Postgraduate Diploma

Radiophysics Applied to Advanced Radiotherapy Procedures

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- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/in/engineering/postgraduate-diploma/postgraduate-diploma-radiophysics-applied-advanced-radiotherapy-procedures**

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01

Introduction

Applied Radiophysics plays a fundamental role in the evolution of advanced radiation therapy procedures in Engineering. In fact, this interdisciplinary field leverages the knowledge of Physics and Engineering to optimize and personalize radiation treatments against Cancer. By integrating innovative technologies, such as Proton Therapy, Intraoperative Radiation Therapy and Brachytherapy, unprecedented precision in the delivery of therapeutic doses is achieved. These advances make it possible to reduce side effects in healthy tissue, improve targeting in tumor areas and adapt treatments to the uniqueness of each patient. These advances make it possible to reduce side effects in healthy tissue, improve targeting in tumor areas and adapt treatments to the uniqueness of each patient.

This Postgraduate Diploma will immerse you in radiological phenomena, the development of three-dimensional treatments and the application of cutting-edge technologies. Don't waste time, enroll now!"

Radiophysics applied to advanced radiotherapy procedures represents an innovative field that fuses medical radiotherapy with engineering, generating significant benefits in the treatment of oncological diseases. Thanks to Applied Radiophysics, advanced customization of treatments is achieved, considering the specific anatomical and biological characteristics of each patient. In addition, the application of more sophisticated imaging and dosimetry techniques allows for greater accuracy in radiation administration, minimizing adverse effects on surrounding tissues.

This way, this Postgraduate Diploma was born, which will address crucial aspects such as Protonterapia, a consolidated technique that uses protons to reduce radiation in healthy tissues during the treatment of Cancer. In addition, the program will analyze the interaction of protons with matter, cutting-edge technology and clinical aspects, including radiation protection.

Also, Intraoperative Radiotherapy will be investigated, consisting of highly precise treatments during surgery, analyzing innovative technology, dose calculations and safety. Finally, the graduates will delve into the physical and biological foundations of brachytherapy, addressing sources of radiation, clinical applications and ethical dilemmas. This will allow professionals to contribute to both practical and investigative development in radiophysics.

This university program offers complete training, with teaching resources developed through the innovative methodology Relearning, pioneer in TECH. This technique involves strategic repetition of essential concepts, to ensure a thorough understanding of the material. In addition, being completely online, the platform will be available 24 hours a day, being able to access from any electronic device with an Internet connection. This eliminates the need to move or adjust to established schedules, providing total flexibility.

This **Postgraduate Diploma in Radiophysics Applied to Advanced Radiotherapy Procedures** contains the most complete and up-to-date program on the market. Its most notable features are:

- The development of practical cases presented by experts in Radiophysics Applied to Advanced Radiotherapy Procedures
- 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 assignments
- Content that is accessible from any fixed or portable device with an Internet connection

With this 100% online program you will master the most innovative procedures, such as the Flash Technique, the latest trend in Intraoperative Radiotherapy"

You will delve into Intraoperative Radiation Therapy, an approach involving the application of radiation during surgical procedures, focusing on technical and clinical details for a complete understanding"

You will analyze the physical and practical principles of Protonterapia through the wide variety of multimedia resources available on the TECH platform.

Bet on TECH! You will immerse yourself in the techniques of implantation of brachytherapy, involving the placement of radioactive sources directly in the patient's body.

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

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Objectives

This program has as fundamental goals to develop a comprehensive understanding of the most advanced techniques, such as prototherapy, intraoperative radiation therapy and brachytherapy. The program is designed to equip engineers with sound theoretical knowledge and practical skills. However, it goes beyond simple training; its aim is to foster innovative mindset, encouraging professionals to not only apply, but also drive continuous progress in this critical field. In this way, the essence of this program is to amalgamate knowledge, skills and a visionary perspective to generate a real and palpable impact in society.

TECH's main focus is to train trained leaders who can successfully face the most complex challenges in the field of Radiotherapy"

General Objectives

- Investigate the interactions of protons with matter
- Establish differences in physical and clinical dosimetry in Protonterapia
- Examine radiation protection and radiobiology in Proton Therapy
- Develop the fundamental principles of intraoperative radiation therapy
- Analyze the technology and equipment used in intraoperative radiation therapy
- Evaluate methods of treatment planning in intraoperative radiation therapy
- Underpinning radiation protection and patient safety practices
- Identify and compare radiation sources used in brachytherapy, demonstrating a thorough understanding of their properties and clinical applications
- Plan doses in brachytherapy, optimizing the radiation distribution in the target
- Propose specific quality management protocols for procedures of Brachytherapy

TECH's innovative tools and the support of leading professionals will lead you towards achieving your goals effectively"

Specific Objectives

Module 1. Advanced Radiotherapy Method. Proton Therapy

- Analyze proton beams and their clinical use
- Evaluate the necessary requirements for the characterization of this radiotherapy technique
- Establish the differences of this modality with conventional radiotherapy
- Develop expertise knowledge in radiation protection

Module 2. Advanced Radiotherapy Method. Intraoperative radiotherapy

- Identify clinical indications for intraoperative radiation therapy
- Analyze in detail the methods of dose calculation in intraoperative radiotherapy
- Examine factors influencing patient and medical staff safety
- Grounding the importance of interdisciplinary collaboration in the planning and execution of intraoperative radiotherapy treatments

Module 3. Brachytherapy in the Field of Radiotherapy

- Develop source calibration techniques through well and air chambers
- Examine the application of the Monte Carlo method in brachytherapy
- Evaluate planning systems using the TG 43 formalism
- Identify key differences between High Dose Rate Brachytherapy (HDR) and Low Dose Rate Brachytherapy (LDR)
- Specify procedures and planning for prostate brachytherapy

03

Course Management

The teaching team leading this program is a living example of excellence and dedication to innovation. Each member has been carefully selected for their extensive experience and knowledge in different areas, ensuring a deep understanding of the most advanced techniqaues in Radiotherapy. These professionals are committed to share their knowledge in a clear and motivating way, constantly adapting to the evolving challenges of Engineering. Their approach goes beyond conventional teaching, fostering critical thinking, promoting ongoing research, and prioritizing practical learning for graduates.

The teaching staff of this university program will be completely dedicated to enhance your skills in Radiotherapy, seeking your optimal development"

Management

Dr. De Luis Pérez, Francisco Javier

- Specialist in Hospital Radiophysics
- Head of the Radiophysics and Radiological Protection Service at Quirónsalud Hospitals in Alicante, Torrevieja and Murcia
- Research Group in Personalized Multidisciplinary Oncology, Catholic University San Antonio of Murcia
- PhD in Applied Physics and Renewable Energies, University of Almeria
- Degree in Physical Sciences, specializing in Theoretical Physics, University of Granada
- Member of: Spanish Society of Medical Physics (SEFM), Royal Spanish Society of Physics (RSEF), Illustrious Official College of Physicists and Consulting and Contact Committee, Proton Therapy Center (Quirónsalud)

Professors

Dr. Irazola Rosales, Leticia

- Specialist in Hospital Radiophysics
- Physician in Hospital Radiophysics at the Biomedical Research Center of La Rioja.
- Working group on Lu-177 treatments at the Spanish Society of Medical Physics (SEFM).
- Collaborator at the University of Valencia
- Reviewer of the journal Applied Radiation and Isotopes
- International PhD in Medical Physics, University of Seville, Spain
- Professional Master's Degree in Medical Physics from the University of Rennes I
- Degree in Physics from the University of Zaragoza.
- Member of: European Federation of Organizations in Medical Physics (EFOMP) and Spanish Society of Medical Physics (SEFM).

Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice"

04

Structure and Content

This academic qualification has been carefully designed to promote professional advancement and excellence in the practice of radiotherapy. Its design is based on an innovative and comprehensive syllabus, where three essential areas converge: Protonterapia, Intraoperative Radiation Therapy and Brachytherapy. From studying the interaction of protons with matter, to practical application in clinical environments and precise dose management, the content will equip engineers to lead evolution in this field.

Boost your professional career! You will gain the necessary tools and confidence to contribute significantly to the field of Radiotherapy"

Module 1. Advanced Radiotherapy Method. Proton Therapy

1.1. Proton Therapy Proton Radiotherapy
 1.1.1. Interaction of Protons with Matter
 1.1.2. Clinical Aspects of Proton Therapy
 1.1.3. Physical and Radiobiological Basis of Proton Therapy
1.2. Equipment in Protontherapy
 1.2.1. Facilities
 1.2.2. Components of a Protontherapy System
 1.2.3. Physical and Radiobiological Basis of Proton Therapy
1.3. Proton Beam
 1.3.1. Parameters
 1.3.2. Clinical Implications
 1.3.3. Application in Oncological Treatments
1.4. Physical Dosimetry in Proton Therapy
 1.4.1. Absolute Dosimetry Measurements
 1.4.2. Beam Parameters
 1.4.3. Materials in Physical Dosimetry
1.5. Clinical Dosimetry in Proton Therapy
 1.5.1. Application of Clinical Dosimetry in Proton Therapy
 1.5.2. Planning and Calculation Algorithms
 1.5.3. Imaging Systems
1.6. Radiological Protection in Proton Therapy
 1.6.1. Design of an Installation
 1.6.2. Neutron Production and Activation
 1.6.3. Activation
1.7. Proton Therapy Treatments
 1.7.1. Image-Guided Treatment
 1.7.2. In Vivo Treatment Verification
 1.7.3. BOLUS Usage

1.8. Biological Effects of Proton Therapy
 1.8.1. Physical Aspects
 1.8.2. Radiobiology
 1.8.3. Dosimetric Implications
1.9. Measuring Equipment in Proton Therapy
 1.9.1. Dosimetric Equipment
 1.9.2. Radiation Protection Equipment
 1.9.3. Personal Dosimetry
1.10. Uncertainties in Proton Therapy
 1.10.1. Uncertainties Associated with Physical Concepts
 1.10.2. Uncertainties Associated with the Therapeutic Process
 1.10.3. Advances in Protontherapy

Module 2. Advanced Radiotherapy Method. Intraoperative Radiotherapy

2.1. Intraoperative Radiotherapy
 2.1.1. Intraoperative Radiotherapy
 2.1.2. Current Approach to Intraoperative Radiotherapy
 2.1.3. Intraoperative Radiotherapy versus Conventional Radiotherapy
2.2. Technology in Intraoperative Radiotherapy
 2.2.1. Mobile Linear Accelerators in Intraoperative Radiotherapy
 2.2.2. Intraoperative Imaging Systems
 2.2.3. Quality Control and Maintenance of Equipment
2.3. Treatment Planning in Intraoperative Radiation Therapy
 2.3.1. Dose Calculation Methods
 2.3.2. Volumetry and Delineation of Organs at Risk
 2.3.3. Dose Optimization and Fractionation
2.4. Clinical Indications and Patient Selection for Intraoperative Radiation Therapy
 2.4.1. Types of Cancers Treated with Intraoperative Radiotherapy
 2.4.2. Assessment of Patient Suitability
 2.4.3. Clinical Studies and Discussion
2.5. Surgical Procedures in Intraoperative Radiotherapy
 2.5.1. Surgical Preparation and Logistics
 2.5.2. Radiation Administration Techniques During Surgery
 2.5.3. Postoperative Follow-Up and Patient Care
2.6. Calculation and Administration of Radiation Dose for Intraoperative Radiotherapy
 2.6.1. Dose Calculation Formulas and Algorithms
 2.6.2. Correction Factors and Dose Adjustment
 2.6.3. Real-Time Monitoring during Surgery
2.7. Radiation Protection and Safety in Intraoperative Radiotherapy
 2.7.1. International Radiation Protection Standards and Regulations
 2.7.2. Safety Measures for the Medical Staff and the Patient
 2.7.3. Risk Mitigation Strategies
2.8. Interdisciplinary Collaboration in Intraoperative Radiation Therapy
 2.8.1. Role of the Multidisciplinary Team in Intraoperative Radiotherapy
 2.8.2. Communication between Radiotherapists, Surgeons and Oncologists
 2.8.3. Practical Examples of Interdisciplinary Collaboration
2.9. *Flash* Technique. Latest Trend in Intraoperative Radiation Therapy
 2.9.1. Research and Development in Intraoperative Radiation Therapy
 2.9.2. New Technologies and Emerging Therapies in Intraoperative Radiotherapy
 2.9.3. Implications for Future Clinical Practice
2.10. Ethics and Social Aspects in Intraoperative Radiation Therapy
 2.10.1. Ethical Considerations in Clinical Decision-Making
 2.10.2. Access to Intraoperative Radiation Therapy and Equity of Care
 2.10.3. Communication with Patients and Families in Complex Situations

Module 3. Brachytherapy in the Field of Radiotherapy

3.1. Brachytherapy
- 3.1.1. Physical Principles of Brachytherapy
- 3.1.2. Biological Principles and Radiobiology applied to Brachytherapy
- 3.1.3. Brachytherapy and External Radiotherapy. Differences

3.2. Radiation Sources in Brachytherapy
- 3.2.1. Radiation Sources used in Brachytherapy
- 3.2.2. Radiation Emission of the Sources used in Brachytherapy
- 3.2.3. Calibration of the Sources
- 3.2.4. Safety in the Handling and Storage of Brachytherapy Sources

3.3. Dose Planning in Brachytherapy
- 3.3.1. Dose Planning Techniques in Brachytherapy
- 3.3.2. Optimization of the Dose Distribution in the Target Tissue
- 3.3.3. Application of the Monte Carlo Method
- 3.3.4. Specific Considerations for Minimizing Irradiation of Healthy Tissue
- 3.3.5. TG 43 Formalism

3.4. Administration Techniques in Brachytherapy
- 3.4.1. High Dose Rate Brachytherapy (HDR) versus Low Dose Rate Brachytherapy (LDR)
- 3.4.2. Clinical Procedures and Treatment Logistics
- 3.4.3. Management of Devices and Catheters used in the Administration of Brachytherapy

3.5. Clinical Indications for Brachytherapy
- 3.5.1. Brachytherapy Applications in the Treatment of Prostate Cancer
- 3.5.2. Brachytherapy in Cervical Cancer: Technique and Results
- 3.5.3. Brachytherapy in Breast Cancer: Clinical Considerations and Results

3.6. Quality Management in Brachytherapy
- 3.6.1. Specific Quality Management Protocols for Brachytherapy
- 3.6.2. Quality Control of Equipment and Treatment Systems
- 3.6.3. Audit and Compliance with Regulatory Standards

- 3.7. Clinical Results in Brachytherapy
    - 3.7.1. Review of Clinical Studies and Results in the Treatment of Specific Cancers
    - 3.7.2. Evaluation of the Efficacy and Toxicity of Brachytherapy
    - 3.7.3. Clinical Cases and Discussion of Results
- 3.8. Ethics and International Regulatory Aspects in Brachytherapy
    - 3.8.1. Ethical Issues in Shared Decision-Making with Patients
    - 3.8.2. Compliance with International Radiation Safety Standards and Regulations
    - 3.8.3. International Liability and Legal Aspects in Brachytherapy Practice of Brachytherapy
- 3.9. Technological Development in Brachytherapy
    - 3.9.1. Technological Innovations in the Field of Brachytherapy
    - 3.9.2. Research and Development of New Techniques and Devices in Brachytherapy
    - 3.9.3. Interdisciplinary Collaboration in Brachytherapy Research Projects
- 3.10. Practical Application and Simulations in Brachytherapy
    - 3.10.1. Clinical Simulation of Brachytherapy
    - 3.10.2. Resolution of Practical Situations and Technical Challenges
    - 3.10.3. Evaluation of Treatment Plans and Discussion of Results

Lead the revolution in the field of radiation therapy! Thanks to the 100% online mode, you can manage your study time according to your personal needs"

05

Methodology

This program offers students a different way of learning. Our methodology follows a cyclical learning process*:* **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 method of skills and knowledge development. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a way of learning 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

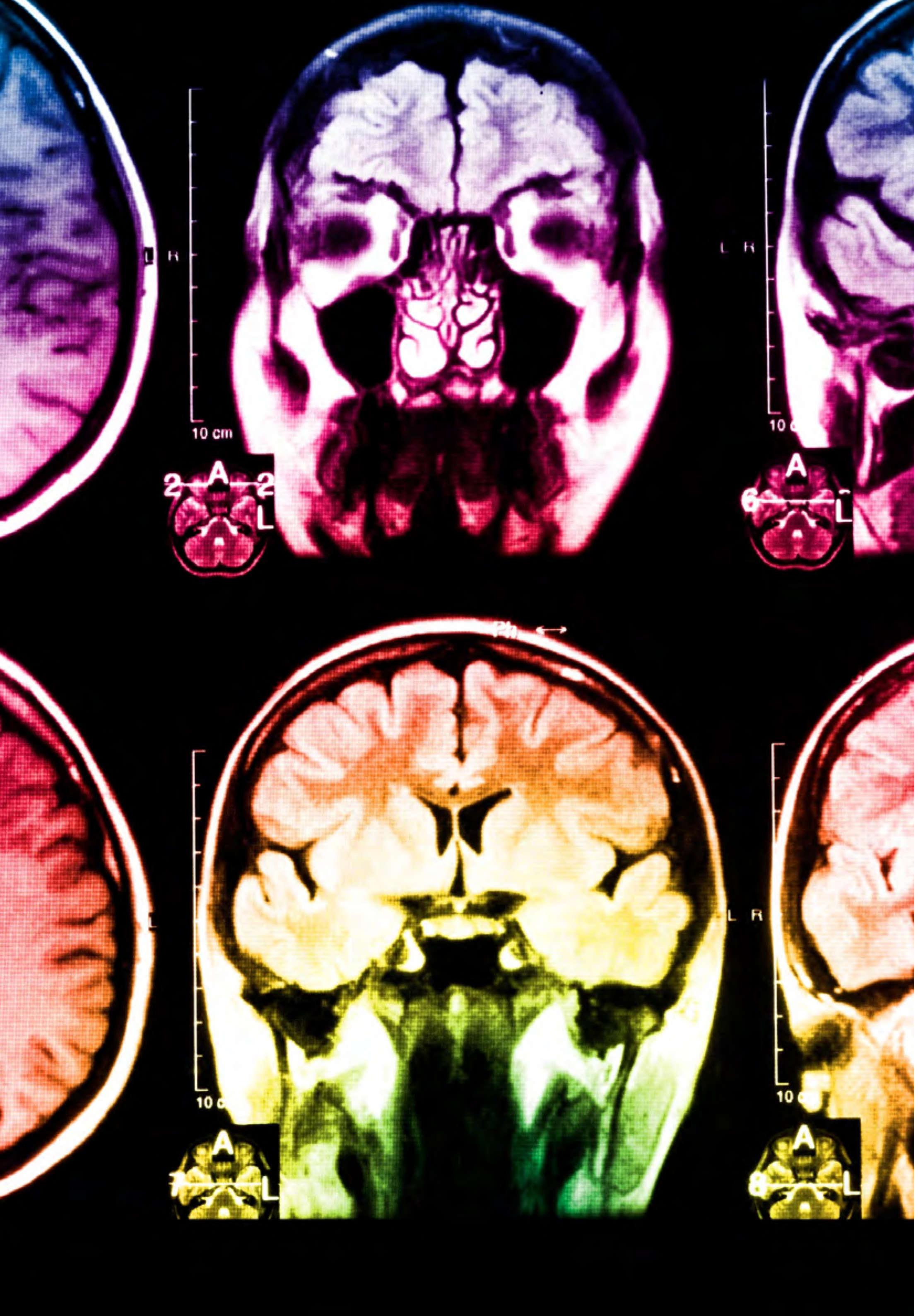
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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 prepare 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 prepared 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 education, 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 adapted in 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.

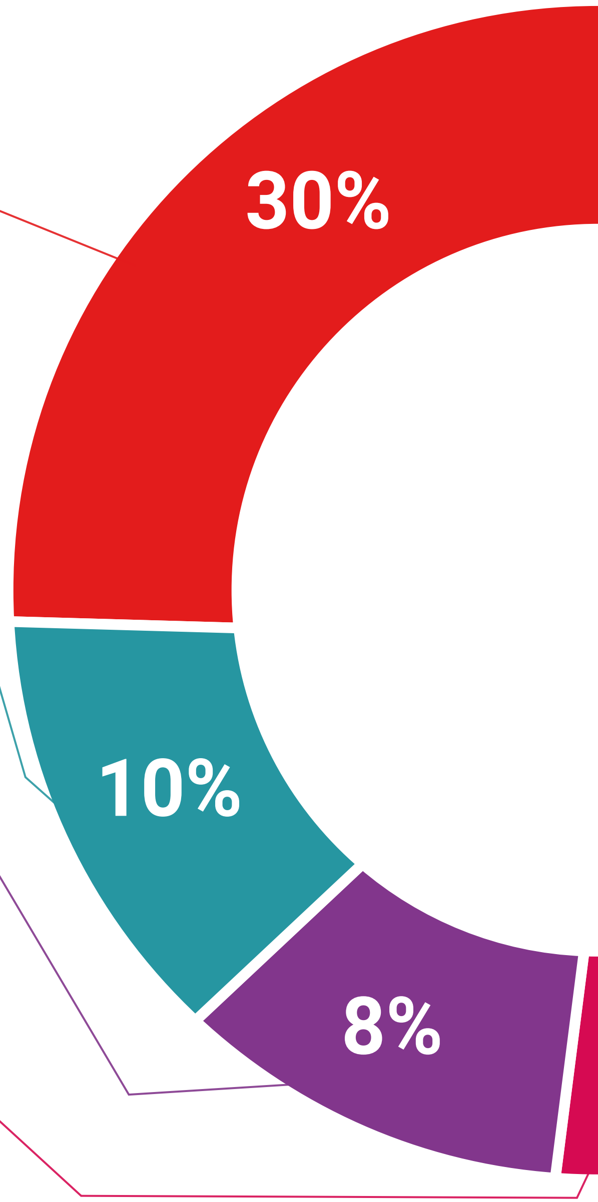
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

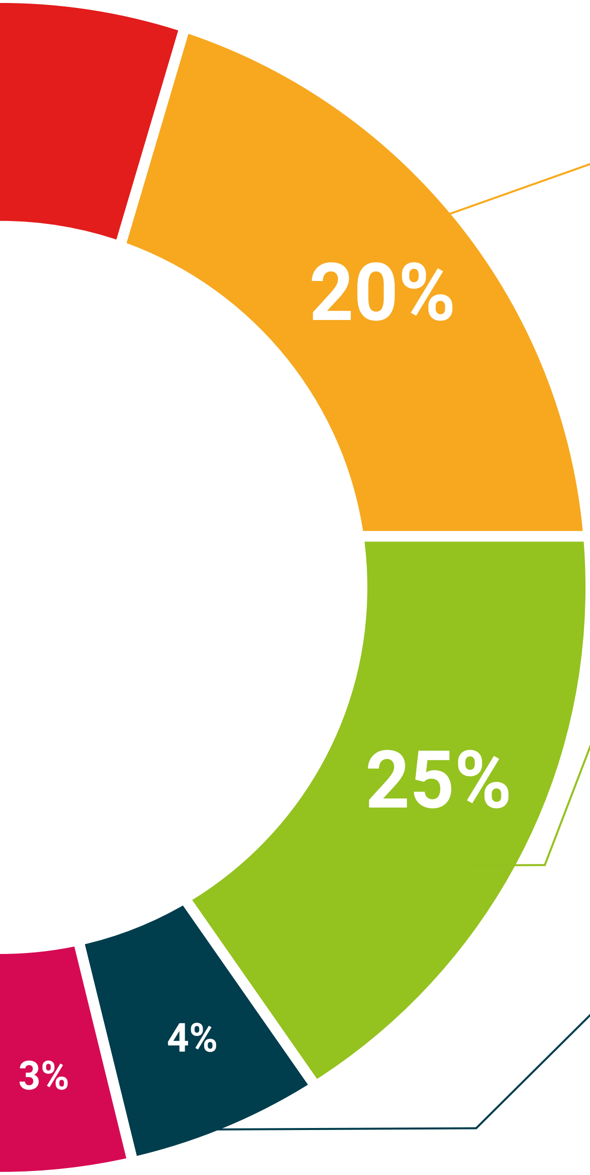
Practicing Skills and Abilities

They will carry out activities to develop specific competencies and skills in each thematic field. 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 assess and re-assess 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 Diploma in Radiophysics Applied to Advanced Radiotherapy Procedures guarantees, in addition to the most rigorous and training, access to a Postgraduate Diploma issued by TECH Technological University.

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

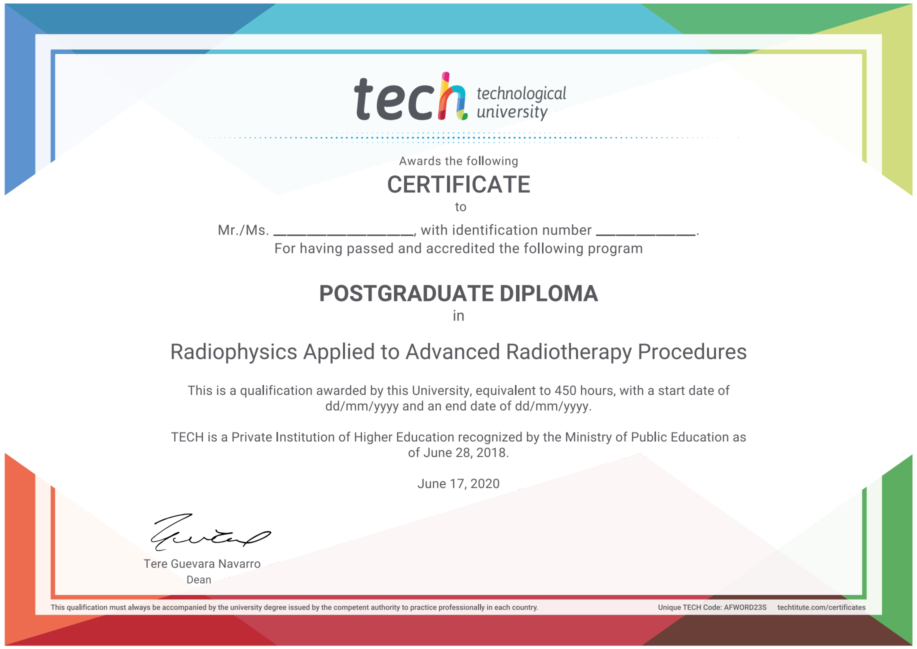
This **Postgraduate Diploma in Radiophysics Applied to Advanced Radiotherapy Procedures** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Diploma** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Diploma, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Diploma in Radiophysics Applied to Advanced Radiotherapy Procedures**

Official Nº of Hours: **450 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. ________________, with identification number ____________.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Radiophysics Applied to Advanced Radiotherapy Procedures

This is a qualification awarded by this University, equivalent to 450 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro

Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

*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.

technological university

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