# University of Bologna Spring Semester

## Courses in English

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Discrete Time Systems Identification and Control 78812

5 quarter/3.3 semester units

The course aims to introduce the main techniques for identifying discrete time systems with particular reference to the family of equation errors models used for prediction and control. The main arguments that are presented in the course are stochastic optimal estimation, Kalman prediction and filtering in the discrete time setting and advanced digital control schemes. At the end of the course students are able to run basic identification algorithms for linear systems and to master design and implementation aspects of digital control systems.

Mechanics Of Machines for Automation 84229

7 quarter/4.7 semester units

The course aims to present complementary aspects of construction of automatic machines that are particular pertinent for automation engineering. Elements of machine design and strength of materials are presented with emphasis to fatigue analysis and structural analysis. At the end of the course students have an insight on the principles of construction of machines that are particularly suited for automation engineering. Also this course aims to strengthen the multidisciplinary knowledge and skills that are required for the development of mechatronic systems (which result from the strong integration of mechanical components with electronics and control algorithms). Advanced methods for the multi-physic modelling, simulation, optimization and control of mechatronic systems (operating in both static and dynamic regimes) will complement the basic methodologies developed at bachelor level. Application of these methods will be shown for the analysis of practical electro-mechanical sensors and actuators, as well as for the synthesis of complex mechatronic systems employing a combination thereof. At the end of the course students master methods and tools for modeling and design of integrated mechatronic systems.

Real Time Systems for Automation 78810

10 quarter units/6.7 semester units

Module 1 (September-December/Module 2 (February-June)/Module 3 (February-June)

The course covers the fundamentals of modern real-time operating systems. Arguments that are addressed in the course are architecture, organization, and functionalities of modern operating systems, task management and resource allocation, mechanisms and tools for synchronization and concurrent programming, characteristics of real-time operating systems and main scheduling algorithms for hard real-time periodic processes. A part of the course is also devoted to supervised lab activity, with a focus on Linux and RTAI. At the end of the course students master all the fundamental aspect of informatics that are instrumental for the design and control of automatic systems.
**Mechatronics Systems Modeling and Control 78983**

7 quarter/4.7 semester units

By taking inspiration from real world problems in automation that are not strictly related to the automatic machine scenario, the course aims at illustrating the main principles and methodologies for the integrated development of a mechatronic system, starting from its modelling and simulation, towards the implementation of proper control laws, that can be verified on the simulative model. Such general principles are then examined in deep and with a more applicative and control-oriented perspective, thanks to one or more projects that students have to develop under the instructor supervision. Lab activities on real setups characterize this course. At the end of the course the students will master lab tools for programming control system units and have a deep understanding of issues regarding implementation of real time control systems.

**Automation Software and Design Patterns 78870**

5 quarter/3.3 semester units

The course aims to provide a rational view of the main principles, methodological issues, design patterns and integrated development environments involved in the implementation of modern automation systems. At the end of the course students are able to master design aspects of advanced software architectures for complex automated machines.

**Electrical and Industrial Engineering**

**Hardware-Software Design of Embedded Systems 35152**

5 quarter/3.3 semester units

The main goal of the class is to provide an overview on the methods for designing, validating and verifying complex embedded electronic system. The importance of software components in virtually all electronic systems will be emphasized. Thus, special focus will be given to hardware-software co-design methods and tools; the most common HW-SW co-design approaches used in industry (telecom, automotive, industrial automation) will be surveyed in details.

**Power Electronic Circuits 73924**

5 quarter/3.3 semester units

At the end of the course students own the knowledge of the principles of modern power electronics: power diodes, controlled switches. They also acquire the knowledge of the following items: commutation transients, reverse recovery, and losses; how the pulse width modulation works, including harmonic analysis of voltage and currents. The students are further capable of calculating and improving the conversion efficiency. Knowledge of DC/DC converters, voltage and current transfer ratio, multi-level converters; DC/AC converters, single-phase, three-phase and multi-phase; The space vector analysis of multiphase AC systems; Space vector modulation of three phase inverters are also elements of the cultural skill that the students acquire at the end of the course.
Electric Drives For Automation 69659

5 quarter/3.3 semester units

The aim of this course is to present advanced problems concerning electrical drives and power electronics for energy conversion. The main topic of the course is the control of high-performance vector drives and power converters used in typical industrial applications, and in more recent applications, such as wind energy plants, solar plants and electric vehicles. The main topics presented in the course are d-q models of electrical machines, fundamentals of the voltage modulation in power converters, modern control schemes for induction machines, anisotropic synchronous machines, reluctance motors and linear actuators, back-to-back converters, UPS and active filters, and their applications in modern smart grids. At the end of the course the students have a deep insight about electrical drives and their advanced control schemes, and know basic tools and technologies for energy conversion. The course requires a previous knowledge of the fundamentals of electrical machines and power electronics.

Predictive Maintenance for Electrical Infrastructures 78455

5 quarter/3.3 semester units

At the end of the course, students are able to choose the most appropriate diagnostic techniques for a specific apparatus, and are able to start using the techniques by themselves, interpreting measurement results. Their expertise is based on the knowledge that they acquire on (a) the typical failure modes of high and medium voltage equipment; (b) the diagnostic techniques most commonly used to identify local defects (weak points in the insulation systems) and bulk degradation; emphasis will be given to the physical basis of these techniques and their limitations; (c) the basic information regarding the use of artificial intelligence techniques in diagnosis and (d) the qualification of insulation systems as a prerequisite to ensure proper reliability levels.

Advanced Solid-State Sensors 84418

5 quarter/3.3 semester units

The learning outcome of this course is that of illustrating the functioning principles of the most important categories of solid-state sensors. The students will learn about sensors realized with process techniques used in Microelectronics and Micro-Electro-Mechanics Systems (MEMS). For each sensor, the physical effect, the model used for its characterization and the technological aspects used for the overall realization will be analyzed. During the lab practice, a number of tools suitable for the numerical simulation of the sensors proposed in the course will be shown.

Electrical Assets Management 78454

5 quarter/3.3 semester units

At the end of the course students own a knowledge of the management techniques of electrical assets in the framework of the issues related to the processes of management and maintenance of electric power systems, starting with technical-economical and power quality aspects; they are capable of developing then, in particular, diagnostic methodologies based on health index evaluation, reliability estimates and life modelling, the concepts of data mining and quality systems.
Electric Drives for Renewables 78761

5 quarter/3.3 semester units

The aim of the course is to provide a general approach to an understanding of the performance and control of electric machines and drives. After the course, the students are able to model and simulate dc motor drives, brushless motor drives and induction motor drives having clear knowledge of the physical aspects of electric machines behavior when operating as motors and generators as well as the mathematical models of electric machines valid for steady-state and transient analysis.

Plasma Engineering 78464

5 quarter/3.3 semester units

At the end of the course the students are able to understand the main aspects of the plasma generation and its behavior at different operating conditions. Few plasma technologies are considered: plasma treatment of surfaces (plasma etching, deposition, implantation and sputtering), electro-plasma-dynamic and magneto-plasma-dynamic interactions and their applications, the main aspects of the thermonuclear fusion with magnetic confinement, and bio-medical plasma techniques. Therefore the students are able to operate on advanced technologies used in industry and in research field.

Analog Circuits, Sensor Readout and Conversion 87199

7 quarter/4.7 semester units

Fundamentals of analog interface design: how to bridge the physical and digital worlds. Application examples will include signal conditioning systems for pressure, temperature and optical sensors. Detailed contents: Operational amplifiers and review of basic linear op-amp circuits, Voltage/current references, Instrumentation Amplifiers, I/V and V/I conversion, charge amplifiers, Active Filters, Noise in analog circuits, A/D and D/A converters, Signal integrity, EMI/EMC.

Interdisciplinary Engineering

Industrial Logistics 34285

5 quarter/3.3 semester units

The objective of the course is to provide the general criteria and quantitative methods that govern the selection, design and management of the flexible manufacturing, assembly, handling and storage systems of the factory. At the end of the course the students know basic aspects for the organization of a flexible factory, having all the tools to choose between different solutions.

Resources Optimization 35192

5 quarter/3.3 semester units

Module 1 (September-January)/Module 2 (February-June)

The objective of the course is to present the most effective techniques for the solution of complex decisional problems arising in the optimal planning and management of large scale systems concerning both the public and the private sectors. Mathematical models and heuristic algorithms for the practical
solution of the corresponding optimization problems will be described. Particular attention will be given to the algorithmic and implementation aspects. Applications of the proposed techniques to real-world problems will be presented and analyzed.

**Polymer Science, Technologies And Recycling 73529**

5 quarter/3.3 semester units

The course provides notions on the correlations between chemical, mechanical and thermal behavior of macromolecules and their structure and microstructure. The complete life-cycle of polymeric material is analyzed and discussed.

**Public Procurement 78965**

5 quarter/3.3 semester units

The aim of the course is to give a complete survey of the juridical and judicial landscape of the Italian and European systems in the topic of public procurement and contract.

**Computational Mechanics 73577**

5 quarter/3.3 semester units

The course is an introduction to computational mechanics of solids and structures. The goal of the course is to provide the students with the fundamental concepts and operating tools to solve current structural problems using computer technology.

**Process Safety Engineering 84195**

5 quarter/3.3 semester units

After the course students will be able to assess the risks due to industrial installations (i.e. chemical and process industries), through the application of basic concepts about: classification of hazardous substances, hazard identification, probabilistic assessment of top events and consequence assessment.

Chemical Engineering

**Chemical Engineering Equipment Design 84194**

7 quarter/4.7 semester units

The course aims at introducing the students to the design of process equipment. Criteria and procedures for equipment selection and sizing will be introduced. Equipment design techniques will be applied to the more important unit operation in the chemical and process industry: heat transfer, distillation and absorption.

**Sustainable Design Of Chemical Processes 84193**

5 quarter/3.3 semester units

Introduction to and training in sustainable design of industrial processes in the chemical, biotechnological and energy sectors. Application of knowledge in thermodynamics, kinetics, heat
transfer, equipment selection to process selection and simulation. Concerted application of skills in the mentioned technical areas in an economical framework while considering environmental, raw-materials and energy availability, as well as safety constraints.

Environmental and Civil Engineering

**Industrial Ecology 69996**

5 quarter/3.3 semester units

The course introduces the student to the connection between technological, environmental, economic and social impacts of industrial production processes, in the light of sustainable development and circular economy. The student will gain knowledge on the evaluation of the life-cycle environmental impacts from industrial activities, on the EU environmental policy and on the main pollution prevention and control techniques applicable to energy production.

**Bioremediation and Exploitation Of Marine Bioresources 78487**

5 quarter/3.3 semester units

The course will provide students with the knowledge of biochemistry, microbiology and bioprocessing required for the sustainable remediation of impacted marine ecosystems (surface and subsurface water and sediments) and the industrial exploitation of marine biodiversity and bioresources.

**Corrosion and Protection of Metallic Offshore Structures 78642**

5 quarter/3.3 semester units

The aim of the course is to introduce the student to the metallic materials used for off-shore installations and equipment. Knowledge on construction technologies, corrosion protection and materials for the protection from fire will also be provided.

**Laboratory of Offshore Operations 81510**

5 quarter/3.3 semester units

The student will be introduced to the main construction and maintenance operations in off-shore activities with the aim of understanding the specificities required by off-shore operations.

**Ocean and Coastal Engineering 78724**

5 quarter/3.3 semester units

The course aims to provide tools and skills for the design and management of coastal and ocean structures, as well as the assessment of their impact. The course will introduce and describe the processes that characterize the oceanic and coastal environment and will provide tools for the analysis and design of coastal defenses, offshore structures, offshore and onshore approach facilities, and renewal energy plants. In particular the student will be able to analyze the sea conditions (waves, currents) and to design coastal and ocean structures, as well as harbors, breakwaters, offshore structures (TLP, offshore). Particular attention will be dedicated to environmental impact assessment. The conversion of energy from the sea (waves and currents) will also be treated.
**Advanced Hydrosystems Engineering 73314**

7 quarter/4.7 semester units

A successful learner from this course will be able to: a) deal with the most actual and urgent hydraulic and environmental problems connected with water supplies and drainage systems; design and operate urban water systems, taking into account: i) advanced design procedures and technological findings; ii) environmental and economic issues; and iii) construction site aspects; the b) apply basic modelling and computational techniques for addressing reliability analysis and risk assessment in civil engineering, with special emphasis on the water sector.

**Biotechnology for the Sustainable Reclamation of Contaminated Lands and Waters 73355**

5 quarter/3.3 semester units

To provide the students with the basics for understanding the roles of microbial populations in natural and contaminated habitats and with the main microbial and technological aspects related the conduction and optimization of the prominent environmental biotechnological processes currently applied in the remediation of industrial wastewaters, sediments and sites contaminated by xenobiotic compounds.

**Industrial And Environmental Safety 81645**

7 quarter/4.7 semester units

The course aims at providing the students with the basic elements of loss prevention and process safety in the chemical and process industry, including oil & gas up-stream and down-stream. Fundamental notions on substance hazards and classification of hazardous substances are provided. The approach to the process of risk assessment and management is described. The framework for risk control, governance and mitigation is also provided. Special focus will be devoted to the environmental consequences of industrial accidents.

**Mineral Production Systems 73319**

5 quarter/3.3 semester units

Students will acquire training that will be able to plan, direct, control open and underground mining and produce and/or examine properly technical documents in support of procedures of concessions to exploit mineral deposits.

**Sustainability In Construction 72748**

5 quarter/3.3 semester units

Course overview, introduction to sustainability. Definitions, trends, measurements. Aspects on sustainability (environmental, economic, social). Environmental footprint of engineered systems, with emphasis on civil engineering (energy consumptions, CO2 emissions, etc). Performance-based design and life-cycle planning. The various aspects to be considered for sustainability in construction: material's production and transformation, management of construction process, occupancy (use costs energy and cost consumptions), occupancy (maintenance and durability issues), end-of-life costs, reuse/recycling. Life-cycle analysis (LCA): Cradle-to-grave analysis, LCA as a min-max problem. Mathematical tools

**Large-Scale Water And Wastewater Structures 78647**

5 quarter/3.3 semester units

The course provides advanced theoretical basis, knowledge of the tools and applied skills for: (1) the design of large scale wastewater systems, with particular emphasis on sewer systems and water supply systems for large cities; (2) the design of large dams, with particular emphasis on the estimation of the forcings, the design of dam's hydraulic facilities, the prevention and detection of leakage, and the design of large scale power plants. Student gain expertise on the hydraulic and management challenges of large scale infrastructures and their environmental impact. Case studies related to large scale sewer systems and recently built large scale dams are considered and provide the way forward through the learning of the concepts.

**Advanced Design of Structures 72756**

7 quarter/4.7 semester units

Advanced methods for the verification and design of concrete structures will be given. The methods are based on the mechanics and simplified models for one- and two-dimensional concrete structures. A variety of civil engineering structures will be analyzed. The advanced methods will be used to solve some real problems, with reference to European and US Codes and Guide Lines. The students will design some one- and two-dimensional structures under the supervision of the teacher.

**Advanced Hydrosystems Engineering 72757**

7 quarter/4.7 semester units

A successful learner from this course will be able to: a) deal with the most actual and urgent hydraulic and environmental problems connected with water supplies and drainage systems; design and operate urban water systems, taking into account: i) advanced design procedures and technological findings; ii) environmental and economic issues; and iii) construction site aspects; the b) apply basic modelling and computational techniques for addressing reliability analysis and risk assessment in civil engineering, with special emphasis on the water sector.

**Infrastructures Systems 72763**

7 quarter/4.7 semester units

The main goals of this course are: (i) to review and explain the theoretical foundations of methods that are necessary to understand, apply and evaluate the various scientific and technological approaches which claim to improve the sustainability of transportation; (ii) to present examples of the aforementioned approaches such as alternative fuels and propulsion methods, innovative transport systems, and various taxation schemes to include external costs and attempts to change awareness. A main purpose is to make students capable to analyzing critically the potential of new approaches to
sustainable transportation, rather than to give a complete coverage of all known methods proposed to date. The student knows how to study the problems related with the vulnerability of road infrastructures, the risk analysis of in-ground constructions, the verification of existing roads and the design of new roads. He is also able to prepare maintenance plans and safety plans for roads and galleries.

**Design Projects 72761**

5 quarter/3.3 semester units

In the course the students will develop a project concerning one of the subject covered in the courses of the 1st year. In particular, the student will develop a project in one of the following fields: structural, hydraulics, road and transportation. The project will be done by the student alone or in small groups, under the supervision of the instructor.

**Building Information Modeling 86582**

5 quarter/3.3 semester units

The course aims at training students on the broad and expanding field of BIM applications by providing a general lexicon, the concepts and techniques of this wide set of tools for management, representation and construction. Starting from a short summary of consolidated modelling techniques (CAD, 3D geometric modelling tools), the course considers both the "pillars" of BIM Technology (datum, contents, views, management) and the innovations introduced in the construction process by this approach to design. The course also provides a comprehensive overview of the main BIM applications currently in use, in order to develop a critical approach to these techniques and evaluate the most suitable solution to design issues.

**Earthquake Engineering 72781**

5 quarter/3.3 semester units

In the course, the student will know the main aspects of earthquake engineering, and in particular: seismology and hazard, behavior of structures under earthquake action, with elastic and inelastic behavior, definition of the seismic action, design methods according to the most important Codes and regulations, detailing. The methods will be described with reference to reinforced concrete, steel and masonry structures.

**Sustainable Design Of Water Resources Systems 78596**

5 quarter/3.3 semester units

Students of this course will learn advanced methods for the design of water resources systems. The main focus will be (1) the estimation of water resources in the presence of human impact and climate change, (2) the estimation of water demands, and (3) the evaluation of alternative solutions for reconciling the availability of water resources with the increasing water needs and the preservation of ecosystems and the environment. Decision theory will be considered as an effective and transparent means to evaluate competitive solutions, while uncertainty assessment will provide the basis for a pragmatic design. The joint analysis and modeling of water resources systems and societal systems will be the driving concept of the course.
**Design of Offshore Structures and Foundations 78491**

7 quarter/4.7 semester units

The aim of the course is to provide for the basic and some advanced elements for design of offshore structures. After an extensive illustration of requirements and protocols for certification of steel for construction, the elements of design of steel structures will be given, including strength requirements, instability verification, design of connections (bolted and welded), with particular emphasis to those typical of off shore structures. Design criteria on more complex steel elements (tanks, pipes, plates, shell, etc.) will be also given. Criteria for life extension of existing off shore platforms will be also given. Then, typologies of foundations for off shore structures will be illustrated, together with the design criteria for different kinds of grounds and loads to be transmitted.

**Materials Characterization and Laboratory 73372**

5 quarter/3.3 semester units

This course provides knowledge of basic and advanced techniques for mechanical, thermal and morphological characterization of materials.

**Computer Engineering/Telecommunications Engineering**

**Antennas for Wireless Systems 82072**

5 quarter/3.3 semester units

The role of antenna as strategic interface between transmitter/receiver and channel. Design rules for the principal families of antennas (wire, aperture, and microstrip antennas), and for their combination in array architectures. Exploitation of antennas in modern energy-aware applications, such as radio-frequency energy harvesting or wireless power transfer systems.

**Multimedia Services And Applications 69494**

5 quarter/3.3 semester units

At the end of the course the student will have knowledge of efficient multimedia signal encoding and delivery; standards for voice, audio, image, video compression; software development kits for multimedia platforms; multimedia rendering; standards for multimedia signal delivery over the Internet, DVB, 3GPP, IEEE 802.x protocols.

**Optical Fiber Systems 75477**

5 quarter/3.3 semester units

Knowledge of the operation of the building blocks of optical communication systems, aimed to their basic design in different realistic scenarios.
**Mobile Radio Networks 87203**

5 quarter/3.3 semester units

The student will be aware of the fundamentals of radio networks, covering aspects of the physical, data link and network layers, with specific reference to the evolution of mobile radio systems from GSM to 5G.

**Digital Systems 73388**

5 quarter/3.3 semester units

At the end of this course, the student will be able to directly design and implement simple synchronous and asynchronous logical networks. They will also know how to use computer assisted programs for designing, partitioning and simulating complex digital systems using VHDL language. They will have also a good knowledge of the problems arising from the real behavior of the digital devices.

**Principles, Models and Applications For Distributed Systems 37085**

5 quarter/3.3 semester units

Knowledge related to the technologies needed for management and usage of computer networks and distributed systems. Course contents: Distributed systems: structure and operations; Hardware concepts; Software concepts: operating systems and protocols; Concurrent programming; Processes, threads: different kinds of interactions.

**Circuit Design for Wireless Systems 82086**

5 quarter/3.3 semester units

Introduction to the principles of performance and to the design techniques of radio-frequency circuits and subsystems used in modern telecommunication systems, in particular mobile radio ones. Knowledge of the main active and nonlinear subsystems and of the methods for their simulation and optimization (deterministic and statistical). Introduction to the use of artificial neural networks.

**Radioprotection and Spectrum Management 82089**

5 quarter/3.3 semester units

Provide the criteria for evaluation and control of electromagnetic fields in terms of interference and environmental impact. This course aims at providing the basis of generation, propagation and interaction of electromagnetic fields with the environment and with biological systems, related to radio frequencies. Students will learn how to identify the main transmission characteristics for industrial and residential electromagnetic sources (radio broadcasting systems, cellular mobile radio systems, household (electrical) appliance, industrial equipment, etc.) and the main bioelectromagnetics mechanisms of interaction. Moreover student will have gained the capacity to identify the suitable prediction models and measurement tools in order to survey, assess and mitigate electromagnetic field exposure. This course is designed in order to provide direction for radio systems frequency planning and radio spectrum efficiency use.
SCHOOL OF SCIENCES

Bioinformatics

**Algorithms and Data Structures for Computational Biology 69443**

8 quarter/5.3 semester units

At the end of the course, the student has the basic knowledge in design and analysis of correct and efficient algorithms and data structures. In particular, the student has basic knowledge on algorithms and data structures. The student will be able to: design correct and efficient algorithm for common computational tasks; analyze existing algorithms and data structures; design and analyze new algorithms and data structures.

**Bioanalytical Proteomics And Interactomics 66571**

5 quarter/3.3 semester units

At the end of the course, the student has the basic knowledge in ultrasensitive and rapid methods based on molecular recognition combined with selective and highly detectable probes: Immunoassay, Hybridization reactions, biosensors, FRET, BRET, whole cell biosensors; Soft impact mass spectrometry technologies and smart sample handling for proteins/peptides quantitative analysis and identification in complex biological matrices; Combined noninvasive separative technologies (FFF) for functional proteomics study; Luminescence Molecular imaging: localization and quantification of analytes in single cells and tissue (combined with microscopy), whole organ and living organisms using nanoparticles and recombinant bioluminescent cells.

Biology

**DNA/RNA Dynamics 66569**

5 quarter/3.3 semester units

At the end of the course, the student has the basic knowledge that gene transcription is intrinsically a dynamic process based on chromatin remodeling and a complex RNAs pool mediating the transcript regulation. In particular, the student will be acquainted with the most up-dated high throughput technologies (microarrays and deep sequencing) from two points of view such as biological and statistics. Data mining and cluster analyses will be acquired by the student.

**Molecular Phylogenetics 72848**

5 quarter/3.3 semester units

At the end of the course the student, starting from the knowledge of the mechanisms of molecular evolution, will be trained in the study of phylogenetic inference and will be able to reconstruct phylogenetic trees based on several molecular markers, applying the State-of-the-Art bioinformatic tools in the field. In particular the student will acquire the basics of phylogenomics and will analyze case studies in phylogenetics and phylogenomics.
Physics

**Charge Transport and Optics in Condensed Matter 84538**

5 quarter/3.3 semester units

At the end of the course the student will learn the basic aspects of the transport and optical properties of condensed matter. These phenomena will be studied within both a classical approach and a quantum-mechanical one with non-interacting electrons.

**Laboratory of Nanoscience And Nanotechnology 84537**

5 quarter/3.3 semester units

At the end of the course the student will be able to implement and perform experiments at the nanoscale on advanced materials, both in terms of fundamental principles and advanced experimental tools for the growth and characterization of nanomaterials. The student will acquire the basic skills needed to critically elaborate and interpret experimental data.

**X-Ray and Synchrotron Radiation Physics 84541**

5 quarter/3.3 semester units

At the end of the course the student will learn the basic notions regarding the physical mechanisms of the interaction between X-rays and condensed matter in both a macroscopic and microscopic approach and the most important properties of synchrotron radiation sources, with emphasis on the underlying physics. Moreover, the student will learn the basics of the main experimental X-ray methods (such as X-ray diffraction, X-ray absorption spectroscopy and photoemission) and their recent application to current research topics.

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**SCHOOL OF LANGUAGES, LITERATURES, TRANSLATION, AND INTERPRETATION**

**Specialized Translation**

**Computer-Assisted Translation and Web Localization 82021**

4 quarter/2.7 semester units

The student - knows and is able to use effectively the main digital resources for file management and computer-assisted translation; has insights into the methodological and technological aspects of software and web localization - is able to devise, manage and evaluate complex projects dealing with computer-assisted translation, linguistic adaptation and web localization, involving several professionals and a variety of skills and competences, in a way that is consistent with professional ethics - is able to acquire higher-level knowledge and competences in the areas of translation technology and localization independently, and to apply them to novel fields
Language, Society and Communication

**Computer Studies and Human Sciences 78665**

2 quarter/1.7 semester units

The student knows how to apply specific software and informatics programs to language and communication ambits.

**Cultural Economics 78693**

7 quarter/4.7 semester units

The student gets the fundamental principles of economic analysis of the cultural market, with particular attention to cinematographic, musical, artistic and televisual fields. S/he also aware of the legal position of some original works categories (with special reference to audiovisual and figurative art works) within the limits of the copyright law. S/he is also able to apply his/her knowledge to the problematic dynamics ruling the demand and offer of the culture and the mechanisms of cultural heritage funding.

**History of Mass Communication 81778**

7 quarter/4.7 semester units

Mass communication is defined as communication reaching large numbers of people through various media, especially since the beginning of mass society. The aim of the course is to study history and development of mass communication. The main topics will be the development and growth of media from the past to the present; the role of media under various political systems and the influence of communication on national building; the relationship between media and politics within different historical environments, in order to understand the importance of media to mass communication both past and present. Particular attention will be given to several case studies to explain the role of media in the states propaganda.

**Management of Cultural Events 78710**

7 quarter/4.7 semester units

The student has a general knowledge of the meeting industry. In particular s/he knows the aspects related to the economic value, the marketing techniques applied to the meeting market and the modalities of the approach to the demand, as to satisfy its needs and requests. S/he knows how to apply the main methodologies and instruments to the planning and organization of meetings and events, with special reference to the medical sciences association meetings market.
**Digital Text In The Humanities: Theories, Methodologies And Applications 85448**

5 quarter/3.3 semester units

The course aims at providing a theoretical and practical knowledge in the application of digital methods and tools for the representation encoding and analysis of texts (literary and not). At the end of the course the students will acquire advanced skills in the techniques and issues related to the creation and the dissemination of electronic documents and the creation and management of digital text archives.

**Information Modeling and Web Technologies 85445**

5 quarter/3.3 semester units

At the end of the course, the student knows the most important approaches to model information and data structures for permanent and robust storage and management. The student also knows the most recent technologies to create successful web resources (both information-oriented web sites and service-oriented web applications). The student is able to write documents ready to be published on the web, is able to design their visual aspects, is able to verify their correctness and universality, and is able to implement simple distributed applications on the web.

**Knowledge Representation and Extraction 85446**

5 quarter/3.3 semester units

This course aims to initiate to methods for interpretation of data and content as knowledge sources. At the end of the new course the students will be able to: master the basics of knowledge representation and reasoning, with application to the Semantic Web (ontologies, linked data, knowledge patterns); be familiar with the state-of-the-art in knowledge representation and extraction technologies; use applications to automatically extract knowledge from text; analyze the knowledge requirements of a customer, and produce a plan to implement them.

**Intangible Artifacts, Cultural Heritage and Multimedia 85447**

5 quarter/3.3 semester units

At the end of the course students are put in touch with the intangible cultural heritage mediated by computer science and expressed under the form of practices, representations and skills that the multimedia research community recognizes as part of its identity. Students are able to reflect upon and manipulate a variety of digital instruments, including objects, artifacts and cultural spaces, manifested through interactive multimedia signs and actions.

**Knowledge Organization and Digital Methods in the Cultural Heritage Domain 85452**

5 quarter/3.3 semester units

The course aims to introduce the issue of organizing knowledge in archives, libraries and museums. In particular at the end of the course the students will be able to: use the standards of the domain for data description; manage the practices oriented to the enrichment of data through semantic strategies.
(ontologies and controlled vocabularies); create complex metadata for digital objects in the cultural heritage domain.

**Data Modelling and Multimedia Databases 85443**

5 quarter/3.3 semester units

This course aims to initiate to data modeling, firstly by reflecting on content type: starting from traditional metadata, continuing with regular (textual) documents, and concluding with most complex multimedia documents. At the end of the course the students will be able to: master the principles and fundamentals of documents’ database design and implementation; master the most suitable methods of documents’ content description, together with their indexing techniques and query paradigms; evaluate the quality of provided results through quantitative metrics (both for effectiveness and efficiency); be familiar with the state-of-the-art of multimedia database management; analyze the requirements of specific contexts in the cultural heritage domain in order to identify the most appropriate solutions for modeling and managing the underlying data.

**Digital Humanities: Sources and Methods 81954**

5 quarter/3.3 semester units

At the end of this course, students will: Show critical awareness of the implications of the Digital environments on changes in research and communication in the Humanities; Have an overview of the tools and methods for source retrieval, editing and annotation, analysis and communication; Demonstrate understanding of the cultural implications underlying digital scholarship and use of digital research infrastructures; Demonstrate ability to apply to a specific project some of the methods and tools, appropriate to the specific research interest of the student, by retrieving and presenting relevant sources and communicate historical elaboration in a research or learning environment.

**Italian Studies**

**Italian Contemporary Performance Scene 85122**

5 quarter/3.3 semester units

At the end of the course, students will have acquired knowledge of the theoretical and critical reflections on the performing arts in Italy from the second half of the twentieth century to the first decade of the new millennium, with a particular focus on mise-en-scène and dance. Students will be capable of autonomously analyzing critical, theoretical and poetic texts regarding the performing arts and will have acquired a series of tools for understanding pertinent iconographic and video documents.

**Italian Political Thought 85105**

5 quarter/3.3 semester units

At the end of the course, students will have the tools for gaining a basic understanding of the theoretical and practical issues debated in the history of Italian political thought in the modern and contemporary ages. By directly analyzing the sources, students will define the theoretical specificities of the main authors of the history of Italian political thought and relate these to one another, communicating them in an effective, coherent way.
**Middle Ages and Renaissance Canon 85107**

5 quarter/3.3 semester units

At the end of the course, students, by reading a series of texts, will be capable of acquiring in-depth knowledge of how the Italian literature of the Middle Ages and Renaissance evolved, with particular reference to the texts that profoundly influenced the subsequent literature and culture, so confirming the canon. Students will be capable of analyzing texts, reading them with a critical eye and relating them to various temporal and social-cultural periods.

**Introduction to Italian Culture 85115**

5 quarter/3.3 semester units

At the end of the seminar students will have acquired awareness of peculiar dimensions of Italian culture. Students will be able to understand the relevance of research problems in a wide series of topics concerning Italian culture such as Italian Renaissance and the modern world, the birth of Italian Nation, landscapes studies,. Students will demonstrate a sound theoretical framework within which specific research interests could be developed in an interdisciplinary perspective.

**History**

**Conflicts and Inequalities in the Neoliberal Era 81949**

5 quarter/3.3 semester units

Students will develop a critical understanding of neoliberal political-economy and its social impacts in local contexts. Students will develop a critical approach to aid industry as a key issue to understand global governance processes. Students will be able to create autonomously a bibliography and a research project on the different issues pertaining to the course.

**Global Health And Suffering 81951**

5 quarter/3.3 semester units

Students will develop a critical understanding of global health policy as a historical, political and moral assemblage to deal with the consequences of global inequalities. They will also gain an appreciation of illness and suffering as the personal embodiment of broader social processes within local moral worlds embedded in historically deep and geographically broad social dynamics.

**Atlantic and Global History of Modern Political Concepts 81719**

5 quarter/3.3 semester units

At the end of the course students will acquire the fundamental methodological and theoretical tools of the so-called «Atlantic History», which redefines the spatial limits of Modern politics, considering Europe, Africa and the Americas as part of one and the same global experience. This perspective well developed in North American universities will be extended to the history of political concepts, with a special attention to antagonistic political cultures and resistance movements, but also to the colonial dimension embedded in the great classics of Modern and contemporary political thought.
Indian Ocean History 81722

5 quarter/3.3 semester

During the course, the students will analyze travel accounts, novels, historical sources, and scholarly works and critically engage with the historiographical debates that characterize the Indian Ocean Studies field. At the end of the course they will both reach an understanding of the Indian Ocean cultures, economies and societies that transcends national histories and be able to engage with a non-Eurocentric approach to processes of globalization.

Intellectual History of Colonial and Post-Colonial South Asia 81962

5 quarter/3.3 semester units

Students will acquire high-level knowledge of intellectual transformations and history of thought in modern and contemporary South Asia, specifically during the colonial and post-colonial period. Students will know in depth the issue of religious and social reforms and recognize the main theoretical positions emerged in the current debate on the historiographical and anthropological representation of the development of South Asian society. Students are also able to properly communicate in written and/or oral form what they learned, using appropriate bibliography in view of further original research.

History of Colonial and Post-Colonial Spaces 81961

5 quarter/3.3 semester units

The course intends to provide a critical and interdisciplinary analysis of the policy and ideology of European colonial expansion between the opening of the Suez Canal (1869) and the outbreak of the First World War, a period characterized by unprecedented competition for overseas territorial acquisitions and the emergence in colonizing countries of doctrines of racial superiority. Students will acquire a top-down and a bottom-up perspective on the process of ‘simplification’ registered in colonial contexts and will be required to adopt a comparative approach that takes on board the Middle East and other geographical contexts directly affected by colonial rule and conflicts, including and particularly African countries and India.

Critical Theories of Contemporary 81968

5 quarter/3.3 semester units

Through the critical review of classical theories of capitalism, students will be able to discuss both fixed and invariant elements in the development of modern capitalism and what makes peculiar its contemporary forms. They will acquire specific awareness of some of the most important concepts in present intellectual and political debate, such as globalization, financialization, etc.

Feminist Critiques of Political and Social Thought 81969

5 quarter/3.3 semester units

At the end of the course students will acquire a knowledge of the ways in which women had historically criticized the theoretical justification of their subordination articulated in Western political and social thought. By applying the fundamental tools of feminist and post-colonial theories, the course will
provide an historical analysis of political and social concepts – such as authority, freedom, rights, citizenship, society, labor – as the expression of gendered relations of power.

**Geography and Cognition of European Territory 81970**

5 quarter/3.3 semester units

Starting from the history of the idea of Europe, the course aims to explain the nature and the logic of European space and landscapes in their geographical, cultural and cognitive roots. The course brings critical perspectives from humanities and from economics to bear in considering how Europe as a set of new transnational policy spaces is making a difference to Europe as a myriad of lived, experienced, meaningful, crucial places.

**SCHOOL OF POLITICAL SCIENCE**

**EU Constitutional Law 85720**

6 quarter/4 semester units

The course aims to analyze the European decision making process and the main institutional elements of the process of European integration, particularly with regard to the legal implications arising from it. At the end of the course, students will be able to understand: the Institutional system, decision-making process, judicial control of EU Court of Justice; the Normative system: analysis of EU acts and assessment of their implementation and interpretation at EU and national level; EU citizenship and fundamental rights. At the end of the course students have developed the ability to analyze the main implications of the EU institutional structure and to determine the overall effects of the law into the municipal legal orders of the Member States, and to illustrate the main trends of the interplay between the Union and its Member States (both internally and on the international scene).

**Europe and Africa: Cooperation And Security 74659**

6 quarter/4 semester units

At the end of the course students will know the main policies and institutions of the EU-partnership in the fields of security and development cooperation, within the framework of the international debate on these topics. In particular, students will be able to: analyze the contemporary literature concerning the political and military relations between the EU and Africa; discuss and contextualize the main global and regional processes of transformation defining the relations between the EU and Africa, - understand the historical evolution of the UE-Africa security and development cooperation; organize and retrieve bibliographic and documentary sources using libraries and web materials.

**Politics of Contemporary Asia 74573**

6 quarter/4 semester units

This course is an overview of international relations of the East Asian region, which aims at broadly exploring the economic and political issues surrounding the Asia-Pacific rim. At the end of the course students will be able to examine topics related to historical and contemporary patterns of state relations in East Asia, US security alliances in East Asia and the new Asian Pivot, the rise of China, nuclear crises in
the Korean Peninsula, territorial disputes, regional multilateral institutions, East Asian development models and economic integration, environmental challenges, energy security, and other related issues.

**Comparative Judicial Systems 74982**

6 quarter/4 semester units

At the end of the course students will be able to analyze with a comparative method the main elements of judicial systems, their interactions, to the role played by courts in the political system, including the analysis of individual rulings, and to assess the perspectives of change in different political contexts.

**Europe in the Global Economy 74570**

6 quarter/4 semester units

The course offers a series of advanced analytical tools to understand European economic development as well as economic policies related to EU integration and enlargement, their political and economic prerequisites and their impact on member states. At the end of the course, students will be able to use models of political economy, institutional economics and economic analysis in order to critically evaluate the process of economic integration in Europe in the trade, monetary and financial areas.

**European Labor Law 77098**

6 quarter/4 semester units

The course is designed to give students a general overview and understanding of the essential features of European labor law in its interaction with and influence on domestic labor law regimes, and to enable students to master the key concepts and institutional aspects and apply their knowledge to new issues within the field of study. The goal of the course is to understand labor law issues in a comparative perspective as well as in the interaction between national legislation and EU law. In this context the course focuses on the study of: the evolution of European labor system, its national, transnational and global framework, fundamental social rights, free movement of workers, equal treatment, conditions of employment, atypical forms of employment, European social dialogue and collective bargaining, worker participation, dismissals and transfer of undertakings, the impact of the financial crisis on the European social model, industrial democracy.

**Diplomacy in a Global World 79534**

6 quarter/4 semester units

The course will examine the new requirements that diplomacy must comply with, both at the national and global level, in the present transitional phase of the international relations system. At the end of the course, students will be able to point out the radical changes that occurred after the "Cold War" and the public and multilateral diplomatic methods that resulted from it, with special reference to specific crisis situations.

**Economic History of Globalization 77975**

6 quarter/4 semester units

Globalization is a complex and multipronged phenomenon. Economic globalization proper has fully unfolded during the last hundred and fifty years, yet globalizing episodes characterized earlier periods as
well. This course will take a long view of the economic and political history of the world, and discuss how flows of commodities, people, and ideas have become increasingly globalized. The course will discuss how globalization affects national and international inequality, economic development and institutions, as well as the relationship between global and local dynamics, and between economic, political, and social phenomena. By the end of the course, students will be able to discuss the fundamental trends of the economic and political history of the world in the last millennium, and critically examine the historical scholarship on globalization.

**Strategic Studies 85629**

6 quarter/4 semester units

By the end of the course, students will be able to: 1) Appreciate variation in conceptions of international security theories. 2) Understand the origins and evolution of mainstream theories on military strategy. 3) Understand the significance of alternative conceptions of national security for states’ policies. 4) Develop an understanding of the capabilities and limitations of modern warfare in strategic international events. 5) Develop analytical skills to be applied to international security issues.

**Institutional Adaptation and Evolution 84698**

6 quarter/4 semester units

The course focuses on political institutions and their effects, with the aim of gaining a better understanding of their persistence and change. A special attention is devoted to democracy in the digital age. At the end of the course the students a) is capable of analyzing and interpreting trajectories and pace of institutional change b) has a deep knowledge of the main approaches to institutional change c) he is able to discuss the relationship among technology and democracy.

**Economic History of Innovation 84700**

6 quarter/4 semester units

By the end of the course, the student will have acquired a solid knowledge of the history of economic innovation in the long term, with particular attention to crucial turning points in human history, and a major focus on the last three centuries. The student will be able to discuss the role of specific actors that contribute to (or curb) innovation in human societies, and how the question of innovation intersects with other major phenomena of the contemporary world, such as globalization, the divide between developed and less developed countries, and inequality. Finally, the student will become conversant with the major historiographical schools in the history of technology, innovation, and growth.

**Analyzing Complexity 85053**

6 quarter/4 semester units

Complex systems science is an effort to identify common patterns in complex systems from multiple scientific perspectives. The aim of this course is to provide students with analytical tools useful for discerning underlying patterns shared by complex evolving systems. Such tools span from the field of network science to agent-based computational models applied to social and political phenomena.
**Creative Thinking and Innovation 85006**

6 quarter/4 semester units

Creativity and innovation are essential to an organization’s capacity to manage the challenges raised by a rapidly changing environment. Creative thinking involves creating something novel or original. Innovation is commonly interpreted as introducing change into relative stable systems. Organizations also refer to design thinking as a way to capitalize on creativity to solve complex problems. Students of this course will learn about techniques to improve originality of their thinking as well as tools used by organizations to foster innovation. At the end of this course, students will be able to a) understand theoretical conceptualizations of creativity as well as organizational practices that facilitate innovation b) develop case studies analysis skills.

**Topics in Economic Policy 78448**

8 quarter/5.3 semester units

The course provides an introduction and overview of some main points of debate on the economic policies of contemporary societies and, in the second module, of the methods and tools used by economists to analyze labor market issues. Using historical and contemporary examples, and simple models and data sets, students understand the importance of well-designed and well-functioning economic institutions and policies and the complexity of economic governance. One specific example concerns the discussion of macroeconomic governance in the Great Recession (2007-to date) Students gain a good understanding also of policy issues that are of particular relevance for the labor market. Accessing research by leading experts, they will be able to evaluate issues like the gender wage gap, youth unemployment in Europe, the efficacy of youth labor market programs, the formalization of informal jobs in developing countries, self-employment and poverty in developing countries, the costs of worker displacement in developed and emerging economies, and labor market adjustment in the Great Recession.

**SCHOOL OF ECONOMICS, MANAGEMENT AND STATISTICS**

**Economics**

**Financial Products and Markets 78159**

5 quarter/3.3 semester units

At the end of the course the student has a sound knowledge of the financial products traded in the market, the differences among them, and the reasons why they were introduced in the market. The products range from standard bonds and stocks, to derivatives and structured finance products. The student has knowledge of the main agents trading in the market, as fund raisers or investors, as well as financial intermediaries.
**Econometrics 1 28885**

5 quarter/3.3 semester units

At the end of the course the student has acquired knowledge of the basic instruments used by economists for their empirical investigations: the linear regression model and the Ordinary Least Squares method. In particular, he/she is able: - to critically understand the applications of this model in the recent empirical economic literature; - to apply the model and perform his/her own analysis of economic datasets using the software STATA.

**Econometrics 2 34481**

5 quarter/3.3 semester units

At the end of the course the student has acquired knowledge of the core time series econometric methods for the analysis of univariate and multivariate economic models. In particular, he/she is able: - to critically understand the applications of these models in the recent empirical economic literature; - to apply the models and perform his/her own analysis of economic datasets using a suitable econometric software.

**Macroeconomics 1 28875**

5 quarter/3.3 semester units

At the end of the course the student has a good understanding of basic general equilibrium dynamic macroeconomic models, used by economists to analyze several theoretical and policy questions, and of modern growth theory. In particular, he/she: knows and is able to solve analytically macroeconomic dynamic models (infinite horizons and overlapping generations); knows the main empirical issues and theoretical models analyzed by modern growth theory; is able to apply models to investigate comparative dynamics across countries and over time.

**Macroeconomics 2 28876**

5 quarter/3.3 semester units

At the end of the course the student should have acquired a good understanding of macroeconomic models used to study the determinants and evolution of output, unemployment and prices, in the short and medium run, and of issues related to the conduct of monetary and fiscal policy. In particular, he/she knows: - the role played by nominal and real rigidities in the transmission of monetary shocks and the role of rational expectations; the determinants of unemployment; the meaning of sustainability and solvency in the public debt dynamics; models of the political economy of public debt and default.

**Macroeconomics 3 34487**

5 quarter/3.3 semester units

This course presents models and techniques used by macroeconomists to study the theory of consumption and investment. At the end of the course, the student: knows basic techniques in dynamic programming and their applications; critically understands macroeconomic models that study the dynamics of Consumption and Investment.
Labor Economics 39069

5 quarter/3.3 semester units

At the end of the course student has knowledge of a detailed analysis of the main areas in labor economics, both from a theoretical and an empirical perspective. Topics include the analysis of labor supply by individual and households, labor demand by firms, equilibrium wage differentials and employment outcomes resulting from the interaction of such supply and demand, education and human capital, life-cycle profiles, job search models, and labor market institutions. At the end of the course student has an understanding of how labor markets work and possess the basic tools to undertake original research in the field.

Industrial Organization: Theory and Applications 81604

5 quarter/3.3 semester units

Students attending this course will acquire a thorough knowledge of how firms interact in markets. By the end of the module, students will understand strategic behavior in markets and how firms may gain and exploit a competitive advantage over their rivals. Furthermore, students will gain a thorough understanding of competition policy: in particular, what are its aims, how it works, and how firms must adapt their behavior in order to avoid antitrust sanctions.

Accounting 47736

7 quarter/4.7 semester units

At the end of the course students are able to manage and interpret accounting processes, balance sheets, accounting principles with a specific focus to European and international norms and principles.

Organizational Behavior 23611

7 quarter/4.7 semester units

At the end of the course students are able to understand how people and organization interact. They know theories and previous research about the main organizational issues and decisions related to business, the relationship between the organization and external contingencies, inter-organizational relationships. Issues such as motivation, behavior, decision processes, communication, small group behavior, cooperation and conflict are discussed in this course. Students will be encouraged to explore organizational identity as a main variable to explain organizational behavior.

Financial Markets and Institutions 37300

5 quarter/3.3 semester units

At the end of the course students will be able to understand and apply the main financial principles and concepts: they will understand why and how financial intermediation exists, how the basics of mathematical finance should be applied in the evaluation of financing contracts and financial instruments; how to invest in a portfolio, taking into account both expected returns and risks; how the
monetary policy is related to what they learn in this course and how to interpret the current issues on financial markets.

**Marketing 09511**

7 quarter/4.7 semester units

At the end of the course students are able to understand and use the main variable, theories and tools of marketing management. After discussing some main theoretical frameworks at the end of the course students will be able to apply them to the real company and market contest. Students are able to analyze behavior and after sale behavior of costumers, to segment the market, to define a marketing plan and decide the main section of marketing mix such as product and brand management, pricing, distribution channels and communication.

**Statistics 47732**

7 quarter/4.7 semester units

At the end of the course students have the basic tools for analyzing and describing a set of data through numerical indexes, graphical representations and dependence models for both univariate and bivariate data. The students are able to deal with basic tools of probability theory and its applications. The students will be also able to estimate population parameters from sample data by using standard inferential techniques (point estimation, confidence interval and hypothesis testing).

**Business Strategy 48142**

7 quarter/4.7 semester units

At the end of the course students are able to manage strategic issues at the business level. Business definition, critical factor of success, competitive analysis, internal resources and strategic positions are discussed to define strategy in markets that can have different degrees of maturity and technology innovation.

**International Economics 25751**

7 quarter/4.7 semester units

At the end of the course students are able to analyze several issues related to macroeconomic policy in open economies and to the evolution of foreign exchange markets. Specifically, students are exposed to the determination and dynamics of exchange rates, on the choice between flexible and fixed exchange rates, with special attention to the European Monetary Union, on the international role of the euro and its relationship with the dollar and, finally, on speculative attacks on currencies and the design of a new international financial architecture.

**International Marketing 21872**

7 quarter/4.7 semester units

At the end of the course students are able to analyze international product markets from the perspective of Italian and European companies both in consumer good and industrial markets. Students are able to define entry strategies and management of steady state markets at the international level. The perspective of both small and medium sized firms and large firms is discussed.
**Commercial Law 37296**

10 quarter/6.7 semester units

*Note this course is taught in 2 modules and takes place over the entire academic year. Module 1 (September-December) and Module 2 (February-May). If you wish to enroll in this course you must participate in the yearlong program.*

At the end of the Teaching Activities related to the course Commercial Law, students will count with a comprehensive understanding of the main institutions accountable for the corporations and the firms, focusing on their basic characteristics and tasks, from the moment certain commercial regulations are conceived until these same regulations and norms expire. Furthermore, students will be able to acquire and grasp the basic notions about all the different types of firms, consortiums and lobbies, in order to assess and verify how these organizations, which are widespread in the Italian Economic scenario, could be profitably used for the practice of the economic activity (principles, structures and organizations). The International approach to the course Commercial Law sets the platform for a continuous comparative evaluation between Italian commercial law and Italian Industrial legislation versus the international directives on this very field (with a special focus on EU regulation on the subject), also considering international agreements, basic concepts of commercial law and industrial law, taking into careful consideration the antitrust legislation, unfair competition and unfair practices like dumping, misleading communication, the regulation of particularities and all creative activities, regulation of know-how and of technologies as well.

**Economics and Finance**

**Economic History 69065**

6 quarter/4 semester units

The course aims at providing students with an up-to-date understanding of the main aspects and trends of the world economy during the 20th and early 21st centuries. At the end of the course students should understand the origin of the most important economic institutions and the features of the economic cycles so far experienced by the world economy. Topics addressed in more detail will include the failure of the command economies, the construction of the European Union, the evolution and transformation of financial systems, the globalization, the regulation of labor market in different countries.

**Public Law 65065**

7 quarter/4.7 semester units

The aim of the course is to provide students with the fundamentals of public law. Topics include: sources and interpretation of the law, national and supranational institutions, the government and associated regulatory authorities in real and financial markets (competition authorities, stock market authorities, central banks, etc.), the role of the European Union in real and financial markets and the relations between the European Union and national government, and the legal relations between businesses and the public administration.
Macroeconomics 59691
6 quarter/4 semester units
This is an introductory course in macroeconomics. The goal is to develop a relatively advanced basis for an understanding of how the national and global economies work at the aggregate level, and how production, employment, prices and interest rates are determined. We will develop the theoretical foundations to analyze the business cycle (why economic activity fluctuates), long run economic growth (why some countries are rich and other poor, why some countries are growing and other stagnating), the 2007-2008 financial crisis and subsequent deep recession as well as how fiscal, monetary, and economic policy in general affect economic activity.

Economics of Financial Intermediation 75663
6 quarter/4 semester units
This course gives an overview of financial markets, financial institutions, and financial authorities. Specific topics include: the supply of and demand for loan funds, securities, and bonds. Emphasis is placed upon the economic effects of financial institutions and markets upon various sectors of the economy. We will outline the institutional structure of financial intermediation and the concerns facing the regulators and managers of these institutions.

International Finance 25752
6 quarter/4 semester units
The course deals with monetary and macroeconomic relations between countries. Specifically, it covers topics such as balance of payments problems and policy, the causes and consequences of exchange rate movements, the implications of macroeconomic linkages between countries, costs and benefits of the European Monetary Union. At the end of the course, the student will be able to understand and analyze important issues such as the global interdependence of macroeconomic policies, the implications of exchange rate policies on emerging countries’ economies, costs and benefits of the introduction of the euro and the effects on European consumers and producers, the relationship between the euro and the dollar, and the future role of the euro in foreign exchange and financial markets.

Calculus and Linear Algebra 75660
10 quarter/6.7 semester units
*Note this course is taught in 3 modules and takes place over the entire academic year. If you wish to enroll in this course you must be on the yearlong program.*

At the end of the course the student will be capable of using the techniques of Linear Algebra; furthermore he will have acquired a working knowledge of First Year Calculus, together with the related applications in Finance and Economics. This course covers a number of introductory topics (pre-calculus), including elementary set theory, sets of real numbers, complex numbers, polynomials, linear and quadratic equations and inequalities, systems of inequalities, absolute value and rational inequalities, Cartesian coordinate system, basic analytic geometry, basic concepts and definitions about functions, elementary functions (power, exponential and logarithmic), exponential and logarithmic equations and inequalities, trigonometric functions.
International Economics 25751

5 quarter/3.3 semester units

This course is intended to analyze the regulatory framework for trade and the regulatory issues relating to international markets and regional markets, such as U.S. and EU markets, and emerging markets in Africa and Asia. The students acquire knowledge: about Institutional structures (GATT/WTO, NAFTA, EU, APEC, SADEC, CEDEAO) and Regulatory authorities; about International dimensions of market regulation (tariffs and customs regulations, product safety and environmental restrictions, trademark and patent regulations); about disputes settlement.

International Marketing 21872

5 quarter/3.3 semester units

The course refers to the most important variables for international marketing and marketing mix investments in different markets. In particular, the student is expected to understand: What is the difference between managing a domestic market and a multinational portfolio of businesses; What are the methods to analyze foreign markets and consumers; What are success stories of international marketing strategies useful to companies that are internationalizing their business.

International Finance 25752

5 quarter/3.3 semester units

The purpose of the course is to study the impact of globalization on firms strategic decisions. Attention will be focused to customization of company's offering in different countries, to standardized/differentiated approach to competition in different countries, to choices to reconfigure their business model on an international basis.

International Management 34539

5 quarter/3.3 semester units

The student is able to analyze the impact of globalization on firms strategic decisions. He is focused to customization of company's offering in different countries, and to standardized/differentiated approach to competition in different countries, to choices of reconfigure their business model on an international basis.

International Accounting 30380

5 quarter/3.3 semester units

The student gains the tools to understand the international dimension of accounting. The main reference is towards IFRS (International Financial Reporting Standards) issued by IASB. The student also takes into consideration the activity of the Italian Accounting Standards Setter and the American Financial Accounting Standards Board.
**Business Intelligence 30376**

5 quarter/3.3 semester units

The students is expert in the design, implementation and information systems management for intelligence of decisions that melt on the management knowledge of analytical nature. The second part (30 hours) of the course is developed in the computing laboratory using the system language of SAS System and SAS Enterprise Miner. At the end of the course, the student knows: - Customer relationship management (CRM) and Customer Intelligence; - Problems of evaluation of the advertising impact; - Oriented information system implementation for the analytical approach to the Business Intelligence; - Software realization for Analytical Business Intelligence projects and statistical data mining.

**International Law for Management 82155**

5 quarter/3.3 semester units

The course of International Law for Management has the aim to offer students a general overview of the public international law and domestic law applicable to international business transactions between private parties, as well as the public international law applicable to trade and investment relations between or among States. This field also involves the analysis of international organizations related to international business and economic activity, including institutional organizations/structures (GATT/WTO, IMF, NAFTA, EU) and regulatory Authorities. At the end of the course, students are expected to understand the regulatory framework of international business transactions, as well as how States relate to one another in the international economy.

**Financial Statement Analysis 72920**

5 quarter/3.3 semester units

The learning objectives for this course are: To help students to further develop a thorough understanding of corporate external reporting practices; To provide students an understanding of how to use financial statement information in analyzing a firm's performance and financial position; and To help students to understand how to carry out business analysis and valuation through a comprehensive approach, in order to value the equity and debt securities of a firm.

**Problem Solving in Industrial Companies: Real Business Cases 82205**

6 quarter/4 semester units

The course objective is to offer students a practical approach in solving managerial problems in industrial companies. The method is based on real case studies proposed by companies of the area, with interviews, data analysis and presentations to the management of the company.

**Risk Management 34547**

5 quarter/3.3 semester units

This course focuses on finance-related risk management techniques designed to maximize value of firm. The course highlights the management of financial risk with emphasis on recognition of financial price risk and tools of risk management from business firm’s perspective. A relevant part of the course is devoted to the analysis of derivatives and their uses in risk management.
**Diversification and Acquisition 34538**

5 quarter/3.3 semester units

The student explores many dimensions of firms growth. He is particularly focused on: 1) acquiring the ability of applying diversification strategies: starting from the analysis of the different reasons that push a company to diversify its business he studies the challenge of building competitive advantage from managing a diversified business portfolio; 2) merger and acquisition strategies: he can understand the reasons that push towards acquisition strategies and knows the critical factors that influence the acquisition success in the most critical phase, the post-acquisition integration of the two companies.

**Business to Business Marketing 73429**

5 quarter/3.3 semester units

The course objective is to give a clear definition of the Business Market (B2B) compared to B2C and B2G. At the end of the course students will be familiar with the concept of a strong long-term relationship with the customers based on trust and satisfaction and the business market itself. In addition, students will be aware of how being “Marketing Oriented” is essential in order to create new customers as well as to implement effective retention plans.

**Brand Management 64703**

5 quarter/3.3 semester units

The course refers to marketing strategies and decisions connected to the the most important outcome of a marketing program, the brand and its value (in competitive and in eco-fin terms). In particular, the student is expected to understand: What is brand value (equity) and its links with marketing strategies; The link between brand equity and the value for the customer (i.e. measurement of the value for the customer techniques); The management of brand and its kinks with the overall marketing strategy of a company.

**Business Venturing 34542**

5 quarter/3.3 semester units

The student explores the many dimensions of new venture creation & growth and acquires the capability to foster innovation and new business formations in independent and corporate settings. He is concerned with content and process questions as well as with formulation and implementation issues that relate to conceptualizing, developing and managing successful new ventures. He is focused on ways to exploit business opportunities as opposed to what opportunity to pursue. He acquires the skill set necessary for crafting a winning business model for his venture, developing and writing a concise, coherent, effective and complete venturing plan, and he is ready for launching his own entrepreneurial business.

**Management Consulting 39050**

5 quarter/3.3 semester units

The course objective is to integrate and transfer the managerial tools that were acquired during the two year program in an operational perspective. A particular focus will be given to the role of consultants in
the strategic decision making of firms, to the management tools used by management consulting firms, to the methodology for the of top management decision making. At the end of the course, participants will have a methodical approach to managerial problem solving in a business company.

### Statistical Sciences

**Nonparametric Statistics 85164**

5 quarter/3.3 semester units

By the end of the course the student knows the fundamentals of the most relevant nonparametric techniques for statistical inference. In particular, the student is able to solve hypothesis testing problems where the conditions for the traditional parametric inferential tools to be applied are not fulfilled; to build nonparametric density estimators or nonparametric estimators of the regression function; and to use these methods in an effective and coherent way.

**Statistical Models and Applications 85160**

8 quarter/5.3 semester units

By the end of the course the student learns the basic notions to define statistical models. In particular, the student is able to estimate parameters, test hypothesis about them and build confidence intervals for generalized linear models and for linear mixed models, and to choose the most suitable model for the specific problem at hand.

**Stochastic Processes and Advanced Time Series 85163**

8 quarter/5.3 semester units

By the end of the course the student knows the basic theory of stochastic processes and martingales. On the theoretical side the student possesses the tools to prove the main results on existence and convergence of conditional expectations and martingales. On the practical side, the student is able to analyze data generated by GARCH, DCS, long memory processes and make inference on the moment estimators.

**Measure Theory 85161**

5 quarter/3.3 semester units

By the end of the course the student is familiar with the basic concepts and results of Lebesgue measure theory (outer measure, measurable sets and connections with topology, Borel sigma algebra) as well as of Lebesgue theory of integrals (measurable functions/random variables, convergence theorems, the Fubini/Tonelli theorem for multivariate integration).

**Experimental Psychology 85171**

5 quarter/3.3 semester units

By the end of the course the student knows the basic constructs of the general psychology and the main methods of the behavior study. In particular the student acquires the basic skills on cognitive and emotional processes.
**Human Genetics 65644**
5 quarter/3.3 semester units

By the end of the course the student knows the analysis of the human genome and the molecular basis of genetic disorders. In particular, the student learns the main approaches for the genetic analysis of Mendelian and complex traits (linkage analysis, association), the elements of molecular pathology and epigenetic mechanisms, the main bioinformatics tools for the analysis of the human genome and some common techniques used in the laboratory.

**Methods and Tools for Official Statistics: Socio-Economic Statistics 85276**
5 quarter/3.3 semester units

By the end of the course the student knows the methodologies adopted by European countries for producing official statistics on main socio-economic phenomena. Particularly, the student should be aware of the data collection and estimation methods adopted by the countries and of the main methodological issues, including the accuracy and the comparability of the official statistics produced by the different countries. The student is also able to analyze and understand the trends of socio-economic phenomena in some European and OECD countries.

**Multivariate Statistics 85195**
5 quarter/3.3 semester units

By the end of the course the student gains an appreciation of the types of problems and questions arising with multivariate data. In particular the student should be able: - to apply and interpret methods of dimension reduction including principal component analysis, multidimensional scaling, factor analysis, canonical variates - to apply and interpret methods for cluster analysis and discrimination - to interpret the output of R procedures for multivariate statistics.

**Econometrics 79062**
5 quarter/3.3 semester units

By the end of the course the student should have acquired the basics of econometric modelling. In particular the student should be able: to specify and estimate linear, single-equation econometric models and to face the endogenous regressors issue; to perform a specification analysis of the model

**Quantitative Finance**

**Financial Mathematics 75318**
5 quarter/3.3 semester units

At the end of the course the student masters the main concepts of financial mathematics. The course will cover the stochastic dynamics of asset prices assumed under the efficient market theory, the concept of arbitrage-free pricing and replicating strategies, leading to the PDE approach to pricing.
Actuarial Mathematics 75319

5 quarter/3.3 semester units

At the end of the course the student masters the main concepts of actuarial mathematics, starting with the main measures of risk analysis. The student will be exposed to the main techniques of evaluation of portfolios of losses for the analysis of portfolios of catastrophe insurance policies.

Economics of Financial Markets 37264

5 quarter/3.3 semester units

At the end of the course knows the economic relationships and decision making in financial markets, choices about funding and risk transfer, both with respect to the kinds of financial products involved, and the choice of the market, such as issuance of equity and bonds to the general public rather than through financial intermediaries. Particular focus is given to the role played in these dynamics by incomplete information.

Statistical Methods for Assessment Management 37757

5 quarter/3.3 semester units

The aim of the course is to provide the basis for modeling and statistical analysis of financial data. By the end of the course the student should be able to apply non-linear models, such as GARCH and extensions, including dynamic conditional score models, to estimate and test the capital asset pricing models, to portfolio selection problems or to estimate the value at risk. Attention will be given also to non-parametric methods.

Innovation and Organization of Culture and the Arts

Law and the Arts 32503

5 quarter/3.3 semester units

Student is expected to get the fundamental notions in the legislative evolution and current setting of cultural heritage and cultural activities. In particular, the student is expected to understand: - the principles - the legislative power - ministerial action and the various subjects - cultural activities - artefacts - resources.

General Management and Arts Organization 81975

5 quarter/3.3 semester units

Arts management faces enormous differences in contexts across the world, in backgrounds and social aspects affecting both consumption and production of arts, in addition to major differences in terms of administrative traditions. While reconstructing systematically these differences will require a whole program on its own on international cultural studies, the course will provide a basic understanding of the variety of contexts within an international comparative view, providing some basic analytical tools and developing skills to deal with these aspects. The focus will be on countries outside the Anglo-Saxon
Based on extensive field research in the last two decades, case studies provided are – with one exception – outside the realm of influence of the common law and commonwealth tradition.

**Service Marketing 37228**

5 quarter/3.3 semester units

The intent of this course is to introduce, discuss, and analyze several topics important to service businesses. After completing this course, the student should: Gain an appreciation for the challenges inherent in marketing and managing services, and in developing/delivering quality service; Learn strategies, tools, and approaches for addressing the challenges of services management and marketing; Develop essential knowledge on the various components of the “services marketing mix” as well as key issues in managing service quality; Become a more perceptive and effective manager (and consumer) through understanding the complexities of service design, delivery, and communication—all aimed at building sustainable service brands; Further develop communication skills and critical thinking through written projects, cases, in-class discussions, and other assignments.

**Art Appreciation 32523**

5 quarter/3.3 semester units

Student is expected to learn the frameworks of management of museum institutions and to understand critical methods for the comprehension of various works of art, through developing a profound understanding of the historical background. - learn methodologies for analyzing works of art - examine the Italian art historical tradition.

**Heritage, History, and the Issue of Organizing 72986**

5 quarter/3.3 semester units

Student is expected to develop knowledge and skills in historical research. Drawing on cases and debates in arts and heritage, the course is focused on methodological issues affecting management discourse in historical terms. Managing (or organizing) is looked at as an element affecting ways in which arts & heritage are dealt with; and as sources itself of current days heritage.

**Science Museums and Exhibitions 84502**

5 quarter/3.3 semester units

The students are expected to understand the important cultural and social role played by museums and other forms of exhibits in the creation and codification of notions of invention and discovery, molding scientific traditions and forging of disciplinary identities. The course will explore the different cultural, economic and social contexts in which museums and other forms of display were rooted, the factors affecting their evolution in the period considered and the legacy of such historical background.