Digital 4 Business

Evolving your digital future

Ready-to-Use Online Materials

Deliverable 3.2

27.09.2024 | National College of Ireland

Contents

Work Package 3

Overview and Initial Commitments

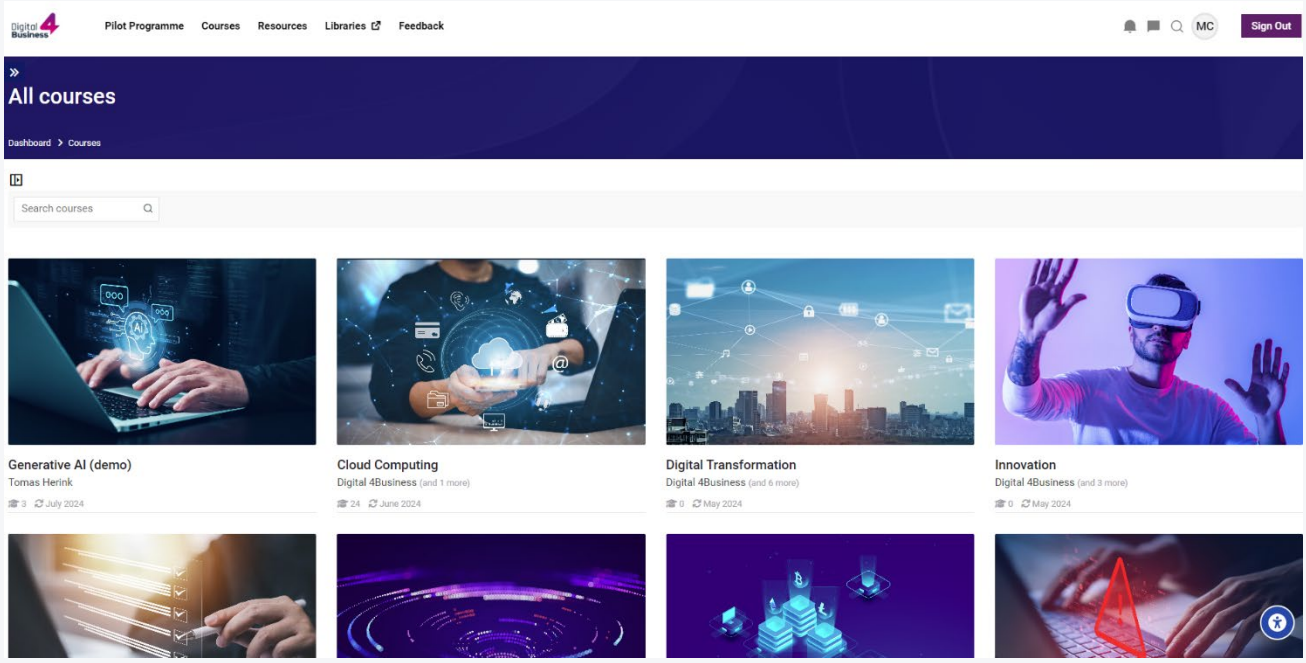
The prototype stage of all fourteen initial modules has been marked with the successful completion of the development of a fully comprehensive suite of Ready-to-Use online Training Materials (Output 1.3: Ready-to-Use online Training Materials) for the online master's program. This collection of materials and modules, pivotal for program delivery, seamlessly integrates with the online platform. Each module makes up for a certain number of credits, there are six modules making up 5 ECTS credits each, these are elective modules. The 8 mandatory modules all make up 10 ECTS credits each.

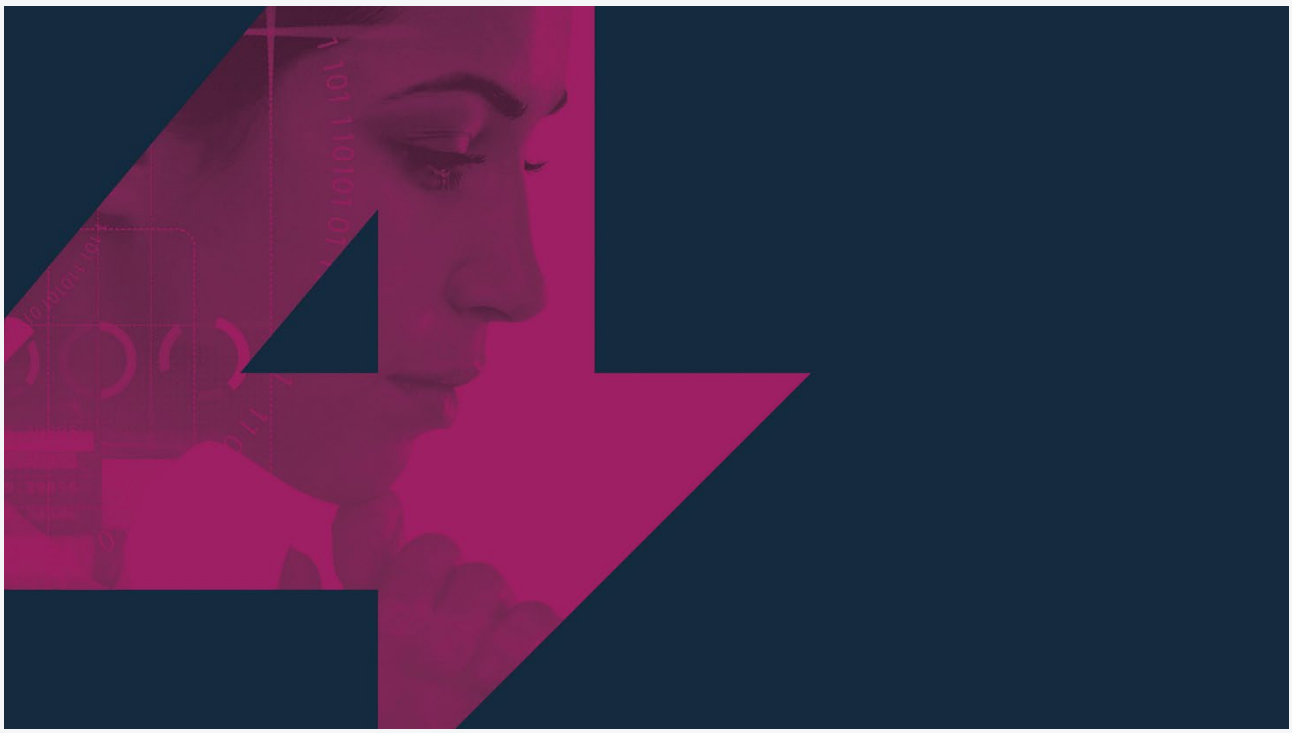
Curriculum Framework Design, Implementation, and Commitments

In advance of module creation, the Curriculum framework underwent a rigorous design process in collaboration with academic partners. Additionally, the HYLET Training Model was adopted. The HYLET Training model integrates Hybrid Learning (a mix of synchronous and asynchronous learning activities), Learning activities (facilitating training with the online community), and Tutoring. As per the agreement, this deliverable serves as a prototype and provides the initial version of the modules, to be finalized before the program launch. The consortium, in collaboration with academic partners, committed to developing modules in the following areas: **AI for Business, Cloud Computing, Cybersecurity, Data Science, Digital Transformation, Digital Transformation (Practicum), Generative AI, Innovation, and Electives: Blockchain, Governance & Ethics, Internet of Things, Programming, Quantum, and Risk Change Management.**

The Active Teaching Methods employed in all fourteen modules include:

- Flipped Classroom – EAS Method
- Case Study
- Problem-Based Learning (PBL)


Pilot Programme
Courses
Resources
Libraries
Feedback
MC
Sign Out
All courses
Dashboard > Courses
Search courses
Generative AI (demo)
Tomas Herink
3 July 2024
Cloud Computing
Digital 4Business (and 1 more)
24 June 2024
Digital Transformation
Digital 4Business (and 6 more)
0 May 2024
Innovation
Digital 4Business (and 3 more)
0 May 2024



Fourteen prototype modules

AI for Business

This module will equip you with essential skills in AI and machine learning, focusing on innovative applications, ethical practices and business optimisation.

In this transformative AI for Business module, you'll dive deep into the core concepts of artificial intelligence and machine learning. Through a blend of theoretical knowledge and practical application, you will learn to design, train and evaluate advanced ML models.

Our innovative curriculum includes real-world projects, strategic AI applications, and a strong emphasis on ethical and sustainable practices. By mastering these cutting-edge technologies, you'll be empowered to drive efficiency, enhance decision-making, and gain a competitive edge in the business landscape. Join us and become a leader in the AI-driven future.


Analyse, synthesise, and innovate within artificial intelligence and machine learning, emphasising critical understanding and the capability to advance the field.
Design, train, and critically evaluate advanced machine learning models, focusing on innovative data and optimisation strategies to boost performance.
Employ innovative techniques for rigorous machine learning model performance assessment, interpret results, and communicate implications across contexts effectively.
Apply strategic thinking in AI and machine learning for complex applications, assess effectiveness critically, and propose innovative solutions or improvements.
Critically explore AI and machine learning's ethical, societal, and environmental impacts, and propose ethical, sustainable development and implementation practices.

Full course content

Subjects covered

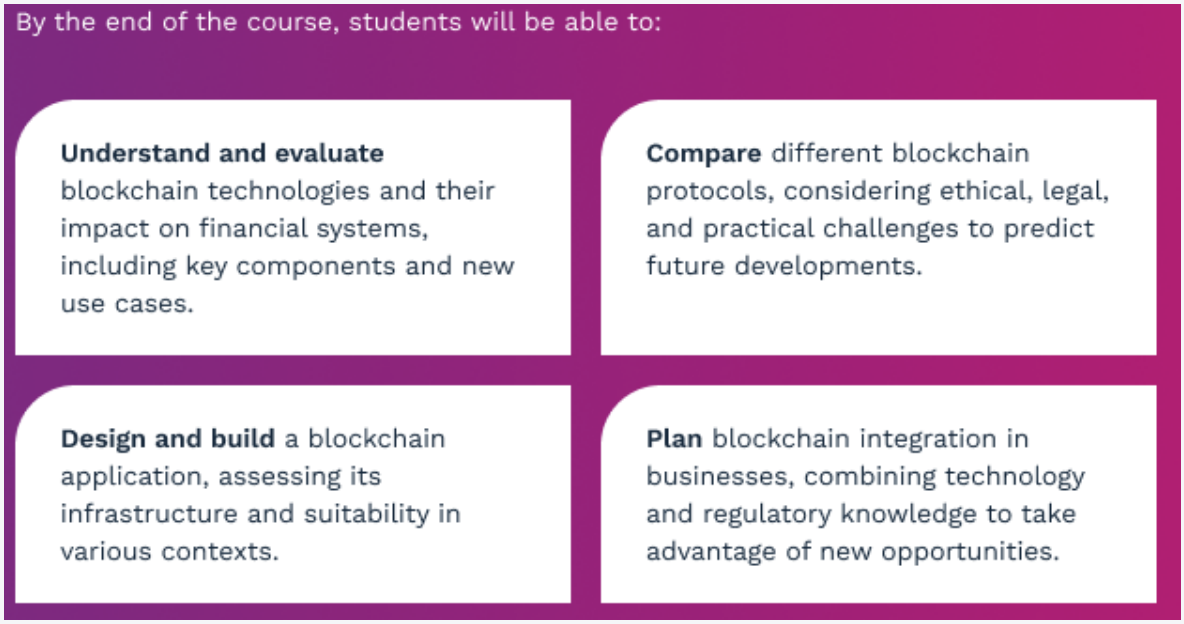
AI for Business is a 10 ECTS module delivered over 5 hours per week for 12 weeks. An indicative schedule of topics to be addressed each week is outlined below:

- **Introduction to AI and its history:** Overview of AI, significance in today's world, historical development, key milestones.
- **Foundational Knowledge for AI:** Problem-solving, search algorithms, heuristics, adversarial search, optimisation.
- **Automated Planning:** Goal achievement, decision-making, resource allocation, simulation, prediction, learning, adaptation, autonomous systems.
- **Introduction to Machine Learning:** Overview of ML, supervised/unsupervised learning, reinforcement learning, introduction to deep learning.
- **Deep Learning:** Neural networks, CNNs, RNNs, deep learning applications.
- **Data and Datasets:** Importance of data, data types, data quality, pre-processing, quality datasets.
- **Natural Language Processing (NLP):** NLP fundamentals, text processing, NLP models and techniques.
- **Computer Vision:** Basics of computer vision, image processing, object detection, challenges, and future trends.
- **AI Tools and Platforms:** Overview of AI tools/ platforms, practical applications, deep learning frameworks.
- **AI and Creativity:** AI in creative industries, design, innovation, future prospects, industry speaker session.
- **Ethical and Social Implications in AI:** Ethical challenges, societal impacts, AI bias and fairness, privacy, security.

Blockchain Technologies

Discover how emerging technologies are transforming business operations and creating a competitive advantage.

This module teaches the fundamentals of blockchain, including distributed ledgers, decentralisation, cryptocurrencies, and dApps. You'll explore the ethical and legal aspects of blockchain technology and see how businesses can harness it for strategic gain. By the end of the module, you will be equipped to use blockchain effectively in business contexts.



Full course content

Subjects covered

Blockchain Technologies is a 5 ECTS module delivered over four hours per week for 12 weeks. The schedule of topics to be addressed each week is outlined below:

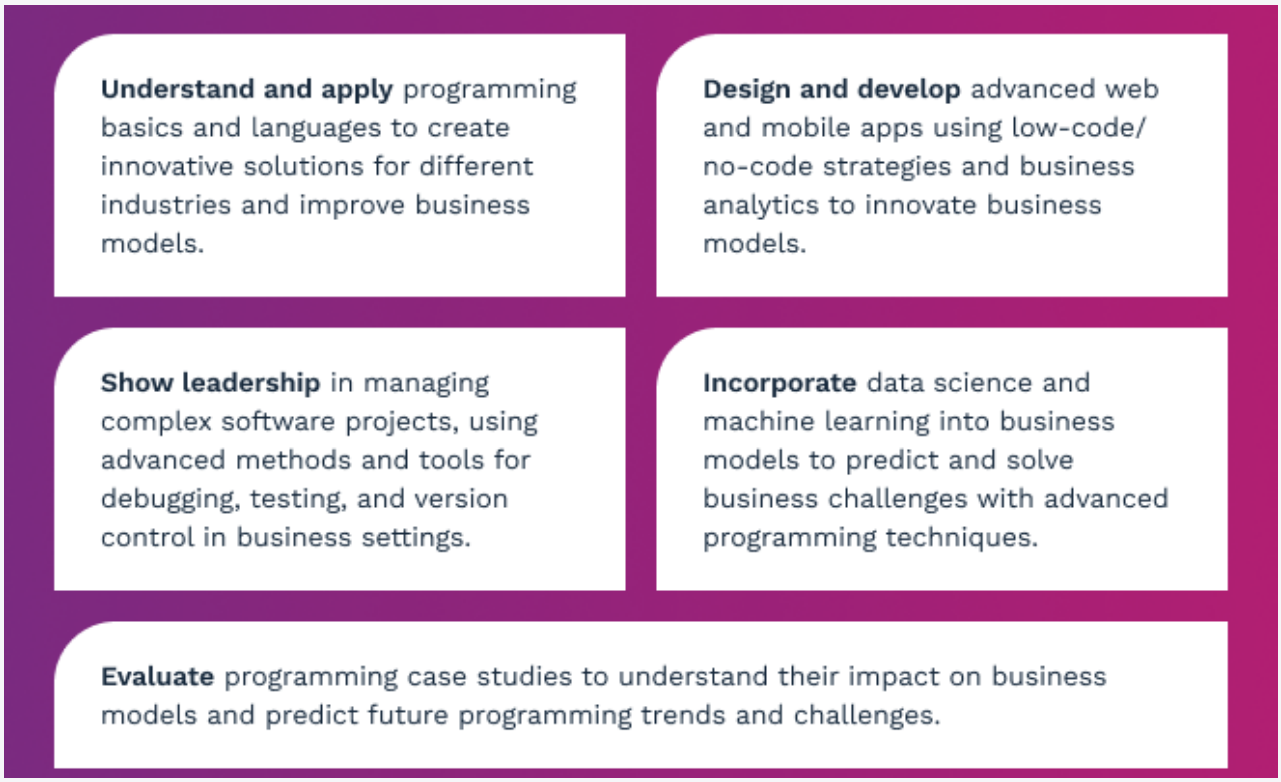
- **Introduction**
  - Introduction to Blockchain and Cryptocurrency
  - Historical Context of Blockchain and Cryptocurrencies
  - Overview of Different Blockchain Types
  - Introduction to the Blockchain Stack and its Core Components
- **Blockchain Stack and Core Components**
  - In-depth Discussion on Web3 and Technological Fundamentals
  - Detailed Analysis of Block Composition and Consensus Mechanisms (POET/ POB/ POS/ POW)
  - Basics of Distributed Systems and Distributed Ledger Technology (DLT)
  - Cryptographic Foundations: Hashing and the Merkle Tree
- **Blockchain Management**
  - Principles of Decentralisation and Brewer's CAP Theorem
  - Examination of Public, Private, and Enterprise Blockchains
  - Business Case Development for Blockchain Applicatios
- **Cryptocurrencies and the Blockchain**
  - Handling Cryptocurrencies: Storage, Use, and Wallets
  - Exploration of Altcoins and Mining Processes
  - Overview of Recent Trends and Developments in the Cryptocurrency Space
- **Evolution of Blockchain**
  - Detailed Study on the Evolution and Revolution of Blockchain: From Bitcoin to Hyperledger
  - Discussion on Enterprise Blockchain, Digital Identities, and Current Use Cases
- **Security, Identity & Cryptography in Blockchain**
  - The CIA Triad in Blockchain: Confidentiality, Integrity, Authentication
  - Exploration of Symmetric and Asymmetric Encryption, Non-Repudiation, and Public/ Private Keys
  - Hash Functions, Digital Signatures, Anonymity, and the Concept of Self-Sovereign Identity (SSI)
- **Blockchain Applications I - Bitcoin**
  - Comprehensive Overview of the Bitcoin System and Stack
  - Examination of Bitcoin Transactions, the P2P Network, and the Mining Process
  - Consensus Mechanisms: Proof of Work (POW)
- **Blockchain Applications II - Ethereum**
  - Comprehensive Overview of the Ethereum System
  - Smart Contracts, Decentralized Applications (DApps), and the Ethereum Virtual Machine (EVM)
  - Introduction to DAOs, Decentralized Finance (DeFi), and NFTs
- **DApp Development I**
  - Introduction to DApp Development Environments and the Web3 Stack
  - Basics of NodeJS and Express in the Context of Blockchain
- **DApp Development II**
  - Advanced Tools for DApp Development: Infura, RemixIDE, ERC Smart Contracts
  - Practical Use of Ganache, Truffle, and Blockchain APIs
- **Legal & Ethical Aspects of Blockchain**
  - Discussion on the Regulatory Landscape for Cryptocurrencies and Tokens
  - Anti-Money Laundering (AML), Counter-Terrorist Financing (CTF), Know Your Customer (KYC), and Know Your Transaction (KYT) Requirements
  - Ethical Considerations and Ongoing Legal Dynamics
- **Emerging Topics in Blockchain**
  - Exploration of Current Research Directions and Emerging Topics: CBDCs, Privacy, the Metaverse, and Quantum Computing's Impact on Blockchain

Business Programming

The Business Programming module curriculum aims to equip learners with a solid understanding of programming fundamentals, applications, and their impact on business model development. This module aims to equip students with a deep understanding of programming fundamentals, paradigms, and languages, focusing on creating innovative solutions for business.

Students will learn to design and implement solutions in web and mobile app development using low-code/no-code strategies and business analytics, enhancing their ability to innovate in digital transformation. The course emphasizes leadership in managing software projects, integrating data science and machine learning to develop business models that can predict and address business challenges. Students will analyze programming case studies to understand their impact and anticipate future trends and challenges in business development.

By the end of the course, students will be able to:



Full course content

Subjects covered

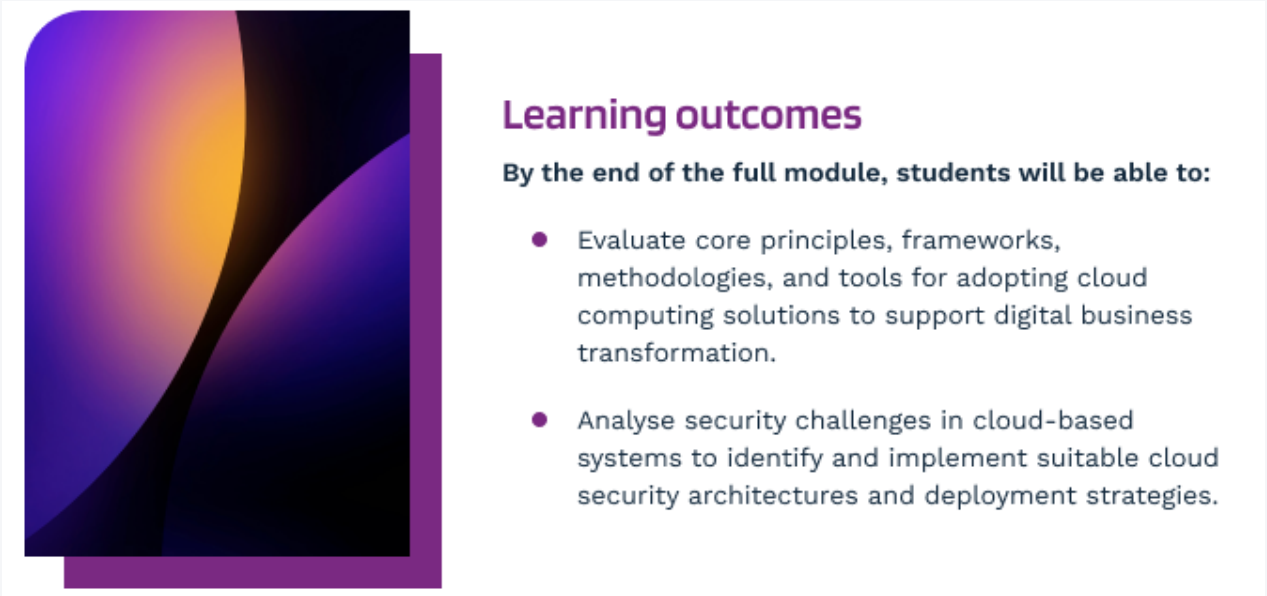
Business Programming is a 5 ECTS module that runs for 12 weeks, with five hours of class time each week. Here's a schedule of the topics we'll cover each week:

- **Introduction to Programming Concepts**
  - Basics of programming including algorithms, data structures, and problem-solving techniques.
  - Foundation of software development for business applications.
- **Programming Paradigms and Languages**
  - Examination of different programming paradigms (procedural, object-oriented, functional) and languages.
  - Discussion on selecting appropriate languages for business model development.
- **Business Model Development Using Programming**
  - Techniques for developing business models through programming.
  - Includes custom software solutions, automation, and leveraging data for decision-making.
- **Web Development for Business**
  - Fundamentals of web development focusing on HTML, CSS, and JavaScript.
  - Overview of both front-end and back-end development to create web applications for businesses.
- **Software Development Methodologies**
  - Overview of Agile, Scrum, and Waterfall methodologies.
  - Importance of project management and best practices in developing business software.
- **Introduction to Low-Code and No-Code Platforms**
  - Exploring low-code and no-code development platforms, highlighting their benefits and business use cases.
- **Advanced Low-Code and No-Code Development**
  - Deep dive into visual development environments and how they enable rapid application development with minimal coding.
- **Debugging and Testing Business Applications**
  - Techniques and tools for debugging and testing.
  - Includes unit testing, integration testing, and test-driven development tailored for business applications.
- **Version Control and Collaboration**
  - Importance of version control (e.g., Git) in software development.
  - Collaboration tools and techniques for team-based projects.
- **Mobile App Development for Business**
  - Overview of approaches to mobile app development (native, hybrid, cross-platform).
  - Tools and frameworks like React Native and Flutter for creating business applications.
- **Automating Business Processes through Programming**
  - Utilizing programming for business process automation.
  - Covers APIs, web scraping, and robotic process automation (RPA).
- **Case Studies and Future Trends**
  - Discussion of real-world case studies in business model development through programming.
  - Future trends including AI and quantum computing's impact on business.

Cloud Computing

Seize this opportunity to explore the future of cloud computing by joining an exclusive pilot course as part of the international Digital4Business master's programme. D4B is offering volunteers a chance to test a sample version of the Cloud Computing for Business module, designed to provide a robust understanding of cloud computing and its applications in business. We are seeking feedback and your expertise to help course coordinators refine the course.

Experience early access to valuable content and learning materials, develop essential cloud computing skills, and take a step towards elevating your career!



Full course content

Topics covered:

- **Introduction to Cloud Computing**
  - What is Cloud Computing?
  - Cloud Computing Service Models
  - Cloud Computing Deployment Models
  - Cloud Technologies
- **Enterprise Digital Architecture and Transformation**
  - Enterprise Systems Architecture
  - Functional/Non-functional architectural requirements
  - Information and Applications
  - Opportunities/Challenges
  - Business Model Innovation
  - Digital Transformation as a staged process
  - Business Readiness
- **Cloud Strategies for Business Transformation**
  - Cloud Strategy
  - Service Level Agreements and Key Performance indicators-
  - Innovation — How moving to the cloud has improved businesses
  - Enterprise Architecture on the Cloud
  - Cloud Computing Characteristics in more Detail (Interoperability, Scalability, Availability, Mobility, Analyticity, Usability)
  - Cloud Adoption
  - Cloud Adoption Frameworks
  - Organisational Change Management
  - Migration Scenarios
  - Hybrid Model
  - DevOpSec
- **Cloud Security Fundamentals**
  - Importance of Cybersecurity
  - Core Security Principles
  - Core Security Principles
  - Cloud Security Concepts and Components
    - Shared Security Model
    - Network Security
    - Data Security
  - Security Considerations for IaaS, PaaS, and SaaS

Skills developed

- Mastery of cloud computing principles and technologies
- Ability to design and implement effective cloud strategies
- Expertise in cloud security practices
- Competence in supporting digital transformation initiatives

Teaching methods

- Fully online learning with synchronous and asynchronous activities
- Comprehensive lectures, seminars and workshops
- Innovative methods including problem-based learning, gamification and flipped classroom techniques

Interactive elements:

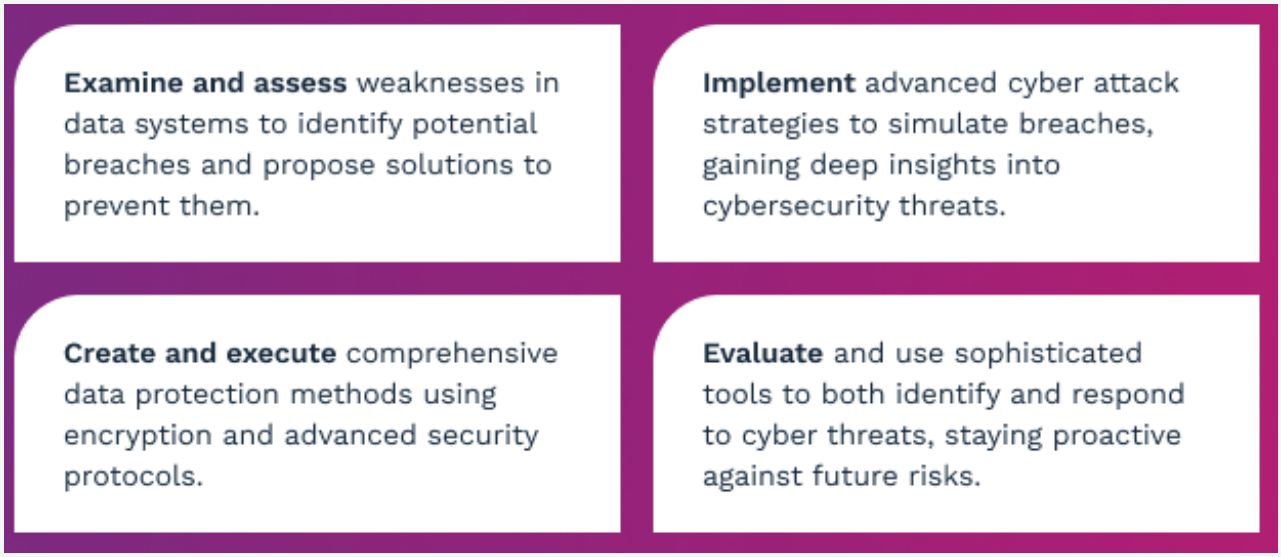
- Practical projects and exercises
- Collaborative group work
- Real-time feedback and interactive discussions

Cybersecurity for Business

Master techniques to protect against evolving cyber threats. This module equips you to safeguard both personal and organisational data. Learn to detect vulnerabilities and prevent breaches in data systems. Create effective protection measures to keep your data secure from future threats.

Discover the ethical and legal complexities of cybersecurity, and gain the confidence to navigate this rapidly changing field. Become a key player in digital security today, ready to handle tomorrow's challenges.

By the end, student will have learned to:



Full course content

Subjects covered

Cybersecurity for Business is a 10 ECTS module with 5 hours per week, over 12 weeks. The following schedule outlines the topics covered each week:

- **Introduction to Cybersecurity**
  - Overview of cybersecurity, its importance, and the growing demand for professionals
  - Understanding online identity, data, and their significance to cybercriminals
  - Seminar on real-world cybersecurity challenges
- **Risk Management and Compliance**
  - Exploring the significance of safeguarding electronic information networks and data
  - Regulatory compliance requirements for business
  - Implementing risk assessments and developing risk mitigation strategies
  - Lab on security breach case studies
- **Network Security for Business**
  - Addressing software and hardware vulnerabilities, device, network, and cloud security
  - Implementing secure network infrastructure including best practices for securing wireless networks and remote access
  - Lab on securing the application landscape, incident response planning and security incidents management
- **Cyber Attacks: Concepts and Techniques**
  - Analysis of cyberattacks, identifying and classifying security vulnerabilities
  - Understanding endpoint security challenges in business environments
  - Securing IoT devices and other connected endpoints in business networks
  - Seminar on vulnerabilities and real-world use cases
- **Data and Privacy Protection**
  - Best practices for protecting computer devices, wireless networks, and online accounts
  - Implementing cryptographic methods for business data
  - Exploration of ethical implications and considerations in using AI and cryptography for data privacy protection
  - Practical exercises on implementing cryptographic techniques for privacy-preserving data sharing and analysis
  - Lab on data encryption and backup strategies
- **Organisational protection and cloud security for business**
  - Techniques for firewall configuration, port scanning, and certificate updates
  - Securing cloud services and data storage in public, private, and hybrid cloud environments
  - Identity and access management in the cloud
  - Data backup and disaster recovery planning for cloud-based systems
  - Lab on using tools for security monitoring
- **Cyberattack Detection and Cyberdefense**
  - Real-time attack detection, best security practices, and understanding botnets and the kill chain
  - Lab on behaviour-based security
- **Tools for incident prevention and detection**
  - Overview of CSIRT, security playbooks, IDS, and IPS
- **Cybersecurity Legal Issues**
  - Personal legal issues. Corporate Legal Issues.
  - International Law and Cybersecurity
- **Ethical Issues in Cybersecurity**
  - Overview of cybersecurity laws, regulations, and industry standards applicable to businesses
  - Understanding ethical considerations in cybersecurity decision-making
  - Addressing legal and ethical challenges related to incident response, data breaches, and privacy violations
  - Discussion on ethical considerations and the role of professional organisations in cybersecurity ethics
- **Cyberwarfare**
  - Understanding cyberwarfare, its objectives, and impacts
- **Emerging Topics and Careers in Cybersecurity**
  - Exploration of AI in cyberattacks and defence, the geopolitical aspects of cyberspace, and blockchain technology

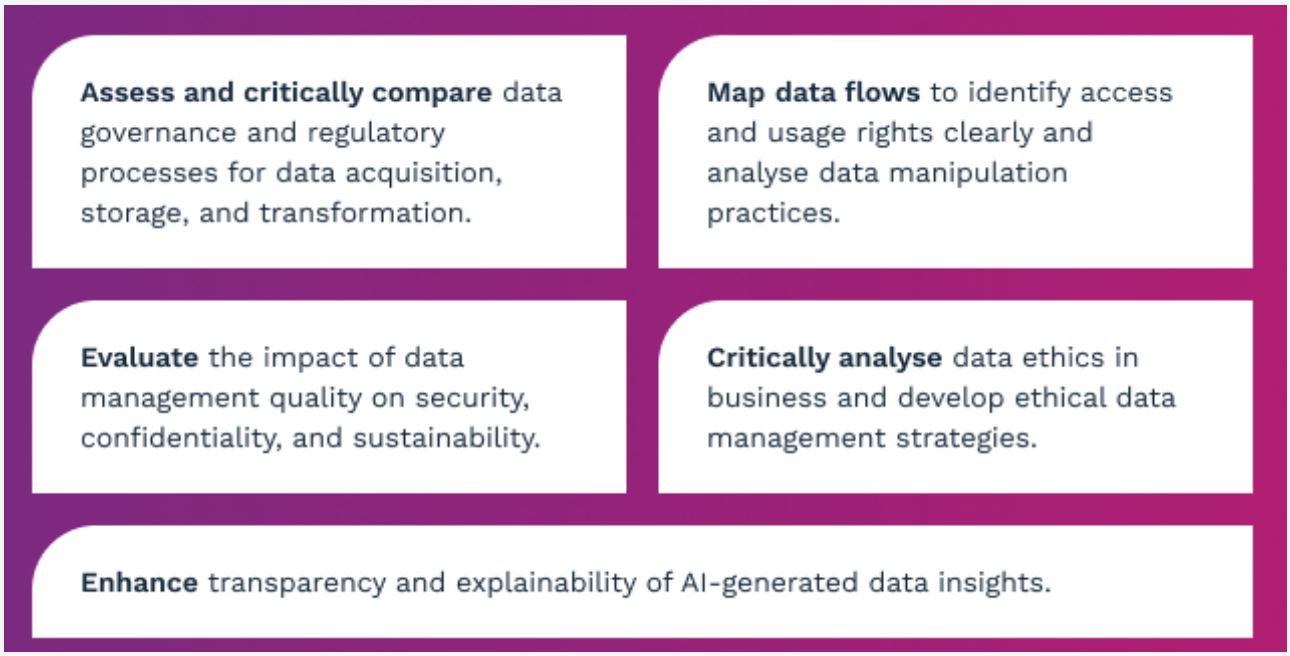
Data Governance and Ethics

Learn to manage data responsibly, ensuring legal adherence and ethical integrity in business operations.

This module covers key aspects of managing data within legal and ethical boundaries. Students will learn to evaluate different frameworks for acquiring, storing, and transforming data. They will understand the legal and ethical issues involved in data management and develop strategies for handling business data responsibly.

The course also explores the role of artificial intelligence in data analysis, ensuring students grasp both the technical and legal aspects. This module prepares students for responsible leadership in the digital business world by emphasising ethical and societal impacts.

Upon successful completion of this module, learners will be able to:



Full course content

Subjects covered

Data Governance and Ethics is a 5 ECTS module delivered over 4 hours per week for 12 weeks. An indicative schedule of topics to be addressed each week is outlined below:

- **Introduction to Data Governance (DG)**
  - Overview of data governance
  - Importance and objectives of data governance in contemporary organisations
- **Big Data Management Principles**
  - Data lifecycle management
  - Principles of data quality, data provenance and data generation
  - Understanding master data and its importance
  - Methods for assessing and improving data quality
- **Data Integrity and Security**
  - Techniques and practices for ensuring data integrity
  - Data security challenges and strategies
  - Implementing master data management and data quality processes
- **DG Frameworks**
  - Examining policies, principles, rules, and procedures
  - Different operating models
  - Implementation challenges and best practices
- **Data Architecture and Metadata Management**
  - Designing data architecture tailored to enterprise needs
  - Using metadata to enhance data governance and usage
  - Integrating metadata management tools into enterprise IT infrastructure
- **Data Risk Management**
  - Understanding data-related risks
  - Roles, responsibilities, and maturity levels in risk management
  - Assessing risks related to data
  - Managing risks related to data confidentiality and security
- **Implementing Data Governance for Business Value Creation**
  - Aligning data governance with business strategy
  - Identifying stakeholders and responsibilities
  - Developing data governance policies and standards
  - Utilizing data for predictive analysis and decision-making
  - Use cases of data analytics to enhance business processes
  - Strategies for monetizing data and creating new business models
- **Ethical Concepts and Frameworks**
  - Introduction to ethics in data management
  - Ethical principles, standards, and practice
- **Privacy, Analytics, and Ethics**
  - Balancing analytics ambitions with privacy laws and ethical standards
  - Case studies
- **Ethics and AI**
  - Ethical considerations in AI and ML
  - Mitigating biases and ensuring fairness
- **Governance of AI and Advanced Analytics**
  - Emerging trends and challenges in AI governance
  - Regulatory and ethical frameworks for AI
- **Business Data Ethics and Future Trends**
  - Applying ethical principles in business data analytics
  - Future trends in data governance and ethics

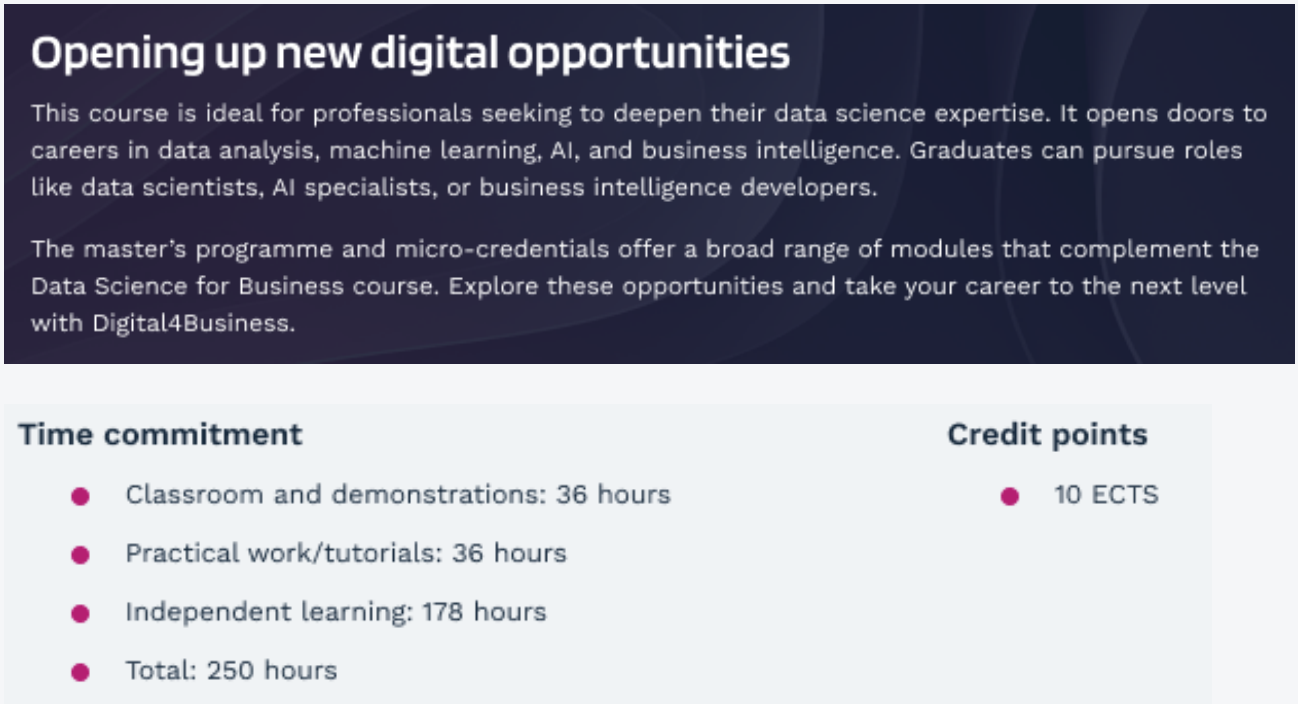
Data Science for Business

This module introduces advanced techniques for interpreting and extracting data-driven insights. You'll dive into innovative data science methods and algorithms that promote creative problem-solving and optimise models crucial for digital transformation. Learn how to apply statistical and machine learning techniques to synthesise insights, driving informed decision-making and clear communication.

You'll also explore advanced visualisation and business intelligence tools, gaining the ability to effectively communicate complex data insights. These skills will boost model performance, while fostering business innovation and success.

Data Science for Business is a 10 ECTS module delivered over 5 hours per week for 12 weeks.

What students will achieve:



Full course content

Subjects covered:

Data Science for Business is a 10 ECTS module delivered over 5 hours per week for 12 weeks. An indicative schedule of topics to be addressed each week is outlined below:

- **Introduction to Data Science**
  - Overview of data science processes
  - Methods, tools and real-world applications
- **Python for Data Science**
  - Python programming basics
  - Data structures
  - Packages for data analysis
- **Data Collection and APIs**
  - APIs
  - Web scraping
  - Working with unstructured data sources
- **Databases and Data Warehousing**
  - Relational databases
  - SQL
  - ETL processes
  - Data warehousing principles
- **Data Pre-processing and Cleaning**
  - Handling missing data
  - Outliers
  - Feature encoding
  - Normalisation
- **Exploratory Data Analysis**
  - Summary statistics
  - Visualisations
  - Identifying patterns
- **Statistical Analysis and Modelling**
  - Regression
  - Classification
  - Forecasting methods
- **Machine Learning**
  - Supervised learning models like classification and regression
- **Advanced Machine Learning Methods**
  - Neural networks
  - Deep learning
  - Reinforcement learning
- **Business Intelligence and Analytics**
  - BI process
  - Dashboards
  - Data storytelling
  - Predictive analytics
- **Data Visualisation and Dashboards**
  - Visual encodings
  - Interactive reports
  - Communicating insights
- **Ethics, Bias and Privacy in Data Science and Major Trends in ML and DS**
  - Responsible AI
  - Transparency
  - Ethical use of data
  - Major trends in ML and DS

Digital Transformation

One of the three modules included in our comprehensive 3.2 Ready-to-Use Online Training Materials is 'Digital Transformation,' provided by UNIBO-Bologna. This module carries a weight of 10 ECT credits, equivalent to 250 hours of study. Within this timeframe, 24 hours are allocated to work-based learning, 36 hours to practical work and labs, 35 hours to classroom sessions and demonstrations, and 190 hours to independent study.

The module covers a range of essential topics, including Digital Transformation, Technologies and Innovations, the SDGs Framework and Digital Transformation, Digital Transformation and Design: Methodologies and Tools, Big Data, and the Platform Society, as well as Digital Competence.

What students will learn:

Full course content

Subjects you'll cover

The Digital Transformation module is a 10 ECTS course, conducted over 12 weeks with 3 hours of lectures per week. Here's an overview of the topics to be covered:

- **Introduction to Digital Transformation**
  - Basic concepts of digital transformation.
  - Evolution stages of digital transformation.
  - Economic and social impacts.
  - Digital paradigms and platform economy.
  - Ethical issues in digital transformation.
  - Interdisciplinary connections.
- **Technologies and Innovations**
  - Emerging digital technologies (AI, Blockchain, IoT).
  - Strengths and weaknesses of main digital technologies.
  - Evolution of AI.
- **Big Data and Platform Society**
  - Platform-based business strategies.
  - Platform economy case studies.
  - Digital and data literacy.
- **Digital Competences**
  - Digital competences framework.
  - Digital communication skills and capabilities.
  - Upskilling and reskilling.
- **Sustainable Development Goals (SDGs) Framework and Digital Transformation**
  - Ethics and sustainability in the digital age.
  - UN SDGs.
  - Digital projects supporting SDGs.
  - Circular economy.
  - KPIs for digital sustainability.
  - CSR and social impact.
- **Digital Transformation Design: Methodologies and Tools**
  - Industry trends in digital transformation.
  - Tools and methodologies for organisational culture and innovation.
  - SWOT analysis.

Digital Transformation Project (Practicum)

This fully online course uses innovative teaching methods for the digital transformation project. It combines synchronous lectures, asynchronous individual study, and lab activities. Expert tutors guide students through problem-based learning, gamification, and flipped classroom approaches. Emerging technologies, such as artificial intelligence, enhance the learning experience.

Students will develop a digital transformation proposal and produce a comprehensive research report, supported by a software artefact. Assessments are ongoing, with the proposal accounting for 30% and the final report and artefact for 70% of the total grade. This structure ensures a deep understanding and practical application of digital transformation strategies.

The Digital Transformation Project / Practicum is a 10 ECTS module delivered over 2 hours per week for 12 weeks with a significant component of independent study. The schedule of topics to be addressed each week is outlined below:

Full course content

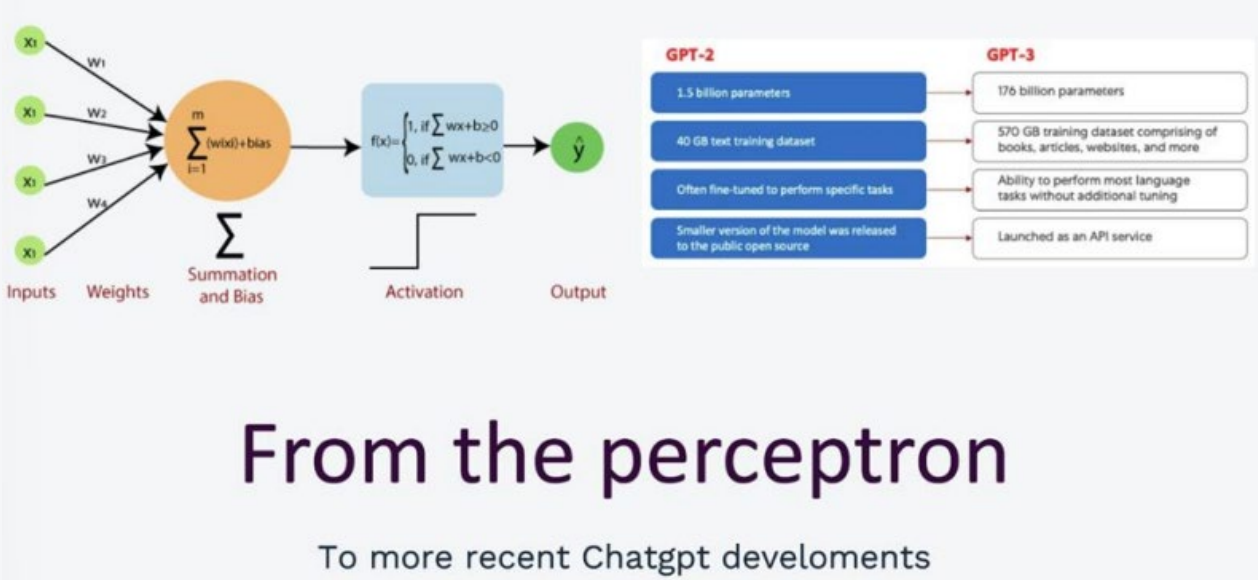
Subjects covered

The Digital Transformation Project / Practicum is a 10 ECTS module delivered over 2 hours per week for 12 weeks with a significant component of independent study. The schedule of topics to be addressed each week is outlined below:

- **Introduction and Project Proposal Development**
  - Overview of module objectives, expectations, and project proposal guidelines.
- **Research Methodologies**
  - Techniques for conducting a literature review and selecting appropriate research methodologies.
- **Project Management for Digital Projects**
  - Applying principles from "Risk & Change Management in Digital Environments" to plan digital projects.
- **Ethical Considerations and Sustainability in Digital Projects**
  - Insights from "Data Governance and Ethics" on incorporating ethical practices and sustainability.
- **Core Area Integration into Practicum Development**
  - Integration of the core area of specialisation into project development. Namely: Data Science for Business, AI for Business, Cybersecurity for Business, and/or Cloud Computing for Business.
- **Project Development Workshop**
  - Hands-on session to develop and refine projects with peer and instructor feedback.
- **Project Presentation and Communication Skills**
  - Enhancing communication skills for presenting complex projects.
- **Project Evaluation and Reflection**
  - Evaluating projects based on set criteria and reflecting on learning outcomes and future research directions.
- **Project Showcase and Viva**
  - Final presentation of projects to an audience, including a viva voce examination.

Generative AI

The Generative AI module, pioneered by NOVA University, encompasses 10 ECTS credits and spans over 12 weeks. Each week delves into fundamental topics essential for grasping the intricacies of generative AI, some of these topics include Introduction to Generative AI, Fundamentals of Natural Language Processing (NLP), Understanding Transformer Architectures, Exploring Automation in Work (Part 1), Exploring Automation in Work (Part 2), Exploring Automation in Work (Part 3), Unleashing the Creative Potential of Generative Art (Part 1), Unleashing the Creative Potential of Generative Art (Part 2), Approaching Development with Responsible Generative AI (Part 1), Approaching Development with Responsible Generative AI (Part 2), Application of Generative AI in Real-World Scenarios, Emerging Trends and Innovations in Generative AI.



Module content

Topics covered:

- **Introduction to generative AI**
  - Overview of AI and ML
  - Applications of generative AI
  - Key concepts and terminology
- **Natural language processing fundamentals and transformer architectures**
  - Introduction to NLP
  - Text representation with embeddings
  - Transformer architectures and their impact on NLP
- **Introduction to ChatGPT and prompting**
  - Capabilities of ChatGPT
  - Techniques for effective prompting
  - Handling complex tasks with prompts
- **Examples and exercises on prompting**
  - Hands-on exercises
  - Analysing and refining prompts
- **Automating work with code and content generation**
  - Using ChatGPT to generate code
  - Automating content creation
  - Developing a website with content generated by ChatGPT
- **Developing responsibly with generative AI**
  - Using ChatGPT to generate code
  - Addressing biases
  - Best practices for responsible AI development

Skills developed

- Mastery of NLP and transformer models
- Proficiency in prompt engineering
- Automation of tasks using AI
- Ethical AI development practices

Teaching methods

Topics covered:

- Fully online learning with a mix of synchronous and asynchronous activities
- Lectures, seminars, and workshops

Interactive elements

- Hands-on projects and exercises
- Group work and collaboration
- Real-time feedback and interactive discussions

Feedback from volunteers:

- Regular feedback sessions
- Personalised feedback on assignments and projects

Innovation

This unit will use case studies and research to delve deeply into how to develop and implement powerful, creative strategies to use innovation at the individual, team and organisational level to transform the company into a more agile and competitive one. Students will learn why certain types of approaches work while others meet resistance and fail. The course will go beyond how to quantify and measure impacts; it will examine how to learn from the results. They'll develop pragmatic insights into how to foster creativity to improve processes and outcomes.

This fully online 10 ECTS credit module incorporates the learning goals into the teaching modalities. Using innovative approaches such as gamification, problem-based learning and the flipped classroom approach, which presents the material ahead of the class and uses the live class time to explore it more deeply with the tutor so that students' questions can drive the content of the session.

Students will engage in synchronous lectures, asynchronous individual study and laboratory work to explore the topics presented. The class will use emerging technologies such as Artificial Intelligence to tackle the materials while simultaneously experiencing the benefits of digital innovation.

This dynamic module is aimed at business leaders, professionals and graduates from all across Europe. It is designed to empower you with cutting-edge skills in business and digital transformation. By the end of the course, you'll not only grasp the essential concepts but also be ready to lead innovative changes in the digital era. Here's what students will achieve:


Learning objectives
Designed to develop a deep understanding of the creative development process and the strategic application of innovative methods across different contexts, the module will enable learners to understand, discuss, and summarise Innovation and the main Innovation Implementation strategies. By the completion of the module, you will be able to:
Demonstrate a critical awareness of the creative development process and the application of creative and innovative strategies in a variety of contexts.
Evaluate and explore various case studies and innovation techniques to help understand creative and innovative practices.
Discern, critique, and apply the various techniques to foster creative talent environments at an individual, team, and organisational level.
Demonstrate impacts and return on investment at an individual and organisational level.
Create and explore strategies to deliver the results of creative work in business.

Full course content

Subjects covered

Innovation is a 5 ECTS module delivered over 4 hours 10 minutes per week for 12 weeks. An indicative schedule of topics to be addressed each week is outlined below:

- **Fundamentals of Innovation I**
  - Creativity and Innovation: Introduction to creativity and its role in innovation.
  - Discussion on the creative process and techniques to foster creativity.
  - Examples of how creativity has driven significant technological advancements.
- **Fundamentals of Innovation II**
  - Emotional Intelligence and Entrepreneurship: Definition and importance of emotional intelligence in entrepreneurship.
  - The role of emotional intelligence in decision-making leadership.
  - Practical exercises to develop emotional intelligence.
- **Innovation and Business Models I**
  - Innovation Management in Business: Introduction to innovation management principles and its role in businesses.
  - Identifying innovation drivers and their relationship with entrepreneurship.
  - Case studies of companies that have successfully implemented innovative business models.
- **Innovation and Business Models II**
  - Designing Innovative Business Models: Developing innovative business models for emerging technologies such as blockchain and 3D printing.
  - Assessing the financial and strategic implications of new business models.
  - Group exercises for creating and evaluating innovative business models.
- **Strategic Innovation and Entrepreneurial Leadership I**
  - Data-Driven Innovation and Product Design: Using data analysis and product design to drive innovation in entrepreneurship.
  - Practical examples of data-driven decision-making in business.
  - Case studies showcasing successful entrepreneurial ventures based on data and design.
- **Strategic Innovation and Entrepreneurial Leadership II**
  - Leading Collaborative Innovation Projects: Leading collaborative innovation projects and the role of entrepreneurial leadership.
  - Effective team dynamics and communication in innovation.
  - Learning from both successful and failed collaborative innovation projects.
- **Entrepreneurial Communication Strategies I**
  - Effective Communication for Technology: Developing persuasive communication strategies for technology-based ventures.
  - Using corporate storytelling and design thinking in technology-related communication.
  - Practical exercises on creating impactful communication plans.
- **Entrepreneurial Communication Strategies II**
  - Engaging Stakeholders through Corporate Stories: The power of corporate storytelling in engaging stakeholders.
  - Examples of successful corporate story-driven communication.
  - Group discussions on how to apply corporate stories to technology-driven ventures.
- **Solving Complex Problems I**
  - Problem-Solving in Technology: Applying problem-solving concepts to technological challenges, including machine learning and robotics.
  - Case studies demonstrating effective problem-solving strategies in the tech industry.
  - Group exercises for hands-on problem-solving in technology.
- **Solving Complex Problems II**
  - Leveraging Data Analysis and Simulations: Using data analysis and simulations to address complex technological problems.
  - Practical application of data-driven decision-making in technology.
  - Case studies on how data-driven solutions have driven innovation.
- **Between Innovation, Ethics, and Sustainability I**
  - Ethical Innovation and Sustainability: Exploring the intersection of innovation, ethics, and sustainability in technologies like renewable energy and sustainable mobility.
  - Identifying ethical and environmental challenges in technological solutions.
  - Examples of innovations that promote ethical and sustainable practices.
- **Between Innovation, Ethics, and Sustainability II**
  - Assessing Environmental and Social Impact: Methods for assessing the environmental and social impact of technologies.
  - Practical exercises in evaluating the sustainability of tech-driven solutions.
  - Case studies of technology initiatives that have positively impacted the environment and society.

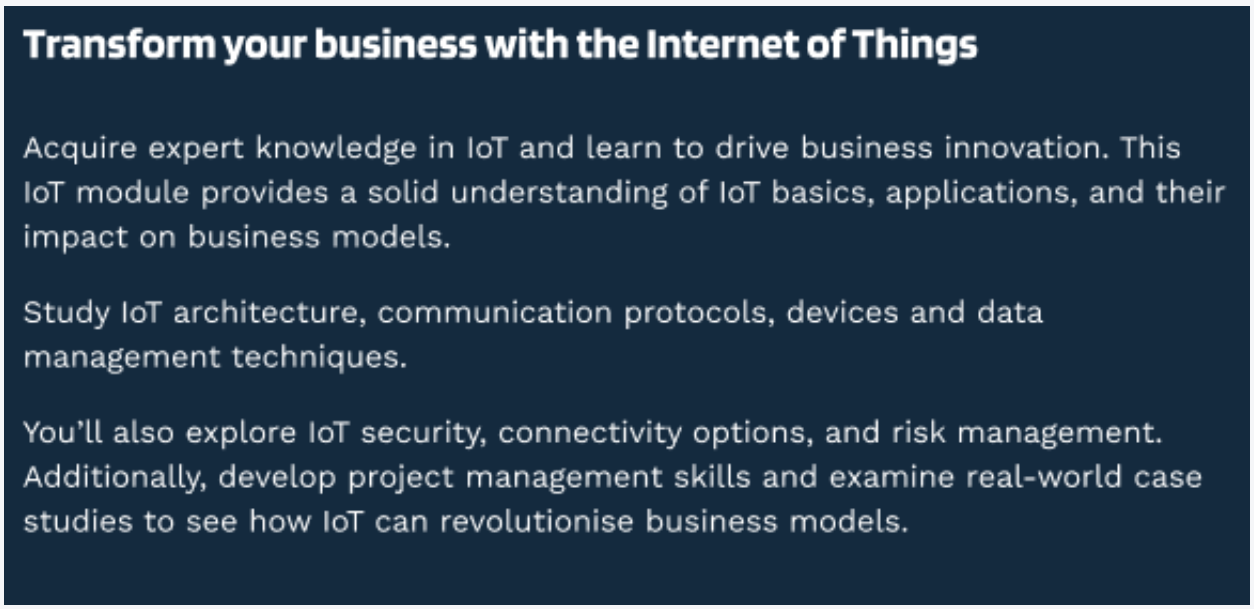
Internet of Things

The Internet of Things (IoT) module will give you a solid understanding of IoT basics, its applications, and how it impacts business models. You'll learn about IoT architecture, communication protocols, devices, and data management techniques.

The course, which amounts to 5 ECT credits, also covers IoT connectivity options, security, and risk management. Additionally, you'll develop skills in managing IoT projects and analyse real-world case studies to see how IoT can transform business models.

Teaching methods include lectures, guest lectures, seminars, case study analysis, and a flipped classroom approach. Both ongoing and final assessments will measure student progress. Ongoing assessments provide feedback to help improve your study pathway. Clear assessment rubrics and criteria will be provided for each topic, showing how you will be assessed against learning objectives.

Various assessment tools such as exams, assignments, projects, and exercises will directly measure your knowledge, skills, and competencies. The final grade consists of a 50% proctored written exam and a 50% end-of-term project.



Full course content

Subjects covered

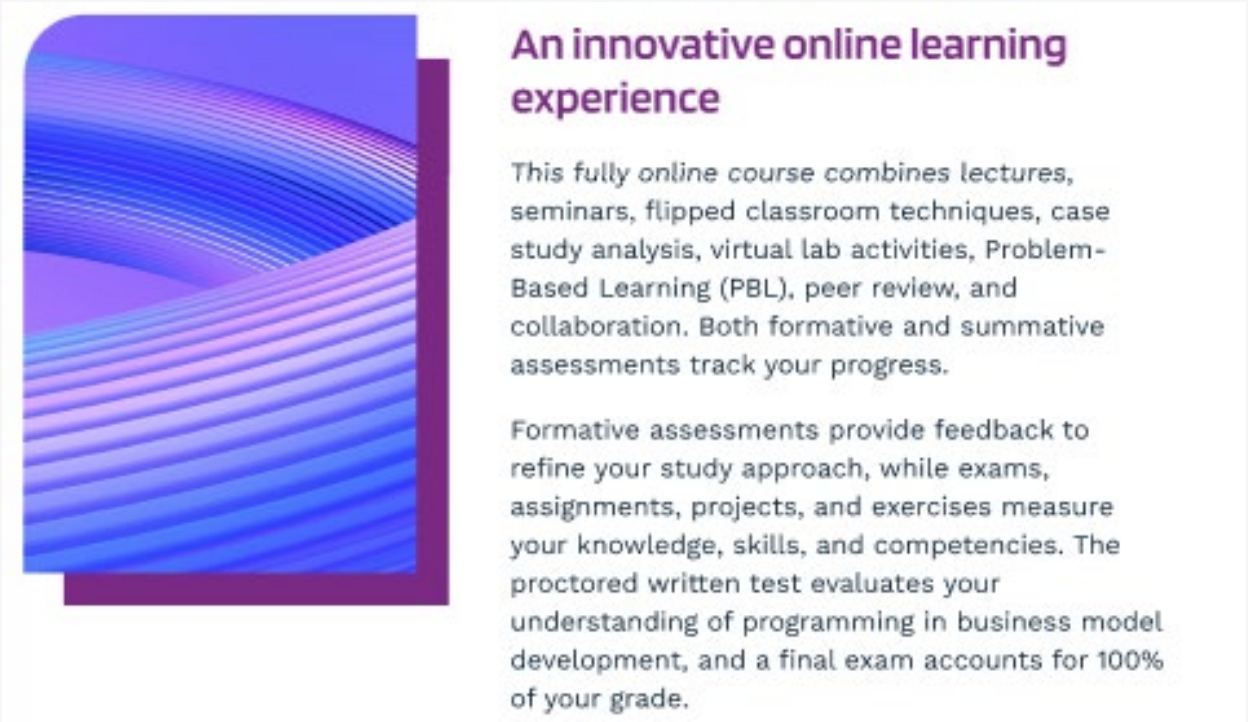
Internet of Things is a 5 ECTS module that runs for 12 weeks, with three hours of class time each week. Here's a schedule of the topics we'll cover each week:

- **IoT Fundamentals for Business**
  - Historical development
  - Key concepts
  - Applications across industries
- **IoT Business Models and Strategies**
  - Value creation
  - Monetization
  - Competitive advantage
  - Case studies
- **IoT Architecture and Protocols**
  - Components
  - Communication protocols
  - Data management
- **IoT Devices and Sensors**
  - Functions and applications
  - Types of sensors, including motion sensors
- **IoT Connectivity and Networking**
  - Connectivity options
  - Networking technologies
  - Challenges
- **IoT Security and Privacy in Business**
  - Security concerns
  - Mitigation strategies
  - Business implications
- **IoT Data Analytics for Business**
  - Data processing
  - Storage
  - Analysis techniques
  - Tools and platforms
- **IoT Cloud Computing for Business**
  - Cloud-based IoT platforms
  - Services
  - Benefits and challenges
- **IoT Edge Computing for Business**
  - Benefits
  - Challenges
  - Use cases
  - Fog computing
- **IoT Project Management for Business**
  - Principles
  - Practices
  - Methodologies
  - Risk management
- **IoT Standards and Regulations for Business**
  - Industry standards
  - Data protection
  - Compliance
- **IoT Business Model Development Case Studies and Future Trends**
  - Case studies
  - Future trends
  - Impact of emerging technologies such as AI and quantum computing

Quantum Computing

Quantum computing is a rapidly developing field that promises to transform and extend computational capabilities using quantum mechanics. With the construction of quantum computers and access via cloud services now a reality, this module introduces the theory and foundations of quantum computing and its applications.

It also provides practical skills to develop and implement algorithms to solve computational problems. Students will explore the current landscape and future potential of quantum computing, evaluating its impact on various industries, and preparing for its business applications.



This module introduces quantum computing theory and applications, providing practical skills to develop and implement algorithms for solving computational problems. By the end of the course, you'll not only grasp the essential concepts but also be ready to lead innovative changes in the digital era. Here's what you'll achieve:

- Interpret and apply mathematical and quantum mechanical principles to qubit systems.
- Critically assess the differences and similarities between quantum and classical computation.

- Solve computational problems through the implementation of algorithms for quantum computers.
- Apply the circuit model of quantum gates when analysing problems and formulating solutions.
- Research and evaluate the impact and potential of quantum computing.

Time commitment

- Classroom and demonstrations: 24 hours
- Practical work/tutorials: 24 hours
- Independent learning: 92 hours
- Total: 125 hours

Credit points

- 5 ECTS

Full course content

Subjects covered

Quantum Computing is a 5 ECTS module delivered over 4 hours per week for 12 weeks. Here's a schedule of the topics we'll cover each week:

- **Introduction**
  - Results from the theory of quantum mechanics
  - Spin and polarisation
  - Measurements/Observables
  - Randomness and probability
  - Bits and Qubits
  - Quantum parallelism and interference
- **Linear Vector Spaces, Hilbert Spaces, and Matrix Representations**
  - Review of linear spaces
  - Hilbert spaces
  - Dirac <bra|ket> notation
  - Operations and operators
  - The Bloch Sphere
  - Pauli Matrices
  - Orthogonal and unitary matrices
  - Operations and operators
  - Eigenvectors and eigenvalues
- **Quantum Circuits**
  - Logic Gates
  - Reversibility
  - Multi-qubit Gates
  - Diagrammatic representation
  - Deutsch's Algorithm
- **Programming for Quantum Computing**
  - Programming environments
  - Language support
  - Simulation
  - Quantum Computing cloud services
  - Coprocessor
- **Entanglement**
  - Entangled states
  - Bell's Inequalities
  - Using the CNOT gate
  - No Cloning Theorem
  - Quantum Teleportation
- **Quantum Information Theory**
  - Elements from the Classical Information Theory
  - Information and Entropy
  - Quantum Information Processing and Error-Correcting Codes
  - Quantum Communications Channels
- **Applications**
  - Quantum Cryptography
  - Quantum Key Distribution
  - Ekert Protocol
  - BB84 Protocol
  - Dense coding
- **Business / Domain Applications**
  - Applications of QC in Pharma, Finance, Cybersecurity, Machine Learning, Chemistry, etc.
  - Business Strategy & Innovation with QC
- **Quantum Fourier Transform**
  - Fourier Series
  - Discrete Fourier Transform
  - Quantum Fourier Transform
- **Quantum Algorithms**
  - Deutsch-Josza Algorithm
  - Simon's Algorithm
- **Quantum Algorithms**
  - Grover's Search Algorithm
  - Schor's Algorithm
- **Emerging Topics**
  - Quantum Hardware
  - Quantum Supremacy
  - Data Security
  - Quantum ML

Risk and Change Management in Digital Business

In this elective module, making up 5 ECT credits, students examine practical strategies to create a workplace culture that values flexibility, agility, and life-long learning. They will learn to apply the core principles of risk and change management in the industry and understand how digital transformation affects business models and workforce dynamics. We focus on communication, stakeholder engagement, and the development of an organisational culture that nurtures digital adaptation. Using critical comparisons of digital business models and strategies, students will build the skills to assess risks and opportunities and evaluate the broader impact of digital disruption and innovation across various industries.

Glean insight from expert guest lecturers offering different insights and observations about risk and change management in an ever-evolving digital ecosystem. Case studies bring the material to life as students grapple with analysing what innovators did and could have done. Seminar-based learning engages students with the material and each other as they forge a practical and strategic approach to apply in their field.

Ongoing assessments offer feedback throughout the course. Clear assessment rubrics and criteria are applied to each topic, and students' progress will be assessed through examinations, assignments, projects and exercises culminating with a proctored written test.

This practical module teaches students to effectively implement change management strategies in digital transformation projects. Students will engage in critical comparisons of digital business models and strategies, assess the associated risks and opportunities, and evaluate the broader impact of digital disruption and innovation across various industries.

- Understand the core principles of risk and change management in digital environments.
- Apply change management strategies effectively, with a focus on communication, stakeholder engagement, and organisational culture development.
- Critically compare digital business models, strategies, and the associated risks and opportunities.
- Design and evaluate comprehensive digital transformation plans and assess their effectiveness in promoting innovation, digital culture, and compliance with ethical standards.

Learning objectives

This module covers data management, focusing on legal, ethical, and regulatory compliance. Students will learn to assess frameworks, handle data responsibly, and understand the impact of artificial intelligence in data analysis. Here's what you'll achieve:

- **Assess and critically compare** data governance and regulatory processes for data acquisition, storage, and transformation.
- **Map data flows** to identify access and usage rights clearly and analyse data manipulation practices.
- **Evaluate** the impact of data management quality on security, confidentiality, and sustainability.
- **Critically analyse** data ethics in business and develop ethical data management strategies.
- **Enhance** transparency and explainability of AI-generated data insights.

Full course content

Subjects covered

Risk and Change Management in Digital Business Environments is a 5 ECTS module delivered over 4 hours per week for 12 weeks. An indicative schedule of topics to be addressed each week is outlined below:

- **Introduction to Risk and Change Management**
  - Fundamentals of risk and change management within digital ecosystems.
  - Explore the dynamics of digital societies and technology trends, highlighting both challenges and opportunities in digital transformation.
- **Digital Transformation and Change Management**
  - Deep dive into digital transformation projects and the critical role of change management for their success.
  - Focus on effective communication, stakeholder engagement, and cultivating a supportive organisational culture.
- **Digital Business Models and Strategies**
  - Examination of prevalent digital business models and strategies, understanding their influence on industries, and the significance of innovation in spearheading digital transformation efforts.
- **Digital Workforce and Workplace Transformation**
  - Investigation of digital technologies' impact on the workforce and workplace dynamics, including remote work, automation, and the use of collaboration tools.
  - Discuss the management of a digital workforce.
- **Risk Management in Digital Transformation**
  - Study of risk management within digital transformation contexts, focusing on risk identification, assessment, mitigation, and the formulation of comprehensive risk management plans.
- **Digital Disruption and Innovation**
  - Exploration of digital disruption effects on industries and the pivotal role of innovation in driving transformation, creating novel business models, and seizing new opportunities.
- **Agile and Adaptive Leadership in Digital Environments**
  - Insight into agile and adaptive leadership styles essential for digital transformation and change management, emphasising flexibility, resilience, and a commitment to lifelong learning.
- **Data-Driven Decision Making in Digital Environments**
  - Introduction to the significance of data-driven decision making in digital environments, including methodologies in data analytics, visualisation, and reporting tools.
- **Digital Ethics, Privacy, and Compliance**
  - Discussion on the ethical, privacy, and compliance challenges in digital environments, focusing on data protection, responsible tech use, and ethical guidelines development.
- **Building a Digital Culture and Fostering Innovation**
  - Examination of the elements comprising a digital culture and methods to nurture a digital mindset within organisations, encouraging collaboration, innovation, and continuous learning.
- **Digital Talent Management and Workforce Development**
  - Analysis of talent management strategies pivotal for digital transformation success, covering attraction, retention, development of digital talent, and the importance of upskilling and reskilling.
- **Risk and Change Management Case Studies and Future Trends**
  - Review of real-world case studies in risk and change management across various industries.
  - Discussion on future trends, potential challenges, and the impact of emerging technologies like AI and quantum computing.

Digital 4 Business

Evolving your digital future