ATHENAI
Technological Business School

CESN
COOPERACIÓN ESTRATÉGICA EN SEGURIDAD NACIONAL

Top Technical Lawyer

New Technologies Applied to Law and Law Applied to New Technologies

1st Edition

Google Cloud Certified PROFESSIONAL MACHINE LEARNING ENGINEER

Google Cloud Certified PROFESSIONAL DATA ENGINEER

Google Cloud Certified PROFESSIONAL CLOUD ARCHITECT

ΑΘΗΝΑΙ
Technological Business School

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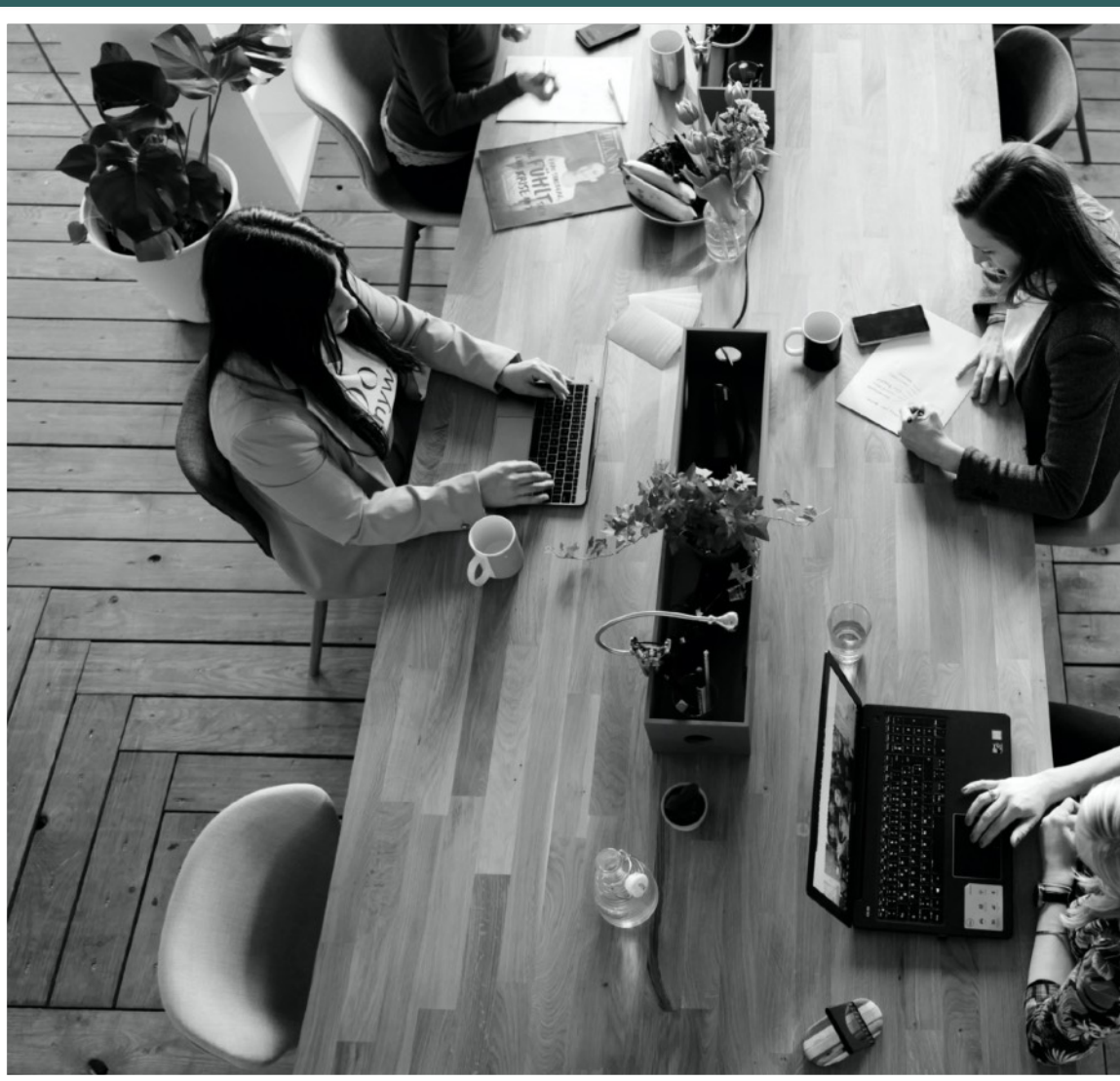

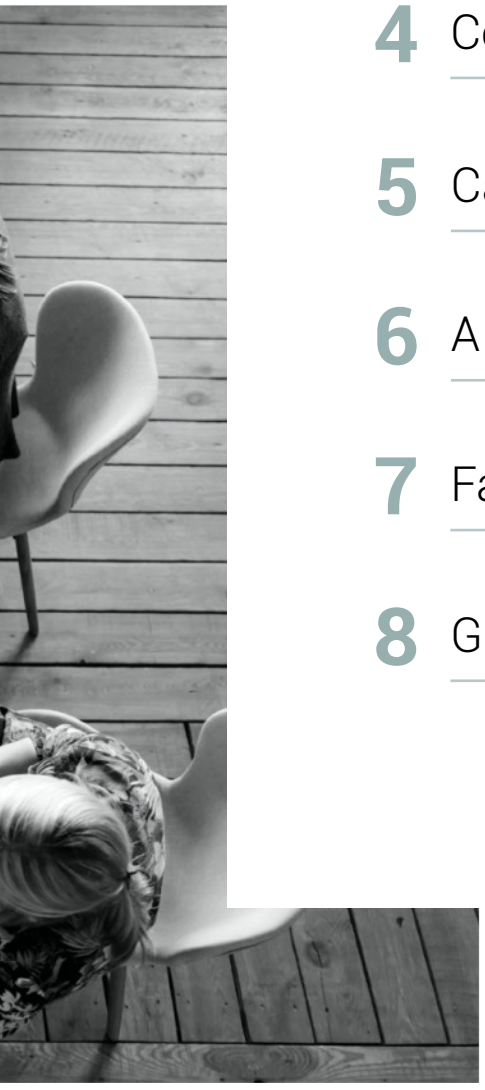

ΑTHENAI
Technological Business School

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AthenAI Technological Business School

A school for those who ***truly want to learn*** and are ***willing to put in the effort***.

CESN: Strategic Cooperation in National Security and Critical Infrastructure

An association dedicated to promoting and supporting a comprehensive approach to National Security and emerging technologies, with a clear focus on the safety and protection of critical infrastructure.

AthenAI Technological Business School

AthenAI is the CESN's school of technological excellence, specializing in advanced training in Artificial Intelligence, Quantum Computing, Blockchain, Cloud Services, and Big Data.

Why Study at AthenAI?

AthenAI is not a school for just any student,

AthenAI is a school for those who truly wish to learn and are willing to embrace challenges.

Here, learning is deep, discussion is rigorous, and research is thorough. Here, failure is possible, because without risk, there is no authentic learning. Leaders are not forged in comfortable classrooms, but in demanding environments that test their determination and effort.

A school for those who do not seek degrees, but aim to transcend

AthenAI Technological Business School was founded with the mission of being a knowledge and technology boutique: a selective, rigorous institution deeply connected to the major challenges of the present and the future.

In a context where quick fixes and superficial degrees abound, AthenAI positions itself as the school of technological excellence for students willing to embark on a deep, complex, and authentic path toward real learning. Here, no shortcuts or prepackaged successes are sought—only leaving a mark through knowledge, effort, and genuine commitment.

Knowledge, Reputation, and Purpose: The Three Pillars

At AthenAI, knowledge is measured not only through grades and rigorous certifications but also by a long-term metric: reputation. Each student will build their professional prestige within a dynamic community, where constant interaction with professors, peers, and alumni generates synergies, opportunities, and challenges. Reputation can be earned, invested in program discounts, content updates, and conference access, and it can also be lost.

At AthenAI, the student is always the protagonist. Our commitment is to create real opportunities through demanding projects and strategic connections. Students who come to AthenAI do not come to settle for a job—they come determined to change the course of their lives, to found their own start-up, to build a unicorn, and to one day appear on the cover of Forbes.

An exclusive community, one of a kind.

AthenAI is designed as a select club, similar to institutions like Mensa or Forbes. Access is restricted, and the standards are exceptionally high. Here, the community is essential: students, mentors, and alumni interact within a dynamic and transparent network, where knowledge and reputation are visible to all.

It is an environment where you can collaborate, debate, compete, and grow. You will become aware of others' strengths and weaknesses, and they will know yours. You will learn alongside them, compete with them, and—most importantly—build deep and lasting relationships that will transform your professional and personal life.

A school that is, in itself, a Unicorn

At this school, you don't come just for a job. You come to found your unicorn. To create something you can be proud of for the rest of your life. Because the world needs great ideas—and great people.

AthenAI not only trains entrepreneurs; AthenAI is itself a unicorn. A unique, ambitious model with a global vision and a disruptive spirit. It is the school where leaders learn to change society through their companies and their vision.

AthenAI: Where Failure Is a Real Possibility.

Unlike other schools, here you can fail, because true learning involves taking risks. Mediocrity stems from the absence of consequences. And those destined to lead must face the real possibility of failure before achieving success.

Enrolling means having the opportunity to successfully complete the program. Not a guarantee of completing it.

A School with Soul

AthenAI was born from the mind of Zeus, combining knowledge, arts, justice, and strategy. Its name evokes not only wisdom but also determination and character.

Our school was founded with a clear purpose and message:

"Build something you believe in"

It's not just about studying, but about creating.

It's not just about working, but about leading.

It's not just about teaching, but about transforming the student into their best version.

It's about distinguishing leaders from those who are not.

Here your story begins.

Welcome to AthenAI

ΑΘΗΝΑΙ
Technological Business School

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About the Master's Program

Lead the technological revolution from a legal perspective and ***turn Artificial Intelligence into a source of revenue for your law firm.***

Top Technical Lawyer: Two Master's Programs That Together Form the Most Comprehensive and Demanding Program in the World

Top Technical Lawyer: The elite in law, Artificial Intelligence, and emerging technologies.

Top Technical Lawyer is not merely an academic program—it is an intellectual challenge of the highest rigor, designed for those who aspire to lead the future of law in the era of Artificial Intelligence and emerging technologies. With a structure unique in the world, it combines academic excellence, intensive training, and international recognition, positioning itself as the highest standard in advanced education.

By pursuing this program, students may obtain two Master's degrees:

- **Technical Lawyer Essential**: 450 instructional hours, equivalent to 54 ECTS (first academic year).
- **Top Technical Lawyer**: 590 instructional hours, equivalent to 70 ECTS (second academic year).

Additionally, the program includes **three top-level official certifications**, awarded by leading entities in each discipline:

Technical Lawyer Essential Certifications:

- Professional Cloud Architect (PCA), issued by Google

Top Technical Lawyer Certifications:

- Professional Data Engineer (PDE), issued by Google
- Professional Machine Learning Engineer (PMLE), issued by Google

Students may choose to enroll only in the Technical Lawyer Essential program, one of the most comprehensive and demanding Master's degrees available on the market, capable of transforming them into highly competitive and distinctive professionals.

Only those who seek to transcend and become true global leaders will take on the challenge of the Top Technical Lawyer. This comprehensive program requires prior completion of the Essential and represents the pinnacle of training in law, Artificial Intelligence, and emerging technologies.

Top Technical Lawyer is not studied: IT IS EARNED

Objective

The profiles admitted to this program usually have clear and ambitious motivations. In most cases, their objectives fall into three main categories:

- **Advancing their professional career**, making both a qualitative and quantitative leap, particularly in terms of responsibility, visibility, and salary.
- **Avoiding technological obsolescence**, by updating and expanding key competencies in a highly dynamic environment—even when already holding senior or well-compensated positions.
- **Entering the job market with a real competitive edge**, through rigorous, multidisciplinary, and clearly differentiating training.

This Master's program is not just another line on a résumé. It is a turning point.

Nature of the Master's Program

The first point to emphasize is the nature of AI for the legal profession..

AI is not an expense; in fact, it will become one of the main sources of revenue for law firms over the coming decades.

If a client presents a case involving Artificial Intelligence, is your firm adequately prepared to take it on? Do you have sufficient knowledge to handle the case?

The primary differentiating factor of this Master's program is its dual learning perspective:

- **Technological law** will be studied from the legal perspective.
- **Artificial Intelligence** will be studied in depth from the technological perspective.

Should a Lawyer Acquire Technological Knowledge?

To effectively represent a client—or challenge the opposing party—it is essential to acquire both legal and technological knowledge. When you build something from scratch, you understand how difficult and delicate the process is, and how easy it is to make a mistake at some stage. This knowledge, from a judicial perspective, becomes a significant differentiating factor in a trial.

It is not the same to work with a pre-Chinchilla LLM as with a post-Chinchilla one. It is not the same to have a static architecture network as an evolving architecture network. It is not the same to use a network with quantum layers as one with quantum-generated features.

The objective of the Master's program is to create a new hybrid profile: the **Techno-Lawyer**, a **Top Technical Lawyer**.

The integration of AI into law firms is significant for two reasons:

The use of AI enhances efficiency in a law firm

- **Relevant Case Law Research:** Beyond thematic or keyword searches, LLM and LRM models enable a true understanding of both the provided context and the database in use. This can significantly multiply the efficiency and accuracy of law firms.

- **Improvement in Legal Document Drafting:** AI can adapt documents to specific styles and formats preferred by particular judges, saving countless hours.
- **Regulation Classification:** Analyzing new regulations and determining which areas they affect could be performed by a neural network, always under human supervision. In fields such as finance, where numerous regulations are issued daily, a tool that identifies whether a new regulation "affects us" or not would not only be useful but also a major efficiency enhancement.

Being able to handle cases involving AI

- Is an online learning network the same as reinforcement learning?
- What does it mean for a network to be a descendant of Pathways?
- Is fuzzy logic part of Machine Learning? Of AI? What happens if we combine a neural network with a swarm algorithm? Do they have the same legal impact? Do the user and the developer bear the same responsibility?
- What could I-Jepa imply for the achievement of AGI?
- If LLM models do not always produce the same output from the same input, what are the legal consequences regarding the reproducibility of results in financial services? And from the perspective of supervision and explainability?
- Lambda and consciousness, the so-called case of the century. ChatGPT and subsequent LLM models are based on the same paper. Should software based on a neural network, such as RAM, have the same legal guarantees as an LLM? What would be the consequences if LLM consciousness were legally recognized?
- Do all the above examples carry the same degree of legal responsibility for their developers? And for the companies that deployed them?

In-depth knowledge of each branch of AI, as well as its underlying models, would enable lawyers to take on cases with genuine expertise—knowing how to defend their clients and challenge each of the opposing party's models.

The creation of the Techno-Lawyer role is essential for trials arising from AI-related conflicts.

For example, in the financial system, fraud detection systems can be built using autoencoder models with a detection accuracy of 70%–75%. These are the systems currently in use.

However, if a classical Machine Learning model like XGBoost is combined with a hybrid quantum model, such as a Quantum Support Vector Machine, and the results are fed into a Random Forest model to determine the final output, fraud detection can increase to 93%.

Is a financial institution exercising **due diligence** to protect its clients if it uses an AI system that detects 70% of fraud, when 93% detection is now achievable?

This trial has not yet occurred, but such a legal inquiry could reach your law firm at any time. A specialized profile is needed to address these questions competently.

Let's consider a real and recent case:

Imagine the reputational damage for **X:** Musk's AI firm forced to delete posts praising Hitler from Grok chatbot

Parliamentary question - P-002793/2025
European Parliament

Download

Generation of antisemitic content and hate speech by Grok AI on X (formerly Twitter)

9.7.2025

Answer in writing

Priority question for written answer P-002793/2025
to the Commission
Rule 144
Sandro Gozi (Renew)

Recent news has confirmed that Grok, the Artificial Intelligence (AI) chatbot developed by xAI and integrated into the social media platform X, published antisemitic content and praised Adolf Hitler. Despite the posts having been removed, the case raises serious concerns about compliance with the Digital Services Act (DSA) as well as the governance of generative AI in the Union's digital space.

- In this scenario, **Grok** was developed by X.
  What legal responsibility does X bear?, Who can X hold accountable—the employee?
- What if Grok had been developed by a third party and X were merely the consumer of the AI?
- What if Grok had been developed by a third party but adapted or retrained by X? Could X claim liability?
- Would your law firm be prepared to take on this case? Would you be ready to lead it?
- Do you want to become a **Top Technical Lawyer**?

Prerequisite Knowledge

No prior experience is required to enroll in the Master's program, but commitment and significant dedication are essential.

Throughout the program, students will develop skills and acquire knowledge in various key areas to become a **Top Technical Lawyer**. This includes in-depth training in law and regulatory frameworks, as well as instruction in programming, AI project management, Artificial Intelligence and machine learning (models, infrastructures, architectures, and use cases), risk management, compliance, data governance, security fundamentals, and vendor assessment.

This Master's program is suitable for you if you are willing to dedicate a minimum of **three hours of study per day**.

Eligible Profiles

This Master's program is accessible from various profiles:

a) Legal Profile

If you come from a legal background, you already possess advanced knowledge of law. By enrolling in this Master's, you can specialize in **technological law**, one of the most sought-after areas by law firms today.

Additionally, you will acquire advanced technical knowledge, including Artificial Intelligence, Python programming, Cloud Services, and Blockchain.

You will also gain a solid understanding of financial markets and their products (equities, fixed income, derivatives…), as well as the functioning of crypto assets, both from a financial and technological perspective.

b) Technical Profile

If you come from a technical background—computer science, engineering, mathematics, physics, telecommunications—you will already have strong programming skills and moderately advanced knowledge of Artificial Intelligence.

This Master's will allow you to gain **in-depth knowledge of technological law**, exploring the legal requirements of technology from the perspectives of the EU, the US, Asia, and the UAE.

You will also enhance your knowledge of Artificial Intelligence, Cloud Services, and Blockchain, and acquire advanced understanding of financial markets and crypto assets.

c) Financial Profile

If you come from a financial background—fund manager, trader, investment director, or working in Compliance or Innovation applied to financial markets—you already have solid knowledge of financial markets and their products.

This Master's will provide you with **deep expertise in technological law**, examining technology-related legal requirements across the EU, US, Asia, and the UAE.

Additionally, it will allow you to gain strong knowledge in Artificial Intelligence, Cloud Services, and Blockchain.

Methodology

The program is based on the principle: **Learning by Doing**.

All classes have a practical focus, avoiding the scenario where a professor merely reads hundreds of slides and students leave without truly learning anything. Each class combines a small amount of theory with numerous exercises of increasing difficulty.

Following this approach, the Master's program does not have traditional exams; it is entirely practice-based. At the end of each knowledge block, students receive a practice assignment to work on at home over three weeks. The goal is to simulate a real work environment: in real life, your supervisor doesn't take away your books or internet; they come with a complex problem that requires a solution.

Students have continuous access to all necessary resources—notes, the internet, forums, tutors, class recordings, and LLMs—the same tools they will use in their professional life after completing the program.

The assignments are challenging and focused on real-world problems related to AI model implementation, governance, and risk management within an organization. Students must research and experiment with different approaches until they solve each exercise, ensuring that this learning stays with them for life.

Students must maintain an approved average grade in the practical assignments to be eligible to submit their **Master's Final Project (TFM)**. All students are required to defend their TFM before a review panel.

Tutorial Support: Being a high-performance program where students constantly apply acquired knowledge, tutorial guidance is essential. Each student is assigned a tutor who provides ongoing support and direction.

All students have access to the online platform containing documentation and exercises, as well as a forum to post questions. In addition to having the email contacts of all professors for scheduling one-on-one tutorials, students also have the academic director's mobile number for immediate support.

Since the practices are designed to be challenging, faculty continuously engage with students to assess their learning levels and the frustration they may be experiencing. If a decline in performance is observed, the student is interviewed to determine whether it is due to insufficient daily study or another reason.

Academic Direction

Gloria Hernández Aler

Academic Background:

- Bachelor of Law from Complutense University of Madrid.
- Master's in Securities & Financial Regulation from Georgetown University, Washington DC, with a Fulbright scholarship.

Professional Experience:

- Currently Co-Founder and Partner at FinReg.
- Former Financial Sector Partner at DELOITTE
- Consultant at the INTER-AMERICAN DEVELOPMENT BANK
- Lawyer at CUATRECASAS
- Legal Counsel at the Madrid Stock Exchange, now BME SiX.

Honors and Achievements:

- Member of the Advisory Committee of the CNMV
- Board member of the IEA and ASCOM.
- Recognized as one of the top financial law attorneys in Spain by Chambers & Partners, Leaders League, and Best Lawyers, among others.

Academic Direction

Jesús Mardomingo

Professional Experience:

Lawyer with over 35 years of professional experience and a renowned partner in the Banking and Finance practice at Andersen, one of the world's largest law firms..

His career has focused on providing legal advice to financial institutions, corporations, and public administrations, covering both public and private law, with specialization in commercial, corporate, and financial law.

From the beginning, he has been deeply involved in promoting the so-called "new economy," leading legal transformations arising from technological innovation and digitalization. He has actively contributed to the creation of regulatory frameworks that drive technology, sustainability, and good corporate governance, with a prominent presence in Ibero-America, particularly in sustainable finance and sovereign debt management projects. Notably, he played a key role in the historic debt-for-nature swap in the Galápagos Islands, recognized by Forbes as a global example of legal and financial innovation.

He combines his professional practice with a strong academic vocation. At the Instituto de Estudios Bursátiles (IEB), he has directed programs such as the Master's in Access to the Legal Profession, Financial Markets, Sustainability, and Innovation.

Honors and Achievements:

He has been recognized in the leading international rankings, consolidating his position as one of the world's foremost lawyers in financial regulation and fintech:

- Chambers Global
- Legal 500
- IFLR1000
- Best Lawyers
- Expert Guides

Member of the Illustrious Bar Association of Madrid, he has chaired the National Advisory Council of the Chartered Institute for Securities and Investment (CISI) for Spain and Latin America since 2022.

His profile combines legal expertise, strategic vision, and technological acumen—a unique combination for leading a program that trains future legal professionals at the critical intersection of law and emerging technologies.

ΑΘΗΝΑΙ
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Program Structure

Every six months, we update the master's program content, ALWAYS offering truly cutting-edge material.

Full Program Structure

Modules	Teaching hours	Wt	Study hours	Total hours	ECTS
0. Introduction and TFM Sessions	30	3 %	60	90	**3,6**
1. Law Applied to Emerging Technologies	250	24 %	500	750	**30**
2. Risks, Governance, and Strategic Fundamentals	110	11 %	220	330	**13,2**
3. Financial Markets and Crypto Assets	65	6 %	130	195	**7,8**
4. Blockchain and Decentralized Market Infrastructure	40	4 %	80	120	**4,8**
5. Programming Fundamentals	30	3 %	60	90	**3,6**
6. Cloud Services and Big Data	180	17 %	360	540	**21,6**
7. Machine Learning and Deep Learning	105	10 %	210	315	**12,6**
8. Advanced and Generative Artificial Intelligence	130	13 %	260	390	**15,6**
9. Cybersecurity and Ethical Hacking	60	6 %	120	180	**7,2**
10. Quantum Computing	40	4 %	80	120	**4,8**
Total	**1.040**	**100 %**	**2.080**	**3.120**	**124,8**

Structure of the ESSENTIAL Master's Program

Modules	Teaching hours	Wt	Study hours	Total hours	ECTS
0. Introduction and TFM Sessions	15	3 %	30	45	**1,8**
1. Law Applied to Emerging Technologies	250	56 %	500	750	**30**
2. Programming Fundamentals	30	7 %	60	90	**3,6**
3. Machine Learning and Deep Learning	85	19 %	170	255	**10,2**
4. Cloud Services and Big Data	70	16 %	140	210	**8,4**
Total	**450**	**100 %**	**900**	**1.350**	**54**

Structure of the TOP Master's Program

Modules	Teaching hours	Wt	Study hours	Total hours	ECTS
0. Introduction and TFM Sessions	15	3 %	30	45	**1,8**
1. Risks, Governance, and Strategic Fundamentals	110	19 %	220	330	**13,2**
2. Financial Markets and Crypto Assets	65	11 %	130	195	**7,8**
3. Blockchain and Decentralized Market Infrastructure	40	7 %	80	120	**4,8**
4. Cloud Services and Big Data	110	19 %	220	330	**13,2**
5. Advanced and Generative Artificial Intelligence	150	25 %	300	450	**18**
6. Cybersecurity and Ethical Hacking	60	10 %	120	180	**7,2**
7. Quantum Computing	40	7 %	80	120	**4,8**
Total	**590**	**100 %**	**1.180**	**1.770**	**70,8**

ESSENTIAL Program

Module 1 | Law Applied to Emerging Technologies

250 Teaching hours

ESSENTIAL Program Overview

- Presentation and Alignment of Objectives
- Emerging Technologies in Cybersecurity
- Business Case (Ensuring Consistency in Technological Application)

Introduction to the Digital Regulatory Framework I

- General Principles of Regulation and Law
- Introduction to Financial Regulation

Introduction to the Digital Regulatory Framework II

- Regulatory Logic and the Various Stakeholders
- Structure and Levels of Regulation and the Normative Hierarchy
- Regulation and Geopolitics: The EU and Other Major Regions

Introduction to the Digital Regulatory Framework III

- The Role of National, European, and International Supervisory Authorities
- CNMV, Bank of Spain, EBA, SEPBLAC, AEPD, EBA
- Licensing, Registrations, and Notifications of Entities and Products
- Supervisory and Sanctions Regime

Introduction to the Digital Regulatory Framework IV

- Overview of Financial Regulatory Sectors
- Banking, Securities, and Insurance and Their Variants in the Current Environment
- New Assets such as Cryptoassets and New Formats such as Tokenized Assets
- General Overview of Ongoing Regulatory Initiatives in Innovation, Sustainability, Technology, and Artificial Intelligence

Law Applied to Insurance I

- Internet of Things (IoT) and Parametric Insurance
- Tokenization of Premiums and Coverage
- Use of Smart Contracts and Blockchain in the Automatic Execution of Claims

Law Applied to Insurance II

- The Challenge of Cyber Insurance: Coverage, Legal Limits, and Emerging Risks
- Regtech and Insurtech: Regulatory Impact and Supervision by the DGSFP
- Ethics, AI, and Insurance: Algorithmic Bias, Duty of Disclosure, and Transparency

Law Applied to Digital Banking I

- From Physical Banks to Digital Banks on the Smartphone
- Neobanks

Law Applied to Digital Banking II

- From Current Accounts to Wallets
- Tokenized Deposits

Law Applied to Digital Payments I

- Introduction to Money
- Types of Money
- Forms of Representation

Law Applied to Digital Payments II

- Payment Ecosystem and Market Participants
- Instant Payments
- Open Banking and PSD2 / PSD3

Law Applied to Digital Payments III

- The Bizum Case
- Invisible Payments

Law Applied to Digital Payments IV

- Payments with Cryptocurrencies
- The Digital Euro

Law Applied to Securities Markets I

- Regulatory Framework of Financial Markets
- Regulatory Authorities and Supervision at the European Level
- MiFID (Markets in Financial Instruments Directive)
- Market Abuse (Directive on Financial Instruments)
- Anti-Money Laundering and Counter-Terrorist Financing
- EMIR, REMIT, FATCA, CRS
- Criminal Liability of Legal Entities
- RDR (Retail Distribution Review)
- The Volcker Rule (Separation of Investment Banking and Commercial Banking Activities)
- SFT (Securities Financing Transactions)
- PRIPs, PRIIPs, KIDs, and KIIDs

Law Applied to Securities Markets II

- Regulation of Collective Investment
- UCITS Directive
- AIFMD (Alternative Investment Fund Managers Directive)
- EUSEF (European Social Entrepreneurship Funds) and EUVECA (European Venture Capital Funds)
- ELTIF (European Long-Term Investment Funds)
- Law 35/2003 on Collective Investment Schemes
- Law 22/2014 on Venture Capital and Collective Investment Entities and Management Companies

Law Applied to Securities Markets III

- Pilot Regime Regulation
- Market Participants: Trading Venues, CCPs, Depositories, and Digital Custodians

Law Applied to Securities Markets IV

- Interconnection Between Traditional Markets and DLT Markets
- Authorized Infrastructures to Date
- Supervision and Innovation: The Role of ESMA and CNMV in Tokenized Markets

Regulation of Credit Institutions

- Justification for the Regulation of Financial

Institutions
- Capital Requirements
  - Basel I
  - Basel II
  - Basel III
- Liquidity Requirements
- Banking Crisis Management Framework
- Banking Crises of 2023

Law Applied to Crypto-Asset Services and Markets I
- Overview of Crypto-Asset Markets
- Crypto-Asset Service Providers: Licensing, Obligations, and Oversight

Law Applied to Crypto-Asset Services and Markets II
- Market Abuse and Crypto-Assets
- AML and Crypto-Assets

Law Applied to Crypto-Assets and Decentralized Technologies I
- An Introduction to MiCA
- Legal Aspects of Smart Contracts: Essential Elements of a Contract, Formalities
- Signature, Party Identification, Applicable Law
- Interpretation of Smart Contracts
- Governance Models
- Onboarding Systems in DLT. Parties' Obligations
- Sanctioning Regimes
- European Regulation on Market Infrastructures Based on Distributed Ledger Technology

Law Applied to Crypto-Assets and Decentralized Technologies II
- Legal Aspects of Smart Contracts
- Sandbox and Positions of CNMV / Bank of Spain / Comparative Law
- Legality of Exchanges
- Compliance
- Regulatory Challenges and Traceability
- Tax Regulation
- Cointracking

Law Applied to Platform and Distributed Services I
- Cloud Services and Data Security
- Types of Cloud Computing Services
  - Building Services from the Cloud: The Use Case of Trust Service Providers (eIDAS2 Regulation)
- Regulatory and Contractual Aspects of Cloud Storage
  - Terms and Conditions: Applicable Versioning
  - Standards and Verification
  - Multi-Jurisdictionality and Data Protection: Virtualization
  - Data Protection in the Cloud
  - Cybersecurity

Law Applied to Platform and Distributed Services II: DSA
- Scope of Application
- Intermediary Liability Exemptions: Good Samaritan Clause
- Due Diligence Obligations
  - Universal
  - For All Hosting Services, Including Online Platforms
  - Additional for Online Platform Providers
  - Special and Additional for Very Large Online Platforms (VLOPs) and Very Large Search Engines (VLSEs)
    - Annual Systemic Risk Assessment
    - Specific Risk Mitigation Measures
    - Crisis Response Mechanisms
    - Recommendation Systems
    - Additional Transparency in Online Advertising
    - Data Access
    - Monitoring and Compliance Functions
    - Independent Audit
    - Transparency Reports
- Additional Provisions for Online Platforms Enabling Consumer Distance Contracts
- Enforcement, Competent Authorities, and Sanctions

Law Applied to Platform and Distributed Services III: DMA
- Context
- Definition of Core Platform Services
- Gatekeepers: Who They Are
- Gatekeepers' Obligations and Prohibitions
  - Competition
  - Data Processing
  - Transparency and Audit: Profiling Practices
  - Transparency Obligations: The Case of Advertising
- Sanctions for Non-Compliance

Law Applied to DLT, Ledgers, and Blockchain I
- Introduction to Blockchain Technology as a Distributed Ledger Technology (DLT) System
- Actors and Components
- Types of Networks: Private, Public, and Permissioned
- Consensus Models

Law Applied to DLT, Ledgers, and Blockchain II: Tokenization and Types of Crypto-Assets
- An Introduction to MiCA
- New Forms of Providing Crypto-Asset Services: Decentralized Autonomous Organizations (DAOs) and Decentralized Finance (DeFi)
- Non-Fungible Tokens (NFTs)

Law Applied to DLT, Ledgers, and Blockchain III: Registration and Smart Contracts
- Legal Aspects of Smart Contracts: Essential Contractual Elements and Formalities
- Signature, Party Identification, Applicable Law
- Interpretation of Smart Contracts
- Smart Contracts and Technological Failures

Law Applied to DLT, Ledgers, and Blockchain IV: Governance Models
- Onboarding Systems in DLT. Parties' Obligations
- Sanctioning Regimes
- Governance Types in Public, Private, and Permissioned Networks
- Legal Systems: eIDAS and eIDAS II Regulations

Law Applied to DLT, Ledgers, and Blockchain V
- Application of Blockchain Technology to Traditional Business Models, with Special Focus on the Financial Sector
- European Regulation on Market Infrastructures Based on Distributed Ledger Technology
- SSI and Digital Identity

- Non-Fungible Tokens (NFTs)
- Intellectual Property Priority Rights
- Customer Data Exchange under the Data Act
- Creation of a Cryptocurrency

Law Applied to Digital Transformation and Sustainability I

- Relationship Between Fintech and Sustainability, and Areas of Collaboration
- Sustainable Finance: Theoretical Perspective and Practical Examples
- EU Sustainable Finance Action Plan: Regulatory Background and Context
- Regulatory Initiatives Derived from the Action Plan
- The Banking Sector's Commitment Beyond Regulation
- Application of Machine Learning in the Financial Sector
- Artificial Intelligence (AI) and Big Data Analytics
- Crowdfunding and Participatory Financing Platforms

Law Applied to Digital Transformation and Sustainability II

- Development of Fintech Firms Based on ESG Criteria and Consumer-Oriented Business Models
- Investment Advice (Robo-Advisory), Credit Decisions, Asset Trading
- Digital Currencies, Automated Transactions, Payment Settlement, Crowdfunding
- Peer-to-Peer (P2P) Transactions and Mobile Wallets
- Implementation of Platforms, Digital Banking, and Branchless Models
- Recovery Plan: Digitalization and Green Transition
- Lighthouse

Law Applied to Digital Transformation and Sustainability III: Blockchain Technology in the Financial Sector and ESG Aspects

- Green Finance, Risk Management, and Reporting
- Carbon Credits
- Accounting and Reporting of Greenhouse Gas (GHG) Impact
- Eco-Certification of Non-Fungible Tokens (NFTs)
- Tokenized Incentives and Rewards
- Decentralized Autonomous Organizations (DAOs)

Law Applied to Digital Transformation and Sustainability IV

- Case Study: Appraisal Companies or Financial Institutions
- The Digital Euro

Law Applied to Digital Identity I: Identity Systems

- Centralized
- Federated
- Decentralized: SSI, DIDs, and ESSIF

Law Applied to Digital Identity II: Identity and Means of Identification under the eIDAS Regulation

- What is Identity?
- Presumed Identity and Risk Analysis: Zero Trust vs. Friction
- Differences Between Identity, Identification, Identity Verification, and Authentication
  - PSD2, EBA, and Authentication Factors
- Identity Model under the eIDAS1 Regulation
  - National Identity Documents: Analog and Digital
  - Signature Certificates: Types of Signatures and Their Evidentiary Value in Identity

Law Applied to Digital Identity III: The Verification Process and Its Five Stages – In-Person and Online

- Applicable Regulations: Spain and EU
- Applicable Standards: Spain and EU
- Service Delivery Models:
  - In-Person and Online
  - Assisted, Unassisted, or Hybrid
  - Biometric Recognition and Verification Tools in Identity Verification Processes
- Cybersecurity in Identity Verification Processes
- Anti-Spoofing Measures, Liveness Detection, Attack Types, and Countermeasures

Law Applied to Digital Identity IV: The Identity Model under the eIDAS Regulation

- The EDIW (European Digital Identity Wallet)
  - Regulation
  - Functioning
  - Interoperability with Trusted Third Parties
  - Wallet Security
- Attribute Attestations: Differences and Commonalities with Verifiable Credentials in Other Models
  - Trusted Attribute Attestation Service Providers
  - Regulation and Functioning
  - Similarities and Differences with Qualified Certificate Issuers and SSI/DID Models
  - Interactions with Other Providers/Operators
- Attribute Attestation Formats
- Interoperability
- Trust Services and Their Providers After the Reform: What Changes and What Remains
- Cybersecurity Requirements: The New Framework and Standards

Law Applied to Artificial Intelligence Systems I

- Big Data Processing Models
- Types of AI and Common Algorithms
  - Artificial Intelligence Regulation
  - Tools by Risk Level
  - Transparency Obligations
  - Audit and Compliance
  - Data Protection Aspects

Law Applied to Artificial Intelligence Systems II

- Use of AI Systems for Decision-Making in the Financial Sector
- GPT-3.5/4 in the Legal Field
- The Decline of LegalTech

Law Applied to Artificial Intelligence Systems III

- Automation and Taxation
- The Operator/Producer Figures and Their Legal Implications
- Autonomous Learning Systems and Cases of Online and Offline Learning

Law Applied to Artificial Intelligence Systems IV

- Legal Frameworks for Artificial Intelligence in Europe, the US, Asia, and the Middle East
- Liability Associated with Artificial Intelligence Systems (I)
- The Operator/Producer Figures and Their Legal Implications

- Autonomous Learning Systems and Cases of Online and Offline Learning

Law Applied to Artificial Intelligence Systems V

- Liability Associated with Artificial Intelligence Systems (II)
- The New Artificial Intelligence Regulation
  - Legal Framework for Advisory Services / Investment Algorithms / MiFID II
  - Requirements for High- and Low-Frequency Trading Algorithms
  - Traceability and Associated Responsibilities
- Data Protection
- Case Studies on Liability in the Use of AI

Law Applied to Artificial Intelligence Systems VI

- The Importance of Ethics in AI Regulation
- Personal Data Protection Regulations in AI Systems
- The Artificial Intelligence Sandbox
- The Spanish AI Supervisory Agency
- Malfunctioning vs. "Past Performance Does Not Guarantee Future Returns"

Law Applied to Artificial Intelligence Systems VII

- Open AI
- Types of Licenses for AI Components
- Model Cards
- Intellectual Property Rights and Their Role
- Impact of Regulation on Models
- Case Studies

Law Applied to Trust Service Providers I

- Electronic Signature: Definition and Properties. Types (Advanced, Probabilistic, Blind, Multiple, Delegated, etc.)
- Document Signing: Creation and Verification of an Electronic Signature
- Standard Signature Algorithms: RSA, DSA, ECDSA
- CAdES, PAdES, and XAdES Signatures

Law Applied to Trust Service Providers II

- Electronic Certificates (With/Without Private Key). Certification Authorities and Relational Structures
- Certificate Revocation
- Time Stamps. Time-Stamping Authorities. Requirements
- Trust Service Providers
- Vulnerabilities and Risk Assessment

Law Applied to Cryptography I

- Cryptography and Cryptanalysis
- Basic Binary Arithmetic: Number Size and Bitwise Operations
- Algorithms and Computational Complexity (Execution Times)
- Basic Mathematical Tools: Modular Arithmetic and Elliptic Curves
- Mathematical Problems Underlying Cryptographic Security: Primality, Factorization, and Discrete Logarithm

Law Applied to Cryptography II

- Random Number Generators (RNGs): Truly Random (TRNG) and Pseudorandom (PRNG)
- Metrics and Standards. Key Generation
- Symmetric-Key Cryptography: DES, 3DES, and AES
- Hash Functions: MD, SHA
- Key Exchange Protocols: DH and ECDH
- Public-Key Cryptography:
  - RSA: Primality and Factorization
  - ElGamal: Discrete Logarithm
  - ECC: Elliptic Curves and Elliptic Logarithm
- Algebraic and Physical Security
- Recommended and Legacy Algorithms (SOG-IS, CCN)
- Current Security and Quantum Computing

Law Applied to Cybersecurity I

- Security vs. Security Management. The ISO/IEC 27001 Model
- From Physical Security to Logical Security: Integrated Security in a Connected World. Cybersecurity
- Risk Analysis
- Common Attack Vectors and Threats (APTs, Ransomware, Cyberattacks – DoS, etc.)
- Application of Controls for Risk Mitigation
- Special Reference to Supply Chain Security
- Penetration Testing

Law Applied to Cybersecurity II: Cybersecurity Regulations and Competent Authorities

- Critical Infrastructures
- NIS1 and NIS2
- Cybersecurity Act
- Connection with Criminal Codes

Module 2 | Programming Fundamentals

30 Teaching hours

Python Programming Fundamentals I

- Installation
- Jupyter Notebooks
- Basic Syntax, Operations, and Core Data Types
- Strings
- Data Structures: Lists, Tuples, Sets, and Dictionaries

Python Programming Fundamentals II

- Control Flow
- Dict and List Comprehensions
- Exceptions
- Functions
- Modules and Scripts
- Writing Text Files and Saving Variables

Python Programming Fundamentals III

- Numpy Library

Python Programming Fundamentals IV

- Pandas Library

Python Programming Fundamentals V

- Data Visualization with Matplotlib
- Data Visualization with Pandas
- Data Visualization with Seaborn
- Financial Data Visualization
- Interactive Visualization with ipywidgets
- Data Acquisition and Storage

Python Programming Fundamentals VI

- Object-Oriented Programming

- Inheritance
- Decorators
- Introduction to HTML
- Web Scraping

Module 3 | Machine Learning and Deep Learning
85 Teaching hours

Machine Learning I
- Introduction to Machine Learning
  - AI vs. ML
  - Supervised vs. Unsupervised Learning
  - Classification vs. Regression
  - Parametric vs. Non-Parametric Models
  - Linear vs. Nonlinear Models
- Examples of Financial Applications Using ML
- K-Nearest Neighbors (KNN)
- Decision Trees
  - Simple Decision Tree Example
  - Explainable AI (XAI) for Trees

Machine Learning II
- Preprocessing and Evaluation Metrics
  - Normalization and Standardization
  - Encoding, Labeling, and Discretization (Dummies)
  - Missing Values, Outliers, and NaNs
  - Approaching Time Series as Sequence Blocks
  - Evaluation Metrics: Confusion Matrix, Precision, Recall
  - Simple and Cross Validation
- Dimensionality Reduction
  - The Curse of Dimensionality
  - Feature Selection and Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA)

Machine Learning III
- More Complex Classification Models
- Bayesian Theory: Naive Bayes
- Ensemble Classifiers: Bagging, Boosting, Random Forest, and Gradient Boosting
- Support Vector Machines (SVMs)

Machine Learning IV
- Agglomerative Hierarchical Clustering
  - Definition (Linkage Types)
  - Manual Implementation
  - Simple Example
- Centroid-Based Clustering: K-Means and K-Medoids
  - Definition and Manual Implementation
  - Simple Example with K-Means
  - Interpreting Centroids as Representatives
- Gaussian-Based Clustering: Expectation-Maximization (EM)
  - Definition (Generalization of K-Means)
- Density-Based Clustering: DBSCAN
  - Definition and Simple Example
- Comparison of Clustering Algorithms
  - Comparison Metrics
  - Selection of Appropriate Clustering Algorithm
  - Comparison Examples
- Asset Clustering Using Correlations and Momentum

Machine Learning V – Practical Case
- Feature Generation
- Extraction of Relevant Attributes
- Dimensionality Reduction Incorporating XAI
- Clustering
- Graphext (No-Code Data Analysis)
- XAI for Obtained Results

Dense Neural Networks I
- Introduction
- Working Environment
- Basic Concepts
- Linear Regression
- Gradient Descent
- Logistic Regression
- Nonlinear Models

Dense Neural Networks II
- Introduction to Neural Networks
- Feedforward Neural Networks
- Implementing a Neural Network (Forward Pass)
- Chain Rule for Derivatives
- Backpropagation

Dense Neural Networks III
- Implementing a Neural Network (Backward Pass)
- Introduction to Keras and PyTorch
- Automatic Differentiation

Dense Neural Networks IV
- Implementing a Neural Network with Keras and PyTorch
- Training a Neural Network
- Stochastic Gradient Descent
- Cost Function
- Activation Function

Dense Neural Networks V
- Regularization
- Weight Initialization
- Batch Normalization
- Other Optimization Techniques
- Second-Order Methods

Dense Neural Networks VI
- Hyperparameter Optimization
- Evaluation Metrics
- Cross-Validation
- Grid Search
- Keras Tuner
- HParams Dashboard

Convolutional Neural Networks I
- Kernel Size
- Stride and Padding
- Max Pooling
- Number of Filters and Features
- Dropout

Convolutional Neural Networks II
- Building in Keras
- Kernel Optimization
- Stride and Padding Optimization
- Max Pooling

- Optimization of Filters and Features
- Dropout
- 1D, 2D, 3D Networks

Convolutional Neural Networks III

- Distance Measures Between Images
- Siamese Networks and Content-Based Image Retrieval (CBIR)
- Learning Representations with CNNs
- Applications in Image Search
- Network Robustness
- Adversarial Examples

Convolutional Neural Networks IV

- Input Perturbation Attacks: One-Pixel Attack
- Adversarial Training Methods: Differential Evolution (DE)
- Applications in Generating Robust Models
- YOLO Networks
- RAM (Recognize Anything)

Recurrent Neural Networks I

- Memory-Based Networks
- Long-Term Dependency Problem
- LSTM Networks in TensorFlow and Keras
- LSTM Variants

Recurrent Neural Networks II

- Truncated Backpropagation
- Accumulating LSTM
- Bidirectional LSTM
- Forecasting with LSTM: Time Series, Sequences, and Predictions

Module 4 | Cloud Services and Big Data

70 Teaching hours

Google Cloud I. Cloud Basics

- IAM, Console
- Cloud shell
- Authentication, permissions

Google Cloud II. Compute

- Compute Engine
- App Engine
- Cloud GPU
- Spot VMs
- Bare Metal
- Disks

Google Cloud III. Storage. Databases

- AlloyDB for PostgreSQL
- Cloud SQL
- Firestore
- Spanner
- Memorystore

Google Cloud IV. Kubernetes I

- Google Kubernetes Engine
- Artifact Registry
- Cloud Build

Google Cloud V. Kubernetes II

- Migrate to Containers
- Knative
- Deep learning Containers

Google Cloud VI. Security and Identity

- Sensitive Data protection
- Google Threat Intelligence
- Security Conmmand Center
- Assured workloads

Google Cloud VII. Networking

- Cloud CDN
- Load balancing
- Cloud NAT
- Virtual Private Cloud
- Private Service Connect

Google Cloud VIII. Developer Tools

- Cloud Workstations
- Cloud SDK
- Cloud Code
- Cloud Deploy

Google Cloud IX. Serverless

- Cloud Run
- Cloud Functions
- Workflows
- API Gateway

Google Cloud X. Operations

- Cloud Logging
- Cloud monitoring
- Error reporting
- Cloud Trace
- Cloud Profiler

Preparation for the Professional Cloud Architect Certification

CI/CD I

- Introduction and Advanced Git Configuration
- Advanced Branch Management, Merges, and Conflict Resolution
- Collaboration on GitHub: Pull Requests, Code Review, Actions
- Collaborative Project Using Git and GitHub (Full Workflow)
- Feedback and Evaluation of Collaborative Project

Advanced Visualization Techniques

- Introduction to HTML
- Introduction to CSS
- Introduction to Flask
- Interactive Interfaces with Dash

Professional Cloud Architect Certification Exam

Master's Thesis Defense I

Master's Thesis Defense II

TOP Program

Module 1 | Risks, Governance, and Strategic Fundamentals

110 Teaching hours

Program Overview

- Presentation and Alignment of Objectives
- Emerging Technologies in Cybersecurity
- Business Case Analysis (Ensuring Coherence in Technological Application)

Evolution of AI and Its Impact on Business

- Main Stages: Symbolic AI, Machine Learning, Deep Learning, Generative AI
- Representative Use Cases for Each Stage
- Effects on Efficiency, Productivity, and Business Models
- Organizational Changes Driven by AI
- New Risks and Challenges: Ethical, Regulatory, and Technological

AI Project Management

- When to Apply Machine Learning and Problems to Address
- Production Software
- Infrastructure
- Best Practices in Development and Deployment
- Tools

Applied Ethics and Responsible AI Principles

- Core Principles: Transparency, Fairness, Non-Maleficence, Accountability
- Social and Ethical Impact Assessment of AI Systems
- Mitigation of Algorithmic Bias and Discrimination
- Regulatory and Normative Frameworks (EU, UNESCO, OECD)
- Integration of Ethics into the AI Development Lifecycle

International Regulatory Frameworks

- EU AI Act: Risk Categories and Obligations
- Relevant ISO Standards: ISO 23894 (Risk Management), ISO 42001 (AI Management System), ISO 22989 (Terminology), etc.
- OECD Principles and UNESCO Guidelines on Responsible AI
- Comparative Approaches: EU, US, China, and Other Regions
- Global Trends Toward Algorithmic Governance and Regulatory Interoperability

Introduction to ISO Standards I

- ISO 22989: Fundamental Terminology for AI Systems and Their Environment
- ISO 23894: Risk Management Specific to AI Systems
- ISO 42001: AI Lifecycle Management System (AI Management System)
- ISO 38507: AI Governance in Corporate Governance Context (Complementing ISO 38500)
- ISO 31000: General Risk Management Framework, Applicable to AI Projects

Introduction to ISO Standards II – AI Management System (ISO/IEC 42001)

- Organizational Context (Understanding Organizations, Third Parties, and AI Management Systems)
- Leadership
- Policies
- Roles and Responsibilities
- Planning (Assessment, Treatment, and Impact)
- Support (Resources, Risks, Communication, Documentation)
- Operations (Risk Assessment and Treatment)
- Improvement

Introduction to ISO Standards III – Governance of Disruptive Technologies (ISO/IEC 38507)

- Scope
- Terms and Definitions
- Implications for Organizational AI Governance
- Overview of AI and AI Systems
- Policies to Address AI Use
- Governance and Organizational Decision-Making

Introduction to ISO Standards IV – Risk Management in AI Systems (ISO/IEC 23894 and 31000)

- Design, Implementation, and Evaluation
- Overall Risk Assessment and Monitoring Process
- Reporting Process
- Objectives
- AI Lifecycle

Certificación ISO - AI Management Leader (ISO/IEC 42001)

Certificación ISO - AI Governance Leader (ISO/IEC 38507)

AI Cybersecurity

- Technical Security Measures
- Adversarial Attacks & One-Pixel Attack
- Data Poisoning
- Prompt Injection
- Defense and Resilience

Model Risks in Integrating AI into Current Technology Infrastructures

- Bias Risk
- Opacity Risk (Black Box), Explainability, and Reproducibility
- Robustness Risk
- Model Drift
- Purpose Limitation
- Improper Output Handling
- Excessive Agency
- System Prompt Leakage
- Vector & Embedding Weaknesses
- Unbounded Consumption

- Third-Party Dependency

AI-Related Risks, Monitoring, and Oversight I

- Model Risk
- Operational Risks

AI-Related Risks, Monitoring, and Oversight II

- Compliance Risk
- Legal Risks
- Ethical Risks

Challenges and Considerations in AI Risk Management Implementation

- Data Quality and Availability
- Model Risk (Including Explainability and Transparency)
- Algorithmic and Fairness Bias
- Regulatory Compliance
- Data Security and Privacy
- Third-Party Dependency (Vendors)
- Shortage of Specialized Talent
- Implementation Costs
- Innovation Pace vs Oversight Capacity

Key Roles and Relationships in Organizations and with the CAIO

- CISO (Chief Information Security Officer)
- DPO (Data Protection Officer)
- CTO (Chief Technology Officer)
- CIO (Chief Information Officer)
- CRO (Chief Risk Officer)

Vendor Management and Evaluation I

- AI Third-Party Risk Management (TPRM) Framework
- Vendor Approval, Assessment, and Monitoring Criteria
- Shared Governance and Quality Control Frameworks

Vendor Management and Evaluation II

- Traceability, Security, and Performance Metrics
- Continuous Oversight
- Incident Response

Data Governance I

- Strategic Role of the CDO in AI
- Data Governance: Quality and Sustainability

Data Governance II

- Legal and Regulatory Framework
- GDPR
- Privacy Principles
- Digital Rights

Data Governance III

- Advanced Data Protection Techniques: Anonymization, Pseudonymization, Federated Learning, Differential Privacy
- Coordination between DPO, CISO, and CAIO
- Transparency, Trust, and Stakeholder Communication

AI GRC Tools

- Inventory and Classification of AI Systems
- Risk and Control Catalog
- Monitoring of Projects, Use Cases, and Dashboards
- System Evaluation Based on Regulation
- Workflow Management

Module 2 | Financial Markets and Crypto Assets

65 Teaching hours

Equity Markets

- Functions of the Stock Exchange
- Distinction between Primary and Secondary Markets
- Types of Corporate Actions: Takeover Bids (Tender Offers), Initial Public Offerings (IPOs), Capital Increases, Stock Splits and Reverse Splits
- Operation of the Spanish Continuous Market (SIBE)
  - Market Phases
  - Block Trades and Special Transactions
  - Auctions vs. Open Market
  - Trading Rules
  - Types of Orders
  - Volatility Auctions: Static and Dynamic Ranges
- Organized Markets vs. OTC (Over-the-Counter)
- Clearing House

Equity and Index Futures

- Forward Price of an Asset
- Concept of Basis and Open Interest
- Futures in Contango and Backwardation
- Futures Pricing and Implied Rates
- Futures Pricing on an Index and the Conversion of Dividends into Index Points
- Speculation and Leverage
- Hedging with Futures on Individual Stocks: Total and Partial Hedging
- Hedging with Index Futures
- Hedging Risks
- Arbitrage Strategies: Cash & Carry and Reverse Cash & Carry
- Time Spreads: Rollover Effect in Contango and Backwardation

Equity Options

- Types: American and European Options
- Intrinsic Value and Time Value
- Classification: In the Money (ITM), At the Money (ATM), Out of the Money (OTM)
- Key Pricing Parameters: Underlying Asset, Strike Price, Dividends, Time to Maturity, Interest Rates
- Asset Replication
- Arbitrage with Options
- Conversion and Reversal Strategies
- Risk Factors
- Put-Call Parity Theory: Formulations and Types of Options
- The Greeks and Sensitivity Management: Delta, Gamma, Vega, Theta, Rho
- Static Hedging Strategies
  - Options Structures: Calls, Puts, Spreads, and Tunnels
  - Selection of Strike Prices and Expiration Dates
  - Risk Profile Analysis and Synthetic Adjustments
  - Combined Strategies:
  - Directional

    - Volatility-based
    - Mixed
  - Volatility Trading: Delta-Neutral Strategies and Gamma Scalping

Foreign Exchange (FX) Markets

- Factors Affecting Exchange Rates
- Spot FX and Cross Rates
- Market Conventions
- Forward Exchange Rate (Implied Interest Rates)
- Currency Futures
- Forward Price: Swap Points
- FX Forwards and Hedging Instruments
- Currency Options
- Delta Hedging
- Volatility Surface
  - Risk Reversal Strategies
  - Volatility Skew
  - FX Contract Characteristics

Fixed Income Markets

- Bond Pricing
- Mathematical Foundations: Capitalization, Discounting, and Time Value of Money
- Interest Rates: Euribor / Eonia / EuroSTR
- Zero-Coupon Yield Curve: Methodologies and Constraints in Its Construction
- Bonds and Floating Rate Notes (FRNs)
- Valuation Metrics: Duration, Sensitivity, Convexity
- Fixed Income Instruments and Trading Practices
- Fixed Income Derivatives: Bond Futures and Euribor Futures

Commodities

- Classification, Markets, and Instruments
- Price Formation, Volatility, and Correlation
- Contango and Backwardation in Commodities
- Base Metals: Aluminum, Copper, Zinc, Nickel, Lead, Tin
- Energy and Emissions: Oil, CO_2
- Precious Metals: Gold, Silver, Platinum, Palladium
- Other Commodities: Plastics, Coal, Agricultural Products, Paper

Modern Portfolio Theory and Beyond I

- Fama and French Three-Factor Model
- Impact of Covariance Matrix Structure
- Portfolio Weight Allocation
- Industry Benchmark: 60/40 Portfolio
- Covariance Matrix Adjustments

Modern Portfolio Theory and Beyond II

- Risk Parity
- Hierarchical Risk Parity
- Inverse Volatility Strategies
- Kalman Filter Applications
- Kelly Criterion
- Portfolio Management Workshop

Cryptoassets I

- Fundamentals of Cryptoassets
- Major Cryptoassets
  - Bitcoin: Use and Adoption
  - Ethereum: Smart Contracts and ERC-20/721 Tokens
  - Other Relevant Assets: Litecoin, Ripple (XRP), Cardano, Solana, TON, Avalanche
  - Memecoins (Community Concept)
- Stablecoins: Definition, Types (Collateralized, Algorithmic), and Use Cases
  - Key Stablecoins: USDC, USDT, DAI
- Platforms and Basic Tools:
  - CoinMarketCap, CoinGecko, Messari
  - Centralized Exchanges (Binance, Kraken) vs. Decentralized Exchanges (Uniswap, PancakeSwap)
  - Security: Custodial vs. Non-Custodial Wallets (e.g., Argent, Criptan)
- Market Landscape: Institutional Players, Fintechs

Cryptoassets II

- Cryptoasset Markets
  - Spot Trading: Basic Functioning
  - Margin Trading: Leverage and Risks
  - Derivatives: Futures, Options, and Perpetual Contracts
- Financial Instruments in Crypto:
  - Cryptocurrency CFDs
  - Crypto-based ETFs and Funds
- Risk Management Principles
  - Cryptoasset Volatility
  - Stop-Loss, Take-Profit, and Hedging Strategies

Cryptoassets III

- Introduction to DeFi (Decentralized Finance): Definition and Operation
  - Key Protocols: Aave, Compound, MakerDAO
- DeFi Products and Strategies:
  - Staking: Proof of Stake (PoS), Lido
  - Decentralized Lending and Borrowing
  - Institutional Lending
  - Yield Farming: Liquidity Pools and Rewards
- Interoperability and Blockchain Bridges:
  - How Cross-Chain Bridges Operate
  - Key Projects: Polkadot, Cosmos
- Risks and Opportunities in DeFi:
  - Smart Contract Security
  - Rug Pulls and Flash Loan Attacks

Cryptoassets IV

- Crypto Mining:
  - Proof of Work (PoW) vs. Proof of Stake (PoS)
  - Cloud Mining and Mining Pools
- Staking as an Alternative
  - Emerging Business Models
- Trends and Regulation:
  - Central Bank Digital Currencies (CBDCs)
  - International Regulation and Market Implications
- DefAI and Real-World Assets (RWA)
- Case Studies of Crypto Adoption:
  - El Salvador
  - Global Corporations
- Current Market Analysis and Future Outlook

Cryptoassets V

- Fintech and Open Banking
- Digital Assets and the Token Economy
- DeFi and Tokenization
- Building a Digital Asset Platform: Renta 4 (Case Study of Success)

Module 3 | Blockchain and Decentralized Market Infrastructure

40 Teaching hours

Blockchain Fundamentals

- Bitcoin
  - The Double-Spending Problem
  - Bitcoin and Blockchain Technology
  - Economic Aspects and Technical Keys
  - Hash Function and Asymmetric Cryptography
  - Keys, Addresses, and Wallets
  - Transactions, Blockchains, and Consensus
  - Lightning Network
- Ethereum
  - Technical Foundations
  - Wallets and Transactions
  - Solidity, Vyper
  - Consensus and Tokens
  - DeFi, Uniswap, Compound, NFTs, DAOs

Smart Contract Programming on Ethereum I

- The Solidity Language
- Structure of a Solidity Source File
- Remix: Development, Deployment, and Interaction
- Structure of a Contract
- Data Types
- Units and Globally Available Variables

Smart Contract Programming on Ethereum II

- Control Structures
- Error Handling
- Inheritance
- Interfaces
- Assembly
- Advanced Concepts
- Debugging and Unit Testing in Remix

Smart Contract Programming on Ethereum III

- ERC20 and ERC721 Token Standards
- Practical Case 1: Bank
- Practical Case 2: Room Reservation
- Practical Case 3: Auction
- Withdraw and Owner Design Patterns
- Smart Contract Security
  - Reentrancy
  - Overflow
  - Denial of Service
  - Code and Security Analysis Tools

Smart Contract Programming on Ethereum IV

- Design Patterns in Solidity
  - Proxy Pattern
  - Smart Contract Upgrade Pattern
  - Diamond Pattern
- Vyper and Other Ethereum Programming Languages
  - Principles and Objectives
  - Vyper vs Solidity
  - Writing a Contract in Vyper
  - Compilation and Deployment
  - Other Alternatives: Yul, Yul+, Fe

Smart Contract Programming on Ethereum V

- Development Tools:
  - Truffle
  - Ganache
  - MetaMask
- Solidity for Application-Oriented Development: Backend
  - Java
  - JavaScript
- Solidity for Application-Oriented Development: Frontend
  - Graphical Interface Integration
  - Connection with MetaMask

Utilities for Decentralized Applications I

- Practical Case: dApp with a Voting System for Members
- Blockchain Oracles
  - What They Are and Why They Are Needed
  - Different Architectures and Designs
  - Provable & Chainlink
  - Practical Cases
- Decentralized Storage
  - IPFS, Swarm
  - Practical Case

Utilities for Decentralized Applications II

- Digital Identity
  - Definition and Non-Blockchain Applications
  - OpenID, Electronic Voting
- Digital Identity on Blockchain
  - Standards and Implementation
  - Decentralized Governance

Module 4 | Cloud Services and Big Data

110 Teaching hours

Big Data and Data Processing I

- Analítica de datos: visión end-to-end de todos los servicios
  - Collect: Pub/sub, VerneMQ
  - Process: dataflow, Dataproc (spark)
  - Store: GCS, BigQuery, BigQuery ML, BigTable
  - Analyze: BigQuery SQL, Dataproc (spark)

Big Data and Data Processing II. Collect I

- Google Cloud Pub/sub
- Messages, Topics
- Best practices
- VerneMQ
- Apache Kafka

Big Data and Data Processing III. Process I
- Dataflow
- Templates
- I/O connectors best practices
- Dataflow runner

Big Data and Data Processing IV. Process II
- Dataproc (spark)
- Dataproce serverless
- Clusters
- Toubleshooting

BBig Data and Data Processing V. Store I
- Google Cloud Storage
- BigQuery
- BigTable

Big Data and Data Processing VI. Analyze I
- BigQuery SQL
- Storage/compute separation
- Dataform

Big Data and Data Processing VII. Analyze II
- Looker
- Looker Studio
- Visualization

Big Data and Data ProcessingVIII
- Data lakes
- Linage, automatizations
- Dataplex

Preparation for the Professional Big Data Engineer Certification

Google Vertex AI – Session I
- Introduction to Vertex AI
- MLOps
- Methodology and Technical Components
- Customer References

Google Vertex AI – Session II
- Training a Custom Model in Vertex AI
- Distributed Training in Vertex AI
- Hyperparameter Tuning in Vertex AI
- Hardware Accelerators for Training

Google Vertex AI – Session III
- Vertex AI Prediction
- Batch Predictions
- Model Monitoring
- Explainable AI

Google Vertex AI – Session IV
- Vertex AI Model Registry
- Vertex AI Experiments
- Model Cards

Google Vertex AI – Session V
- Vertex AI Pipelines
- Kubeflow Pipelines
- Components
- Pipelines
- I/O v2

Google Vertex AI – Session VI
- Tabular Workflows
- Hands-On Pipelines I
- Hands-On Pipelines II

Google Vertex AI – Session VII
- ML Metadata
- Low-Code/No-Code
- AutoML
- BQML

Google Vertex AI – Session VIII
- Model Garden: LLMs/LRMs in Vertex AI
- LLMOps in Vertex AI
- Vertex AI Workbench
- Colab Enterprise

Preparation for Professional ML Engineer Certification

Legal Aspects (Open AI)
- Open AI
- Types of Licenses for AI Components
- Model Cards
- Intellectual Property Rights and Their Role
- Impact of Regulation on Models
- Case Studies

State of the Art in Artificial Intelligence
- Inspiration and Research Directions for Master's Thesis Projects

Professional Big Data Engineer Certification Exam
Professional ML Engineer Certification Exam

Module 5 | Advanced and Generative Artificial Intelligence
150 Teaching hours

Kohonen Networks
- Unsupervised Competitive Networks
- 2D Self-Organizing Maps (SOMs)
- 3D Self-Organizing Maps
- Solving the Traveling Salesman Problem with Self-Organizing Maps

Genetic Algorithms
- Objective Function
- Selection Strategies
- Crossover
- Mutation
- Generational Replacement

Swarm Algorithms
- Ant Colony Optimization (ACO)
  - Environment Construction
  - Path Selection
  - Pheromone Quantity
  - Evaporation
  - Pruning toward the Optimal Solution
- Other Swarm Algorithms (ABC, Bacterial Foraging, Herd/Pack Methods, PSO, ...)

Fuzzy Logic
- Fuzzy Sets and Degrees of Membership
- Fuzzy Operators
- Rule Creation
- Fuzzification
- Defuzzification

Natural Language Processing I
- Corpora and Stopwords
- Word2Vec Models; Language Representation
- NLP Models and Sequence-to-Sequence Models
- Bucketing & Padding

Natural Language Processing II
- Supervised Learning in NLP; Defining the Language Domain
- Named Entity Recognition: Entity Detection and Financial Applications
- Text Classification: Headlines, Reports, News
- Sentiment Analysis: News and Social Media

Natural Language Processing III
- Transfer Learning in NLP; TensorFlow Hub
- Pre-trained Models: BERT, ELMo
- Fine-tuning Pre-trained Models for Specific Tasks

Natural Language Processing IV
- Attention Layers
- Attention-based Models
- Introduction to Transformer Models

Natural Language Processing V
- Advanced Transformer Models
- Generative Pre-Training: GPT Models
- PaLM, Chinchilla, Flamingo, Minerva, Gato

Generative Models I
- Dimensionality Reduction and Factors: PCA
- Autoencoders; Non-linear Models
- Maximum Likelihood and GMM
- Generation of Stock Quotes with PCA + GMM
- GANs, Diffusion Models, and Conditional Models

Generative Models II
- Deep Generative Models
- Variational Autoencoders (VAE)
- Memory-Augmented Autoencoders (MAAE)
- Sparse Autoencoders
- Generative Adversarial Networks (GAN)
- Recurrent Generative Models
- Normalizing Flows

Generative Models III
- Pre-training Large Language Models
- Tuning
- PEFT (Parameter-Efficient Fine-Tuning)
- Distillation
- Frameworks: T5X, PAX, Others
- TPU Architectures

Generative Models IV
- Introduction to LangChain
- Components I: Memory, Models, and Prompt
- Components II: Retrieval, Chains, and Agents
- RAG Techniques (Retrieval-Augmented Generation)

Recommender Systems
- Clustering of Profiles and Assets
- Generation and Assignment of Recommendations
- TensorFlow Recommenders
- Similarity-based Systems
- Factorization-based Systems
- Deep-Learning-based Systems

Anomaly Detection and Analysis
- Types of Anomalies: Point, Contextual, Collective
- Linear Methods: PCA, MCD, LMDD, One-Class SVM
- Proximity Methods: Local Outlier Factor, Histogram-based Outlier Score
- Probabilistic Methods: Angle-Based Outlier Detection, Stochastic Outlier Selection
- Ensemble Methods: Isolation Forest, Feature Bagging, LSCP, LODA
- AI-based Methods: XGBOD (Extreme Boosting-Based Outlier Detection), Deep Autoencoders

Fair Learning
- Model Adjustment Methods for Fair Learning
- Information Theory
- Dependence via Kernel Methods
- Dependence via Multivariate Gaussianization

Explainable Artificial Intelligence (XAI) I
- Reverse-Engineering Methods
- Explainability in Machine Learning (General)
- XAI in Deep Learning
- XAI Tooling

Explainable Artificial Intelligence (XAI) II
- Nature of XAI Algorithms
  - Interpret vs. Explain vs. Transparency; Local vs. Global Explainability
  - Task-Specific vs. Model-Agnostic Explainability
  - Model Transparency
- Challenges in eXplainable Deep Learning (XDL)
- Data Visualization/Explainability
- Global Explainability
  - Component Analysis of Models (Neural Networks, Trees, SVM)
- Local Explainability
  - Permutation
  - Substitution: LIME (Local Interpretable Model-Agnostic Explanations)
- Measuring the Degree of Explainability

Explainable Artificial Intelligence (XAI) III
- Explainability Strategies for Deep Learning
  - Perturbation-based Explainability
  - Gradient-based Local Explainability
  - Relevance-based Local Explainability: LRP
- Explainability for Recurrent Networks
  - Vanishing Gradient Problem: Why It Affects Explainability
  - Mitigation: Processing All Time Steps
  - Gradient- and LRP-based Explainability for RNNs

Explainable Artificial Intelligence (XAI) IV
- Transparency of Recurrent Networks
  - Can an RNN Be Interpreted as a State Machine?

    - Can an RNN Serve as an Oracle to Infer State Machines?
  - Workshops
    - Adversarial Image Attacks Derived from Explainability
    - Audio Signal Filtering via Explainability
    - Spatio-Temporal Analysis of Biological Signal Processing (P300-ERPs) via Explainability

Explainable Artificial Intelligence (XAI) V

- Fundamentals of Causal Inference
- Causal Estimation Techniques
- Applied ML
- Counterfactual Reasoning and Structural Models
- Advanced Causality and Real-World Applications
- Features and Heatmaps
- Sparse Representations
- XAI for Specific Model Families:
  - Transformers
  - Generative Models
  - Reinforcement Learning

Reinforcement Learning I

- Markov Decision Processes
- Learning Algorithms
- Function Approximation
- Q-Learning
- Double Q-Learning
- SARSA
- Search Methods

Reinforcement Learning II

- Automated Machine Learning
- Model Selection
- Architecture Search
- Full Pipeline Optimization
- Policy-based Algorithms
- Actor-Critic Methods (A2C, A3C)

Reinforcement Learning III

- Practical Review of RL System Components
- Introduction to Environment Creation
- Factors to Consider in Algorithm Design

Causality

- Causal AI & Causal Factor Investing
- Fundamentals of Causal Inference
- Causal Estimation Techniques
- Applied ML
- Counterfactual Reasoning and Structural Models
- Advanced Causality and Real-World Applications

Agentic AI I

- Deterministic AI Agents: Dialogflow
- Generative AI Agents: Playbooks
- Agentic Architectures
- Data Stores for Agents

Agentic AI II

- ADK (Agent Development Kit)
- MCP (Model Context Protocol)
- A2A (Agent-to-Agent Protocol)
- Introduction to LangChain

Agentic AI — Session III

- Agents: Foundational Concepts
- Getting Started Building Agents on Google Cloud
- Agentic Memory
- Memory Management; LLMs as Operating Systems
- Labs

Agentic AI — Session IV

- Agent Engine and Agent Garden
- Evaluation/Improvement of Agents
- AgentOps
- Labs

LRM — Large Reasoning Models

- Architectures
- Differences Between LLMs and LRMs
- Gemini 2.5 vs. OpenAI o3, o4
- Evaluation Methodology
- Use Cases

Module 6 | Cybersecurity and Ethical Hacking

60 Teaching hours

Security Fundamentals I: Basic Security Concepts

- CIA Triad (Confidentiality, Integrity, Availability)
- Fundamental terms and definitions
- Evolution of information security
- Regulatory framework and international standards
  - Relevance: CISSP (D1), Security+ (D1), CASP+ (D5), CCSP (D1)

Security Fundamentals II: Core Risk Management

- Risk identification and analysis
- Vulnerability assessment
- Threat management and countermeasures
- Business Impact Analysis (BIA)
  - Relevance: CISSP (D1), Security+ (D5), CASP+ (D1), CCSP (D1)

Security Fundamentals III: Security Architecture and Models

- Reference models (OSI, TCP/IP)
- Access control models (DAC, MAC, RBAC, ABAC)
- Defense-in-depth architectures
- Network zoning and segmentation
  - Relevance: CISSP (D3), Security+ (D3), CASP+ (D1), CCSP (D1)

Security Fundamentals IV: Security Controls and Categorization

- Types of controls (administrative, technical, physical)
- Preventive, detective, and corrective controls
- Implementation of risk-based controls
- Evaluation of control effectiveness
  - Relevance: CISSP (D1, D8), Security+ (D5), CASP+ (D5), CCSP (D1)

Ethical Hacking I: Introduction to Ethical Hacking

- Definition and scope of ethical hacking
- Differences between ethical hacker, white hat, black hat, and grey hat
- Legal framework and ethical considerations
- Methodologies and standards (OSSTMM, PTES, OWASP)

Ethical Hacking II: Reconnaissance and Information Gathering

- Passive footprinting techniques
- OSINT (Open Source Intelligence)
- Reconnaissance tools (Shodan, Maltego, theHarvester)
- Metadata analysis and public sources

Ethical Hacking III: Network Scanning and Enumeration

- Host and service discovery
- Port scanning techniques
- Vulnerability identification with Nmap and Nessus
- Enumeration of users, services, and resources

Ethical Hacking IV: Web Application Vulnerabilities

- Web application testing methodology
- OWASP Top 10 – Major vulnerabilities
- SQL Injection and Cross-Site Scripting (XSS)
- Web testing tools (Burp Suite, OWASP ZAP)

Ethical Hacking V: Exploitation Techniques and Privilege Escalation

- Identification of attack vectors
- Exploitation of known vulnerabilities
- Use of exploitation frameworks (Metasploit)
- Privilege escalation techniques in Windows and Linux

Ethical Hacking VI: Network Security Testing

- Man-in-the-Middle attacks
- Sniffing and traffic capture
- Analysis of insecure protocols
- Perimeter security bypass techniques

Ethical Hacking VII: Social Engineering and Forensic Analysis

- Principles and techniques of social engineering
- Phishing and impersonation attacks
- Fundamentals of digital forensic analysis
- Evidence collection and analysis

Ethical Hacking VIII: Reporting and Best Practices

- Documentation of vulnerabilities and tests performed
- Structure and drafting of technical reports
- Mitigation strategies and recommendations
- Planning for recurring tests and follow-up

Module 7 | Quantum Computing

40 Teaching hours

Fundamentals of Quantum Computing I: Basic Quantum Mechanics

- Principles of quantum mechanics
- Superposition and entanglement
- Mathematical foundations

Fundamentals of Quantum Computing II: Qubits and Gates

- Quantum states
- Dirac notation
- Single-qubit gates (X, Y, Z, H)
- Controlled gates (CNOT, Toffoli)
- Circuit construction
- Bell and GHZ states
- Projective measurements
- Phase Kickback

Fundamentals of Quantum Computing III: Basic Algorithms

- Bernstein–Vazirani algorithm
- Quantum teleportation
- Dense coding

Fundamentals of Quantum Computing IV: Quantum Hardware

- Superconducting qubit technologies
- Trapped ions
- Photonic quantum systems
- Control and measurement
- Quantum error correction
- Scalable architectures

Quantum Algorithms I: Shor's Algorithm

- Mathematical foundations
- Quantum Fourier Transform
- Phase estimation
- Detailed implementation
- Complexity analysis
- Cryptographic implications

Quantum Algorithms II: Grover's Algorithm

- Quantum search
- Quantum oracle
- Amplitude amplification
- Algorithm optimization
- Practical applications
- Use cases

Quantum Optimization

- Variational Quantum Eigensolver (VQE)
- Quantum Approximate Optimization Algorithm (QAOA)
- Grover Adaptive Search

Scenario Simulation with Quantum Computing

- Quantum Random Walks
- Quantum Bayesian Networks

Master's Thesis Defense I
Master's Thesis Defense II

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4

Certifications

You can earn up to ***three AI and Cloud Services certifications*** issued by Google, all while pursuing this Master's program.

Professional Machine Learning Engineer (PMLE), Google Cloud

The **Professional Machine Learning Engineer (PMLE) certification**, issued by Google, is designed as a key credential for students, developers, and data scientists who wish to demonstrate skills in machine learning, model deployment, data governance, and AI infrastructure.

This certification is intended to validate that professionals can:

- Design scalable and maintainable ML solutions.
- Implement ML models following Google Cloud best practices.
- Assess the effectiveness and risks of deployed ML models.

Certification Content

Machine Learning Conceptual Framework:

- Selection of modeling techniques and data
- Hyperparameter tuning and evaluation

ML Model Development:

- Creation of data pipelines
- Implementation of algorithms and techniques for supervised and unsupervised problems

Production Deployment:

- Automation of ML models
- Continuous monitoring and improvement of deployed models

Google Cloud Tools:

- Use of Vertex AI, TensorFlow, and BigQuery ML

Benefits for Students

- Global Recognition by Google
- **Enhanced Employability and Credibility:** ML and Google Cloud skills are highly sought after across various industries, including finance.
- **Access to an Innovation Ecosystem:** GCP products and AI technologies are constantly evolving; this certification demonstrates that the student is prepared and officially certified by Google.

To obtain this certification, students must pass an exam of approximately **2 hours**, consisting of **50–60 multiple-choice questions**, taken remotely under supervision without access to reference materials.

The exam fee is **200 USD**, which must be paid directly to Google by the student.

Professional Cloud Architect (PCA), Google Cloud

The **Professional Cloud Architect (PCA) certification**, issued by Google, is designed to validate the skills required to design, develop, and manage secure, scalable, and highly available infrastructures on Google Cloud Platform (GCP). It is an essential credential for professionals seeking to master cloud architecture with a practical and strategic approach.

This certification demonstrates that professionals are capable of:

- Designing robust, efficient, and secure cloud architectures.
- Managing infrastructure solutions that meet technical, business, and regulatory requirements.
- Monitoring, optimizing, and securing the performance of cloud environments.

Certification Content

Cloud Architecture Design:

- Selecting appropriate services for different business needs
- Defining network, storage, compute, and database structures

Security and Regulatory Compliance:

- Implementing access control, encryption, and auditing policies
- Ensuring alignment with regulatory frameworks such as GDPR or MiFID II

Management and Optimization of GCP Solutions:

- Monitoring resources and performance
- Automating tasks using tools like Cloud Deployment Manager and Terraform

Specific Use Cases:

- Implementing financial analytics, big data, and AI solutions on GCP

Google Cloud Tools:

- Cloud Storage, Compute Engine, Kubernetes Engine, BigQuery, Cloud IAM, among others

Benefits for Students

- **International Recognition:** Official certification issued by Google Cloud.
- **High Employability:** Cloud architecture skills are essential in banking, fintech, and capital markets.
- **Preparation to Lead Digital Transformation:** Students will be equipped to design solutions that meet the highest standards in the financial sector.

To obtain this certification, students must pass an exam of approximately **2 hours**, consisting of **50–60 multiple-choice questions**, taken remotely under supervision without access to reference materials.

The exam fee is **200 USD**, which must be paid directly to Google by the student.

Professional Data Engineer (PDE), Google Cloud

The **Professional Data Engineer (PDE) certification**, issued by Google Cloud, is aimed at professionals who design, build, and optimize scalable, secure, and value-oriented data processing systems. This credential certifies key skills for turning data into actionable insights, which is essential in the financial sector.

This certification validates that professionals can:

- Design and build efficient, scalable data processing systems.
- Integrate and transform large volumes of structured and unstructured data.
- Ensure data security, integrity, and governance.
- Apply machine learning techniques to extract advanced insights.

Certification Content

Data System Design:

- Architectures for data ingestion, storage, and analysis
- Selection of technologies for streaming and batch data

Data Pipeline Construction:

- Implementation of processing workflows using tools such as Dataflow, Pub/Sub, Dataproc, and Apache Beam
- Data cleaning, transformation, and enrichment

Data Modeling and Analysis:

- Using BigQuery for real-time analytics
- Applying machine learning models to large-scale datasets

Security and Compliance:

- Access management, auditing, and regulatory compliance in regulated environments

Key Google Cloud Tools:

- BigQuery, Cloud Composer, Dataflow, Dataproc, Pub/Sub, Vertex AI

Benefits for Students

- **Globally Recognized Certification:** Endorsed by Google Cloud and acknowledged by leading companies in the financial and technology sectors.
- **High Employability:** The role of Data Engineer is highly sought after due to its critical role in digital transformation.
- **Practical Skills for the Financial Sector:** Specific preparation for working with high-frequency financial data, market history, and risk analysis.

To obtain this certification, students must pass an exam of approximately **2 hours**, consisting of **50–60 multiple-choice questions**, taken remotely under supervision without access to reference materials.

The exam fee is **200 USD**, which must be paid directly to Google by the student.

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5

Career Opportunities

Become a ***Top Technical Lawyer*** by mastering Law, AI, Cloud Services, Blockchain, Financial Markets, and Crypto Assets— all from a legal perspective.

One Master's Program, Multiple Career Paths

The Master's program offers **powerful, ambitious, and highly relevant career paths** aligned with legal profiles in the emerging law-technology paradigm. Several natural routes exist upon program completion, though they are not exhaustive:

- **Law Applied to Insurance**

Graduates can specialize in legal advisory for insurers and reinsurers in the digital context, covering topics such as policy automation via smart contracts, cyber risk management, and regulatory compliance for AI-based insurance.

- **Law Applied to Digital Banking**

Students will be qualified to serve as legal advisors in digital banks, neobanks, and fintechs, providing guidance on cloud-based financial services, PSD2 compliance, and regulations on credit scoring algorithms.

- **Law Applied to Digital Payments**

Professionals trained in the Master's program can provide legal advice to PSPs (Payment Service Providers), wallets, and payment platforms, ensuring secure solutions compliant with European and international regulations on electronic payments and crypto-assets.

- **Law Applied to Securities Markets**

Graduates will be prepared to work in supervisory bodies, investment firms, or legal advisory roles related to asset tokenization, regulation of algorithmic trading platforms, and MiFID compliance in the digital environment.

- **Law Applied to Crypto-Asset Services and Markets**

Opportunities open in law firms, exchanges, and crypto-asset operators, assisting in interpreting and applying MiCA regulations, designing compliance frameworks for ICOs, and legally structuring new decentralized financing models.

- **Law Applied to Platform and Distributed Services**

Graduates can join legal teams of major digital platforms, marketplaces, or tech companies to advise on platform governance, intermediary obligations, and compliance with the Digital Services Act (DSA).

- **Law Applied to DLT, Ledgers, and Blockchain Technology**

The program equips students to work on projects utilizing decentralized technologies, providing legal support regarding liability, legal validation of blockchain-registered transactions, and smart contracts.

- **Law Applied to Digital Transformation and Sustainability**

Graduates can work with companies and consultancies on digital transformation projects with an ESG perspective, ensuring compliance with technological regulatory frameworks that have social and environmental impact, and promoting sustainable digital best practices.

- **Law Applied to Digital Identity**

This profile enables work in public institutions, technology companies, and financial organizations on identity verification, data protection, and eIDAS 2.0 compliance, as well as the legal design of digital wallets and verifiable credentials.

- **Law Applied to Artificial Intelligence Systems**

Graduates can join law firms, compliance teams, or public administrations to assess legal risks of algorithms, ensure transparency, and guarantee compliance with the EU AI Regulation (AI Act).

- **Law Applied to Trust Service Providers**

This path includes working with electronic signature providers, digital seal services, timestamping, and digital custody services, in line with eIDAS regulations and their technical and legal implications.

- **Law Applied to Cryptography**

Professionals can provide specialized legal services in confidentiality and information security, interpret regulations on encryption, and conduct legal audits of cryptographic systems in regulated sectors.

- **Law Applied to Cybersecurity**

Graduates will be prepared to participate in legal teams handling incident response, compliance with regulations such as NIS2, security breach impact analysis, and the design of internal legal cybersecurity policies.

Comparison of Profiles

	Content	Other National Master's	Other International Master's	Essential Technical Lawyer	Top Technical Lawyer
Law	Law Applied to Insurance	Expert	Expert	Expert	Expert
	Law Applied to Digital Banking	Expert	Expert	Expert	Expert
	Law Applied to Digital Payments	Expert	Expert	Expert	Expert
	Law Applied to Securities Markets	Advanced	Advanced	Expert	Expert
	Law Applied to Crypto-Asset Services and Markets	Advanced	Advanced	Expert	Expert
	Law Applied to Platform and Distributed Services	Advanced	Expert	Expert	Expert
	Law Applied to DLT, Ledgers, and Blockchain Technology	Advanced	Expert	Expert	Expert
	Law Applied to Digital Transformation and Sustainability	Advanced	Expert	Expert	Expert
	Law Applied to Digital Identity	Expert	Expert	Expert	Expert
	Law Applied to AI Systems	Advanced	Advanced	Expert	Expert
	Law Applied to Trust Service Providers	Expert	Expert	Expert	Expert
	Law Applied to Cryptography	Advanced	Expert	Expert	Expert
	Law Applied to Cybersecurity	Advanced	Expert	Expert	Expert
	Risks, Governance, and Strategic Fundamentals	-	Advanced	-	Expert
Technology	Financial Markets and Crypto-Assets	-	-	-	Expert
	Blockchain and Decentralized Market Infrastructure	-	-	-	Expert
	Programming Fundamentals	-	-	Expert	Expert
	Cloud Services and Big Data	-	Advanced	Advanced	Expert
	Machine Learning and Deep Learning	-	Beginner	Advanced	Expert
	Advanced and Generative AI	-	Beginner	Advanced	Expert

Toolbox Upon Completion

Programming Language

Python

Cloud Architecture

Google Cloud

You Will Achieve:

Machine Learning (ML)

- Frameworks: TensorFlow, PyTorch, Keras
- Model evaluation
- Data visualization
- Clustering algorithms

Deep Learning (DL)

- Convolutional Neural Networks (CNN)
- Recurrent Neural Networks (RNN)
- Principal Component Analysis (PCA)
- Natural Language Processing (NLP)
- Probabilistic Graphical Models (PGM)
- Bayesian Networks (BN)
- Generative Adversarial Networks (GAN)
- Variational Autoencoders (VAE)
- Deep Autoencoders (AE)
- Reinforcement Learning (RL)
- Recommendation Systems
- Transfer Learning (TL)
- Large Language Models (LLM)
- Explainable AI (XAI)
- AI Agents
- ...

Technology Law and Regulatory Frameworks

Applied to:

- Artificial Intelligence
- Digital Transformation and Sustainability
- Platform and Distributed Services
- Cybersecurity
- Digital Identity
- Data Governance

Governance and Strategic Fundamentals

- Business strategy
- AI project management

Risk management

- Advanced risk management
- AI-related risks
- Compliance and legal aspects (regulations, audits, contracts, data privacy, etc.)
- Key technology and AI roles within an organization
- Vendor management and evaluation
- Data governance

Finance and Crypto-Assets

- Equities
- Futures
- Options
- Currencies
- Fixed income
- Commodities
- Crypto-assets
- Portfolio optimization and management
- Wealth management

Governance and ISO Standards

- AI Management System (ISO/IEC 42001)
- Governance of Disruptive Technologies (ISO/IEC 38507)
- Risk Management in AI Systems (ISO/IEC 23894 & 31000)

Professional Career Paths

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A UNIQUE Program

We embrace a dual perspective that makes us UNIQUE: Law applied to new technologies and new technologies applied to law. ***We do not merely teach law—we transform lawyers into Top Technical Lawyers***.

A Dual Perspective – Nature of the Master's Program

This aspect is one of the most important differentiating factors compared to any other master's program.

While other law or technology law master's programs focus exclusively on the legal perspective, our school aims to create a new profile: a lawyer who thoroughly understands technology, enabling them to leverage that knowledge within their law firm.

Our goal is to develop a **Top Technical Lawyer**, without neglecting the legal dimension. The master's includes **250 hours of law applied to emerging technologies**, ensuring you become an expert lawyer from a legal standpoint.

But it also emphasizes the technological perspective. Other technology-focused master's programs aim to create **advanced users of AI**—users who depend on third-party software. The objective of this program is to create **AI experts**—professionals capable of designing their own AI software, from conception to production, and adapting it to solve any task at hand.

We aim to train lawyers who are experts both legally and technologically, acquiring cutting-edge knowledge in both fields, maximizing the student's skills and professional potential. This career-oriented approach is one of the main differences from any other master's program. Our focus is not merely on covering an academic syllabus to grant a degree, but on identifying **who should be hired**.

Learning by Doing

We avoid the "professor reading hundreds of slides" model, where students leave class without truly learning. Our approach combines theory with numerous practical exercises, both legal and technological. Students must solve increasingly complex cases.

No Theoretical Exams, Only Practical Assignments

At the end of each knowledge block, students receive a challenging practice assignment with **three weeks to complete and submit it**. The goal is to simulate a **fully realistic work environment**.

Real Possibility of Failing

This master's is designed to **distinguish the exceptional students** from the rest, creating a talent pool of excellence. To achieve this level, there must be a real possibility of failing.

Google-Certified Program

Part of the AI module faculty includes engineers from Google. During this module, students receive training necessary to obtain the **Cloud Architect, Big Data Engineer, and Machine Learning Engineer certifications**. Exams are conducted directly through Google, the entity responsible for certifying the students' knowledge.

Constant Content Updates

While many business schools claim to do this, few truly understand what constant updating means. This is **one of the most significant differentiating points** of this master's program.

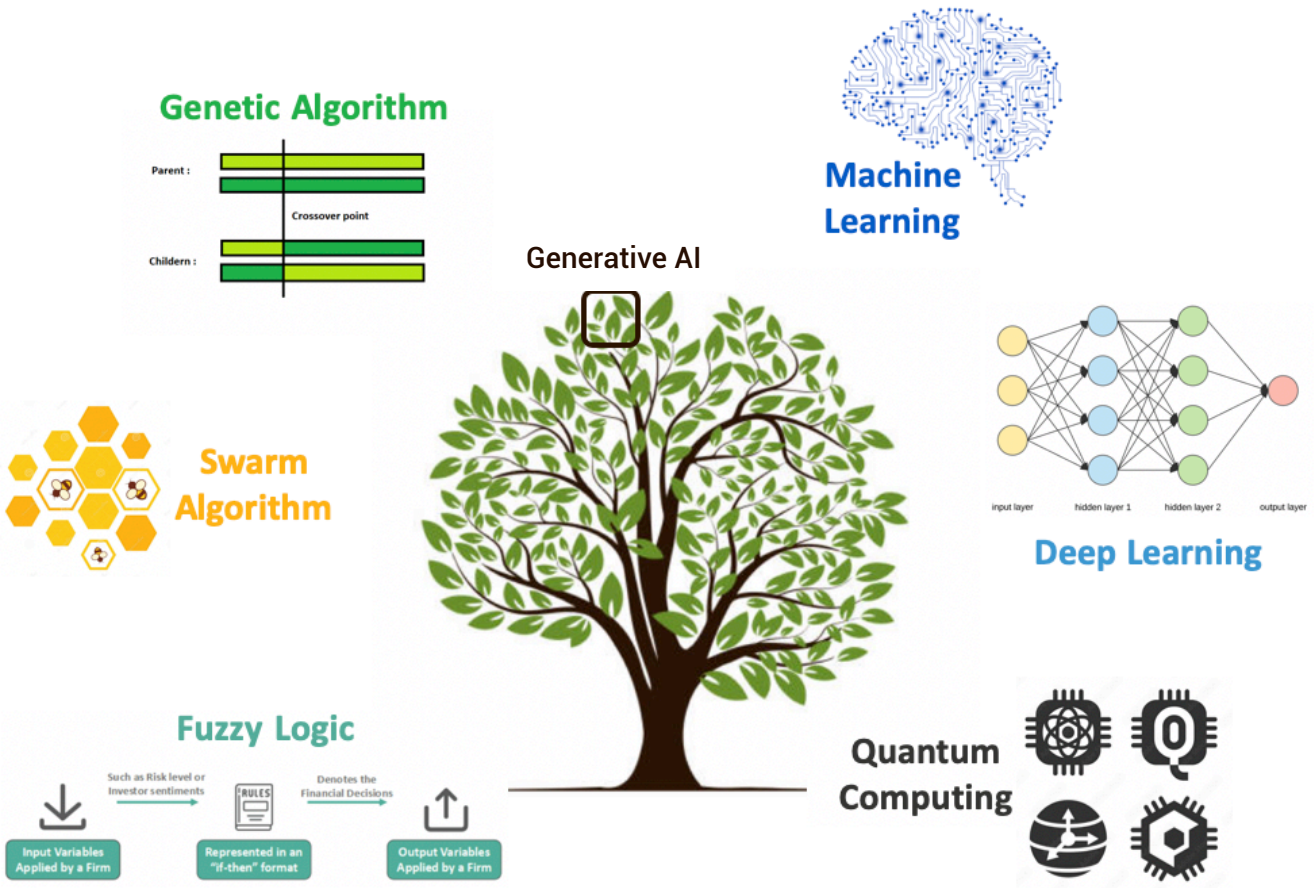
The program's content is **thoroughly reviewed each edition** to ensure it always offers the most cutting-edge material. Google engineers themselves present students with the **latest research papers**, from both Google and its competitors (Microsoft, Meta, Amazon), making each edition's content distinct and fully up-to-date.

This Master's Does Not Focus Only on Deep Learning

There are five main branches of Artificial Intelligence:

- Genetic Algorithms
- Swarm Algorithms
- Fuzzy Logic
- Machine Learning and Deep Learning
- Quantum Computing

This master's program is the **only one in the world** where all five AI branches are explored in depth, explaining each concept and detailing what is currently being used in the industry.



Quality of the Faculty

The faculty is the most valuable asset of the master's program, which is why the selection of professors is one of the areas receiving the most time and attention.

All professors have been carefully selected for:

- Their deep knowledge in the field they teach.
- Their ability to effectively convey that knowledge to students.
- Their real-world experience in corporate projects.

Employability and Talent Pipeline for Tech-Focused Law Firms

The profile of a technology lawyer is currently considered one of the most difficult to fill within law firms, and it is one of the highest-paying roles in the sector.

The high standards of the master's program, together with the continuous updating of its content, position graduates as the natural talent pool for any law firm, whether it already has a technology department or is considering creating one.

The program maintains direct connections with various law firms nationally and internationally, as well as with the Madrid Bar Association. These partnerships provide case studies for final master's projects, turning them into employment opportunities for graduates.

Our goal is to continually seek collaborations with leading law firms to ensure that the employability of our graduates approaches 100%.

Community and Content Updates for Alumni

For us, the master's program does not end with the last class.

Given the rapid pace of obsolescence in many areas covered by our master's programs, our innovative platform provides alumni with continuous and relevant updates to the content studied.

Alumni naturally act as ambassadors for our programs. Their professional success and satisfaction with the education received reinforce the master's reputation and attract new students.

Once a master's program is completed, grades lose importance; what truly matters is reputation, which must continue to evolve, be visible, and serve as a form of currency for professional growth, granting:

- Discounts on future programs and master's courses
- Access to international conferences
- Free content updates

Factors Influencing Reputation

- Contributing to the learning of others: Responding to student inquiries in the school forums and helping to create an environment of collaboration and mutual support.
- Publishing research or papers with the school, sharing knowledge with the academic and professional community.
- Actively participating in school competitions, demonstrating capability and commitment in practical and challenging contexts.

- Share your personal experience on social media by posting videos and testimonials about your journey at the school, inspiring others and positioning yourself as a reference.
- Develop innovative projects and services in collaboration with the school, providing concrete solutions that benefit the community.
- Attract new students by recommending the school to prospective applicants and acting as a brand ambassador.
- Collaborate in school events and activities by participating in conferences, seminars, or mentorships that reinforce your role as a leader within the community.

Factors Influencing Ethics

- Negatively affecting the school's image, whether through destructive behavior, malicious comments, or actions that damage its reputation.
- Maintaining unethical or violent behaviors, such as dishonest practices, unnecessary conflicts, or attitudes that compromise personal or institutional integrity.
- Ignoring community rules, violating academic, ethical, or behavioral policies that govern the school.
- Discrediting peers or community members, generating unjustified conflicts and contributing to a toxic environment.
- Showing disinterest or abandoning commitments, leaving projects or tasks incomplete and negatively impacting collective work.

In the profile view of any user, you will be able to see the knowledge, reputation, and certifications of the person you are interacting with. Likewise, that person will be able to see yours.

The knowledge section will display the year in which each skill was acquired, making it important to update them regularly.

Knowledge, reputation, and purpose are the three fundamental pillars of AthenAI.

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Faculty of Experts and Instructors

The faculty is the ***most valuable asset of the Master's program***, which is why the selection of professors is one of the aspects to which we have devoted the most time and attention.

Professor		Specialty	Education	Current Position
	**Alberto Lopez Nestar**	FinTech	- Industrial Organization Engineer, Technical Engineer in Management Computing, Business Administration Diploma, Master in Project Management	Deputy General Director, Iberpay
	**Álvaro Suárez Bravo**	Blockchain	- Computer Engineering Degree, Master in Computer Science	Principal Software Engineer, DLT Finance AG
	**Ángel Luis Quesada Nieto**	Blockchain	- Mathematics Degree, MBA, Master in Business Management for Entrepreneurs	Founder & CEO, Onyze, Kubide & Climbspot
	**Antonio Bravo Jiménez**	Finance	- Specialization in Company Valuation, Specialization in Financial Options and Futures, Business Administration Degree	Head of Equity, Cecabank
	**Carlos Muñoz Ferrandis**	Law	- Law Degree, Master in Legal Practice, Master in Intellectual Property and IT Law, PhD in Philosophy, PhD Candidate in Law	Co-founder & COO, Alinia AI
	**César Sanz**	Finance	- Master in Economics and Financial Markets, Economics Degree	Trader in Equities, Derivatives & Market Making, Cecabank
	**Cristina Carrascosa Cobos**	Law	- Master in Law (LLM), Master in Intellectual Property / IT Law, Master in Tax / Finance, Law Degree, Member of Blockchain Observatory Working Group, Forbes 2023 & 2024 Recognitions	Founder & Managing Partner (Fintech & Regulation), ATH21
	**Daniel Dorado García-Marina**	Finance	- Master in AI and Quantum Computing Applied to Financial Markets (MIAX), Business Administration Degree	Head of Credit and Equity Trading, Cecabank
	**David del Val**	Finance	- Dual Degree in Economics and Law, Master in Macroeconomic and Financial History, Former Economist and Presidential Advisor at La Moncloa	Senior Economist, International Economics and Markets, CaixaBank Research
	**Fanny Solano Agramonte**	Law	- Law Degree, Master in Private Law, Master in Financial Advisory, Banking and Finance, Master in Insurance Distribution, MBA	Director of Legal Affairs in Regulation, Private Banking & Product Governance, CaixaBank

Professor		Specialty	Education	Current Position
	**France Vidal Leca**	Law	- Master in Intellectual Property, Advanced Studies Diploma (DEA) in Law and European History, Master in Private Law	VP Legal & Compliance, Signaturit
	**Gloria Hernández Aler**	Law **Academic Direction**	- Law Degree, Master in Securities & Financial Regulation	Co-founding Partner, finReg
	**Gonzalo Navarro Ruiz**	Law	- Law Degree, Business Administration Degree, Master in Corporate Legal Advisory (Top of class), PhD in Corporate Law & Capital Markets (Summa cum laude), Executive MBA	Head of Financial Regulation, ONTIER
	**Guillermo Meléndez Alonso**	Artificial Intelligence	- Diploma in Business Administration (Top of class), Business Administration Degree (Top of class), Master in Auditing, Master in Quantitative Finance, Master in Stock Market & Alternative Investments, Master in Data Science & Big Data (Top of class), Master in Deep Learning (Top of class)	CEO, AthenAI
	**Jesús Mardomingo**	Law **Academic Direction**	- Lawyer with over 35 years of professional experience and a renowned partner in the Banking and Finance practice at Dentons, the largest law firm in the world.	Partner, Dentons
	**Jesús Sanz del Real**	Artificial Intelligence + Finance	- Law Degree, Business Administration Degree, Master in Applied AI for Financial Markets (MIAX), CFA Level II	Associate Team Leader & Data Scientist, Oliver Wyman
	**Jorge Soriano Lázaro**	Cryptoassets	- Architecture Degree	Co-founder & CEO, Criptan
	**Jose Zamora**	Artificial Intelligence	- Dual Degree in Computer Science & Hardware Engineering, Master in Computer Vision, Master in Digital Intelligence, MBA	Director of AI, GenAI & MLOps
	**Luis Fernando Lago Fernández**	Artificial Intelligence + Mathematics	- Physics Degree, Mathematics Degree, PhD in Computer Science	Biological Neurocomputing Department, Technical University of Madrid

Professor		Specialty	Education	Current Position
	**Maite Sanz de Galdeano**	Law	- Law Degree, Master in Cultural Management, Master in eCommerce & Digital Marketing Management; Expert Graphologist & Judicial Handwriting Expert; Expert in Indigenous Peoples, Human Rights & International Cooperation	Lawyer, Legal Consultant, Auditor & Lecturer in Data Protection, Digital Law & AI
	**Manuel Sánchez Montañés Isla**	Artificial Intelligence	- Physics Degree, PhD in Computer Engineering	Researcher, Autonomous University of Madrid
	**Mariona Pericas Estrada**	Law (FinTech + CryptoAssets)	- Dual Degree in Law & Business Administration, Master in Economic Criminal Law	Director of Financial Regulation, finReg360
	**Miguel García Cordo**	Artificial Intelligence	- Master in Applied AI for Financial Markets (MIAX), Master in AI (AI Institute), ISO 42001 AI Management Leader Certificate, ISO 38507 AI Governance Leader Certificate	Chief Risk Officer (CRO), Inversis
	**Miguel Jaureguízar**	Finance + Blockchain	- Telecommunications Engineer (Honors), Advanced Studies Diploma (DEA) in Applied Economics, Postgraduate Studies in Applied Economics	Director of Digital Development & Digital Assets, Renta4 Banco
	**Minerva Rodríguez Cabrera**	Artificial Intelligence	- Master in Applied AI for Financial Markets (MIAX)	Operations Analyst, Broker Darwinex
	**Pablo Corredoyra**	Law	- Law Degree, Master in International Business	Senior Associate, finReg360
	**Paloma Llaneza González**	Law	- Law Degree with Honors, completed a medium-level Computer Programming degree; Diploma in Advanced European Studies	Lawyer, CISA & Managing Partner, Razona Legaltech

Professor		Specialty	Education	Current Position
	**Paula Ortiz López**	Law	- Master in Telecommunications & Information Technology Law, MBA, Master in Advertising & Digital Communication, Law Degree	Co-Founder & CEO, TheLegal.School
	**Pedro Ventura Gómez**	Artificial Intelligence	- Master in Applied AI for Financial Markets (MIAX, 1st cohort), Expert in Back Office Management & Financial Services, Telecommunications Engineer	Project Director, March Asset Management
	**Rafael Sánchez**	Artificial Intelligence + Big Data	- Telecommunications Degree, PhD in Engineering & Telecommunications	Manager, Generative AI / ML, Southern Europe & Middle East, Google
	**Raquel Hernández Falcón**	Artificial Intelligence	- Degree in Mathematics, Statistics & Research, Master in Applied AI for Financial Markets (MIAX), Master in Quantitative Finance	Risk Control & Regulatory Compliance, March Asset Management
	**Valero Laparra Pérez-Muelas**	Artificial Intelligence	- Telecommunications Degree, Mathematics Graduate, PhD in Philosophy, PhD in Artificial Intelligence (New York University)	Professor & Researcher, University of Valencia

ΑΘΗΝΑΙ
Technological Business School

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General Information

General Information

Duration

Full program equivalent to 125 ECTS

Technical Lawyer Essential

- Equivalent to 54 ECTS
- 450 teaching hours
- 1.350 teaching + study hours
- 12 months

Start Date	*End Date*
April 10th, 2026	March 16th, 2027

Top Technical Lawyer

- Equivalent to 71 ECTS
- 590 teaching hours
- 1.770 teaching + study hours
- 15 months

Start Date	*End Date*
April 2nd, 2027	June 27th, 2028

Schedule

Wednesday and Thursday from 7:00 PM to 9:30 PM

Friday from 4:00 PM to 9:00 PM

Saturday from 9:00 AM to 2:00 PM

* Wednesday, Thursday, and Friday classes will be conducted exclusively online.
* Saturday classes will be delivered both in-person and online.

Location

Essential master's programs are delivered entirely online.

Top master's programs combine online training with in-person sessions, although they may also be completed fully online. All in-person sessions take place in Madrid.

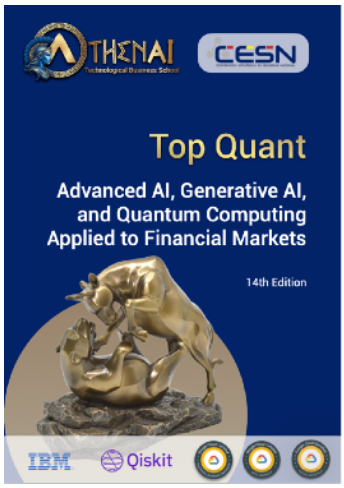
Price

The price of the **Technical Lawyer Essential** program is €11,000.

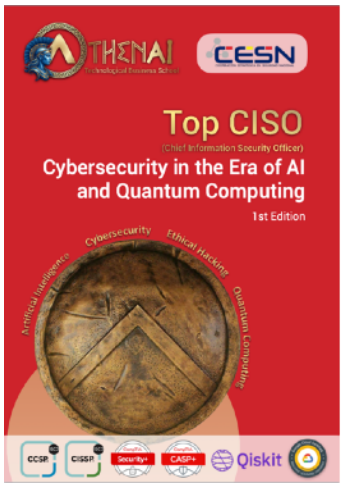
The price of the **Top Technical Lawyer** program is €15,000.

The price for the **Full program** is €26,000.

Content recognition between master's programs: a unique advantage



Focused on Financial Markets, AI, and Quantum Computing



Focused on Cybersecurity, AI, and Quantum Computing

Focused on the role of Chief Artificial Intelligence Officer (CAIO)

Focused on Law and Emerging Technologies

At our school, each master's program specializes in a different area, yet all share a common knowledge base in the new technologies modules: Python, AI, Cloud Services, Cybersecurity, Quantum Computing...

This structure allows students to take the common subjects only once, benefiting from automatic content recognition in any other master's program they choose.

For example, if you first complete the Top Technical Lawyer Master's program, priced at €26,000, you will have covered much of the common content of other master's programs, so:

- You can access the other master's programs with automatic recognition of the previously completed content modules*.
- The price of the subsequent master's programs will be significantly reduced**.
- You could complete all four master's programs for only €50,000***, instead of paying €108,000 (€27,000 × 4 master's programs).

This creates a powerful leverage effect on your education: more knowledge, greater specialization, lower cost.

* If you access a master's program with more than 50% of its content recognized, it will be offered exclusively online.

** The price of each master's program will be at least 20% of its original value.

*** This price is an approximate example, as it may vary depending on each master's program.

**** Recognitions can only be applied if the original master's program has been successfully completed.

In 2025, AthenAI established a program to train the world's top tech lawyers. Its purpose was to teach how to combine law and Advanced Artificial Intelligence to lead a new generation of law firms.

The official name of the Master's program was:

"New Technologies Applied to Law and Law Applied to New Technologies".

Students referred to it as…

Top Technical Lawyer