Postgraduate Diploma
Radiophysics Applied to Diagnostic Imaging

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Postgraduate Diploma
Radiophysics Applied to Diagnostic Imaging

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

Website: **www.techtitute.com/us/medicine/postgraduate-diploma/postgraduate-diploma-radiophysics-applied-diagnostic-imaging**

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01

Introduction

The generation of X-rays has been a major breakthrough in the follow-up of patients with chronic diseases. In this way, dynamic imaging systems enable experts to assess the function of moving organs, such as the heart. However, any exposure to ionizing radiation involves health risks for both patients and healthcare professionals. For example, expert handling of radiopharmaceuticals can result in radioactive contamination if nuclear material spills occur, it is therefore vital that radiological protection measures are taken. In this context, TECH has developed a 100% online program for nurses to keep up to date with dosimetric control and in the international regulations that govern it.

You will master digital image processing thanks to the best digital university in the world, according to Forbes"

The Compton Effect is one of the most important processes to keep in mind when calculating radiation dose in treatments. The reasons lie in the implications it has on the generation of medical images and radiation dosage in different therapies. If experts were to make mistakes when measuring this process, this would lead to everything from incorrect diagnoses to radiation overdosage. This, in turn, could lead to side effects and damage to normal tissues.

In order to obtain proper education on fabric composition and density, TECH has implemented this advanced Postgraduate Diploma. In this way, nurses will be able to carry out safe clinical practices, using both X-Ray and Gamma Rays. In fact, the curriculum will address the interactions between photons and matter.

It will also delve into the weighting factors of organs according to their radiosensitivity, analyzing various tools for quality control in visualization systems. This will allow the graduate to identify the risks in the hospital area and to design structural shielding for the protection of both patients and personnel.

In order to consolidate these contents, the methodology of this program reinforces its innovative character. In this way, TECH offer a 100% online educational environment. to the needs of busy professionals looking to advance their careers. In addition, it will employ the Relearning methodology, based on the repetition of key concepts to fix knowledge and facilitate learning. In this way, the combination of flexibility and a robust pedagogical approach makes it highly accessible. In addition, learners will have access to an extensive library of innovative multimedia resources in different audiovisual formats, such as interactive summaries, explanatory videos, photographs, case studies and infographics.

This **Postgraduate Diploma in Radiophysics Applied to Diagnostic Imaging** 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 experts in Radiophysics applied to Diagnostic Imaging
- The graphic, schematic and practical contents with which it is conceived gather scientific and practical information on those 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
- The availability of access to content from any fixed or portable device with an Internet connection

You will delve into the interaction between photons and matter to irradiate tumors with high precision"

Looking to get the most out of Mammography equipment? Develop the most advanced tests in quality control, thanks to TECH"

You will cover dosimeter calibration in detail to ensure reliable radiation exposure measurements.

With the Relearning system, pioneer in TECH, you will reduce long hours of study and memorization.

The program's teaching staff includes professionals from the sector 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 academic year For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

This Postgraduate Diploma has an incisive focus on the understanding of radiation-matter interactions, dosimetry and quality control in diagnostic practice. In this way, it will seek not only to transmit in-depth knowledge, but also to foster critical skills to optimize medical imaging. In addition, it will aim to specialize experts committed to diagnostic excellence and radiological safety, preparing them to address the constant technological advancement and the growing demands of an accurate, ethical and safe medical practice.

With TECH you will acquire theoretical knowledge but also practical skills essential to meet contemporary challenges in the use of radiation in diagnostic imaging"

General Objectives

- Develop the physical basis of radiation dosimetry
- Distinguish between dosimetric and radiation protection measurements
- Determine the ionizing radiation detectors in a hospital
- Establish the basis of measurement quality control
- Delve into the physical elements of X-Ray beam collection
- Evaluate the technical characteristics of the equipment that can be used in a radiodiagnostic facility
- Examine the role of quality assurance and quality control systems in the achievement of optimal diagnostic images
- Analyze the importance of radiological protection, both for the professionals and for the patients themselves
- Investigate the risks derived from the use of ionizing radiation
- Develop the international regulations applicable to radiation protection transfer
- Specify the main safety actions in the use of ionizing radiation
- Design and manage the structural shielding against existing radiation in hospitals

You will be able to implement innovative technologies, evaluate and ensure the quality of the procedures and equipment Used in Radiodiagnosis"

Specific Objectives

Module 1. Interaction of Ionizing Radiation with Matter

- Internalize the Bragg-Gray theory and the dose measured in air
- Develop the limits of the different dosimetric quantities
- Analyze the calibration of a dosimeter
- Perform quality control of an ionization chamber

Module 2. Advanced Diagnostic Imaging

- Investigate the operation of an X-ray tube and a digital image detector
- Identify the different types of radiological images (static and dynamic)
- Analyze the international protocols for quality control of radiology equipment
- Delve into the fundamental aspects from the dosimetry in patients undergoing radiological tests

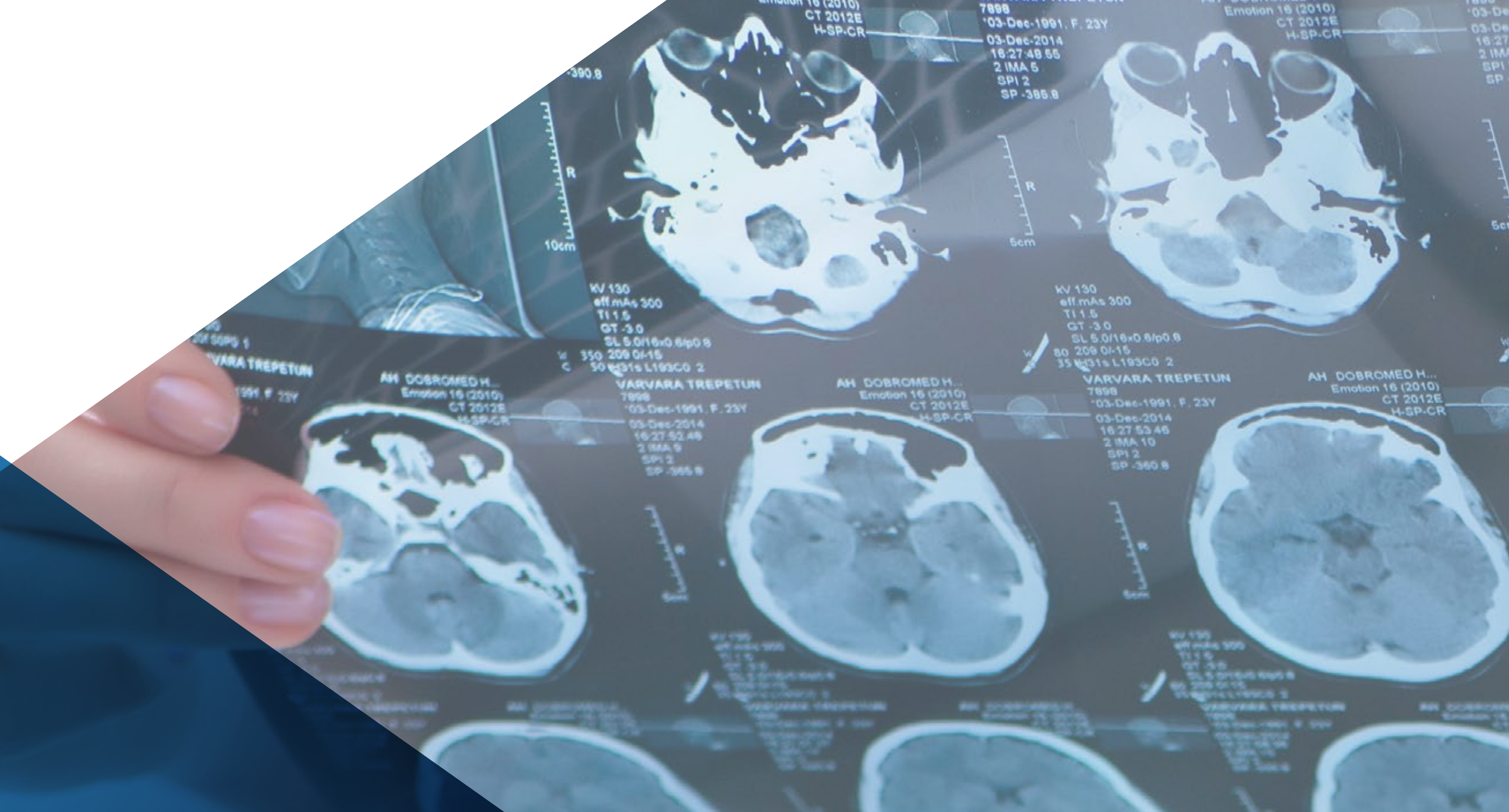
Module 3. Radiation Protection in Hospital Radioactive Facilities

- Determine the radiological hazards present in hospital radioactive facilities
- Identify the main international laws governing radiological protection
- Develop the actions carried out at the radiation protection level
- Establish the concepts applicable to the design of a radioactive facility

03

Course Management

In line with its commitment to offer educational maximum excellence, TECH has a prestigious teaching staff. These specialists have an extensive work background, having been part of renowned health centers. As a result, they are defined by their in-depth knowledge of the most innovative techniques for measuring ionizing radiation. In addition, they are up to date in all the advances that have been made in Radiophysics Applied to Diagnostic Imaging. Therefore, the graduates will have the guarantees that are demanded in a profession that is advancing by leaps and bounds.



Get updated in Design of Structural Shielding by the best experts in the field. Launch your professional career with TECH!"

Management

Dr. De 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, Universidad Católica San Antonio de 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

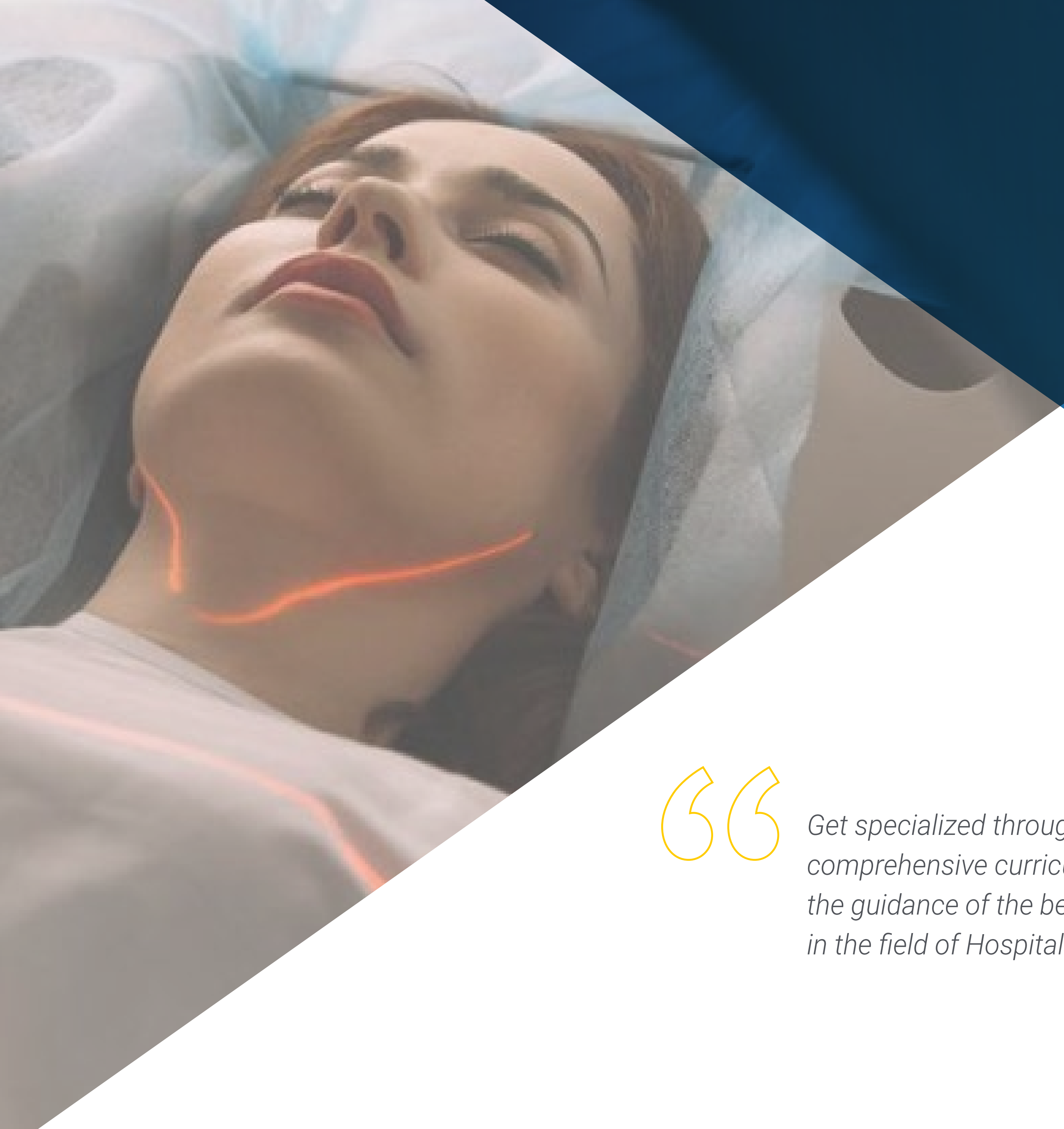
Dr. Rodríguez, Carlos Andrés

- Specialist in Hospital Radiophysics
- Physician in Hospital Radiophysics at the University Clinical Hospital of Valladolid, head of the Nuclear Medicine section
- Principal Tutor of residents of the Department of Radiophysics and Radiological Protection of the Hospital Clínico Universitario de Valladolid
- Degree in Hospital Radiophysics
- Degree in Physics at the University of Salamanca

04

Structure and Content

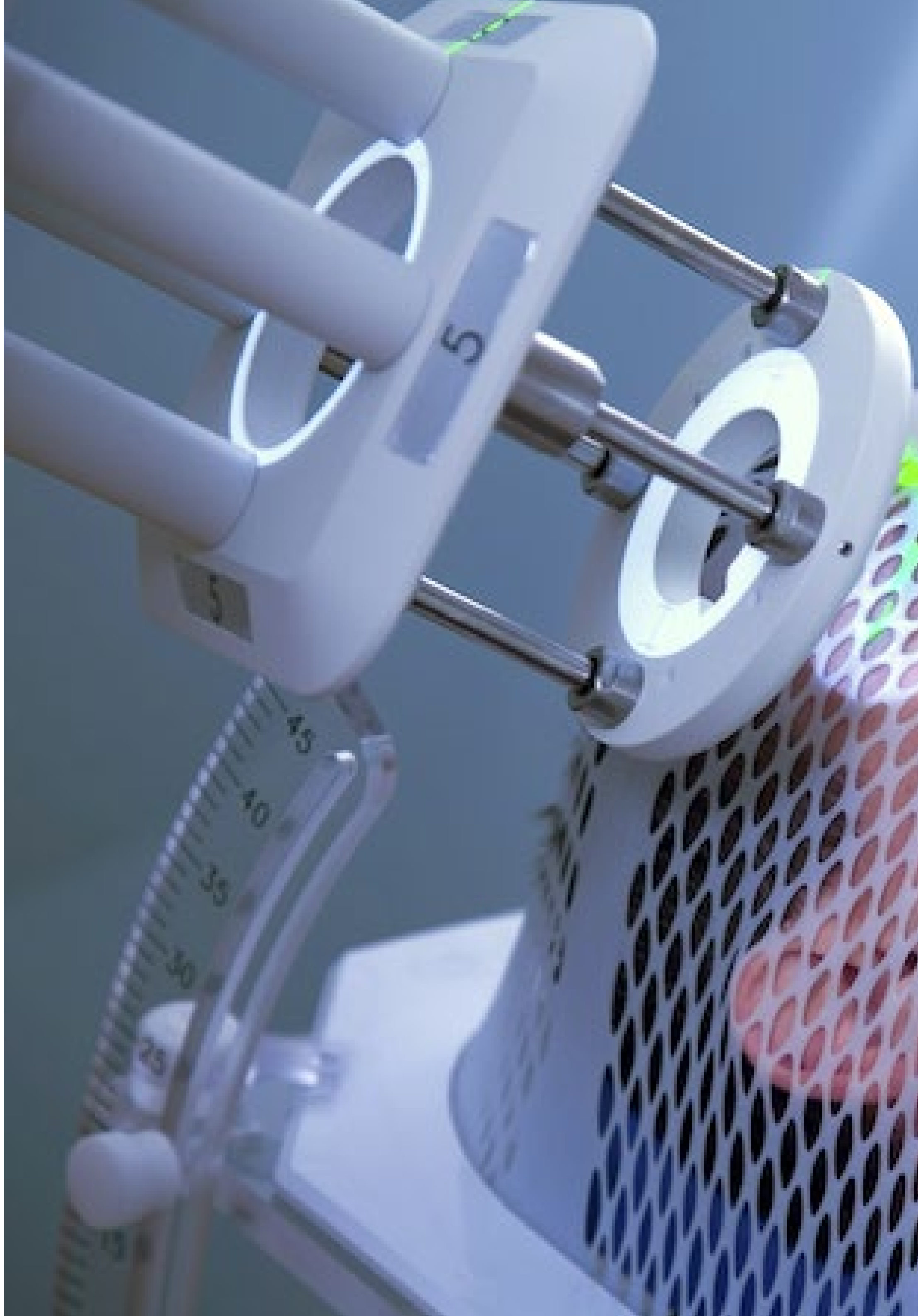
The program is distinguished by its comprehensive structure and dynamic content. In fact, its design is composed of modules that will cover everything from radiation interactions with matter to dosimetry and radiation protection, thus covering every essential aspect of quality medical imaging. With an updated and applied approach, this program will offer theoretical knowledge, supported by the latest technology used in real radiodiagnostic facilities. In addition, it will include a detailed analysis of radiological protection, a key element to ensure the safety of both medical staff and patients.



Get specialized through this comprehensive curriculum, as well as the guidance of the best professionals in the field of Hospital Radiophysics"

Module 1. Interaction of Ionizing Radiation with Matter

1.1. Radiation Ionizing-Matter Interaction
  1.1.1. Ionizing Radiation
  1.1.2. Collisions
  1.1.3. Braking Power and Range
1.2. Charged Particle-Matter Interaction
  1.2.1. Fluorescent Radiation
    1.2.1.1. Characteristic Radiation or X-rays
    1.2.1.2. Auger Electrons
  1.2.2. Braking Radiation
  1.2.3. Spectrum upon Collision of Electrons with a High Z Material
  1.2.4. Electron-positron Annihilation
1.3. Photon-Matter Interaction
  1.3.1. Attenuation
  1.3.2. Hemireductive Layer
  1.3.3. Photoelectric Effect
  1.3.4. Compton Effect
  1.3.5. Pair Creation
  1.3.6. Predominant Effect according to Energy
  1.3.7. Imaging in Radiology
1.4. Radiation Dosimetry
  1.4.1. Charged Particle Equilibrium
  1.4.2. Bragg-Gray Cavity Theory
  1.4.3. Spencer-Attix Theory
  1.4.4. Absorbed Dose in Air
1.5. Magnitudes in Radiation Dosimetry
  1.5.1. Dosimetric Quantities
  1.5.2. Radiation Protection Quantities
  1.5.3. Radiation Weighting Factors
  1.5.4. Weighting Factors of Organs according to their Radiosensitivity



1.6. Detectors for the Measurement of Ionizing Radiation
- 1.6.1. Ionization of Gases
- 1.6.2. Excitation of Luminescence in Solids
- 1.6.3. Dissociation of Matter
- 1.6.4. Detectors in the Hospital Setting

1.7. Dosimetry of Ionizing Radiation
- 1.7.1. Environmental Dosimetry
- 1.7.2. Area Dosimetry
- 1.7.3. Personal Dosimetry

1.8. Thermoluminescence Dosimeters
- 1.8.1. Thermoluminescence Dosimeters
- 1.8.2. Calibration of Dosimeters
- 1.8.3. Calibration at National Dosimetry Center

1.9. Physics of Radiation Measurement
- 1.9.1. Value of a Quantity
- 1.9.2. Accuracy
- 1.9.3. Precision
- 1.9.4. Repeatability
- 1.9.5. Reproducibility
- 1.9.6. Traceability
- 1.9.7. Quality in the Measurement
- 1.9.8. Quality Control of an Ionization Chamber

1.10. Uncertainty in Radiation Measurement
- 1.10.1. Uncertainty in the Measurement
- 1.10.2. Tolerance and Action Level
- 1.10.3. Type A Uncertainty
- 1.10.4. Type B Uncertainty

Module 2. Advanced Diagnostic Imaging

2.1. Advanced Physics in X-Ray Generation
- 2.1.1. X-ray Tubes
- 2.1.2. Radiation Spectra Used in Radiodiagnosis
- 2.1.3. Radiological Technique

2.2. Imaging in Radiology
- 2.2.1. Digital Image Recording Systems
- 2.2.2. Dynamic Imaging
- 2.2.3. Radiodiagnostic Equipment

2.3. Quality Control in Radiodiagnostics
- 2.3.1. Quality Assurance Program in Radiodiagnosis
- 2.3.2. Quality Protocols in Radiodiagnostics
- 2.3.3. General Quality Control Checks

2.4. Patient Dose Estimation in X-Ray Installations
- 2.4.1. Patient Dose Estimation in X-Ray Installations
- 2.4.2. Patient Dosimetry
- 2.4.3. Diagnostic Dose Reference Levels

2.5. General Radiology Equipment
- 2.5.1. General Radiology Equipment
- 2.5.2. Specific Quality Control Tests
- 2.5.3. Doses to Patients in General Radiology

2.6. Mammography Equipment
- 2.6.1. Mammography Equipment
- 2.6.2. Specific Quality Control Tests
- 2.6.3. Dose to Patients in Mammography

2.7. Fluoroscopy Equipment. Vascular and Interventional Radiology
- 2.7.1. Fluoroscopy Equipment
- 2.7.2. Specific Quality Control Tests
- 2.7.3. Dose to Patients in Interventions

2.8. Computed Tomography Equipment
- 2.8.1. Computed Tomography Equipment
- 2.8.2. Specific Quality Control Tests
- 2.8.3. Dose to Patients in CT

2.9. Other Radiodiagnostics Equipment
- 2.9.1. Other Radiodiagnostics Equipment
- 2.9.2. Specific Quality Control Tests
- 2.9.3. Non-ionizing Radiation Equipment

2.10. Radiological Image Visualization Systems
- 2.10.1. Digital Image Processing
- 2.10.2. Calibration of Display Systems
- 2.10.3. Quality Control of Visualization Systems

Module 3. Radiation Protection in Hospital Radioactive Facilities

3.1. Radiation Protection in Hospitals
- 3.1.1. Radiation Protection in Hospitals
- 3.1.2. Radiological Protection Magnitudes and Specialized Radiation Protection Units
- 3.1.3. Risks in the Hospital Area

3.2. International Radiation Protection Standards
- 3.2.1. International Legal Framework and Authorizations
- 3.2.2. International Regulations on Health Protection against Ionizing Radiation
- 3.2.3. International Regulations on Radiological Protection of the Patient
- 3.2.4. International Regulations on the Specialty of Hospital Radiophysics
- 3.2.5. Other International Regulations

3.3. Radiation Protection in Hospital Radioactive Facilities
- 3.3.1. Nuclear Medicine
- 3.3.2. Radiodiagnostics
- 3.3.3. Radiotherapy Oncology

3.4. Dosimetric Control of Exposed Professionals
- 3.4.1. Dosimetric Control
- 3.4.2. Dose Limits
- 3.4.3. Personal Dosimetry Management

3.5. Calibration and Verification of Radiation Protection Instrumentation
- 3.5.1. Calibration and Verification of Radiation Protection Instrumentation
- 3.5.2. Verification of Environmental Radiation Detectors
- 3.5.3. Verification of Surface Contamination Detectors

3.6. Tightness Control of Encapsulated Radioactive Sources
    3.6.1. Tightness Control of Encapsulated Radioactive Sources
    3.6.2. Methodology
    3.6.3. International Limits and Certificates
3.7. Design of Structural Shielding in Medical Radioactive Facilities
    3.7.1. Design of Structural Shielding in Medical Radioactive Facilities
    3.7.2. Important Parameters
    3.7.3. Thickness Calculation
3.8. Structural Shielding Design in Nuclear Medicine
    3.8.1. Structural Shielding Design in Nuclear Medicine
    3.8.2. Nuclear Medicine Facilities
    3.8.3. Calculation of the Workload
3.9. Structural Shielding Design in Radiotherapy
    3.9.1. Structural Shielding Design in Radiotherapy
    3.9.2. Radiotherapy Facilities
    3.9.3. Calculation of the Workload
3.10. Structural Shielding Design in Radiodiagnostics
    3.10.1. Structural Shielding Design in Radiodiagnostics
    3.10.2. Radiodiagnostics Facilities
    3.10.3. Calculation of the Workload

“You will face emerging challenges in Applied Radiophysics for Diagnostic Imaging, continuously improving diagnostic processes and radiological safety in the hospital setting”

05 Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

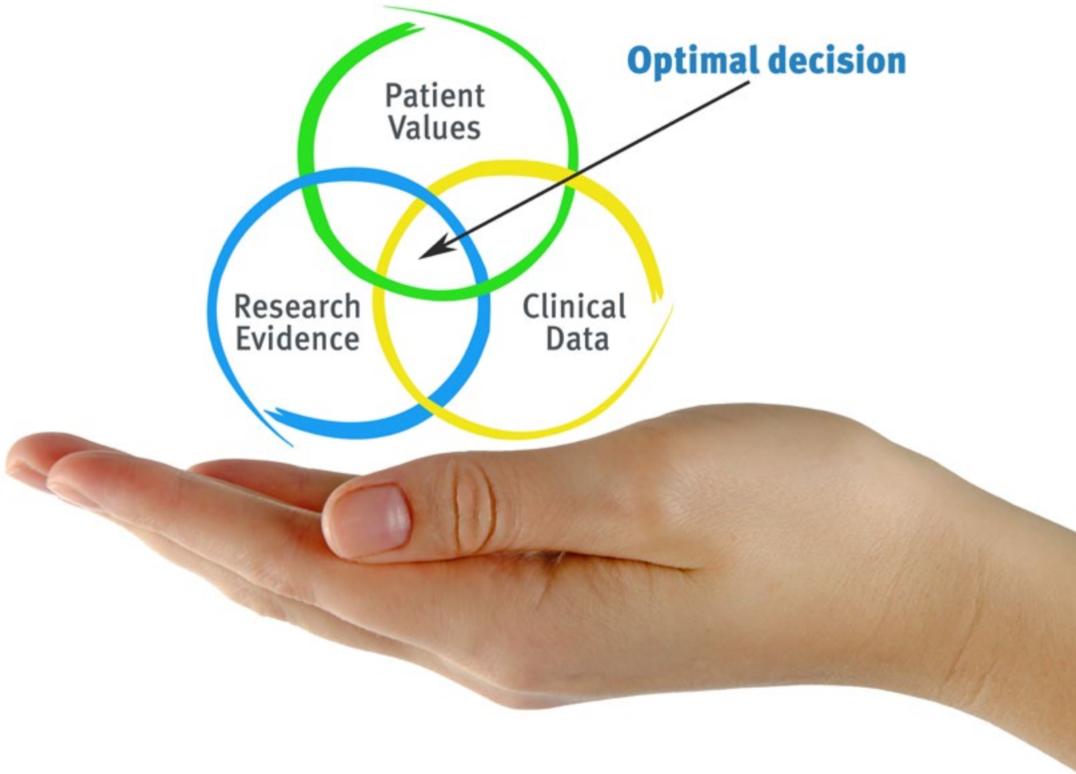
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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

What should a professional do in a given situation? 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 you will 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 in the physician's professional practice.

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:

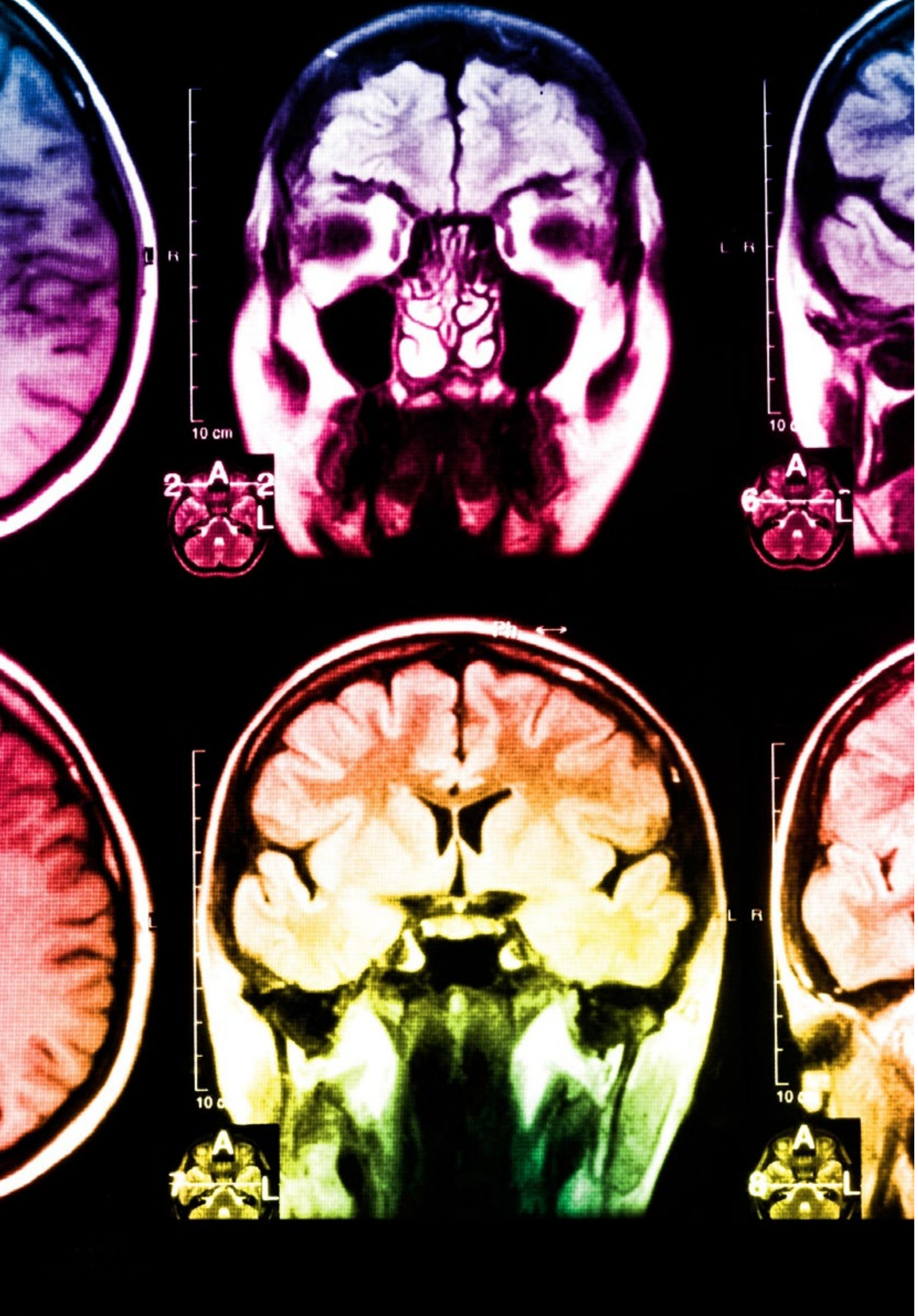
1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
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.

Professionals will learn through real cases and by resolving 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 250,000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

Relearning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to 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.

Surgical Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current medical techniques. 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.

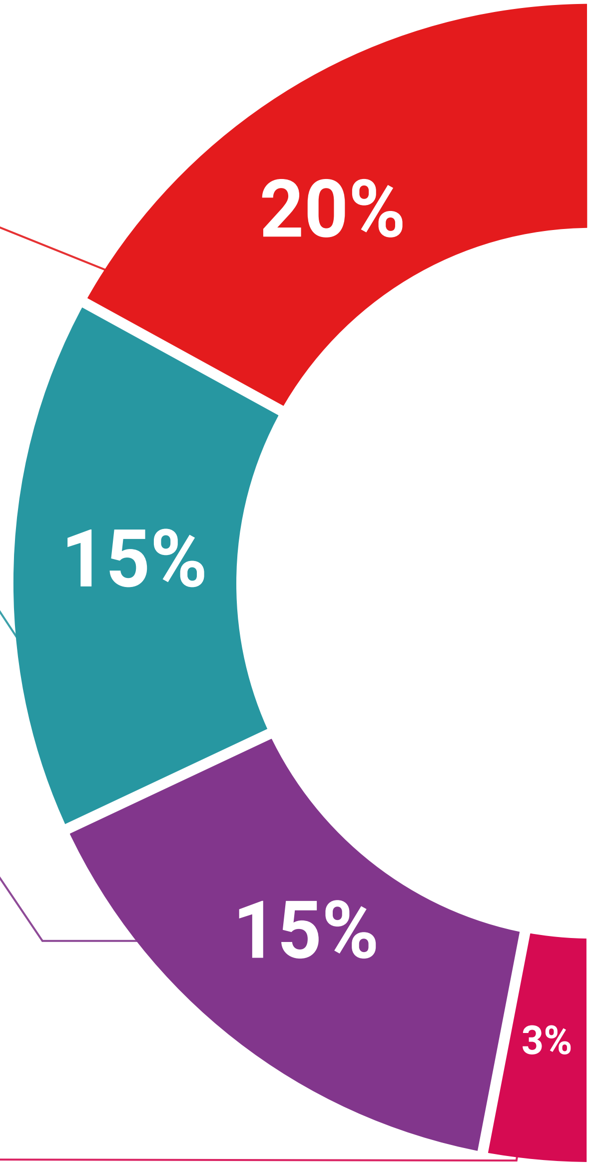
Interactive Summaries

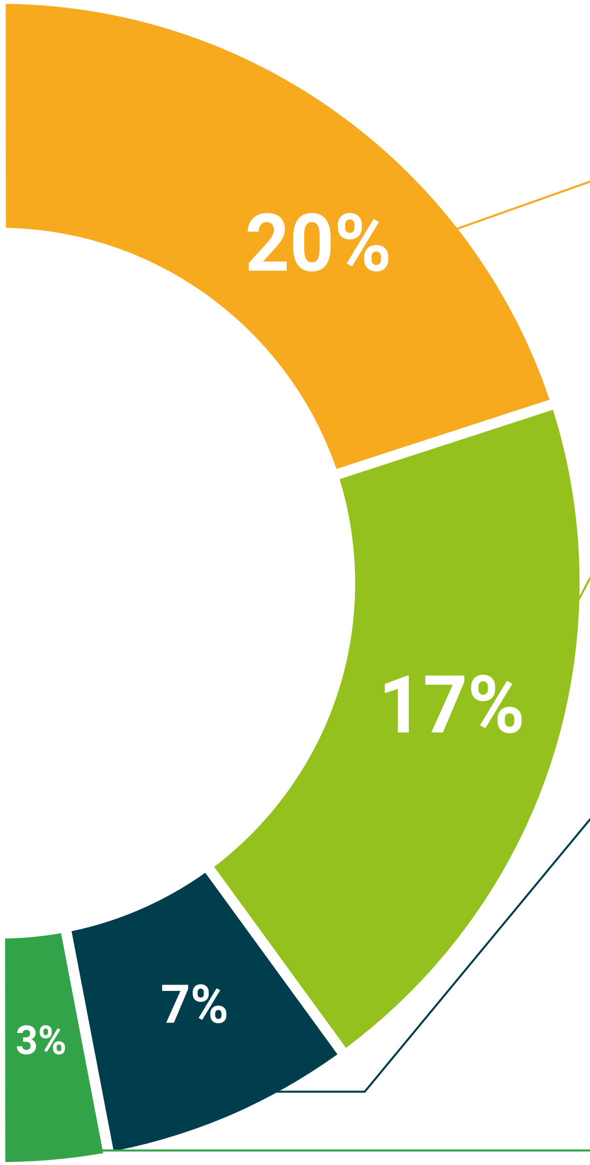
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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 on the usefulness of learning by observing experts. The system known as 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.

06

Certificate

The Postgraduate Diploma in Radiophysics Applied to Diagnostic Imaging guarantees, in addition to the most rigorous and up to date knowledge, 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 Diagnostic Imaging** 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 Diploma** issued by **TECH Technological University** via tracked delivery*.

The diploma 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 Diagnostic Imaging**

Official Nº of hours: **450 h.**


tech technological university

Awards the following

DIPLOMA

to

Mr./Ms. _______________, with identification number ___________.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Radiophysics Applied to Diagnostic Imaging

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 diploma issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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