

# Postgraduate Certificate Industrial Separation and Heat Transfer Operations in Chemical Engineering



## Postgraduate Certificate Industrial Separation and Heat Transfer Operations in Chemical Engineering

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

Website: [www.techtute.com/us/engineering/postgraduate-certificate/industrial-separation-heat-transfer-operations-chemical-engineering](http://www.techtute.com/us/engineering/postgraduate-certificate/industrial-separation-heat-transfer-operations-chemical-engineering)

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# 01

# Introduction

Evolving scientific research has enabled the development of thermodynamic models, to advance the prediction and optimization of heat transfer in complex systems or to use more sophisticated simulation software tools. Faced with this reality, the engineer is faced with a field that has an impact on process design, efficiency improvement, and sustainability. For this reason, TECH has developed this 100% online program with numerous multimedia teaching materials that will allow you to increase your knowledge about the design of transfer operations, and their different applications. All this, with a syllabus prepared and elaborated by a specialized faculty team with extensive experience in the scientific and educational sectors.





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*A 100% online Postgraduate Certificate that fits your daily schedule and your career aspirations in the Chemical Industry”*

In a world where sustainability has become essential to be aware of the advances achieved in this field from the Chemical Industry is indispensable for the engineering professional. The efforts of companies, authorities, and the scientific community have focused on improving efficiency and reducing resource consumption.

In this scenario, advances in the understanding of multicomponent systems and heat transfer allow the design of much more effective and safer processes. This is complemented by research into new materials and applications. In this line, this Postgraduate Certificate in Industrial Separation and Heat Transfer Operations in Chemical Engineering, designed by TECH, is focused on this topic.

This is an educational itinerary of 6 weeks duration and 180 teaching hours, in which the high school students will achieve advanced learning about vapor-liquid equilibrium, ideal solutions, rectification of multicomponent mixtures, adsorption, or separation processes with membranes, among others. To achieve this learning in an engaging and dynamic way, video summaries, in-depth videos, essential readings, and case study simulations are available to high school students.

In addition, thanks to the Relearning method, based on the continuous reiteration of key concepts, the graduate will achieve a solid teaching, without the need to dedicate long hours to study and memorization.

The engineers are therefore faced with an ideal opportunity to improve their knowledge and apply it in their daily professional performance through the theoretical-practical approach presented in this program. All this, from the convenience of being able to access the syllabus with a digital device with an Internet connection and anywhere in the world.

This **Postgraduate Certificate in Industrial Separation and Heat Transfer Operations in Chemical Engineering** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of practical cases presented by experts in Chemistry 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 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 work
- ◆ Content that is accessible from any fixed or portable device with an Internet connection



*Inquire from the comfort of your home about the application of the Pinch method to heat exchanger networks"*

“

*Delve with the best teaching material into applications in the extraction of high value-added compounds"*

*Thanks to the Relearning method you will achieve a much easier learning process without investing long hours of study.*

*Delve into heat transfer in complex systems at any time from your laptop with an Internet connection.*

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



# 02 Objectives

TECH provides high school students with the most advanced pedagogical tools to obtain the most effective learning to design, operate, and optimize chemical processes, identify quality improvement opportunities, and extract profitability from chemical processes. For this, the graduate has a theoretical-practical syllabus, prepared by an excellent faculty with extensive experience in the Chemical Industry and in scientific research in this sector. A unique opportunity, through the the world's largest digital university.





“

*Enroll now in a program that  
will give you a boost to your  
career in the Chemical Industry”*



## General Objectives

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- ◆ Analyze the principles and methods for the separation of substances in multicomponent systems
- ◆ Master advanced techniques and tools for the configuration of heat exchange networks
- ◆ Explore job opportunities in L+O+I in Chemical Engineering

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*The case studies will allow you to dynamically delve into simulations of membrane separation processes”*





## Specific Objectives

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- ◆ Analyze the fundamentals of ideal solutions and their deviations from ideality as applied to transfer operations
- ◆ Evaluate the effectiveness of supercritical fluids as solvents in transfer operations
- ◆ Delve into extraction techniques for the separation of multiphase systems
- ◆ Examine the mechanisms involved in the separation of substances by adsorption
- ◆ Develop a comprehensive approach to the design of membrane separation processes
- ◆ Substantiate the principles related to heat transfer in exchangers
- ◆ Propose configurational classifications of heat exchangers
- ◆ Determine the design of heat exchanger networks

03

# Course Management

The management and faculty of this syllabus are distinguished by their in-depth knowledge of inorganic chemistry and catalysis, heat transfer, biomass energy, and other environmental applications of chemistry. In addition, the faculty's experience in the field of research and teaching will allow high school students to obtain not only the most current information, but also the most rigorous and useful information for a professional career in the Chemical Industry.





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*Learn from leading experts in biomass energy and other environmental applications of chemistry”*

## Management



### Dr. Barroso Martín, Isabel

- ♦ Expert in Inorganic Chemistry, Crystallography and Mineralogy
- ♦ Postdoctoral researcher of the I Own Research and Transfer Plan of the University of Málaga
- ♦ Research Staff at the University of Málaga
- ♦ ORACLE Programmer in CMV Consultants Accenture
- ♦ PhD in Sciences from the University of Málaga
- ♦ Master's Degree in Applied Chemistry - specialization in materials characterization - from the University of Málaga
- ♦ Master's Degree in SE, High School, Vocational Training, and Language Teaching - specializing in Physics and Chemistry University of Malaga

## Professors

### Dr. Torres Liñán, Javier

- ♦ Expert in Chemical Engineering and Associated technologies
- ♦ Specialist in Environmental Chemical Technology
- ♦ Collaborator of the Chemical Engineering Department of the University of Málaga
- ♦ PhD from the University of Málaga in the PhD program of Chemistry Chemical Technologies, Materials, and Nanotechnology
- ♦ Master's Degree in ESO, High School, Form. Prof. and Language Teaching. Esp. Physics and Chemistry from the University of Málaga
- ♦ Master's Degree in Chemical Engineering from the University of Málaga



# 04

# Structure and Content

The syllabus of this university program consists of a single module that will lead the high school students to obtain an advanced learning in Transfer Operations, fundamental in the Chemical Industry. To this end, TECH provides high school students with pedagogical tools using the latest technology applied to university teaching and a syllabus prepared by real experts in the sector. Undoubtedly, this is a unique opportunity to take a high-level Postgraduate Certificate course, aimed at increasing the field of action of engineers.





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*Specialized readings will allow you to further extend the advanced and current information surrounding the design of Transfer Operations”*

## Module 1. Advanced Transfer Operations Design

- 1.1. Vapor-Liquid Equilibrium in Multicomponent Systems
  - 1.1.1. Ideal Solutions
  - 1.1.2. Vapor-liquid Diagrams
  - 1.1.3. Deviations from Ideality: Activity Coefficients
  - 1.1.4. Azeotropes
- 1.2. Rectification of Multicomponent Mixtures
  - 1.2.1. Differential or Flash Distillation
  - 1.2.2. Rectification Columns
  - 1.2.3. Energy Balances in Condensers and Boilers
  - 1.2.4. Calculation of the Number of Plates
  - 1.2.5. Plate Efficiency and Overall Efficiency
  - 1.2.6. Discontinuous Rectification
- 1.3. Supercritical Fluids
  - 1.3.1. Use of Supercritical Fluids as Solvents
  - 1.3.2. Elements of Supercritical Fluid Systems
  - 1.3.3. Applications of Supercritical Fluids
- 1.4. Extraction
  - 1.4.1. Liquid-Liquid Extraction
  - 1.4.2. Extraction in Plate Columns
  - 1.4.3. Leaching
  - 1.4.4. Drying
  - 1.4.5. Crystallization
- 1.5. Solid Phase Extraction
  - 1.5.1. The PSE Process
  - 1.5.2. Addition of Modifiers
  - 1.5.3. Applications in the Extraction of High Value-Added Compounds
- 1.6. Adsorption
  - 1.6.1. Adsorbate-Adsorbent Interaction
  - 1.6.2. Adsorption Separation Mechanisms
  - 1.6.3. Adsorption Equilibrium
  - 1.6.4. Contact Methods
  - 1.6.5. Commercial Adsorbents and Applications



- 1.7. Membrane Separation Processes
  - 1.7.1. Membrane Types
  - 1.7.2. Membrane Regeneration
  - 1.7.3. Ion Exchange
- 1.8. Heat Transfer in Complex Systems
  - 1.8.1. Molecular Energy Transport in Multicomponent Mixtures
  - 1.8.2. Equation of Conservation of Energy Thermal
  - 1.8.3. Turbulent Energy Transport
  - 1.8.4. Temperature-Enthalpy Diagrams
- 1.9. Heat Exchangers
  - 1.9.1. Classification of Heat Exchangers According to Flow Direction
  - 1.9.2. Classification of Heat Exchangers According to Structure
  - 1.9.3. Exchanger Applications in Industry
- 1.10. Heat Exchanger Networks
  - 1.10.1. Sequential Synthesis of an Exchanger Network
  - 1.10.2. Simultaneous Synthesis of an Exchanger Network
  - 1.10.3. Application of the Pinch Method to Heat Exchanger Networks

“*Delve into heat exchanger networks with the dynamism provided by the multimedia pills in this program*”



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"*

## 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.

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*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.



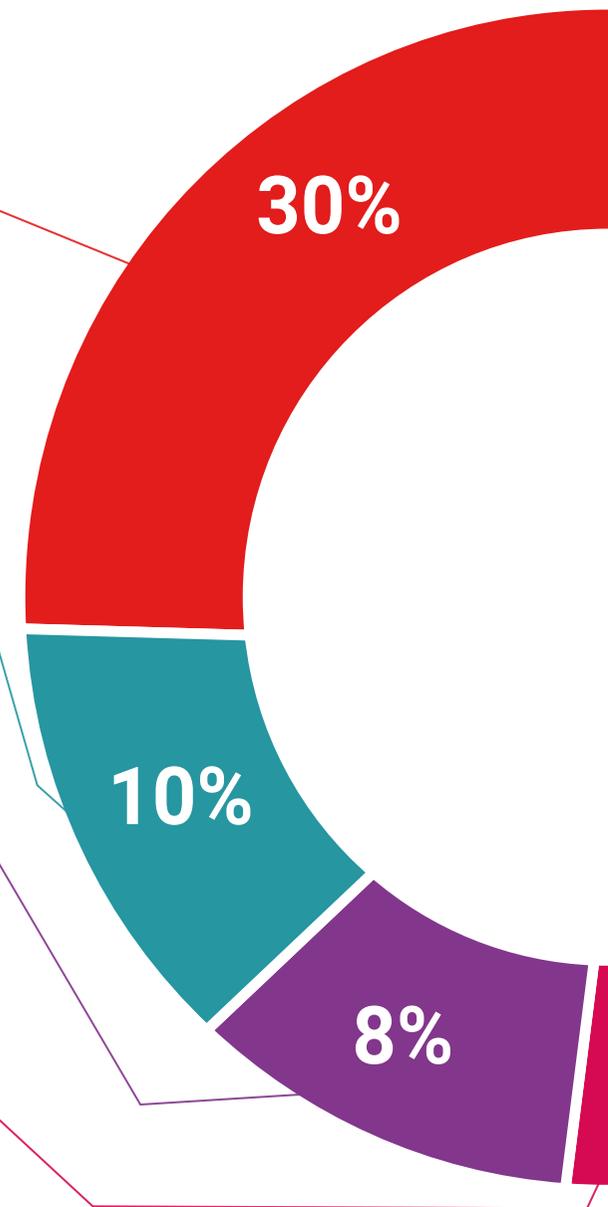
### Practising Skills and Abilities

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.



06

# Certificate

The Postgraduate Certificate in Industrial Separation and Heat Transfer Operations in Chemical Engineering guarantees students, in addition to the most rigorous and up-to-date education, 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 program will allow you to obtain your **Postgraduate Certificate in Industrial Separation and Heat Transfer Operations in Chemical Engineering** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

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

Title: **Postgraduate Certificate in Industrial Separation and Heat Transfer Operations in Chemical Engineering**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



\*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.



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