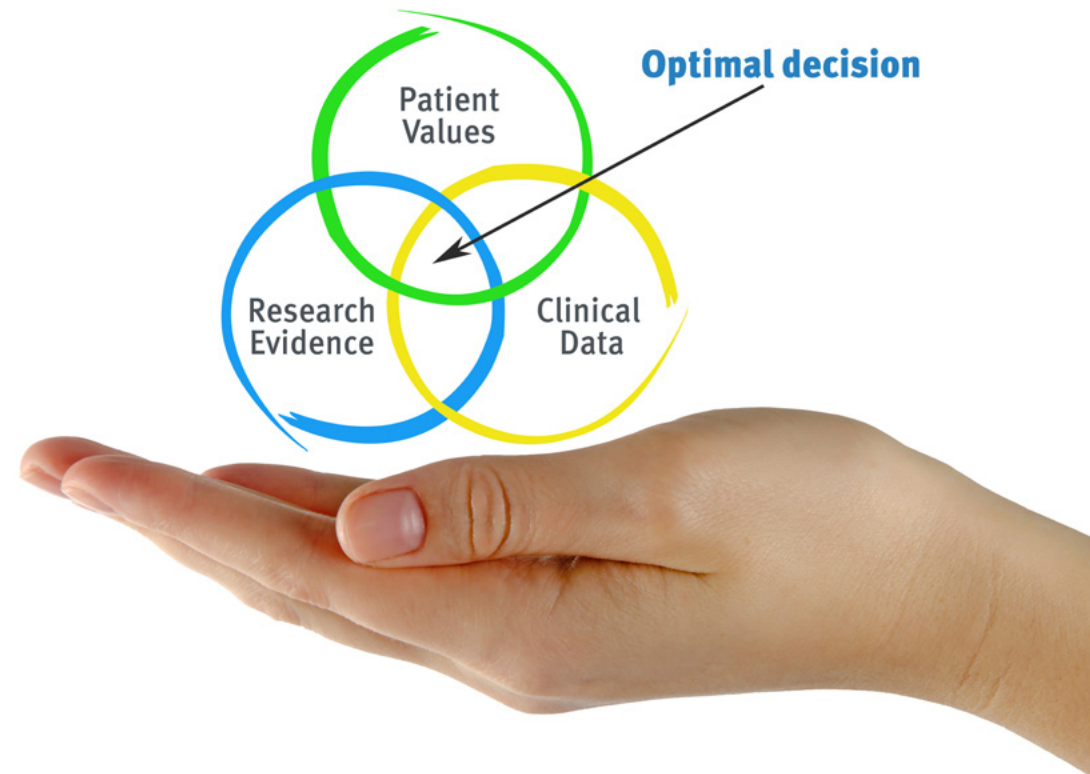
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Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

At TECH we use the Case Method

What should a professional do in a given situation? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Specialists learn better, faster, and more sustainably over time.

With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.



According to Dr. Gervas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, trying to recreate the real conditions in the physician's professional practice.

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Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method”

The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.



Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.

Professionals will learn through real cases and by resolving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology, more than 250,000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

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

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.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.



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.



Surgical Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current medical techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch the videos as many times as you like.



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.

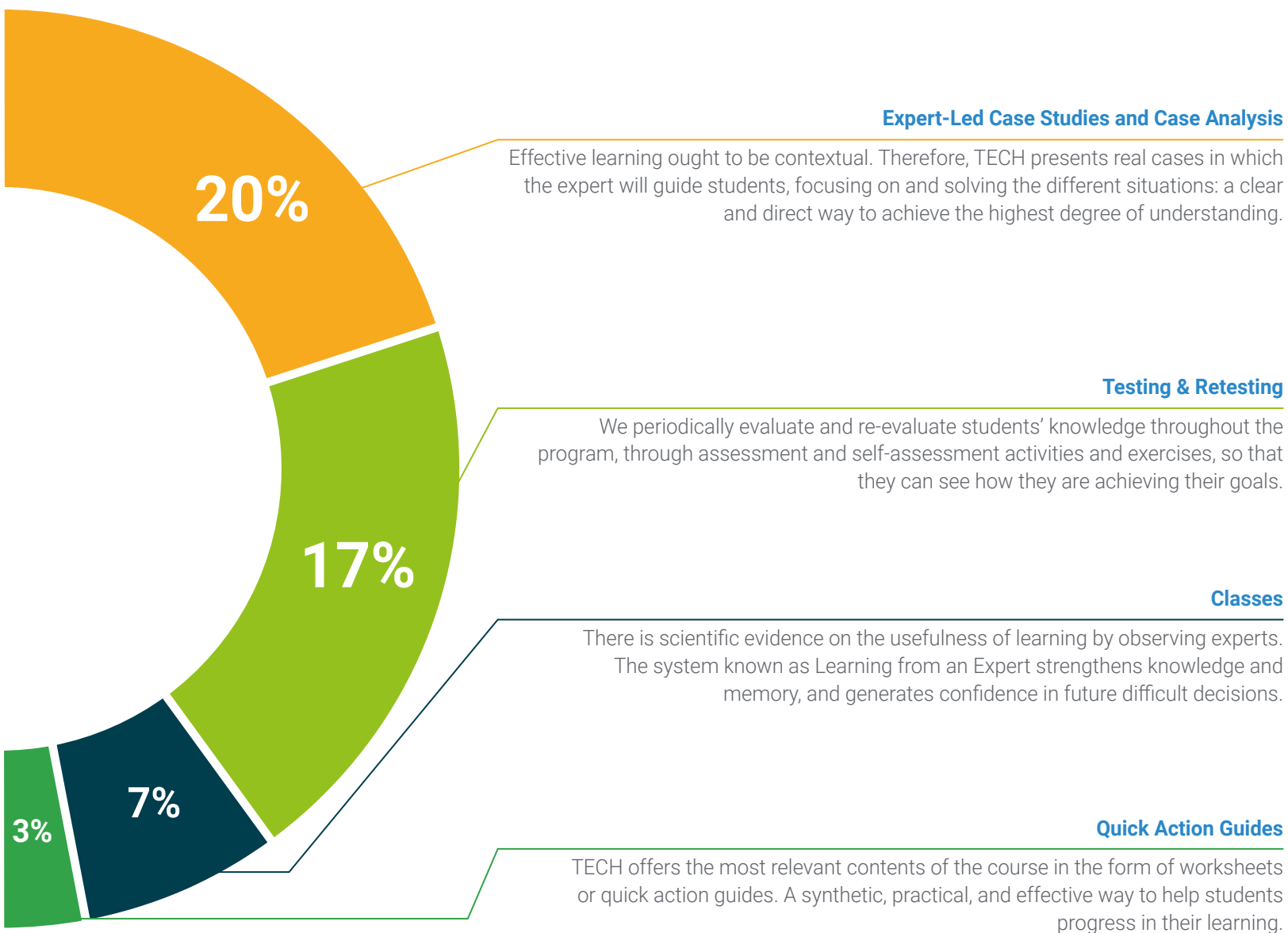
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



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.





06 Certificate

The Postgraduate Certificate in Artificial Intelligence in Clinical Microbiology and Infectious Diseases guarantees, in addition to the most rigorous and updated knowledge, access to a Postgraduate Certificate issued by TECH Global University.



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

This private qualification will allow you to obtain a **Postgraduate Certificate in Artificial Intelligence in Clinical Microbiology and Infectious Diseases** 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** private qualification, 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.

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Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**





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