		Sector	ECTS
1st year			
1st Semester - 30 ECTS to choose among the following activities:			
- PROGRAMMING AND COMPUTER ARCHITECTURES - 12 ECTS		INF/01	12
At the end of the course, the student acquires the basics of Python programming, data structures and algorithms. He is able to use the libraries to work with statistics, graphs and tables, spreadsheets and web pages. Providing the student with the concepts necessary for understanding computer architectures and the role of hardware components in the performance of computing systems.			
- DATABASE SYSTEMS		ING.INF/05	6
The student learns the fundamental principles of the relational data model and of the relational database management systems. In particular, the student will be able to understand the structure of a relational database, the integrity constraints on data and the SQL query language. Moreover, the student gains an introductory background in NoSQL architectures and non-relational data models.			
- OPERATING SYSTEMS, NETWORKS and WEB c.i.			12
	OPERATING SYSTEMS and NETWORKS	INF/01	6
At the end of the course the student knows the main technical problems and the related solution behind networking with particular reference to the Internet. The student can understand the functional principles of a network service and the related quality of service issues as well as the Internet protocol architecture and the main protocols. The student knows how to implement some basic network applications and is able to analyze a protocol behavior.			
	WEB and MOBILE SYSTEMS	INF/01	6
At the end of the course, the student knows the most important technologies used in the World Wide Web and in the mobile context. The student knows platforms and systems that can be used to design and develop Web sites and applications. The students is able to create web documents and simple distributed web and mobile applications, defining a friendly user interface on the basis of the human computer interaction methodologies.			
- FUNDAMENTALS OF MANAGEMENT and ORGANIZATION c.i.			12
	FUNDAMENTALS OF MANAGEMENT	SECS.P/08	6
The goal of this course is to provide students with a framework of the core concepts of firms' management. Through the learning of the course content, students will gain fundamental knowledge and skills for management and will develop analytical and critical thinking skills. By the end of the course students will understand the main management problems, learn about strategic decision management, and will are able to apply tools and techniques useful to support management's processes. Specifically, the learning objectives for students are: o To acquire knowledge of key principles of management and be able to critically apply this knowledge to the analysis of case studies o To understand and apply a selected management topic to a real organizational setting o To be able to discuss with others the key management principles and showing application of knowledge to case study material			
	ORGANIZATION, TEAMS AND DIGITAL LEADERSHIP	SECS.P/10	6
At the end of this course students know the basics of organizations' design, how to build, manage and motivate work teams, both physically available and online. Students can make use of conceptual and computational models to manage and understand distributed intelligence.			
- FUNDAMENTALS OF FINANCE AND BANKING c.i.			12
	FUNDAMENTALS OF CORPORATE FINANCE	SECS.P/09	6
managed financial decisions. Companies face two broad financial questions: What investments should the firm make? And how should a firm raise money to finance those investments? At the end of the course, students can: (a) make investment decisions based on the net present value rule; (b) understand how much should the firm borrow; (c) calculate the opportunity cost of capital in a framework of the risk and return market model.			
	FUNDAMENTALS OF BANKING	SECS.P/11	6
The course is designed for students who want to increase their familiarity with finance, banks, financial intermediation, financial markets and financial instruments. At the end of the course, students have the basic skills to work within financial institutions, financial advisory firms and corporate finance department.			
FUNDAMENTALS OF ACCOUNTING		SECS.P/07	6
This course is designed to provide students with a solid basis of accounting. At the end of the course students are able: (a) to understand the difference between accrual accounting and cash flows; (b) to understand the nature of the information on the income statement, the balance sheet, and the statement of cash flows; (c) to know the basics of management accounting and cost analysis.			

2nd semester - core compulsory courses:		
CYBERSECURITY	INF/01	6
At the end of the course, the student knows the basic principles of computer security and he/she is able to identify the main problems of computer and network security. He/she gets to understand and explain the main protocols and mechanisms used for securing communications and data transfer. He/she is able to perform a critical evaluation of the security of a computing infrastructure and to suggest the best countermeasures to mitigate the vulnerabilities, reduce the risk and increase the resilience to attacks. He/she is also capable of contributing to the design of systems that are		
SOFTWARE ENGINEERING	ING-INF/05	6
Students will get acquainted with basic aspects of the following topics: - service-oriented architectures, API, microservices: principles, technologies, enterprise viewpoint - cloud computing: principles, technologies, enterprise viewpoint - agile development: principles and methodologies, the role of testing, the case of SCRUM - devops: DVCS, agile project management tools, continuous development/integration/delivery - intelligent systems: definitions, problems, applications - multi-agent systems for the engineering of intelligent systems: models, technologies, methodologies		
BUSINESS MODELS	SECS.P/08	6
This course provides a relevant knowledge for designing new business models from scratch and for designing experiments concerned with innovating existing business models. At the end of this course students will be able to: - comprehend the basic foundations of business models, their elements and relationships to other management concepts and how to describe and communicate about them on different levels of abstraction - understand what it means to innovate business models versus other types of innovation and understand the relationship between business models, digital technologies and data - acquire and apply design-thinking tools and techniques to design and innovate business models		
BUSINESS PERFORMANCE ANALYTICS and BUSINESS INTELLIGENCE	SECS.P/07	9
This course provides a relevant knowledge for comprehending the dynamics of business performance, exploring and exploiting new and alternative opportunities of value creation through and in combination with the systematic use of multiple sources of data, analytical methods. The course also provides the skills to design and implement the business intelligence platform that enables information fruition. At the end of this course students will be able to: •To provide a relevant knowledge for developing an analytical business performance management. •To comprehend the role of performance measures in the design of business models and in their effective management •To understand performance dynamics and drivers •To combine and apply analytical tools and techniques with performance measures to support strategic, process and operational management •To introduce Big Data and Analytics in Performance Management . • To design of a business performance management system • To design a Data Warehouse • To carry out OLAP analyses • To carry out data source integration and data extraction		

2nd year		

BIG DATA and CLOUD PLATFORMS	ING-INF/05	6

At the end of the course, the student:
- Knows the applications of Big Data technologies and the respective challenges
- Knows the hardware and software architectures proposed to handle Big Data
- Knows the techniques to store the data and the fundamentals aspect of new generation database systems
- Knows the programming paradigms generally adopted in this kind of systems and the main analysis methodologies (batch, interactive, streaming)
- Learns the design patterns that regulate the deployment in the Cloud of complex ICT solutions
- Learns some of the most relevant components of the Cloud Platforms, with a specific focus on those services that enable Big Data management and IoT applications
- Is able to make decisions concerning the appropriate Cloud Platform and the related services to be adopted
- Knows the billing models that lay behind Cloud Computing services and learns how to estimate the cost of a specific solution, to support project management, to prepare quotations, or to support the management control system
- Acquires practical expertise through laboratory activities in using some of the main open-source Big Data software tools, as well as some of the most adopted Cloud Computing services available on the market

MACHINE LEARNING and DATA MINING	ING-INF/05	6

After the course the student:
-kows the main machine learning techniques
- knows the methodologies for handling a mining project
- develops practical skills in the analysis and interpretation of results through practical exercises with commercial tools and / or open source ones.

LABORATORY ON DIGITAL TRANSFORMATION TECHNOLOGIES	ING-INF/05	3

At the end of the course the student:
- has practical experience in dealing with real management problems and solutions of digital innovation challenges
- has practical experience of teamwork in the context of digital innovation projects
- acquires skills in dealing with problems and training to identify the solution

LABORATORY ON DIGITAL TRANSFORMATION	SECS.P/07	3

At the end of the course the student:
 - Has a practical experience on digital business design and on structuring a business case
 - Has a practical experience in the analysis, evaluation and planning of the financials and economics of a digital business
 - Has a practical experience in deploying into a performance management systems digital projects and strategies

MARKETING IN THE DIGITAL AGE, INNOVATION and ENTREPRENEURSHIP c.i.		12
MARKETING, SALES and PLATFORMS FOR THE DIGITAL AGE	SECS.P/08	6

At the end of the course, the student knows the way in which marketing is understood and thought up to the digital age that has brought the proliferation of channels and technologies which in turn have radically changed the context in which marketers find themselves operating.
The student acquires the new marketing skills: data and analytics, customer experience, content, omni-channels and personalization.
The students knows the details of Digital Platforms and underlying reasons for adopting them in a business environment and the strategic and innovative technical details as microservices and API management to have a full picture of the key features that make a digital platform really valuable and effective for an organization. Moreover, the student acquires the key capabilities of an omnichannel platform and the standard tools used to select software and solutions the best fit a specific application. Playing with a high-level general-purpose solution (IFTTT) the student understands how much easy is to create new services on top of open platforms. At the end, the student knows platform business model fundamentals to have a full understanding of what make a digital platform a digital business ecosystem.

	ENTREPRENEURSHIP	SECS.P/08	6

At the end of this course the student will: - comprehend the role and the function of entrpreneurship with a specific focus on the potential of digital and new technologies in business venturing and business innovation; -be able to indentify, evaluate, and select effective business idea and business opportunities; - be able to deploy business idea and model into a business plan; be able to design and write a business plan; - acquire the basic knowledge for stimluating, coordinating and controlling corporate venture iniaitives

EU LAW OF ALGORITHM	IUS/07	6

At the end of the course the student acquires an advanced critical understanding of the legal issues involving impact of algorithm decision-making on private and working life of persons and the role played by the EU law in granting the respect of human rights and governing transparency and accountability of automated decisions.

Elective courses - 12 ECTS		
(to choose among the following ones or in other degree programme of the University of Bologna)		
OPERATIONAL ANALYTICS	ING-INF/05	6
Operational analytics, a specific type of business analytics, is focused on the analysis of business processes to the end of creating competitive advantage by means of operational data analysis and of the application of analytical algorithms. The course concentrates on the algorithmic side, specifically presenting predictive analytical techniques, forecasting future data on the basis of available time series, and prescriptive analytical techniques, defining optimized usage of available resources. Real world cases will be studied and used as testbed for self-developed systems.		
INDUSTRY 4.0	ING-INF/05	6
The general objective of this course is to provide the general conceptual and technological framework that characterise Industry 4.0, focusing in particular on Internet of Things (IoT), Industrial IoT and Computer Vision and their application in digital transformation contexts. At the end of the course, a student: - has a global understanding about the big picture related to Industry 4.0 - knows the main principles, technologies and standards about Internet of Things (IoT) and Industrial IoT, integrated with contents delivered by other courses (e.g. service oriented architectures, API, web, cloud) - knows some main state-of-the art directions in this context. Examples are Web of Things, Digital Twins - knows the main application domains and concrete case studies concerning the application of IoT and Industrial IoT - knows the main topics in the field of computer vision (e.g. object detection and classification) and their applications - knows state-of-the art approaches and technologies in the context of computer vision, with reference to both classic techniques for image representation and deep learning based solutions - is able to analyse and evaluate the application of the models and technologies, as well as to build projects and prototype technologies, given a Digital Transformation context/problem		
INNOVATION STRATEGY	SECS-P/08	6
At the end of the course the student: - Understands Business Ecosystems that encompasses several Industries; - Discusses the management of emerging (and often disruptive) technologies; - Recognises the dynamics of multi-sided markets, platforms and business ecosystems; - Develops Scenario Plans for Business Ecosystems, analyse its impacts on new and existing companies and formulate corresponding strategies.		
ENTREPRENEURIAL and SOCIAL FINANCE	SECS-P/11	6
At the end of the course, students have acquired the business skills to deal with social and environmental problems in a sustainable way, including from an economic and financial point of view.They have the skills to evaluate development projects and impact finance tools. Students are familiar with the main components of social business venture funds, sustainable finance projects for financial, insurance and banking intermediaries and for Third Sector entities. They know the paths of social incubators / accelerators for Social Business enterprises.		
Internship for the thesis preparation		9
Final thesis		6