

Internship Program  
Precision Oncology:  
Genomics and Big Data



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Internship Program  
Precision Oncology:  
Genomics and Big Data

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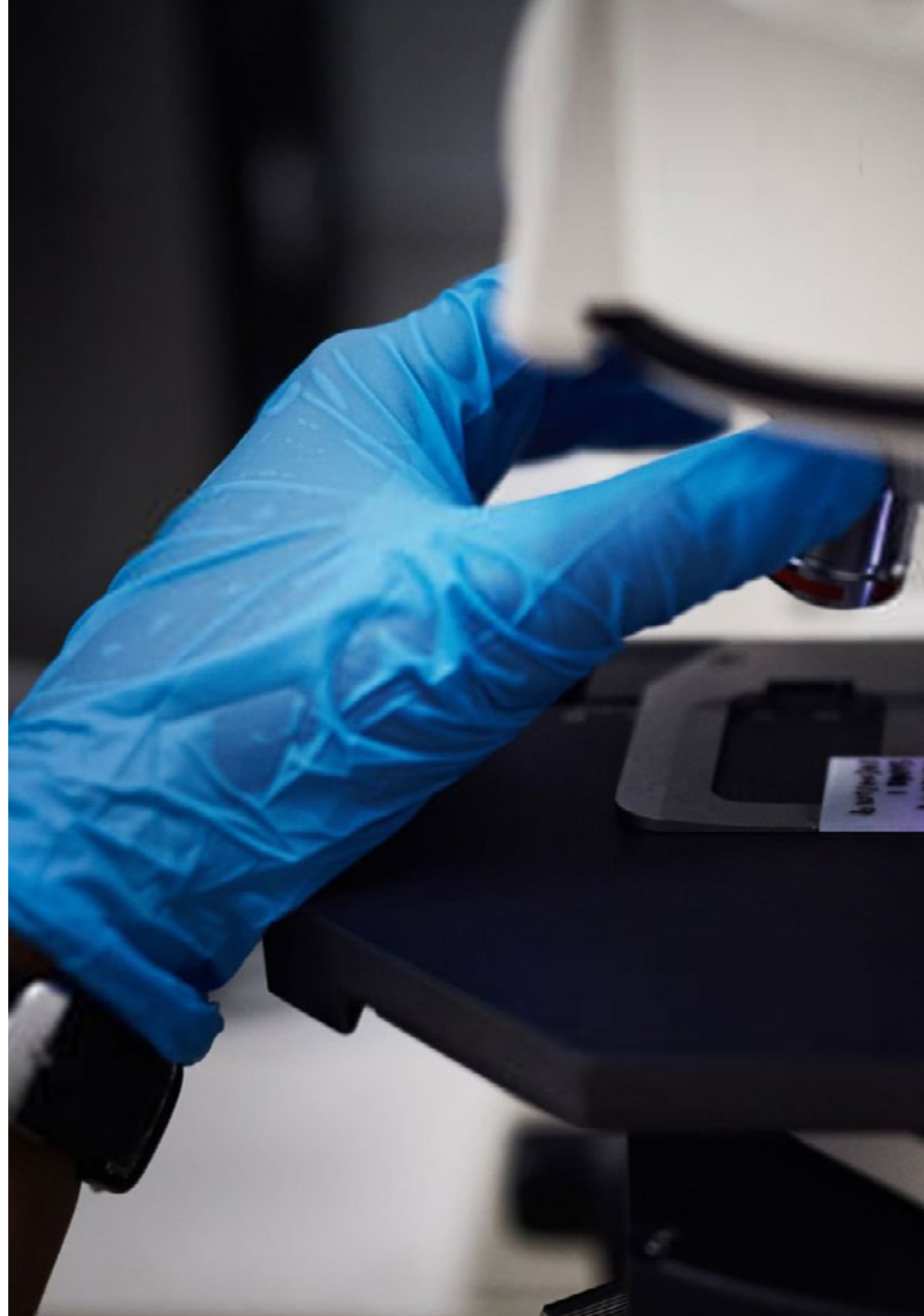
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# 01 Introduction

New information technologies have revolutionized various fields of science, particularly medicine. Oncology is one of the health fields that has advanced the most in recent years thanks to these research advances and, as a result, experts in this area now have much more efficient and sophisticated bioinformatics work programs. However, not all specialists are properly prepared to handle them. For this reason, TECH offers a 100% practical, face-to-face and intensive degree where the physician will acquire top-level competencies through a 3-week stay in a prestigious hospital facility and the accompaniment of renowned professionals.

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*Incorporate the most relevant advances in Precision Oncology into your professional practice, through a practical learning experience of only 120 hours"*





Over the last few years, scientific and technological innovations in the field of Precision Oncology have followed one another at an accelerated pace. Thus, in just a few decades, tools such as liquid biopsies have appeared, and new therapeutic targets have been discovered that can be used to prevent specific tumor pathologies or treat them effectively. At the same time, the sequencing of human DNA and the in-depth analysis of each of its component genes have generated large volumes of information. To manage this data, it is imperative to have bioinformatics programs and platforms whose analysis and interpretation of various clinical results allow the physician to make much more accurate clinical decisions.

However, not all specialists are prepared to use these advances. For this reason, TECH has designed this Internship program of excellence. The educational program offers oncologists the opportunity to take an intensive, immersive, face-to-face stay at a prestigious hospital center. The learning experience will last 3 weeks to be completed in 8-hour days, from Monday to Friday. During this period, the medical professional will have the opportunity to directly manipulate the most advanced informatics tools and to recognize the molecular investigations necessary to obtain specific data.

At the same time, the graduate will develop this academic modality under the guidance of an assistant tutor. This teaching figure, in addition to supervising their progress, will insert tasks of varying complexity to help them expand their skills. In addition, they will have the opportunity to work together with experts of a distinguished professional trajectory. From this perspective, you will achieve greater excellence in your healthcare activity, incorporating the most innovative protocols and procedures of the moment.

# 02

## Why Study an Internship Program?

In the turbulent educational market, only TECH offers oncologists the practical mastery of the latest bioinformatics tools in a program that lasts only 3 weeks. This Internship program applies an intensive mode of study where, from the very beginning, the specialist will acquire skills and develop them in the clinical care of real patients. At the same time, thanks to the face-to-face and immersive nature of the degree, you will share experiences with highly prestigious experts in the health sector.



*With this degree, you will acquire an advanced handling of the R programming language and you will be able to incorporate its use into your daily practice immediately"*

### 1. Updating from the latest technology available

New technologies have successfully revolutionized Oncology, leading to the development of much more personalized diagnostics and therapeutics. For this reason, and with the aim of bringing the specialist closer to this technology, TECH presents this Internship program with which they will be able to enter a cutting-edge clinical environment, accessing the latest generation resources that today Precision Oncology uses with full guarantees.

### 2. Gaining In-Depth Knowledge from the Experience of Top Specialists

The large team of professionals that will accompany the specialist throughout the entire practical period is a first-rate endorsement and a guarantee of unprecedented updating. With a specifically designated tutor, the physician will be able to see real patients in a state-of-the-art environment, which will allow him/her to incorporate the most effective procedures and approaches in relation to Precision Oncology into their daily practice.

### 3. Entering First-Class Clinical Environments

TECH carefully selects all available centers for Internship Programs. TECH carefully selects all available centers for its Internship programs. Thanks to this, the physician will have guaranteed access to a prestigious clinical environment in the area of Precision Oncology. In this way, they will be able to experience the day-to-day of a demanding, rigorous and exhaustive area of work, always applying the latest theses and scientific postulates of this specialty.



#### **4. Putting the acquired knowledge into daily practice from the very first moment**

The academic market is plagued by teaching programs that are poorly adapted to the daily work of the specialist and that require long hours of teaching. For this reason, TECH offers a new learning model, 100% practical, which allows you to get to grips with state-of-the-art procedures in Precision Oncology and, best of all, to put it into professional practice in just 3 weeks.

#### **5. Expanding the Boundaries of Knowledge**

TECH offers the possibility of carrying out this Internship Program in centers of international importance. This way, the specialist will be able to expand their frontiers and catch up with the best professionals, who lies in different continents. A unique opportunity that only TECH, the largest online university in the world, could offer.

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*You will have full practical immersion at the center of your choice”*

# 03 Objectives

The objective is to be updated in the latest diagnostic and therapeutic procedures to which a physician can have access through the most advanced Precision Oncology tools. This updating will take place in a hospital institution whose prestige is guaranteed by the implementation of optimal technological resources and its staff made up of distinguished experts.



## General Objectives

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- ♦ Update knowledge on the molecular biology of cancer, in relation to different concepts such as genetic heterogeneity or microenvironment reprogramming
- ♦ Provide and expand knowledge on immunotherapy as an example of a clear scientific advance in translational research
- ♦ Learn about a new approach to the classification of the most frequent tumors based on genomic data available in The Cancer Genome Atlas (TCGA) Research Network







## Specific Objectives

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- ♦ Interpret tumor mutational burden (TMB) as a genomic biomarker that has a significant impact on the landscape of cancer immunotherapy
- ♦ Learn how liquid biopsy of circulating DNA allows us to understand specifically what kind of molecular changes are happening in the tumor in real time
- ♦ Describe the current paradigm for incorporating genomic data into current clinical practice
- ♦ Master the Linux operating system, which is currently essential in the scientific world both for the interpretation of biological data from sequencing as it should also be for medical text mining when handling large-scale data
- ♦ Provide the basics of accessing a Linux server and how to find and install packages to install software locally
- ♦ Describe basic Linux commands for: creating, renaming, moving, and deleting directories; listing, reading, creating, editing, copying, and deleting files
- ♦ Understand how permissions work and how to decrypt the most cryptic Linux permissions easily
- ♦ Discuss how the adoption of next-generation sequencing (NGS) in a diagnostic context raises numerous questions regarding the identification and reporting of variants in secondary genes for patient pathology
- ♦ Get started in the R programming language, which has the advantages of being an open-source programming language and has multiple statistical analysis packages available
- ♦ Performing operations in R, including sorting, creating or importing data
- ♦ Provide examples of R programming in a way that will help make the connection between concepts and their implementation

- ♦ Using visualization techniques to explore new datasets and determine the most appropriate approach
- ♦ Describe the most appropriate statistical techniques as an alternative when data do not conform to the assumptions required by the standard approach
- ♦ Learn the basics of conducting reproducible research by using R scripts to analyze data
- ♦ Rapidly and automatically process and analyze enormous volumes of complex structured, semi-structured and unstructured data in big data
- ♦ Understand what machine learning is and use some of the techniques for data classification (decision tree, k-NN, Support Vector Machines, neural networks, etc.)
- ♦ divide data into a test set and a training set and discover the concepts of bias and variance
- ♦ Finding patterns and regularities in databases through targeted mining
- ♦ Learn to apply the principles of data mining to the analysis of large complex datasets (Big Data), including those in very large databases or on web pages
- ♦ Explore, analyze and leverage data and convert it into useful and valuable information for clinical practice
- ♦ Understand how most scientific data appear in documents such as web pages and PDF files that are difficult to process for further analysis, however, using scraping techniques they can be used
- ♦ Access to many data sources through the web for the implementation of precision medicine by allowing massive extraction of information



- ♦ Put into practice the knowledge acquired for the interpretation of a genomic study in several cancer cases by extracting useful information that will help in decision making
- ♦ Using several algorithms performed with the R language for the extraction of knowledge from Pubmed, DGIdb and Clinical Trials databases based on the search for genetic information in certain tumors
- ♦ Understanding the function of genes with little clinical information based on ontological proximity
- ♦ Discover genes involved in a disease based on a massive Pubmed search and graphical representation of the level of scientific evidence

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*Thanks to TECH you will learn how to implement several algorithms made with the R language for the extraction of knowledge from Pubmed, DGIdb and Clinical Trials databases”*

# 04

## Educational Plan

The Internship program in Precision Oncology: Genomics and Big Data of TECH is made up of a practical stay in a prestigious center, to be developed for 3 weeks, from Monday to Friday with days of 8 consecutive hours. This academic preparation, of a face-to-face and intensive nature, will take place next to an assistant specialist who will supervise all the doctor's progress.

In addition, they will have the opportunity to see real patients, together with a team of experts with extensive experience and international reference within this academic field. Thus, by applying the most innovative diagnostic procedures and planning the latest generation therapeutics in each pathology, you will achieve the highest possible update within your professional field.

In this completely practical Internship Program, the activities are aimed at developing and perfecting the skills necessary to provide healthcare care in areas and conditions that require highly qualified professionals, and are oriented towards specific expertise for practicing the activity, in a safe environment for the patient and with highly professional performance.

The practical teaching will be carried out with the active participation of the student performing the activities and procedures of each area of competence (learning to learn and learning to do), with the accompaniment and guidance of teachers and other fellow trainees that facilitate teamwork and multidisciplinary integration as a key element of the course.

The procedures described below will form the basis of the practical part of the training, and their implementation is subject to both the suitability of the patients and the availability of the center and its workload, with the proposed activities being as follows:



*Receive specialized education in an institution that can offer you all these possibilities, with an innovative academic program and a human team that will help you develop your full potential”*



Module	Practical Activity
<b>Changes in Current Clinical Practice and New Applications With Genomic Oncology</b>	Detect tumor-specific mutations through a peripheral blood sample or liquid biopsy
	Reveal mutations in genes, or their possible expression, through genetic or genomic tests to anticipate the onset of cancer
	Interpreting genomic biomarkers that have a significant impact on the cancer immunotherapy landscape
	Apply the most recognized therapeutic targets against Lung Cancer derived from the identification of mutations and translocation of specific genes
	Addressing the latency of the HER2 molecule and its relationship to advanced gastric cancer
<b>New applications of Bioinformatics in Genomic Oncology</b>	Handling the Unix system and its command lines for file organization and basic medical history information in the patient under suspicion of oncologic disease
	Incorporate R programming language applications to facilitate the analysis and comparison of diagnostic tests of an oncologic patient and those performed for follow-up
	Perform protein and proteome studies using state-of-the-art bioinformatic tools
	Implement various algorithms performed with the R language for knowledge extraction from the Pubmed, DGIdb and Clinical Trials databases from the search of genetic information in specific tumors
<b>Machine learning for Big Data analysis</b>	Rapidly and automatically analyze huge volumes of complex structured, semi-structured and unstructured medical data in Big Data
	Use Big Data's own techniques for data classification, including the Big Data tree decision tree, k-NN, Support Vector Machines, neural networks, among others
	Apply the principles of data mining to the dissection of large complex medical datasets
<b>Other genomic data mining techniques and their applications</b>	Extracting pharmacological data from the OncoKB database
	Evaluating genomic data from the My Cancer Genome platform
	Manipulating next-generation sequencing technologies on the market to examine patients DNA and RNA
	Employ Artificial Intelligence programs to select specific data from open and broad information with multiple results

# 05 Where Can I Do the Internship Program?

In its maxim of offering quality education for Precision Oncology professionals, TECH has decided to broaden academic horizons with this clinical practice. To this end, it has arranged for it to be taught from various internationally renowned hospitals, equipped with the most advanced technologies and care protocols of the moment. Also, in these facilities, the physician will find experts with extensive experience in these health issues. With their advice, you will gain the best practical skills to continue expanding your practice and personal career.



*Take your Internship program in a renowned hospital center and put into action everything you have learned from the best professionals in the sector"*





The student will be able to do this program at the following centers:



Medicine.

### Hospital HM Modelo

Country: Spain City: La Coruña

Address: Rúa Virrey Osorio, 30, 15011, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Anaesthesiology and Resuscitation
- Palliative Care



Medicine.

### Hospital HM Rosaleda

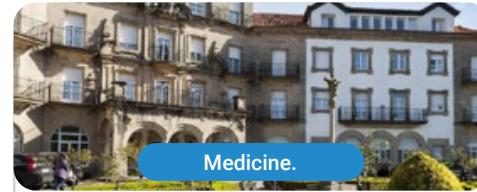
Country: Spain City: La Coruña

Address: Rúa de Santiago León de Caracas, 1, 15701, Santiago de Compostela, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Hair Transplantation
- Orthodontics and Dentofacial Orthopedics



Medicine.

### Hospital HM La Esperanza

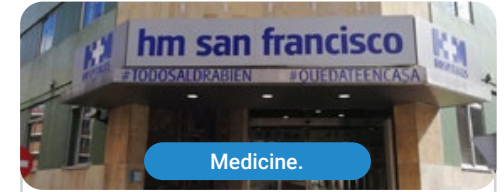
Country: Spain City: La Coruña

Address: Av. das Burgas, 2, 15705, Santiago de Compostela, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Oncology Nursing
- Clinical Ophthalmology



Medicine.

### Hospital HM San Francisco

Country: Spain City: León

Address: C. Marqueses de San Isidro, 11, 24004, León

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Update in Anesthesiology and Resuscitation
- Trauma Nursing



Medicine.

### Hospital HM Nou Delfos

Country: Spain City: Barcelona

Address: Avinguda de Vallcarca, 151, 08023 Barcelona

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Aesthetic Medicine
- Clinical Nutrition in Medicine



Medicine.

### Hospital HM Madrid

Country: Spain City: Madrid

Address: Pl. del Conde del Valle de Súchil, 16, 28015, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Palliative Care
- Anaesthesiology and Resuscitation



Medicine.

### Hospital HM Montepíncipe

Country: Spain City: Madrid

Address: Av. de Montepíncipe, 25, 28660, Boadilla del Monte, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Palliative Care
- Aesthetic Medicine



Medicine.

### Hospital HM Torrelodones

Country: Spain City: Madrid

Address: Av. Castillo Olivares, s/n, 28250, Torrelodones, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Anaesthesiology and Resuscitation
- Palliative Care



Medicine.

### Hospital HM Sanchinarro

Country	City
Spain	Madrid

Address: Calle de Oña, 10, 28050, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Anaesthesiology and Resuscitation
- Palliative Care



Medicine.

### Hospital HM Nuevo Belén

Country	City
Spain	Madrid

Address: Calle José Silva, 7, 28043, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- General and Digestive System Surgery
- Clinical Nutrition in Medicine



Medicine.

### Hospital HM Puerta del Sur

Country	City
Spain	Madrid

Address: Av. Carlos V, 70, 28938, Móstoles, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Palliative Care
- Clinical Ophthalmology



Medicine.

### Hospital HM Vallés

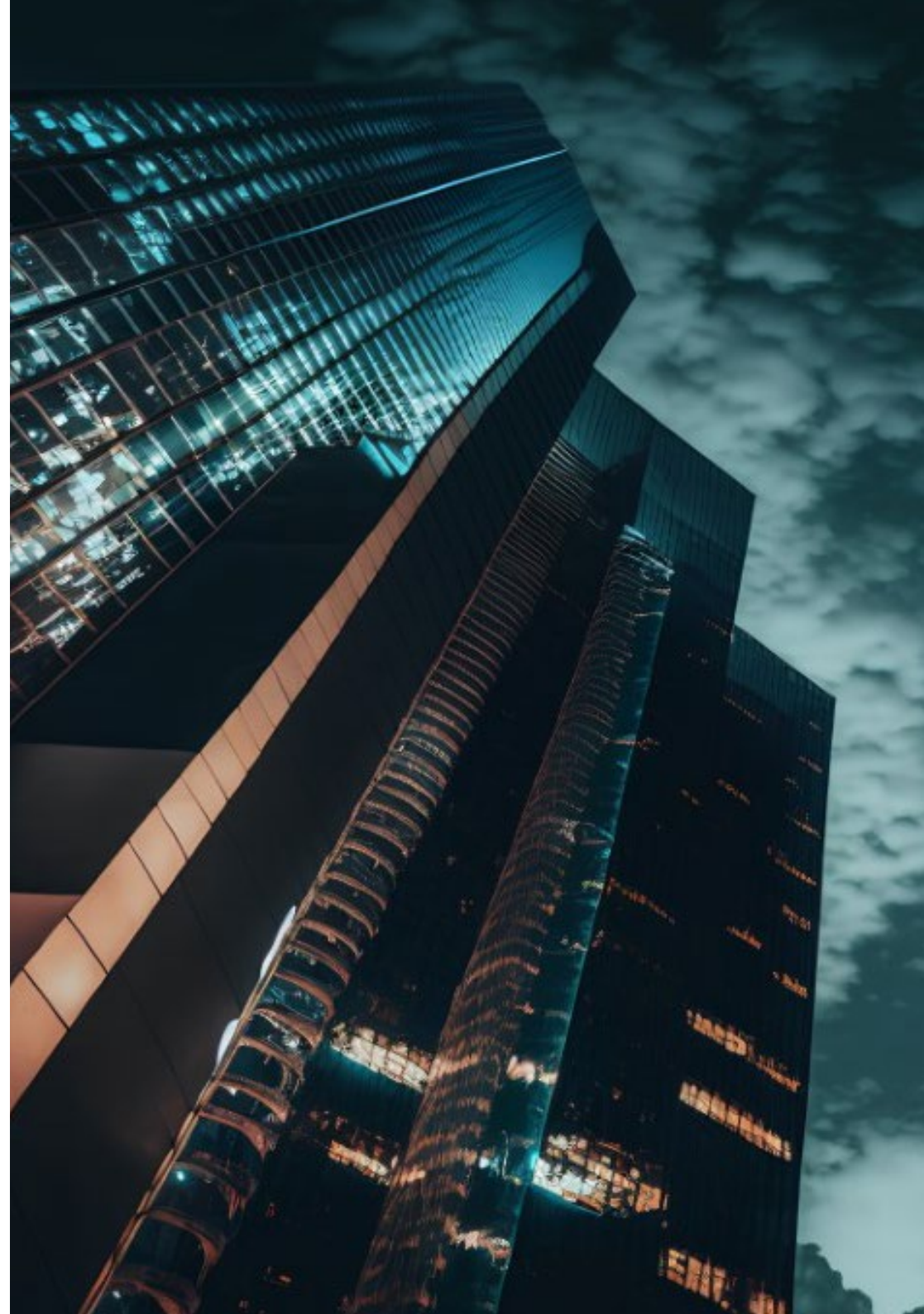
Country	City
Spain	Madrid

Address: Calle Santiago, 14, 28801, Alcalá de Henares, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

**Related internship programs:**

- Gynecologic Oncology
- Clinical Ophthalmology







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*You will learn firsthand the reality of working in the area, in a demanding and rewarding environment"*

# 06

## General Conditions

### Civil Liability Insurance

This institution's main concern is to guarantee the safety of the trainees and other collaborating agents involved in the internship process at the company. Among the measures dedicated to achieve this is the response to any incident that may occur during the entire teaching-learning process.

To this end, this entity commits to purchase a civil liability insurance policy to cover any eventuality that may arise during the course of the internship at the center.

This liability policy for interns will have broad coverage and will be taken out prior to the start of the practical training period. That way professionals will not have to worry in case of having to face an unexpected situation and will be covered until the end of the internship program at the center.



## General Conditions of the Internship Program

The general terms and conditions of the internship agreement for the program are as follows:

**1. TUTOR:** During the Internship Program, students will be assigned two tutors who will accompany them throughout the process, answering any doubts and questions that may arise. On the one hand, there will be a professional tutor belonging to the internship center who will have the purpose of guiding and supporting the student at all times. On the other hand, they will also be assigned an academic tutor, whose mission will be to coordinate and help the students during the whole process, solving doubts and facilitating everything they may need. In this way, the student will be accompanied and will be able to discuss any doubts that may arise, both clinical and academic.

**2. DURATION:** The internship program will have a duration of three continuous weeks, in 8-hour days, 5 days a week. The days of attendance and the schedule will be the responsibility of the center and the professional will be informed well in advance so that they can make the appropriate arrangements.

**3. ABSENCE:** If the students does not show up on the start date of the Internship Program, they will lose the right to it, without the possibility of reimbursement or change of dates. Absence for more than two days from the internship, without justification or a medical reason, will result in the professional's withdrawal from the internship, therefore, automatic termination of the internship. Any problems that may arise during the course of the internship must be urgently reported to the academic tutor.

**4. CERTIFICATION:** Professionals who pass the Internship Program will receive a certificate accrediting their stay at the center.

**5. EMPLOYMENT RELATIONSHIP:** The Internship Program shall not constitute an employment relationship of any kind.

**6. PRIOR EDUCATION:** Some centers may require a certificate of prior education for the Internship Program. In these cases, it will be necessary to submit it to the TECH internship department so that the assignment of the chosen center can be confirmed.

**7. NOT INCLUDED:** The Internship Program shall not include any element not described in these conditions. Therefore, it does not include accommodation, transportation to the city where the internship takes place, visas or any other items not listed

However, students may consult with their academic tutor for any questions or recommendations in this regard. The academic tutor will provide the student with all the necessary information to facilitate the procedures in any case.

# 07 Certificate

This **Internship Program in Precision Oncology: Genomics and Big Data** contains the most complete and up-to-date program in the professional and academic landscape.

After the student has passed the assessments, they will receive their corresponding Internship Program diploma issued by TECH Technological University via tracked delivery\*.

The diploma issued by TECH will reflect the grade obtained in the test.

Title: **Internship Program in Precision Oncology: Genomics and Big Data**

Duration: **3 weeks**

Attendance: **Monday to Friday, shifts of 8 consecutive hours**

Total Hours: **120 h. of professional practice**



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Precision Oncology:  
Genomics and Big Data

# Internship Program

## Precision Oncology: Genomics and Big Data



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