

Postgraduate Certificate Classic Mechanics



Postgraduate Certificate Classic Mechanics

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Global University
- » Credits: 12 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: www.techtitute.com/us/engineering/postgraduate-certificate/classic-mechanics

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01

Introduction

Without Newton's laws of motion it would not have been possible to solve many of the problems posed by classical mechanics, and without its development, machines that are part of the industrial sector would not have been designed and created. This knowledge, which undoubtedly represented a real revolution in 1687, is today the basis for any engineering professional. That is why TECH has created this program, which offers the graduate the most relevant information for solving problems by applying rotational symmetry, or the key concepts of Hamiltonian or Lagrangian formulations. For this purpose, you will have multimedia teaching resources and a Relearning system, which will allow you to advance in a much more dynamic and natural way through the content of this 100% online program.





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This university program in Classic Mechanics will lead you to acquire a solid learning in this field, which will allow you to grow as an engineering professional"

The application of classical mechanics in our days are the result of the great work done by Isaac Newton and the mathematical models created by Leibniz, Lagrange or Euler, among other scientists. Thanks to them, accurate results are obtained in the study of the behavior of physical bodies at rest and at speeds below the speed of light.

In the field of engineering, mastering all these concepts, their fundamentals and the resolution of different problems by applying physics are essential in the planning, design and development of any machinery in the industrial or automotive sector. That is why this academic institution has created this Postgraduate Certificate in Classic Mechanics, which provides the graduates with an advanced and intensive learning, which will lead him to prosper as firm steps in his professional career.

A program with a clear theoretical approach, but at the same time practical, which will take students for 6 weeks to deepen in kinematics and dynamics, Lagrangian and Hamiltonian formalisms or analytical mechanics. For this purpose, there are video summaries of each topic, detailed videos, case studies or complementary readings that can be accessed from any electronic device with an Internet connection.

In addition, thanks to the Relearning method, used by TECH in all its programs, students will advance in a much more natural and progressive way through a syllabus that will lead them to master the main mathematical tools of the quadrivectors. In addition, this system will even allow them to reduce the long hours of study that are so frequent in other teaching methods.

Thus, the professionals are facing an excellent opportunity to study a university program taught exclusively online, which can be accessed comfortably whenever and wherever you want. You only need a computer, tablet or cell phone with Internet connection to consult the syllabus hosted on the Virtual Campus. In addition, you have the freedom to distribute the 300 teaching hours of this Postgraduate Certificate according to your needs.

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

- ◆ Practical case studies are presented by experts in Physics
- ◆ 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



You are facing an ideal academic option for those who wish to pursue a quality university program that is compatible with their personal responsibilities"

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You have at your disposal 24 hours a day a library of multimedia resources that you can access comfortably from your computer or tablet with Internet connection”

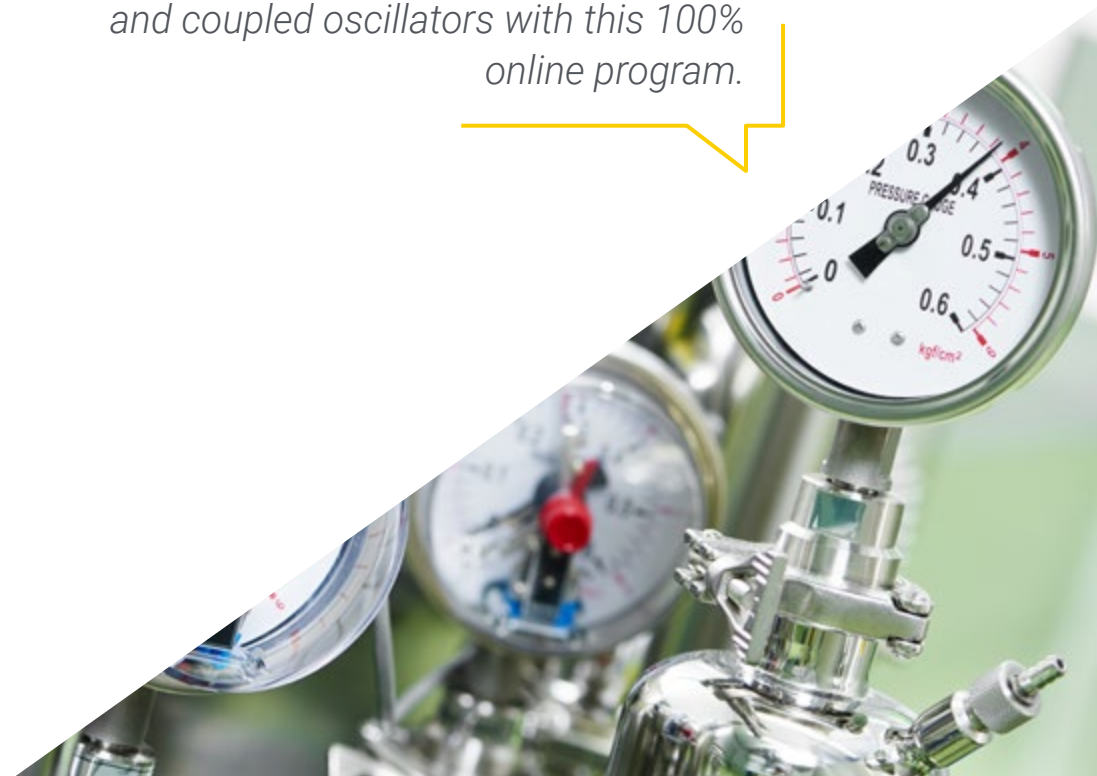
The program's teaching staff includes professionals from the sector who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will provide the professionals 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 professionals must try to solve the different professional practice situations that are presented throughout the academic course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned experts.

This Postgraduate Certificate shows you a theoretical and practical approach to Classical Mechanics, to advance your professional career.

Delve into particle systems and simple and coupled oscillators with this 100% online program.



02

Objectives

This Postgraduate Certificate in Classic Mechanics provides students with the necessary knowledge to be able to effectively apply the concepts of classical mechanics in the field of engineering. This will allow them not only to be able to design new machines, but also to be able to solve any problem through this learning. For the successful achievement of these goals, the graduates have a specialized teaching team that will answer any questions they may have about the content of this course.



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Click and enroll now in an advanced Postgraduate Certificate, which will allow you to master the keys to Classic Mechanics"



General Objectives

- ◆ Solidify knowledge of Newtonian mechanics
- ◆ Advance in Relativistic Dynamics
- ◆ Know how to solve classical mechanics problems using Newton's formulation as well as Lagrange's and Hamilton's

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You will be able to efficiently solve central force problems using the concepts of rotational symmetry”





Specific Objectives

- ◆ Solve central Forces problems using rotational symmetry
- ◆ Know how to deal with particle and rigid solid systems
- ◆ Study rigid solid rotations, the inertia tensor and Euler's equations
- ◆ Know how to deal with particle systems and simple and coupled oscillators
- ◆ Understand and know how to use quadrivector mathematical tools
- ◆ Learn Lagrangian and Hamiltonian formalisms

03

Structure and Content

Students who take this university course have at their disposal 24 hours a day, a library of multimedia resources (video summaries, videos in detail, specialized readings), which will lead them to delve into the main concepts of Classic Mechanics. In this way you will be able to delve into kinematics, formulations and problem solving through case studies developed by the teaching team that integrates this 100% online program.





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A program of studies with which you will obtain the advanced knowledge you need in Classic Mechanics to advance in your professional career in the field of Engineering"

Module 1. Classical Mechanics I

- 1.1. Kinematics and Dynamics: Review
 - 1.1.1. Newton's Law
 - 1.1.2. Reference Systems
 - 1.1.3. Motion Equation of Particles
 - 1.1.4. Conservation Theorems
 - 1.1.5. Particle System Dynamics
- 1.2. More Newtonian Mechanics
 - 1.2.1. Conservation Theorems for Particle Systems
 - 1.2.2. Universal Gravity Law
 - 1.2.3. Force Lines and Equipotential Surfaces
 - 1.2.4. Limitations of Newtonian Mechanics
- 1.3. Kinematics of Rotations
 - 1.3.1. Fundamentals of Mathematics
 - 1.3.2. Infinitesimal Rotations
 - 1.3.3. Angular Velocity and Acceleration
 - 1.3.4. Rotational Reference Systems
 - 1.3.5. Coriolis Force
- 1.4. Rigid Solid Study
 - 1.4.1. Rigid Solid Kinematics
 - 1.4.2. Inertia Tensor of Rigid Solids
 - 1.4.3. Main Inertia Axes
 - 1.4.4. Steiner and Perpendicular Axes Theorems
 - 1.4.5. Kinetic Energy of Rotation
 - 1.4.6. Angular Momentum
- 1.5. Symmetries and Conservation Laws
 - 1.5.1. Conservation Theorem of Linear Momentum
 - 1.5.2. Conservation Theorem of Angular Momentum
 - 1.5.3. Energy Conservation Theorem
 - 1.5.4. Classical Mechanic Symmetries: Galileo Group
- 1.6. Coordinate Systems: Euler Angles
 - 1.6.1. Coordinate Systems and Changes
 - 1.6.2. Euler Angles
 - 1.6.3. Euler Equations
 - 1.6.4. Stability Around a Major Axis
- 1.7. Rigid Solid Dynamics Applications
 - 1.7.1. Spherical Pendulum
 - 1.7.2. Free Symmetrical Top Movement
 - 1.7.3. Symmetrical Top Movement with a Fixed Point
 - 1.7.4. Gyroscopic Effect
- 1.8. Movement Under Central Forces
 - 1.8.1. Introduction to Central Force Fields
 - 1.8.2. Reduced Mass
 - 1.8.3. Trajectory Equation
 - 1.8.4. Central Field Orbits
 - 1.8.5. Centrifugal Energy and Effective Potential
- 1.9. Kepler's Problem
 - 1.9.1. Planetary Motion - Kepler's Problem
 - 1.9.2. Approximate Solution to Kepler's Equation
 - 1.9.3. Kepler's Laws
 - 1.9.4. Bertrand's Theorem
 - 1.9.5. Stability and Perturbation Theory
 - 1.9.6. 2-Body Problem
- 1.10. Collisions
 - 1.10.1. Elastic and Inelastic Shocks: Introduction
 - 1.10.2. Center of Mass Coordinate System
 - 1.10.3. Laboratory Coordinate System
 - 1.10.4. Elastic Shock Kinematics
 - 1.10.5. Particle Dispersion - Rutherford's Dispersion Formula
 - 1.10.6. Effective Section



Module 2. Classical Mechanics II

- 2.1. Oscillations
 - 2.1.1. Simple Harmonic Oscillator
 - 2.1.2. Damped Oscillator
 - 2.1.3. Forced Oscillator
 - 2.1.4. Fourier Series
 - 2.1.5. Green's Function
 - 2.1.6. Non-Linear Oscillators
- 2.2. Coupled Oscillations I
 - 2.2.1. Introduction
 - 2.2.2. Coupling of Two Harmonic Oscillators
 - 2.2.3. Normal Trends
 - 2.2.4. Weak Coupling
 - 2.2.5. Forced Vibrations of Coupled Oscillators
- 2.3. Coupled Oscillations II
 - 2.3.1. General Theory of Coupled Oscillations
 - 2.3.2. Normal Coordinates
 - 2.3.3. Multiple Oscillator Coupling. Continuous Boundary and Vibrating Wire
 - 2.3.4. Wave Equation
- 2.4. Special Relativity Theory
 - 2.4.1. Inertial Reference Systems
 - 2.4.2. Galileo's Invariance
 - 2.4.3. Lorentz Transformations
 - 2.4.2. Relative Velocities
 - 2.4.5. Linear Relativistic Momentum
 - 2.4.6. Relativistic Invariants

- 2.5. Tensor Formalism of Special Relativity
 - 2.5.1. Quadriectors
 - 2.5.2. Quadrimomentum and Quadriposition
 - 2.5.3. Relativistic Energy
 - 2.5.4. Relativistic Forces
 - 2.5.5. Relativistic Particle Collisions
 - 2.5.6. Particle Disintegrations
- 2.6. Introduction to Analytical Mechanics
 - 2.6.1. Links and Generalized Coordinates
 - 2.6.2. Mathematical Tools: Variance Calculation
 - 2.6.3. Definition of Action
 - 2.6.4. Hamilton Principle: Extreme Action
- 2.7. Lagrangian Formulation
 - 2.7.1. Lagrangian Definition
 - 2.7.2. Variance Calculation
 - 2.7.3. Euler-Lagrange Equations
 - 2.7.4. Conserved Quantities
 - 2.7.5. Extension to Non-Holonomous Systems
- 2.8. Hamiltonian Formulation
 - 2.8.1. Phasic Space
 - 2.8.2. Legendre Transformations: Hamiltonian
 - 2.8.3. Canonical Equations
 - 2.8.4. Conserved Quantities
- 2.9. Analytical Mechanics-Extension
 - 2.9.1. Poisson Parentheses
 - 2.9.2. Lagrange Multipliers and Bond Forces
 - 2.9.3. Liouville Theorem
 - 2.9.4. Virial Theorem



- 2.10. Analytical Relativistic Mechanics and Classical Field Theory
 - 2.10.1. Charge Movement in Electromagnetic Fields
 - 2.10.2. Lagrangian of a Free relativistic particle
 - 2.10.3. Interaction Lagrangian
 - 2.10.4. Classical Field Theory: Introduction
 - 2.10.5. Classical Electrodynamics

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Thanks to this program you will get up to date with the different applications of nuclear medicine”



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"

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.



05

Certificate

The Postgraduate Certificate in Classic Mechanics 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 program will allow you to obtain your **Postgraduate Certificate in Classic Mechanics** 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 Classic Mechanics**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 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.



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