Postgraduate Certificate

Automata Theory and Formal Languages

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Postgraduate Certificate
Automata Theory and Formal Languages

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

Website: **www.techtitute.com/us/artificial-intelligence/postgarduate-certificate/automata-theory-formal-languages**

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01

Introduction

Automata Theory and Formal Languages acquire significant importance in the field of Artificial Intelligence. Although a *priori* these disciplines may seem distinct, there are both deep connections and direct applications between them. For example, Finite Automata are used in pattern recognition to contribute to aspects such as facial or voice recognition. In this regard, a recent scientific study found that 65% of companies in Spain use techniques from these areas for tasks ranging from algorithm design to the automation of repetitive tasks. In view of their growing importance, TECH is developing a pioneering 100% online university program for experts who wish to delve deeper into these areas.

You will master Abstract Computational Models such as Finite or Turing Automata with this 100% online Postgraduate Certificate, which will allow you to increase your knowledge without interrupting your professional work"

In the technological discipline of Machine Learning, Formal Languages are key to perform an optimal Natural Language Processing. Such systems are useful for modeling the structure and grammar of different languages. In addition, they include the representation of grammatical rules, the definition of lexicons and the specification of formal semantics. This considerably facilitates the analysis and generation of text by intelligent models. To get the most out of these processes, experts need to update their knowledge frequently to keep abreast of developments in these ever-expanding fields.

To help them with this task, TECH is launching a Postgraduate Certificate in Automata Theory and Formal Languages. Under a theoretical-practical approach, the educational resources will help students acquire new analytical skills aimed at solving computational problems. The syllabus will delve into the different types of Finite Automata, so that graduates can use these tools for aspects such as software verification. Likewise, the syllabus will provide students with advanced structures focused on the syntactic analysis of languages (among which the Derivation Trees or the Pumping Lemma stand out). In addition, the didactic contents will examine the Closure Properties of Languages in order to understand the relationships between different sets of languages.

As for the methodology of the university program, it is taught in a fully online format. TECH is fully aware of how difficult it can be for students to combine such an academic program with the rest of their daily activities. For this reason, the technological institution eliminates both face-to-face classes and fixed schedules. In this way, it is the experts themselves who set their own schedules and plan their educational timetables. All they need is an electronic device with an Internet connection to embark on an educational experience that will raise their professional horizons.

This **Postgraduate Certificate in Automata Theory and Formal Languages** contains the most complete and up-to-date program on the market. The most important features include:

- Development of case studies presented by experts in IT Engineering
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

A university program designed to acquire analytical skills and solve problems related to the syntax of formal languages"

You will incorporate Derivation Tree structures into your projects, thus facilitating various tasks in software development and language processing"

You will master the Closure Properties of Regular Languages in only 180 hours thanks to this revolutionary university program.

You will reach your full potential in the field of Theoretical Computer Science thanks to the most complete and pragmatic pedagogical resources in the academic market.

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

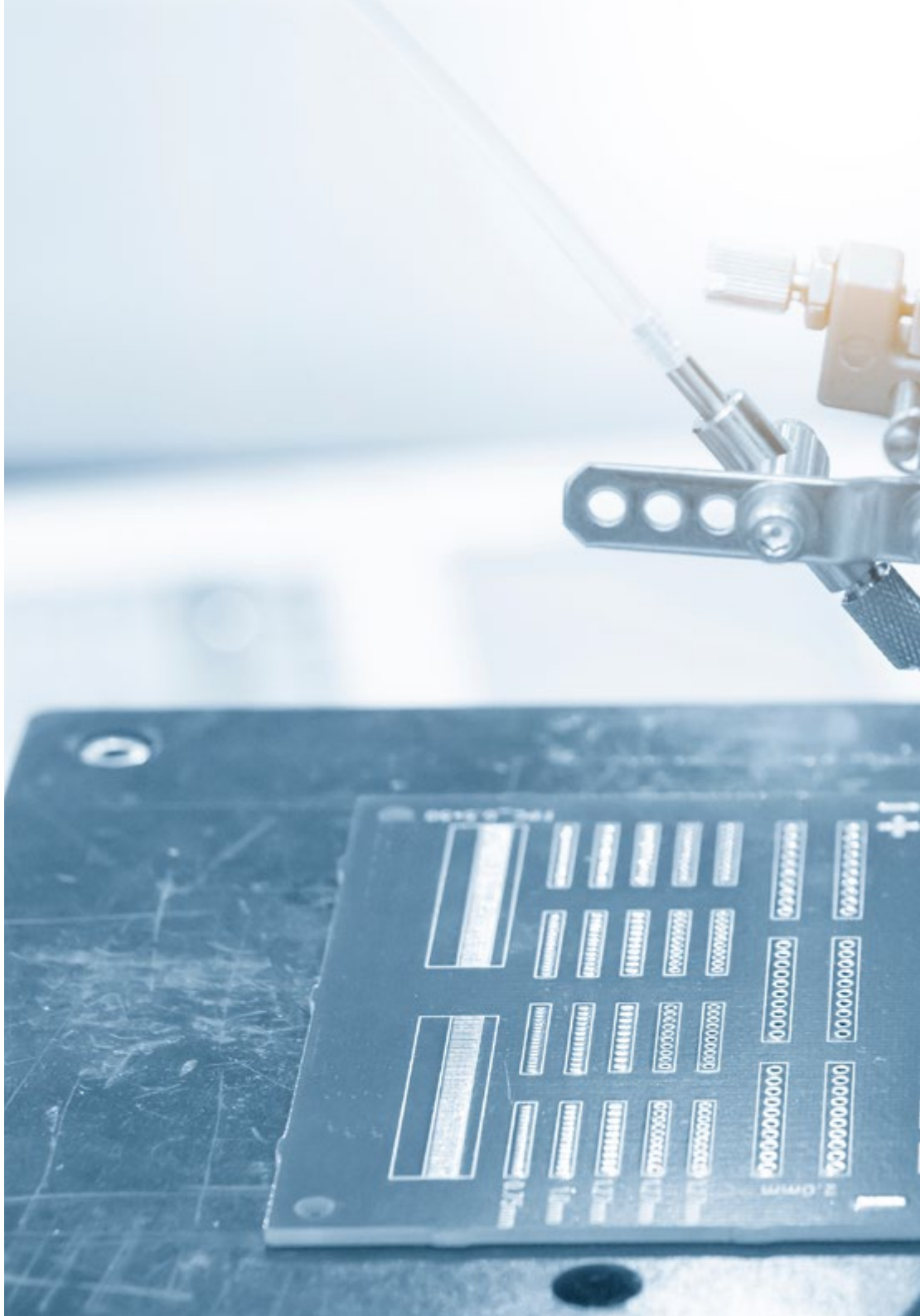
Objectives

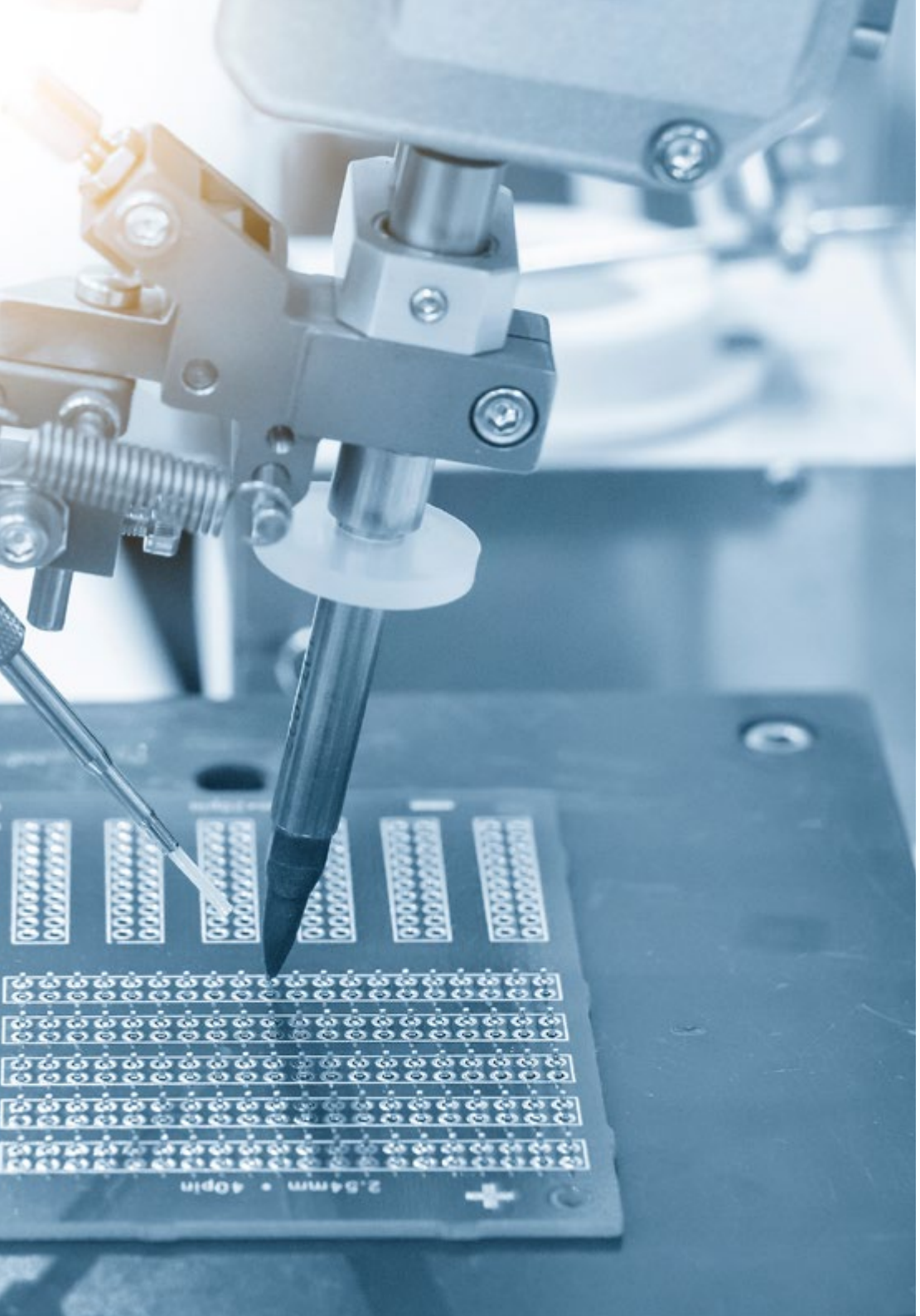
After 180 hours of learning, graduates will obtain an integral vision in the field of Automata Theory and Formal Languages. Likewise, they will nurture their daily procedures by incorporating various Artificial Intelligence tools to optimize their professional work. In tune with this, students will master the most important programming languages, including the algebra of Regular Expressions or the Pumping Lemma. In addition, they will effectively handle Finite Automata to represent systems of states and transitions. In this way, they will develop innovative solutions in fields such as cryptography, digital circuit design or embedded systems.

You will become a distinguished Computer Engineer, who keeps abreast of the latest research and developments in Artificial Intelligence to provide the best services"

General Objectives

- Prepare scientifically and technologically, as well as to develop the professional practice of Intelligent Systems, with a transversal and versatile approach adapted to the new technologies and innovations in this field
- Specialize students in the use of cutting-edge tools and techniques in the field of Artificial Intelligence and intelligent systems, including the mastery of relevant programming languages
- Develop problem solving and critical thinking skills, to evaluate different approaches in the design and implementation of Intelligent Systems
- Stimulate creativity and innovation in both the design and development of Intelligent Systems, promoting new ideas and approaches to address challenges in the field of Artificial Intelligence





Specific Objectives

- Understand the theory of automata and formal languages, learning the concepts of alphabets, strings and languages, as well as how to perform formal demonstrations
- Delve into the different types of finite automata, both deterministic and non-deterministic
- Learn the basic and advanced concepts related to regular languages and regular expressions, as well as the application of the pumping lemma and the closure of regular languages
- Delve into normal forms, the pumping lemma of context-independent grammars and properties of context-independent languages

Take the opportunity and get up to date on the latest trends in Regular Expression Conversion in Automata"

03

Structure and Content

With this program, students will have a thorough understanding of the fundamentals underlying computation. The program will focus on Automata Theory, providing graduates with the tools to master aspects such as programming languages and system verification. Also the syllabus will delve into Context Independent Grammars, tools designed to describe the syntactic structure of formal languages. The materials will also address the principle of the Pumping Lemma. In this way, practitioners will use it effectively during their demonstrations to prove that certain languages do not belong to the context-free category.

Update your knowledge in Algebra of Regular Expressions by means of innovative multimedia content that will optimize your learning. You will take what you have studied to practice in a simpler way!"

Module 1. Automata Theory and Formal Languages

1.1. Introduction to Automata Theory
- 1.1.1. Why Study Automata Theory?
- 1.1.2. Introduction to Formal Demonstrations
- 1.1.3. Other Forms of Demonstration Mathematical Induction
- 1.1.5. Alphabets, Strings and Languages

1.2. Deterministic Finite Automata
- 1.2.1. Introduction to Finite Automata
- 1.2.2. Deterministic Finite Automata

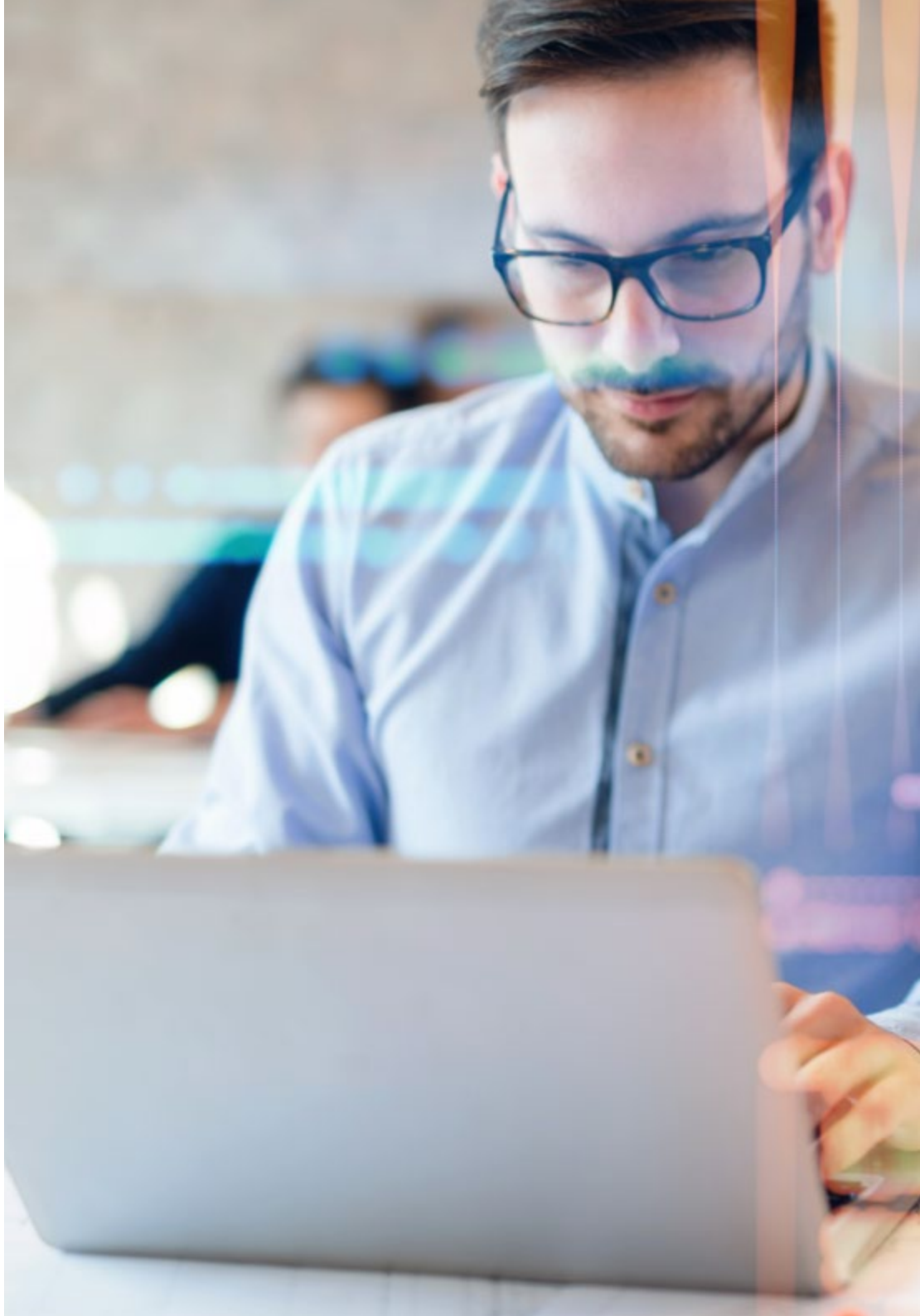
1.3. Non-Deterministic Finite Automata
- 1.3.1. Non-Deterministic Finite Automata
- 1.3.2. Equivalence Between AFD and AFN
- 1.3.3. Finite Automata with Transitions

1.4. Languages and Regular Expressions (I)
- 1.4.1. Languages and Regular Expressions
- 1.4.2. Finite Automata and Regular Expressions

1.5. Languages and Regular Expressions (II)
- 1.5.1. Conversion of Regular Expressions into Automata
- 1.5.2. Applications of Regular Expressions
- 1.5.3. Algebra of Regular Expressions

1.6. Pumping and Closure Lemma of Regular Languages
- 1.6.1. Pumping Lemma
- 1.6.2. Closure Properties of Regular Languages

1.7. Equivalence and Minimization of Automata
- 1.7.1. AF Equivalence
- 1.7.2. AF Minimization



1.8. Context-Independent Grammars (CIGs)
- 1.8.1. Context-Independent Grammars
- 1.8.2. Derivation Trees
- 1.8.3. Applications of CIGs
- 1.8. 4 Ambiguity in Grammars and Languages

1.9. Stack Automatons and GIC
- 1.9.1. Definition of Stack Automata
- 1.9.2. Languages Accepted by a Stack Automaton
- 1.9.3. Equivalence between Stack Automata and CIGs
- 1.9.4. Deterministic Finite Automata

1.10. Normal Forms, Pumping Lemma of GICs and Properties of LICs
- 1.10.1. Normal Forms of CIGs
- 1.10.2. Pumping Lemma
- 1.10.3. Closure Properties of Languages
- 1.10.4. Decision Properties of LICs

Do you want to improve your skills in Automata Theory and Formal Languages? Achieve it with real cases and resolution of complex situations in TECH's simulated learning environments"

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.

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.

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 has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. 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 course, students 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

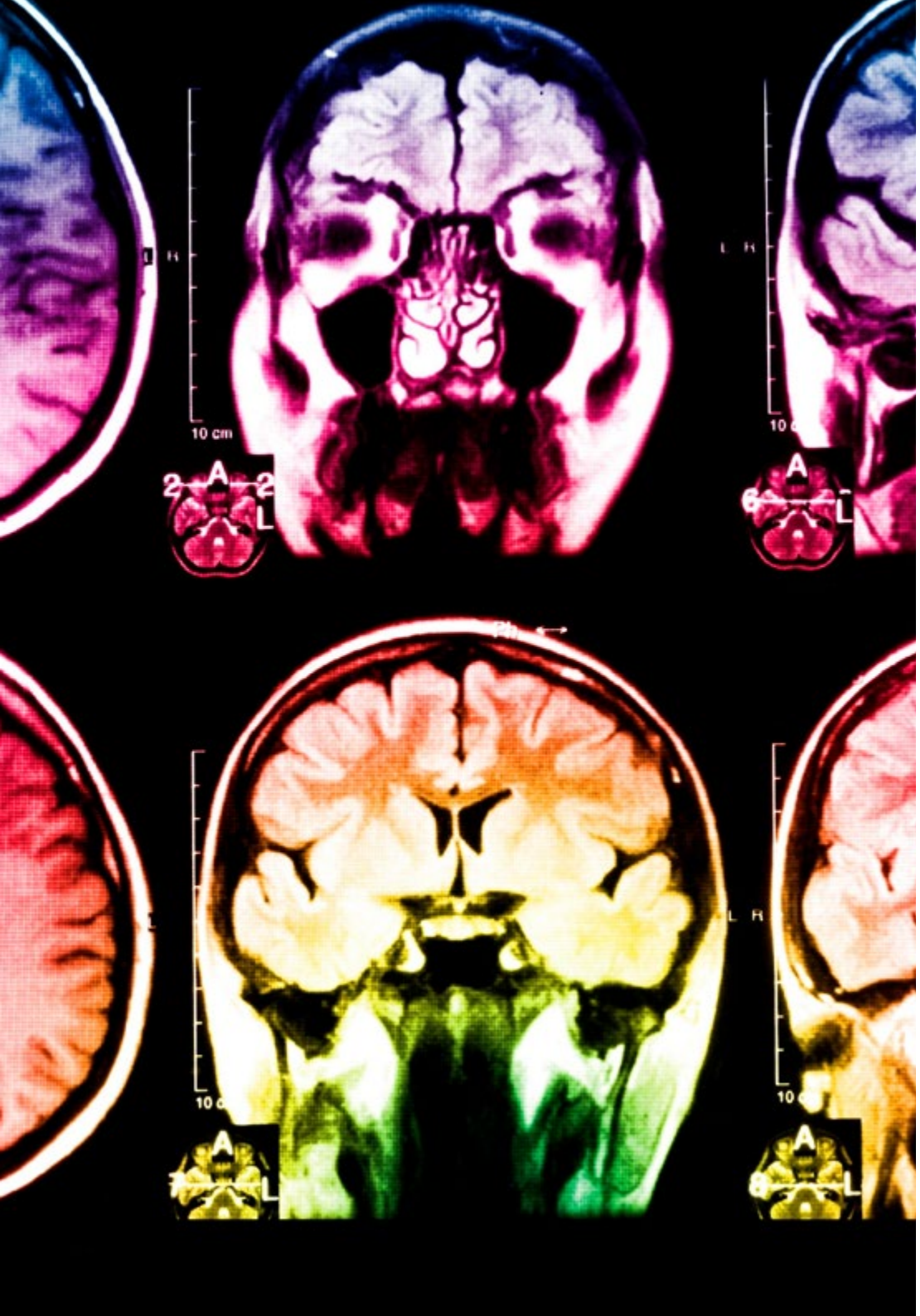
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

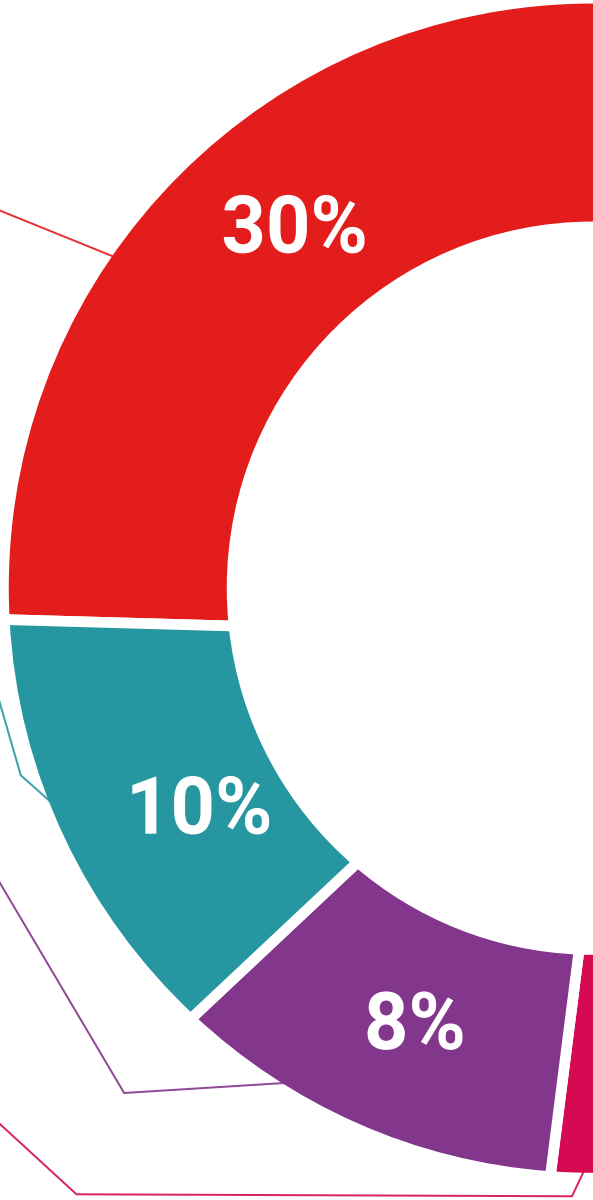
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

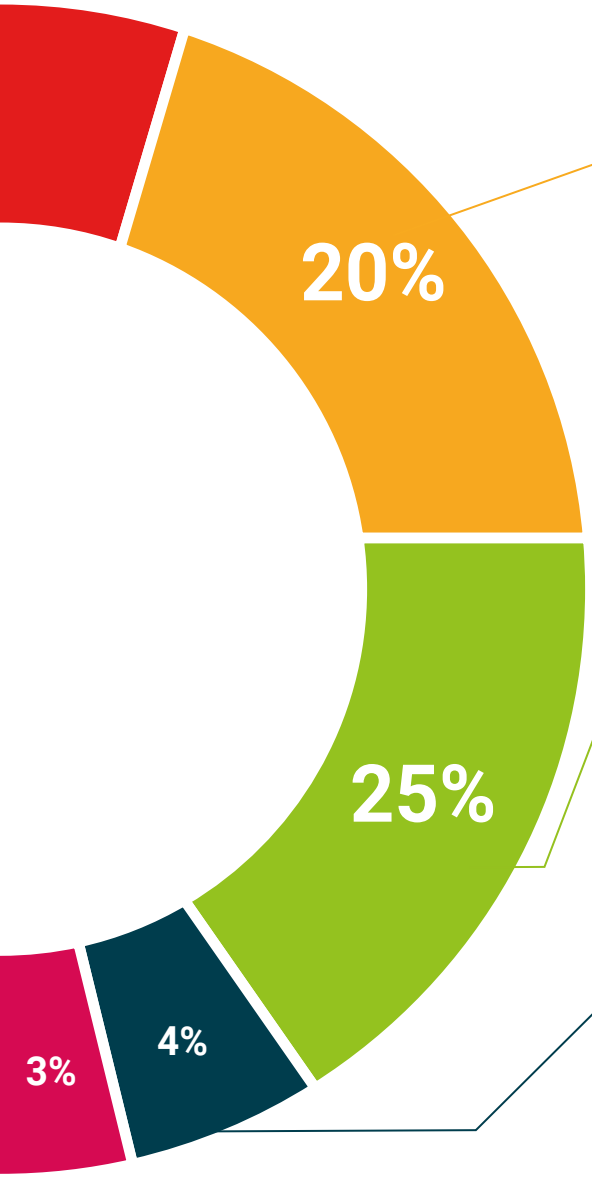
Practising Skills and Abilities

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 Automata Theory and Formal Languages guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.

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 Automata Theory and Formal Languages** 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 Automata Theory and Formal Languages**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Postgraduate Certificate in Automata Theory and Formal Languages

This is a program of 180 hours of duration equivalent to 6 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Rector

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 Global University will make the necessary arrangements to obtain it, at an additional cost.

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