

# Postgraduate Certificate

## Fundamentals of Biology and Microbiology in Food Industry



## Postgraduate Certificate Fundamentals of Biology and Microbiology in Food Industry

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/in/nutrition/postgraduate-certificate/fundamentals-biology-microbiology-food-industry](http://www.techtute.com/in/nutrition/postgraduate-certificate/fundamentals-biology-microbiology-food-industry)

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# 01

# Introduction

The area of Fundamentals of Biology and Microbiology in Food Industry addresses the knowledge and tools necessary to understand the biological and microbiological processes involved in food production and preservation. For this reason, it is important for industries to have trained personnel to delve into these fundamentals, which led TECH to design a 100% online program for those interested in acquiring solid and updated knowledge in these areas. The degree allows the professional to understand and apply the basic concepts of Biology and Microbiology in the Food Industry. This program allows students flexibility in organizing their academic resources and is based on the Relearning pedagogical methodology.





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*Become an expert in Food Biology and Microbiology!  
This Postgraduate Certificate program will provide  
you with the skills necessary to understand how  
microorganisms affect food safety and quality”*

Today, the food industry is facing increasing challenges in terms of the safety and quality of its products. Biology and microbiology are essential fields of study for understanding the diversity of organisms present in food and how they can affect human health. That is why it is essential to have professionals trained in Fundamentals of Biology and Microbiology in Food Industry.

The reason for the need for a Postgraduate Certificate in this subject is that the knowledge and skills acquired in this TECH degree allow students to understand the biological and microbiological processes involved in food production and preservation, as well as in the prevention of food-borne diseases. In addition, knowing the different microorganisms that may be present in food and knowing how to control them is essential to ensure the safety and quality of food products.

During the Postgraduate Certificate, students will acquire knowledge about biological and microbiological diversity, population ecology, the role of nutrition in plants, the different types of microorganisms, their growth and control, bacterial genetics and taxonomy, microbiological immunology and epidemiology and prophylaxis of foodborne diseases. In addition, they will learn about the main microorganisms of food interest and their implication in the production and preservation of food.

The program's methodology combines theoretical classes with practical sessions, allowing students to put the acquired knowledge into practice. In addition, at the end of the Postgraduate Certificate program, students will be prepared to apply the concepts and techniques learned in their work environment and contribute to the improvement of food product safety and quality.

This **Postgraduate Certificate in Fundamentals of Biology and Microbiology in Food Industry** contains the most complete and up-to-date scientific program on the market.

The most important features include:

- ◆ The development of case studies presented by nutrition experts focused on the Fundamentals of Biology and Microbiology in Food Industry
- ◆ 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



*With this degree you will learn about biological diversity, microbial control and staining techniques. Sign up now and become a highly skilled professional in the food industry!"*

“

*Don't miss the opportunity to improve your skills and increase your job opportunities in the food industry with the development of this Postgraduate Certificate program”*

*In the course of this degree you will discover the importance of biodiversity in ecosystems and how it affects food production.*

*You will learn to apply the principles of Biology and Microbiology in the Food Industry to improve food quality and safety.*

The program's teaching staff includes professionals from 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. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.



# 02 Objectives

Through the study of the biological and microbiological aspects of food processes, students will be able to develop skills and abilities that will allow them to understand the dynamics of the ecosystems and communities involved in food production and preservation. In addition, the Diploma seeks to foster ethical attitudes in relation to environmental balance, promoting the sustainable use of natural resources and the application of good laboratory practices in the handling and analysis of microorganisms. In this sense, the objective of the program is to provide comprehensive training that allows students to understand and apply concepts in the food industry.





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*During the development of this Postgraduate Certificate you will acquire practical skills in the use of laboratory techniques for the identification of microorganisms in food”*



## General Objectives

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- ◆ Develop ethical attitudes about the environmental balance that should exist in all food production and research processes, through the study of community and ecosystem dynamics
- ◆ Identify and understand Biology as an experimental science through the application of the scientific method
- ◆ Recognize the levels of organization of prokaryotic and eukaryotic microorganisms, as well as relate their main structures to their function
- ◆ Identify the differential nature of acellular organisms (viruses, viroids and prions) in terms of their structure and mode of replication, with respect to eukaryotic and prokaryotic cell models





## Specific Objectives

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- ◆ Broaden your knowledge of cell structure and the differences between prokaryotes and eukaryotes, as well as the differences between animal, plant and fungal cells
  - ◆ Acquire essential knowledge about the main functions of plants in terms of water economy and mineral nutrition, their transport systems, reproductive strategies and their relationship with the environment
  - ◆ Basic knowledge of the main primary and secondary metabolites of interest for Food Science and Technology
  - ◆ To know and apply knowledge about plants on physiological aspects that are useful in food technology, such as gas exchange, respiration, primary and secondary metabolism
  - ◆ Acquire general knowledge of animals of interest for Food Science and Technology, their behavior and fundamentals of their exploitation
  - ◆ Acquire basic knowledge and know how to apply it to population growth and the sustainable exploitation of natural resources
  - ◆ Learn interesting points about plant development and its regulation by hormonal and environmental factors
  - ◆ Understand the basis of microbial pathogenicity and the defense mechanisms of the human body against existing pathogens
  - ◆ Acquire basic knowledge of epidemiology and prophylaxis
  - ◆ Know the main techniques and strategies for the inhibition, destruction or elimination of microbial populations
- ◆ Acquire the basic skills to handle and analyze microorganisms, following the guidelines of good laboratory practices
  - ◆ Acquire and handle the appropriate scientific terminology
  - ◆ Recognize and understand the different types of microbial metabolism and their nutritional requirements, linking it to their development in different types of food
  - ◆ Know and interrelate the main mechanisms of genetic exchange in microorganisms and their application in food biotechnology



*You will learn to identify the different types of microorganisms present in food and how to control their growth to ensure food safety thanks to this qualification”*

# 03

## Structure and Content

The Diploma in Fundamentals of Biology and Microbiology in Food Industry is an academic proposal that comprehensively addresses the study of biological and microbiological aspects related to the production, processing and preservation of food. Its structure is based on a combination of theory and practice, with the objective of offering students a solid and updated training in the area. The content of the program includes topics such as cell structure, genetics, microbial diversity, food microbiology and food safety. In addition, as it is a 100% online program, students can access the content at any time and from anywhere, which facilitates the training process.





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*TECH's pedagogical method, Relearning, will allow you to review and reinforce the knowledge acquired in each module for a more efficient learning”*

## Module 1. Biology Fundamentals

- 1.1. Biological Diversity
  - 1.1.1. Biological Sciences Methodology: origin and history of life
  - 1.1.2. Prokaryotic and Eukaryotic Cells: Origin of Meiosis, Sexual Reproduction, Diploidy and Haploidy
  - 1.1.3. Synthetic Theory of Evolution
    - 1.1.3.1. Macroevolution and Microevolution of the Species
    - 1.1.3.2. Processes of Genetic drift and Morphological Adaptations
  - 1.1.4. Classification of Living Organisms
    - 1.1.4.1. The Division in the Realms: Homology and Analogies
    - 1.1.4.2. Different Taxonomic Classification Systems
- 1.2. Protists and Fungi
  - 1.2.1. General Characteristics of Protists
    - 1.2.1.1. Morphology and Function
    - 1.2.1.2. Protist Ecology
  - 1.2.2. General Characteristics of Fungi
    - 1.2.2.1. Morphology and Function
    - 1.2.2.2. Classification of Fungi
    - 1.2.2.3. Ecology and Fungi
  - 1.2.3. Main Stakeholders in Food Technology
- 1.3. Population Ecology
  - 1.3.1. General Features of Population Ecology
  - 1.3.2. Population Growth and its Regulation
    - 1.3.2.1. R and K Strategies
  - 1.3.3. Types of Growth Curves
  - 1.3.4. Human Population growth
- 1.4. Communities and Ecosystems
  - 1.4.1. Community and Ecosystem Diversity
  - 1.4.2. Ecosystem Disturbances: Natural and Anthropogenic Factors
  - 1.4.3. Biogeochemical Cycles
- 1.5. General Plant Biology
  - 1.5.1. General Plant Characteristics
  - 1.5.2. Plant Metabolism and Nutrition
  - 1.5.3. Characteristics of the Plant Cell
    - 1.5.3.1. Structure and Function
    - 1.5.3.2. Similarities with Animal Cells
  - 1.5.4. Plant Organs and Tissues
    - 1.5.4.1. Root, Stem and Leaf
    - 1.5.4.2. Meristems
- 1.6. Nutritional Function in Plants
  - 1.6.1. Water in the Plant: Water Relationships
  - 1.6.2. Concept of Water Potential
  - 1.6.3. Adaptations to the Conquest of the Terrestrial Environment
  - 1.6.4. Absorption of Water and Nutrients
    - 1.6.4.1. Xylem Transport
    - 1.6.4.2. Phloem Transport
- 1.7. Photosynthetic Apparatus
  - 1.7.1. Photosynthesis Process
    - 1.7.1.1. Light phase
    - 1.7.1.2. Dark Phase
  - 1.7.2. Energy Capture and Transduction
  - 1.7.3. Fixation and Absorption of CO<sub>2</sub>
  - 1.7.4. C<sub>3</sub> Plants and Photorespiration
  - 1.7.5. C<sub>4</sub> Plants and CAM
- 1.8. Plant Growth and Reproduction
  - 1.8.1. Concept of Growth and Differentiation
  - 1.8.2. Plant Hormones: Types and Functions in Plants
  - 1.8.3. Development of the Reproductive System
    - 1.8.3.1. Flowering and Ripening Process of Fruits and Seeds
    - 1.8.3.2. Types of Fruits and Seeds
    - 1.8.3.3. Seed Germination
    - 1.8.3.4. Aging and Abscission
  - 1.8.4. Metabolites of Interest in Plants for Food Science and Technology

- 1.9. Invertebrate Animal Exploitation
  - 1.9.1. Types of Animal Exploitation
  - 1.9.2. Mollusks and Annelids: Conchiculture and Lumbriculture
  - 1.9.3. Crustaceans and Insects: Astaciculture, Apiculture and Sericiculture
- 1.10. Vertebrate Animal Exploitation
  - 1.10.1. Exploitation of Fish: Aquaculture
  - 1.10.2. Amphibians and Reptiles
  - 1.10.3. Exploitation of Birds: Aviculture
  - 1.10.4. Mammals and Main Uses

## Module 2. Fundamentals of Microbiology

- 2.1. Introduction to Microbiology
  - 2.1.1. Concept of microbiology and historical aspects
  - 2.1.2. Prokaryotic cell model
    - 2.1.2.1. Morphological
    - 2.1.2.2. Structure and Function
  - 2.1.3. Relevance of microorganisms in society
- 2.2. Observation of Microorganisms. Microscopy and Staining
  - 2.2.1. Basic microscopy Concepts
  - 2.2.2. Types of microscopes: structure and function
    - 2.2.2.1. Optical Microscopes
    - 2.2.2.2. Electronic Microscope
    - 2.2.2.3. Fluorescence Microscope
  - 2.2.3. Types of Staining more used in Microbiology
    - 2.2.3.1. Grams Stain
    - 2.2.3.2. Endospore staining
    - 2.2.3.3. Acid fast bacilli alcohol resistant (BAR) stain
- 2.3. Microbial growth and control
  - 2.3.1. Types of metabolism in prokaryotes
  - 2.3.2. Bacterial growth curve
  - 2.3.3. Isolation and conservation techniques of microorganisms
  - 2.3.4. Factors affecting microbial growth
    - 2.3.4.1. Bacteriostatic and bactericidal agents
    - 2.3.4.2. Environmental agents
- 2.4. Bacterial genetics and taxonomy
  - 2.4.1. Mechanisms of genetic exchange
    - 2.4.1.1. Transformation
    - 2.4.1.2. Conjugation
    - 2.4.1.3. Transduction and bacteriophages
  - 2.4.2. Mutations in the bacterial genome
  - 2.4.3. Basic concepts of systematics and classification
  - 2.4.4. Bacterial classification methods
- 2.5. Pathogenesis of microorganisms and microbiota
  - 2.5.1. The microbiota and its importance
  - 2.5.2. Mechanisms of pathogenesis
    - 2.5.2.1. Virulence factors: capsule and lipopolysaccharide
    - 2.5.2.2. Routes of dissemination of microorganisms
  - 2.5.3. Toxiinfections and food poisoning
  - 2.5.4. Microbial foodborne diseases
- 2.6. Virus
  - 2.6.1. General characteristics: structure and composition
  - 2.6.2. Virus classification
  - 2.6.3. Life cycles in viruses and crops
  - 2.6.4. Mechanisms of pathogenesis associated with viruses in food
  - 2.6.5. Types of antivirals
- 2.7. Fungi
  - 2.7.1. General characteristics: structure and composition
  - 2.7.2. Mushroom classification
    - 2.7.2.1. Ascomycetes
    - 2.7.2.2. Deuteromycetes
    - 2.7.2.3. Basidiomycetes
    - 2.7.2.4. Zygomycetes
  - 2.7.3. Mechanisms of pathogenesis associated with fungi in food
    - 2.7.3.1. Types of Mycotoxins
  - 2.7.4. Types of antifungals

- 2.8. Microbiological immunology: Antigens and antibodies
  - 2.8.1. Background of immunology
  - 2.8.2. Types of immune response
    - 2.8.2.1. Innate response
    - 2.8.2.2. Adaptive response
    - 2.8.2.3. Regulation of the immune system
  - 2.8.3. Structure and function of antibodies
  - 2.8.4. Methods of immune system evasion
- 2.9. Epidemiology and prophylaxis
  - 2.9.1. Background in epidemiology
  - 2.9.2. Epidemiological chain and health concept
  - 2.9.3. Epidemiology and preventive measures of infectious diseases in foodstuffs
  - 2.9.4. as a of disease transmission
- 2.10. Main microorganisms of food interest
  - 2.10.1. Development of microorganisms in food
  - 2.10.2. Types of Food Microorganism
    - 2.10.2.1. Altering microbes
    - 2.10.2.2. Pathogenic microbes
    - 2.10.2.3. Microbes benefits
  - 2.10.3. Foodborne Diseases







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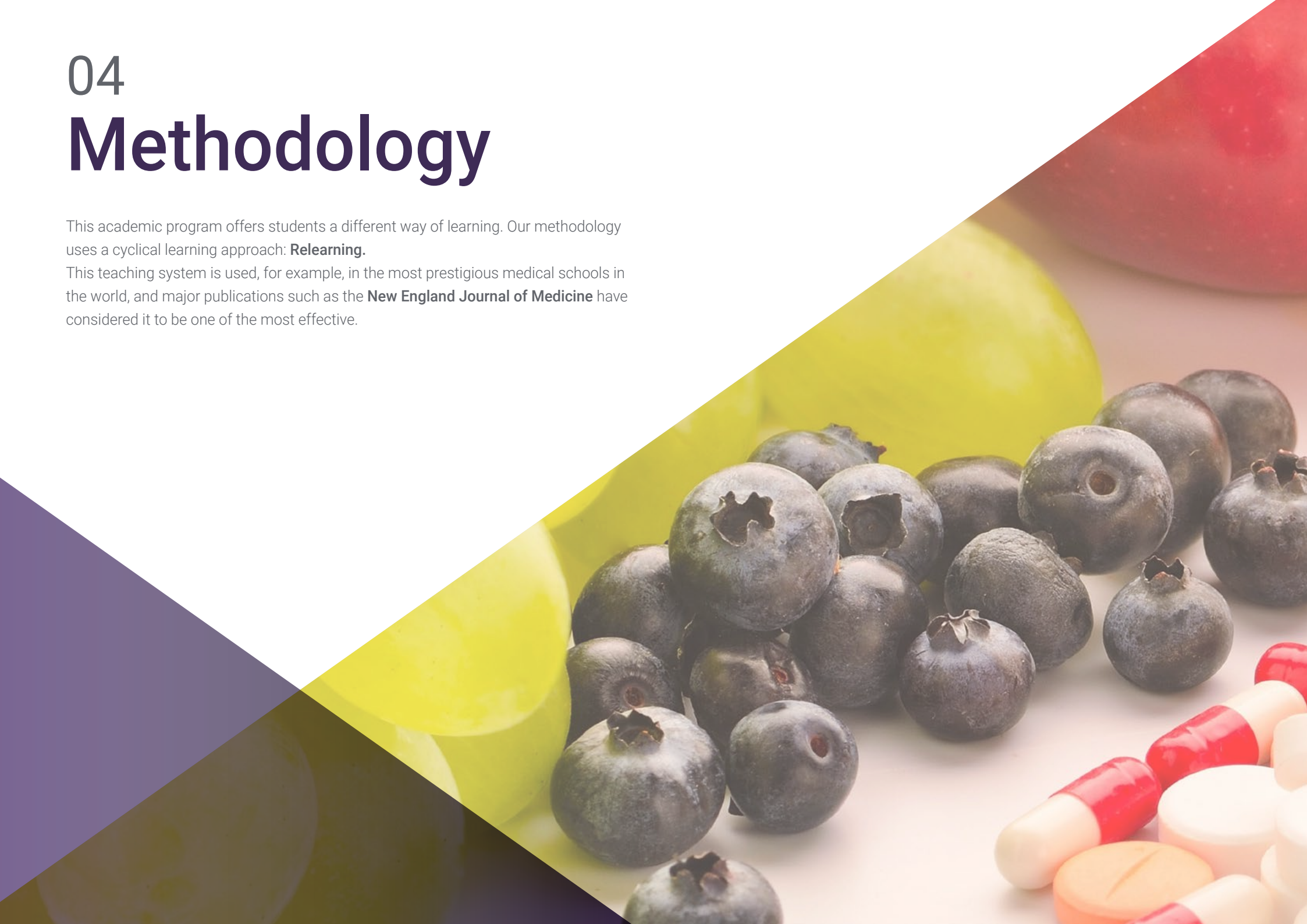
*In this program you will have state-of-the-art multimedia resources that complement the teaching for a more interactive and dynamic learning”*

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.





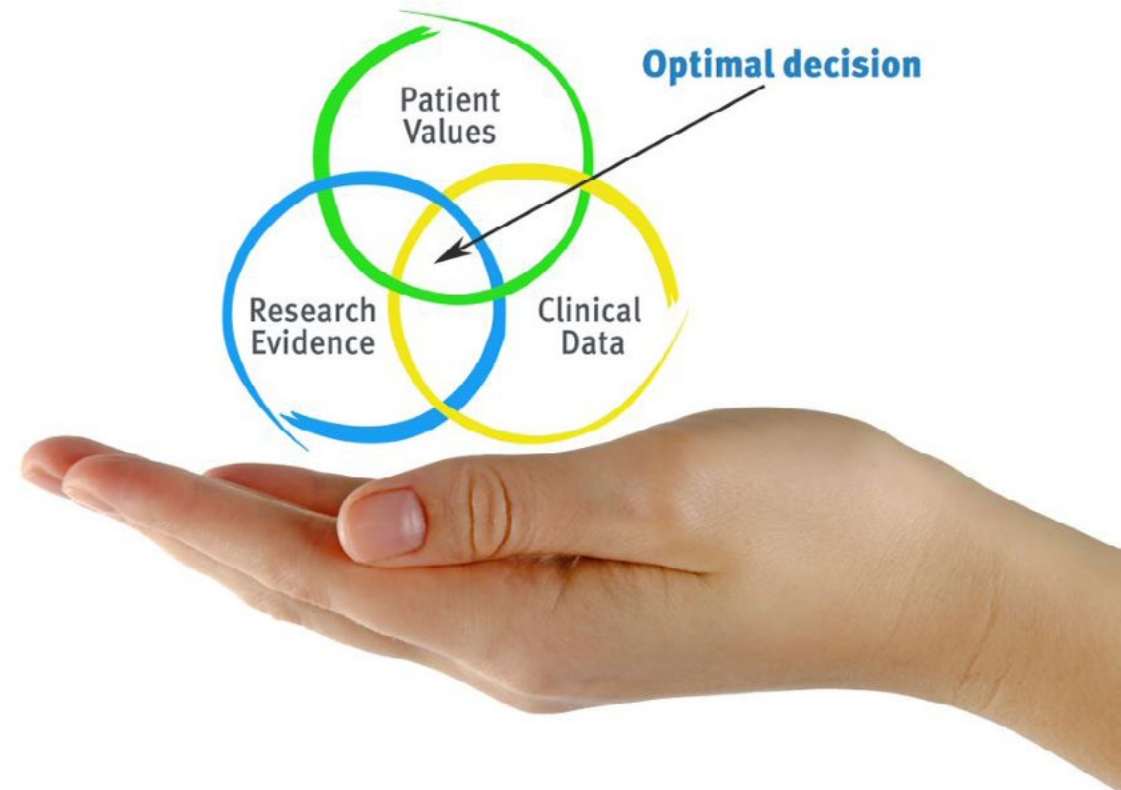
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*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## At TECH we use the Case Method

In a given situation, what should a professional do? 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, nutritionists can experience a way of learning that is shaking the foundations of traditional universities around the world.*



According to Dr. Gérvas, 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 of professional nutritional 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. Nutritionists who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity through exercises to evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the nutritionist to better integrate knowledge into clinical practice.
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.

*The nutritionist will learn through real cases and by solving 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 45,000 nutritionists have been trained with unprecedented success in all clinical specialties regardless of the surgical load. 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.*

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.



#### Nutrition Techniques and Procedures on Video

TECH brings students closer to the latest techniques, the latest educational advances and to the forefront of current nutritional counselling techniques and procedures. 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.







#### Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.



#### 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.



#### 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.



#### Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.



05

# Certificate

The Postgraduate Certificate in Fundamentals of Biology and Microbiology in Food Industry guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



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

This **Postgraduate Certificate in Fundamentals of Biology and Microbiology in Food Industry** contains the most complete and up-to-date scientific 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 certificate 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 Fundamentals of Biology and Microbiology in Food Industry**

Official N° of Hours: **300 h.**



\*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION 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



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# Postgraduate Certificate

Fundamentals of Biology and  
Microbiology in Food Industry