

# Postgraduate Diploma Environmental Microbiology and Epidemiology





## Postgraduate Diploma Environmental Microbiology and Epidemiology

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 18 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-environmentak-microbilogy-epidemiology](http://www.techtute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-environmentak-microbilogy-epidemiology)

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# 01

# Introduction

Numerous scientific literature, which delves into the impact of atmospheric pollution on health, shows an increase in mortality due to respiratory and cardiac problems, as well as an increase in hospitalizations for this cause. The effects of pollutants on the environment and human beings are analyzed through different models that need to be further developed in order to measure the real effects and risks on people's physical well-being. This is why this institution has designed this 100% online program that focuses on Environmental Epidemiology, the measures established to prevent diseases or the simulation of processes, where the contribution of the environmental engineer is essential. The multimedia didactic resources, as well as the case studies that students will have access to 24 hours a day, will be key to successful learning.





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*In only 6 months you will get the specialization  
in Microbiology and Environmental Epidemiology  
you need to advance in your professional career”*

Scientific studies warning of the dangers of pollutants and waste in the environment have raised public awareness and have also prompted new lines of research. These focus on the search for more precise methodologies for risk assessment methods and environmental remediation strategies in the face of contaminant occurrence.

In this field, engineering professionals are able to provide technical and multidisciplinary knowledge that enables them to find effective solutions to problems that affect people's health. This has led, for example, to the use of microorganisms in the treatment of water supply, wastewater or in biomining. Progress in Microbiology and Environmental Epidemiology that graduates who wish to advance in their professional careers in this field should be aware of.

For this reason, TECH has developed this Postgraduate Diploma, where students will be able to delve into the basics of microbial diversity and its importance in the biosphere, the use of microorganisms in the recovery of minerals and energy or their use for the production of fuel and biomass over a period of 6 months. Furthermore, through multimedia teaching resources, engineers will be able to delve into the sources of pollution found in ecosystems or the modeling of environmental systems.

The practical case studies provided by specialists in the field will serve to bring students closer to situations that can be of direct application in their professional performance and that, therefore, will allow them to advance in the field of engineering.

Graduates have an excellent opportunity to study a university degree taught exclusively online, which they can access easily, whenever and wherever they wish. All they need is an electronic device (computer, tablet or cell phone) with Internet connection to view the syllabus anytime. Moreover, the Relearning system, used by TECH in all its training program, students will be able you to advance in a from this Postgraduate Diploma way, reducing even the hours of study so frequent in other methodologies.

This **Postgraduate Diploma in Environmental Microbiology and Epidemiology** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of case studies presented by experts of Environmental 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



*It stands out in a sector that increasingly calls for more professionals qualified in environmental epidemiology”*

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*Advance your career with a university degree that dynamically introduces you to the application of microorganisms in environmental and industrial processes”*

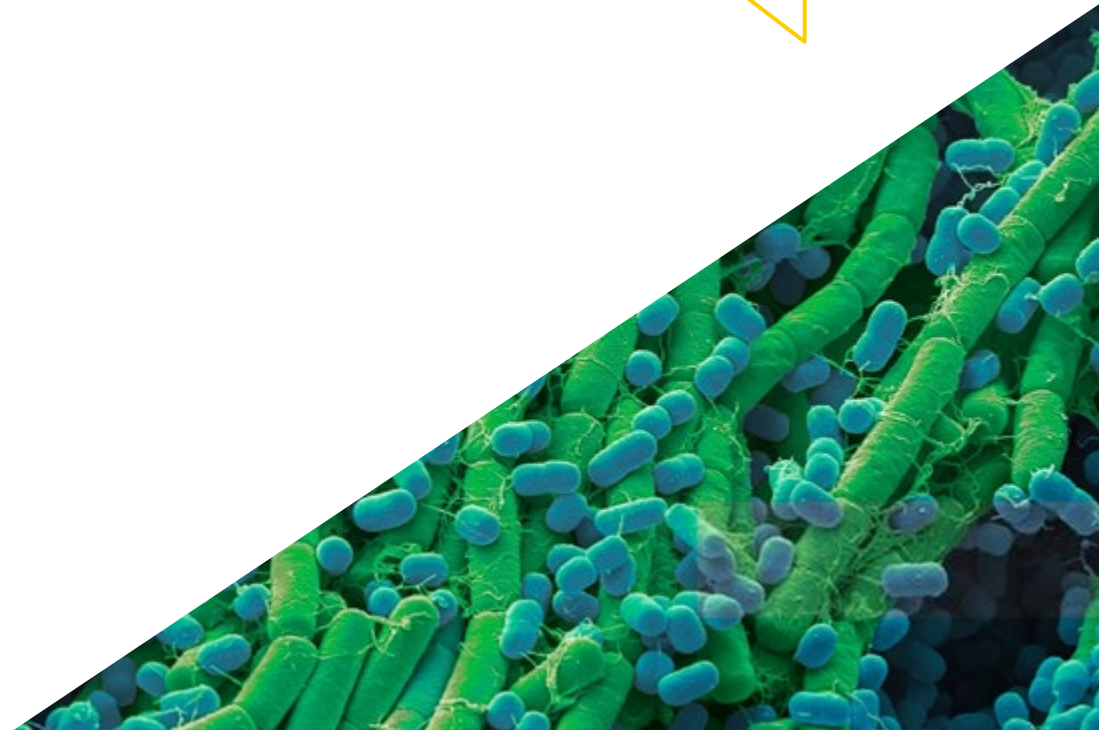
The program's teaching staff includes professionals from the sector who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will allow professionals to learn in a contextual and situated learning environment, i.e., a simulated environment that will provide immersive education programmed to prepare in real situations.

The design of this program focuses on Problem-Based Learning, by means of which professionals must try to solve the different professional practice situations that are presented to them throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

*The learning resources library is available to you, 24 hours a day, 7 days a week. Enroll now.*

*Learn about important advances in biomass, water treatment using microorganisms or biomining.*



# 02

# Objectives

During 450 teaching hours, engineering professionals who take this degree will obtain the most advanced and comprehensive knowledge on Environmental Microbiology and Epidemiology. This way, upon completion of this program, they will be able to determine the different sources of contamination, identify the different methods of risk assessment or the use of mathematical models in environmental sciences. For this purpose, they will be provided with video summaries, detailed videos and interactive diagrams, which will be very useful to achieve a specialization that will allow them to progress in their professional field.





“

*TECH adapts to you and that is why it has designed an online Postgraduate Diploma, where you will be able to distribute the course load according to your needs. Enroll now”*



## General Objectives

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- ◆ Explain potential problems in building and validating models and sensitivity analyses
- ◆ Differentiate the sources of pollution found in ecosystems, both natural and anthropogenic, and toxin mobility between the different compartments of ecosystems
- ◆ Know the main methods used in risk assessment and environmental remediation strategies that have been developed to counteract the effect of pollutants
- ◆ Understand both intrinsic and extrinsic factors that affect compound toxicity and organism response to it



*This program will allow you to deepen your knowledge of the action of different toxicants at the molecular or cellular level"*





## Specific Objectives

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### Module 1. Environmental Microbiology

- ◆ Identify and understand the basis of microbial diversity and its role in the biosphere
- ◆ Know and understand the physiological state of microorganisms in the environment and the dynamics of microbial communities
- ◆ Understand modern techniques to estimate and interpret microbial biodiversity, and assess their potential application in environmental and industrial processes
- ◆ Analyze the importance of using microorganisms to solve environmental problems: water supply treatment, wastewater treatment and biomining techniques

### Module 2. Environmental Epidemiology and Public Health

- ◆ Understand the processes toxins undergo upon entering a living organism and the response mechanisms that are activated to counteract their impact
- ◆ Know the different methods used to assess toxicity and the requirements that validate them
- ◆ Understand the mechanisms of toxicity at a cellular level
- ◆ Learn the toxic effects on different organs and systems of living beings
- ◆ Identify the mode of action of different types of toxins at the molecular, cellular and systemic levels

### Module 3. Modeling Environmental Systems

- ◆ Describe the concept of model and study the use of mathematical models in environmental sciences
- ◆ Understand the difference between discrete and continuous models
- ◆ Distinguish between spatially homogeneous and heterogeneous models
- ◆ Study the mathematical expression of some general behaviors
- ◆ Know how to verify and validate a model by comparison with experimental data



# 03

## Structure and Content

The syllabus of this university degree has been designed with the objective of offering students the most recent scientific evidence on environmental microbiology and the latest advances in epidemiology. For this reason, the syllabus of this degree has been divided into three different modules that will take you deeper into these fields, as well as into the modeling of environmental systems and their application in engineering. All of this, in addition to innovative content that can be accessed at any time of the day, comfortably from a computer or Tablet with internet connection.





“

*The multimedia resources will take you into the Generalized Linear Models in the environment or the working method: DaisyWorld”*



## Module 1. Environmental Microbiology

- 1.1. History of Microbiology
  - 1.1.1. History of Microbiology
  - 1.1.2. Development of Axenic Culture
  - 1.1.3. Relation between Microbiology and Environmental Sciences
- 1.2. Methods to Study Microorganisms
  - 1.2.1. Microscopy and Microscopy
  - 1.2.2. Grams Stain
  - 1.2.3. Microorganism Cultures
- 1.3. Microbial Cell Structure
  - 1.3.1. Bacteria
  - 1.3.2. Protozoa
  - 1.3.3. Fungi
- 1.4. Microbial Growth and Environmental Factors
  - 1.4.1. Microbial Evolution
  - 1.4.2. Genetic Evolutionary Basis
  - 1.4.3. Biodiversity Evolution
  - 1.4.4. Microbial Diversity
- 1.5. Microbial Metabolism
  - 1.5.1. Catabolism
  - 1.5.2. Anabolism
  - 1.5.3. Biosynthetic Pathways
- 1.6. Microbial Communities and Ecosystems
  - 1.6.1. Microbial Community Dynamics
  - 1.6.2. Microbial Community StructuresMicrobial Community BORRAR
  - 1.6.3. Ecosystems



- 1.7. Quantitative Ecology: Number, Biomass and Activity
  - 1.7.1. Sample Collection
  - 1.7.2. Processing Samples
  - 1.7.3. Hydro-Ecosphere
  - 1.7.4. Litho-Ecosphere
- 1.8. Biogeochemical Cycles and Microbiology
  - 1.8.1. Carbon Cycle
  - 1.8.2. Hydrogen Cycle
  - 1.8.3. Oxygen Cycle
  - 1.8.4. Nitrogen Cycle
  - 1.8.5. Sulfur Cycle
  - 1.8.6. Phosphorus Cycle
  - 1.8.7. Iron Cycle
  - 1.8.8. Other Cycles
- 1.9. Virology
  - 1.9.1. General Characteristics of Viruses
  - 1.9.2. Herpes Virus
  - 1.9.3. Hepatitis Virus
  - 1.9.4. Immunodeficiency Virus
- 1.10. Microorganisms and the Environment
  - 1.10.1. Microorganisms in Mineral and Energy Recovery and Fuel and Biomass Production
  - 1.10.2. Microbial Pest and Disease-Causing Population Control
  - 1.10.3. Ecological Aspects of Biodeterioration Control and Soil, Waste and Water Management

## Module 2. Environmental Epidemiology and Public Health

- 2.1. General Concepts and Epidemiokinetics
  - 2.1.1. Introduction to Epidemiology and Toxicology
  - 2.1.2. Toxin Action Mechanisms
  - 2.1.3. Toxin Entrance Routes
- 2.2. Toxicity Assessment
  - 2.2.1. Types of Tests and Parameters for Toxicity Assessment
  - 2.2.2. Toxicity Assessment in Medicines
  - 2.2.3. Hormetins
- 2.3. Factors that Affect Toxicity
  - 2.3.1. Physical Parameters
  - 2.3.2. Chemical Parameters
  - 2.3.3. Biological Parameters
- 2.4. Toxicity Mechanisms
  - 2.4.1. Mechanisms at the Cellular and Molecular Levels
  - 2.4.2. Damage at the Cellular Level
  - 2.4.3. Survivability
- 2.5. Toxicity without Organotropism
  - 2.5.1. Simultaneous Toxicity
  - 2.5.2. Genotoxicity
  - 2.5.3. Impact of Toxicity on Organisms and Ecosystems
- 2.6. Pollution and Public Health
  - 2.6.1. Pollution Problems
  - 2.6.2. Public Health Issues Related to Pollution
  - 2.6.3. Health Effects of Pollution on Human Health
- 2.7. Main Types of Contaminants
  - 2.7.1. Sources of Physical Pollution
  - 2.7.2. Sources of Chemical Pollution
  - 2.7.3. Biological Pollution Sources

- 2.8. Pollutant Entry Routes into Ecosystems
  - 2.8.1. Pollution Entry Processes into the Environment
  - 2.8.2. Sources of Pollution
  - 2.8.3. The Significance of Pollution in the Environment
- 2.9. Pollutant Movement in Ecosystems
  - 2.9.1. Pollutant Distribution Processes and Patterns
  - 2.9.2. Local Pollution
  - 2.9.3. Transboundary Pollution
- 2.10. Risk Assessment and Environmental Remediation Strategies
  - 2.10.1. Remediation
  - 2.10.2. Remediation of Polluted Areas
  - 2.10.3. Future Environmental Problems

## Module 3. Modeling Environmental Systems

- 3.1. Models, Computation and Environment
  - 3.1.1. Introduction to Scale and Complexity Problems
  - 3.1.2. Presenting Alternatives to Computer Modeling and Environmental Simulation Processes
- 3.2. Introduction to R
  - 3.2.1. Program R
  - 3.2.2. R Applications in Modeling
- 3.3. Systems and Systems Analysis
  - 3.3.1. Main Types of Systems Analysis in Environmental Sciences
- 3.4. Models and Modeling
  - 3.4.1. Types of Models
  - 3.4.2. Components
  - 3.4.3. Modeling Phases
- 3.5. Parameter Estimation, Model Validation and Sensitivity Analysis
  - 3.5.1. Estimate
  - 3.5.2. Validation
  - 3.5.3. Sensitivity Analysis

- 3.6. Algorithm and Programming
  - 3.6.1. Flowcharts and Language
  - 3.6.2. Forrester Diagrams
- 3.7. Applications
  - 3.7.1. Formulating and Implementing Simple Models: Surface Radiation
  - 3.7.2. Generalized Linear Models in the Environment
  - 3.7.3. *DaisyWorld*: working method
- 3.8. Mathematical Concepts in Modeling
  - 3.8.1. Random Variables
  - 3.8.2. Probability Models
  - 3.8.3. Regression Models
  - 3.8.4. Models in Differential Equations
- 3.9. Conditions, Iterations and Repeatability
  - 3.9.1. Definition of Concepts
  - 3.9.2. Applying Iterations and Repeatability to Environmental Models
- 3.10. Functions and Recursion
  - 3.10.1. Function Construction to Obtain Reusable Modular Codes
  - 3.10.2. Introducing Recursion as a Programming Technique

“ *This program will give you an in-depth understanding of how contaminant distribution processes and models are developed* ”



04

# 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.



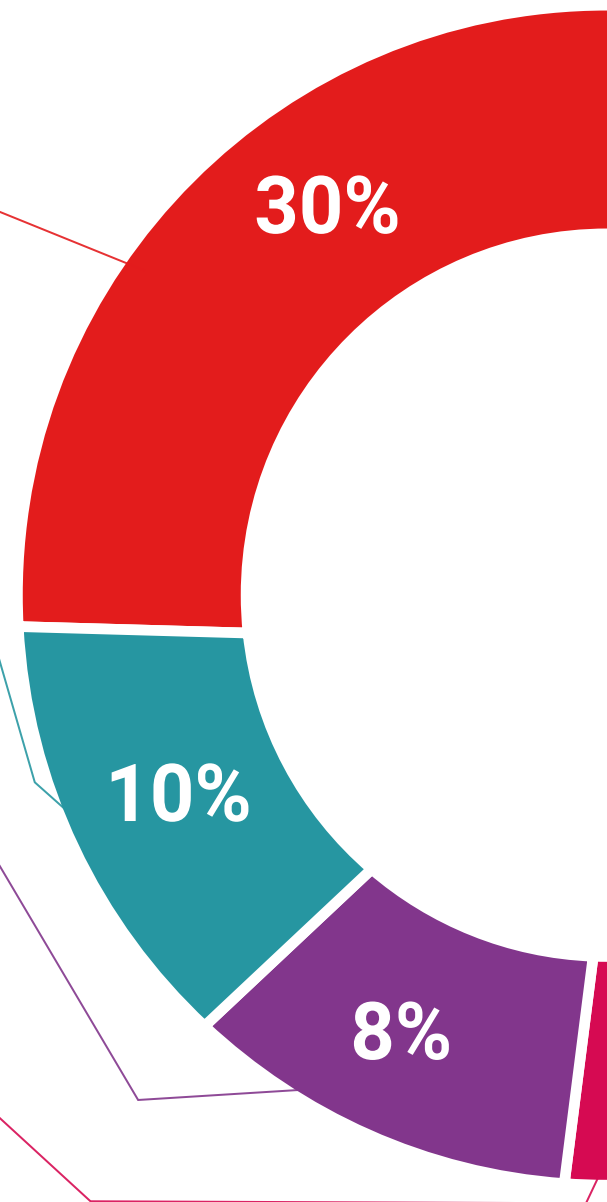
### Practising Skills and Abilities

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.



05

# Certificate

The Postgraduate Diploma in Environmental Microbiology and Epidemiology guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma 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 program will allow you to obtain your **Postgraduate Diploma in Environmental Microbiology and Epidemiology** 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 Diploma in Environmental Microbiology and Epidemiology**

Modality: **online**

Duration: **6 months**

Credits: **18 ECTS**



\*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.



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



**Postgraduate Diploma**  
Environmental Microbiology  
and Epidemiology

- » Modality: **online**
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