University of Padova

School of Engineering

CATALOGUE OF COURSES HELD IN ENGLISH

FOR ERASMUS, FOREIGN AND ITALIAN STUDENTS

academic year 2013 > 2014

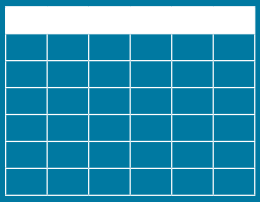
MASTER DEGREES OF THE SCHOOL OF ENGINEERING WITH COURSES HELD IN ENGLISH

Civil Engineering
Aerospace Engineering
Chemical and Process Engineering
Electrical Engineering
Energy Engineering
Materials Engineering
Mechanical Engineering
Automation Engineering
Computer Engineering
Electronical Engineering
Telecommunications Engineering
Engineering and Management (Vicenza campus)
Product Innovation Engineering (Vicenza campus)

MASTER DEGREE OF THE SCHOOL OF ENGINEERING ENTIRELY HELD IN ENGLISH

Enviromental Engineering

Master degree = Second-cycle degree



FOR COURSES BASED ON A SEMESTER ORGANIZATION

First semester: October 1st, 2013 to January 25th, 2014
Second semester: March 3rd, 2014 to June 14th, 2014

FOR COURSES BASED ON A TRIMESTER ORGANIZATION

First trimester: October 1st, 2013 to December 7th, 2013
Second trimester: January 13th, 2014 to March 15th, 2014
Third trimester: April 7th, 2014 to June 21th, 2014

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IRONMAKING AND STEELMAKING

NANOSTRUCTURED MATERIALS

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SPORTS ENGINEERING AND REHABILITATION DEVICES

department of Information Engineering

TELECOMMUNICATIONS NETWORKS

COMPUTER NETWORKS

COMPUTER NETWORK MANAGEMENT

INNOVATION AND PROJECT MANAGEMENT

NETWORK MODELLING

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CHANNEL CODES AND CAPACITY

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NETWORK MODELLING

NETWORK SECURITY

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WIRELESS SYSTEMS AND NETWORKS

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OPERATIONS RESEARCH APPLICATIONS

PRODUCT VARIETY MANAGEMENT

QUALITY AND METROLOGY IN MANUFACTURING

SERVICE OPERATIONS MANAGEMENT

STATISTICAL METHODS AND APPLICATIONS

DESIGN WITH COMPOSITE MATERIALS

QUALITY AND METROLOGY IN MANUFACTURING

ASEISMIC DESIGN OF BUILDING STRUCTURES

Master degree in Civil Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 9 ECTS

1

- Seismic action and buildings performance related to code prescribed limit states.
- General criteria for aseismic design and modelling of structures.
- Methods for analysis and verification of RC and load-bearing masonry buildings and buildings with base isolation systems. Example of design for RC buildings: comparison between modal analyses and nonlinear static analyses (push-over); comparison between frame and wall-system structures. Example of design for load-bearing masonry buildings: comparison between static linear analyses and static non-linear analyses; comparison between un-reinforced and reinforced masonry buildings.
- Basics of base-isolation systems. Example of design for buildings with base isolation.
- Numerical methods for static and dynamic analysis of structures and application with software codes.
- Experimental methods in earthquake engineering.

NEARSHORE HYDRODYNAMICS AND COASTAL PROTECTION

Master degree in Civil Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Luca Martinelli
Credits: 9 ECTS

2

- WAVE THEORY: elementary theory of waves, the dispersion relation, diffraction, refraction, shoaling, wave breaking process, radiation stress, wave set-up, Piling up. Longitudinal coastal currents (longshore), cross (rip) and return (undertow) currents. Distribution of the longshore currents induced by wave breaking. Sea level rise. Astronomical tide. Storm surge. Subsidence.
- SEDIMENT TRANSPORT Average wave climate concept. Sediment transport mechanisms, depth of closure. Equilibrium profile. Dean profile. Longitudinal and cross-shore transport. CERC formula, Equation of the shore line (diffusion model). Distribution of the longshore sediment transport, Bijker formula. Sediment balance. Elements of coastal morphology. The beaches: the size of the sediment. Physiographic unit.
- COASTAL PROTECTION Selection of the design wave. Return period, probability distribution and cumulative frequency. Frequency factor. Materials, mechanical properties. Beach nourishment. Techniques, fill factor concept. Initial volumes and reintegration. Long-term effectiveness of the nourishments. Dunes. Detached breakwaters, emerged and submerged, innovative works, geotextiles, bypass systems of the sands. Dredging near shore and offshore, Flooding risk. Global Change: sea level rise and coastal erosion, coastal flooding and risk assessment.
- TECHNOLOGIES: pontoons, boats, tugs.

Hydraulic excavators, mechanical, buckets for excavations in water. Geotextiles, laying methods. Analysis of the costs and timings. Planning areas. Impact assessment of the work, the authorization process.

- PHYSICAL AND NUMERICAL MODELING Models for wave propagation, circulation, morphological, morpho-dynamic models. One line, 2D, 3D models. Froude scale, theory of wave generation, laboratory instruments, calibration procedures.
- WAVE ENERGY CONVERTERS Seminar by: Prof. P. Frigaard, Aalborg University (DK), director of the Civil Engineering Department, which assesses possible interest to carry out one/two thesis in Aalborg.
- LABORATORY Exercises: 1) Calibration of wave gauges; 2) Generation of a regular wave 3) Generation of an irregular wave 4) Data acquisition 5) Optional: Perform a simple experiment (based on availability of the laboratory)
- MATLAB OR OCTAVE EXERCISES 1) Introduction; Operations between vectors; Functions; Charts; Solution dispersion relation of the waves, if/for cycles, load data from laboratory 2) Design of a nourishment, analysis of wave climate; 3) Design of nourishment, 4) design of groin system (assessment annual longitudinal transport distribution) 5) Analysis of Laboratory data: Identification of incident and reflected waves, Evaluation of transmission coefficient, of loads.

NON LINEAR SOLID AND STRUCTURAL MECHANICS

Master degree in Civil Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Carmelo Majorana
Credits: 9 ECTS

PRECAST AND TIMBER STRUCTURES

Master degree in Civil Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 9 ECTS

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- R.C. Precast Structures: Construction industrialization concept. General design principles. Design tolerances. Frame and Shear Walls Structures Construction typologies and concepts. Single and Multi-storey buildings: plane and spatial static schemes; horizontal and vertical joints. Industrial buildings: bearings and scheme problems. Particular schemes. Precast r.c. and beams: typologies, design requirements, structural details. Slabs: hollow core, double-tee, ribbed and special roofing elements. Structural elements: corbels, diffusion zones, foundation elements. Deep and shallow foundations. Connections: typology, preliminary design and final check. Mechanical devices for fixing, lifting and bearing. Pre-tensioning and post-tensioning technologies and concepts. Facade panels: typology and computation. Bracing calculation (shear walls or plane trusses). Lateral stability of precast r.c. and p.c. large depth beams and columns, instability in precast structures, lateral action effects. Beam stability in temporary and final conditions. Design examples and reinforcement details. Numerical models for static and seismic design. Performance in recent seismic events. Seismic retrofitting of existing structures.
- Timber Structures: Properties of timber: anisotropy, moisture and long duration effects. Consequence of timber properties on structural analysis and detailing. Design standards for timber structures. Overview of glulam and manufactured wood products. Static and seismic design concepts within the limit design approach. Introduction to main timber construction technologies: frame structures and shear-wall platform frame of crossLam structures. Review of loading formulation: static and seismic loading. Design of structural members: beam, columns, floor diaphragms, shear-wall, trusses. Traditional and modern connections: typologies and design. Analytical and numerical models for timber structures. Design, detailing and structural analysis of timber roof structures, buildings and bridges. Discussion of design examples.
- Common aspects: Approach to fire design of precast/prestressed RC and Timber Structures.

WATER DISTRIBUTION AND DRAINAGE SYSTEMS

Master degree in Civil Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Nadia Ursino
Credits: 9 ECTS

5

- The hydrologic cycle. The urban hydrologic cycle. Groundwater hydrology-ground water flow. Transport processes: advection dispersion dilution, reaction. Mechanical treatment processes. Sedimentation, filtration. Water availability. Water reuse.
- Project and numerical modelling of the following hydraulic structures: water distribution network; storage tanks; drainage systems; pumping stations; infiltrations systems and other best management practices.

AIR POLLUTION CONTROL

Master Degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Antonio Mantovani
Credits: 6 ECTS

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APPLIED ACOUSTIC

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Dr. Antonino Di Bella
Credits: 6 ECTS

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COASTAL MANAGEMENT AND PROTECTION

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Piero Ruol
Credits: 6 ECTS

8

- Characteristics of the marine environment.
- Coastal climate: wind, currents, sea level oscillations.
- Short waves: theoretical approach. Wave generation, forecasting and hindcasting. Wave regimes and extreme conditions evaluation. Wave propagation from offshore to shallow waters and associates phenomena. Wave-structures interactions.
- Hydrodynamics of coastal regions. Beach regimes, sediment characteristics. Costal morphodynamics, costal processes. Cross-shore and long-shore sediment transport. River deltas and inlets dynamics.
- Shore protection interventions: hard interventions (groins, detached breakwaters, etc.), soft interventions (beach nourishment) and mixed solutions. Dune systems.
- Coastal management and environmental impact assessment of different policies. Mathematical and physical models for coastal studies.

DESIGN OF STRUCTURES FOR ENVIRONMENTAL PROTECTION

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Francesco Pesavento
Credits: 9 ECTS

9

- Structural safety. Limit state method. Actions on structural systems.
- Materials for constructions. Structural behaviour of reinforced concrete elements.
- Bond and anchorage.
- Ultimate state for flexure and axial load. Ultimate state for shear and torsion. Ultimate state for stability. Serviceability limit states.
- Elements of dynamics and seismic design.
- First elements of Finite Element Method. Elements of design of steel structures.
- Verification of structural elements with Eurocodes. Numerical examples.

ECOTOXICOLOGY

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: To be appointed
Credits: 6 ECTS

10

- Environmental exposure and effect assessment of chemicals. Exposure and effect assessments are key elements for EU classifications and risk assessments of chemicals. The exposure assessment covers the environmental chemical fate i.e. transport, degradation, intermedia transfer and partitioning of chemicals in different parts of the environment. These processes like biodegradation, hydrolysis, photodegradation, sorption, volatilization, and bioaccumulation are fundamental for understanding the environmental behaviour of chemicals. The processes are related to the physico-chemical and chemical structure properties and to the characteristics of the environmental compartments (water, aquatic sediments, aquatic biota, soil, and air). Calculation exercises and computer-based models for distribution of compounds are used to illustrate the environmental chemical fate. The effect assessment covers ecotoxicological effects of chemicals. This subject is taught through lectures dealing with the theoretical aspects of toxicity testing and regulatory use of toxicity data and through field/lab experiences.
- Environmental problems from local to landscape scale (i.e. global warming).

ENVIRONMENTAL ELECTRICAL SCIENCE

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Prof. Alvise Maschio
Credits: 6 ECTS

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- Analysis of the environmental impact of electromagnetic fields.
- Different effects due to the values of the frequency of the fields and biological effects, analysed and compared with the present regulations.
- Possible policies of prevention and protection.

ENVIRONMENTAL FLUID MECHANICS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Prof. Stefano Lanzoni
Credits: 6 ECTS

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- General principles: mass and energy balances; molecular diffusion; ensemble and temporal averages; ensemble mean concentration; ensemble mean cloud and ensemble mean of clouds; turbulent diffusion; laminar and turbulent dispersion.
- Outlline of chemical reaction kinetics and of equilibrium chemical modeling.
- Transport and mixing in rivers: mass balance equation; Streeter-Phelps equation and its improvements; waste load allocation; Dissolved Oxygen dynamics in wide rivers and estuaries; outline of numerical modeling of the convection-diffusion equation.
- Transport and mixing in lakes: characteristics of water circulation in lakes; horizontal and vertical mixing in the Epilimnion and in the Hypolimnion; phosphorous as a limiting nutrient; mass balance of total phosphorous in lakes, nutrient loading criteria; dynamic ecosystem models for eutrophication assessments.

ENVIRONMENTAL GEOTECHNICS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Marco Favaretti
Credits: 6 ECTS

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- COMPACTION: theory, geotechnical properties and structure of compacted soils, field compaction equipment. In situ and laboratory permeability and shear tests on compacted samples.
- SLOPE STABILITY: Peak and residual shear strength. Infinite and limited height slopes. Classification of landslides. Landslides monitoring (inclinometers, piezometers, etc.). Static and dynamics conditions, Safety factors according to limit equilibrium methods.
- GEOSYNTHETICS: designing with geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners etc.
- SOLID WASTE LANDFILL: Design concepts and construction layout. Top and bottom natural and syntetic barriers. Shear strength and compressibility of municipal and industrial solid waste. Slurry walls.

ENVIRONMENTAL HYDRAULICS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 2nd Semester
Lecturer: Prof. Andrea Marion
Credits: 6 ECTS

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- Modern advances in environmental hydraulics, moving forward from classical theories of advection, dispersion and sediment transport treated in basic courses.
- State-of-the-art scientific knowledge and practical engineering tools (such as tracer tests) for water quality mathematical and physical modelling including surface and hyporheic transport of solutes and sediments.
- Procedures required to perform Environmental Assessment Studies on the design of hydraulic structures for irrigation, renewable energy production and river and wetland restoration.
- Risk analysis and vulnerability assessment of environmental damages caused by hydro-geological extreme events, including collapse of hydraulic structures, sewer overflow, overaggradation and flooding.

ENVIRONMENTAL IMPACT AND LIFE CYCLE ASSESSMENT

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Luca Palmeri
Credits: 6 ECTS

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- Environmental impact assessment procedure: legislation (European and national), administrative practice, environmental impact study document writing and tools for the evaluation of impacts.
- Strategic environmental evaluation, incidence evaluation and integrated pollution prevention and control.
- Introduction to the general theory of decision making and of decision support systems. Principal evaluation tools, e.g. multi-criteria analysis, risk analysis and life cycle assessment.
- Applications to real case studies.

ENVIRONMENTAL PROJECT WORK

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Raffaello Cossu
Credits: 6 ECTS

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- Analysis of the composition and production of solid waste in a given basin, calculation of the flows of the different fractions after separate collection, choice and dimensioning of pre-treatment systems of the non-separated fraction.
- Dimensioning of a landfill according to current legislation.
- Graphical representation of all parts of a system, in particular the bottom barrier, leachate drainage system and extraction, biogas collection and final cover.
- Writing of a Technical report, including the economical evaluation metric calculation.
- A real-scale wastewater treatment aimed at complying with legal limitations established for discharges, including civil engineering works and plants, with a view to optimization of the process and operational and maintenance costs. Preparation of graphs illustrating the general plan, block scheme, hydraulic profile, project data, current legislation, discharge limits, depuration guarantees.
- Industrial discharges: problems, project data, specific pollutants, treatment schemes. Dimensioning of the process. Hydraulic profile, load loss, hydraulic calculations.
- Problems connected to civil engineering works.
- The different sections of a treatment plant (water and sludge streams). The main machines used, the different hydraulic components (pipes, valves, special parts, materials, etc.) instruments. Problems in start-up, management, and maintenance. Major problematic issues in the process, design and management countermeasures.

GEOGRAPHICAL INFORMATION SYSTEMS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Prof. Giuseppe Salemi
Credits: 6 ECTS

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- Introduction: Geographical Information Systems and related components.
- Spatial data, maps, thematic features.
- Modelling of spatial data: entities, models, structures, surfaces, networks.
- Multidimensional data management (3D and 4D). Management of attribute data.
- Data analysis: measurements, query, classification, buffer, overlay, spatial interpolation. Data quality, error budgeting and uncertainty.
- Management of a GIS project: identification, design, implementation, evaluation.

GEOLOGY AND GEOCHEMISTRY

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Raffaele Sassi
Credits: 6 ECTS

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- Propedeutical concepts. Earth internal structure and outline on plate tectonics.
- Mineralogy. Mineral properties. Outline on silicate structures and classification. Clay minerals. Diagnostic methods.
- Petrology and petrography. Magmatic, sedimentary and metamorphic processes and related rocks.
- Structural geology. Folds; faults; overthrusting and tectonic nappes. Outline on mechanichs of rock materials.
- Geomorphology. Landscapes forms and their evolution in the glacial, eolic, coastal, fluvial, carsic environment. Mass movement and slope stability. Laboratory. Identification and classification of rocks on hand specimens. Geologic maps and sections: practical examples.
- Chemical differentiation of the Earth. Geospheres. Geochemical classification of the elements. Chemical fractionation. Geochemistry of the petrogenic process.
- Weathering. Dissolution, hydrolysis and oxidation. Silicate, carbonate and sulphide weathering.
- Soils Geochemistry. Clay minerals. Soils mineralogy. Soil composition and classification.
- Geochemistry of surface water. Geochemical survey. Geochemical anomalies. Sampling. Organizing a report on Environmental geochemistry. Analytical methods. Sample preparation. Introduction to SEM, XRPD, XRF, EMP analytic techniques.

GEOLOGY AND GEOPHYSICS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Prof. Silvana Martin
Credits: 6 ECTS

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- Elements of cartography.
- Geographic, UTM and Gauss Boaga coordinates, topographic maps, stratimetry analysis, geological profiles.
- Properties of the rocks and sediments. Review of stratigraphy, rock and sediment classification.
- Elements of structural geology and geomorphology, erosion process and sediment production, geomorphological implications.
- Geological maps of Veneto, Garda, Padua, Trentino, Euganean hills, Apennine, Italy.
- Elements of geothermics. Seismic refraction and reflection survey, examples.
- Electrical survey, resistivity profiles.
- Stress and strain, elasticity, rock reology, fault mechanics, elements of seismotectonic and seismic hazard. Earthquakes seismology.
- Elements of geodynamics, mantle and core physical parametres, geothermal setting and gravity.
- Field laboratories: Structural and geomechanical measures: Euganean hills. Geophysics (geoelectrical and seismical survey): Fenice Parc. Radon measures: Euganean hills.

GROUNDWATER HYDROLOGY

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: To be appointed
Credits: 6 ECTS

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INTERNATIONAL ENVIRONMENTAL LAW

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 6 ECTS

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- International environmental law and treaties.
- European environmental law.
- Environmental liabilities in major industrial accidents (Bhopal and Severo case-studies).
- IPPC Directive and the notion of "Best available techniques".
- International waste law.
- Environmental impact assessment.
- EHS: Environment, Health and Safety.
- Cultural and legal bases of the precautionary principle.
- New technologies and the environment. A case study: nanotechnologies and environmental risk.

MODELLING AND CONTROL OF ENVIRONMENTAL SYSTEMS

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: To be appointed
Credits: 6 ECTS

22

- Generalities about models, physical and mathematical models.
- Concepts of modelling: Types of models, selection of optimal complexity, sensitivity analysis, calibration and validation.
- Models of ecological processes: Physical (mass transport and balance, energetic factors, settling and resuspension), chemical (chemical reactions, hydrolysis, redox, acid-base, adsorbition / desorbition and ion exchange, volatilization) and biological (biological cycles in aquatic environments, photosynthesis, algal growth, zooplankton growth, fish growth, single population growth, ecotoxicological process).
- Trophic network analysis and models.

REMEDIATION OF CONTAMINATED SITES

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Dr. Roberto Raga
Credits: 9 ECTS

23

- Sources to soil and groundwater pollution.
- Characteristics of the contaminants and their interactions with soil and groundwater.
- Sampling and analysis for site characterization according to the current legislation.
- Attenuation and degradation of pollutants.
- In situ and ex-situ techniques for remediation of contaminated soil and groundwater (Biological, Chemical-physical and Thermal treatment): Soil vapour extraction; Air sparging; Soil washing; Chemical oxidation; Thermal desorption and incineration; Bioremediation, Groundwater Remediation (pump and treat, reactive barriers).
- Landfill Remediation.
- Case studies.

RIVER ENGINEERING

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Prof. Paolo Salandin
Credits: 9 ECTS

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- Aims of hydraulic structures and design regulations.
- Elements of hydrology: hydrological cicle; collection and analysis of data; geometrical representation of hydrological basins and of rivers; rainfall data analysis; flood models.
- Hydraulic of rivers and mountain streams.
- Bed-load transport; check dams; riverbank stabilization and protection; stream junctions; levee design and other river improvements; diversion work; culverts and bridges.
- Hydroelectric plants: dam regulation, weir and barrages; energy dissipation; diversion works; canals and hydraulic tunnels.
- Elements of inland waterways.

SOIL PROTECTION PROJECT WORK

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Paolo Carrubba
Credits: 6 ECTS

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- European and national rules for geotechnical design.
- Theories on the horizontal earth pressure under static and seismic loadings.
- Rigid and flexible retaining structures.
- Soil reinforcements and composite structures.
- Landslide stabilizations by means of active and passive solutions.
- Landfill reclamation and stabilization.

SOLID WASTE MANAGEMENT

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Raffaello Cossu
Credits: 9 ECTS

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- Waste production and quality. Current legislations about waste management, resource recovery and disposal of residues.
- Waste management systems and strategies.
- Waste collection and transport. Separate collection and material recovery. Mechanical selection schemes and processes. Separation of single fractions.
- Recycling and recovery processes of material (paper, plastics, glass, etc.). RDF production. Biostabilization processes for the biodegradable fraction. Energy recovery from waste: biological and thermal processes. Management and disposal of residues.
- Landfill technologies. Processes in landfill. Barriers, drainage and leachate collection. Mathematical models for evaluation of leachate and biogas production. Landfill long term emissions. Landfill aftercare. Top cover systems and closure of landfills.
- Biogas collection and treatment. Leachate treatment.

SUSTAINABLE AND RENEWABLE RESOURCES

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: To be appointed
Credits: 6 ECTS

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General concepts of sustainability and sustainable development; biological and energy cycles; sustainable assessments; renewable resources; social sustainability; health & wellbeing in relation to sustainable developments.

WASTE MANAGEMENT IN DEVELOPING COUNTRIES

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 6 ECTS

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WASTEWATER TREATMENT

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: To be appointed
Credits: 9 ECTS

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WATER RESOURCES MANAGEMENT

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Gianluca Botter
Credits: 6 ECTS

30

- Water resources and the hydrologic cycle: recalling basic concepts from probability and hydrology.
- Modelling and forecasting of rainfall processes: i) Zero-dimensional rainfall models: poissoninan models; Cluster models (Bartlett Lewis, Neymann-Scott); ii) Rainfall forecasting (outline): global circulation models, limited area models, downscaling, meteorologic forecasting and flood protection.
- Soil moisture dynamics: i) soil moisture dynamics and runoff production; ii) stochastic modelling of soil moisture; iii) soil moisture and plant nutrition.
- Streamflow characteristics: i) floods and droughts; ii) continuous models of the hydrologic response; iii) stochastic analysis of streamflows series (duration curves, distributions of extremes).
- Water resources management models: i) reservoirs: floods mitigation, industrial and agricultural supply; ii) Reservoirs regulation; iii) flood retention plains.
- Irrigation systems and schemes.

WATER SUPPLY TREATMENT

Master degree in Environmental Engineering
Department of Civil, Environmental and Architectural Engineering
Language: English
Teaching period: 1st / 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 6 ECTS

ELECTRICAL ACTUATORS FOR AEROSPACE SYSTEMS

Master degree in Aerospace Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Nicola Bianchi
Credits: 9 ECTS

- Recall of electromechanical energy conversion.
- Analysis of the more used electrical machines: DC motor, induction motor, synchronous machine.
- Classification and machine design criteria. Motors with very high dynamics.
- Power electronics: components, static converters, rectifiers, chopper, inverter, PWM technique.
- Criteria for the choice of electrical machines and drives: load characteristics, mechanical characteristics of the electrical machines, choice of the proper type of drive and control.
- Design criteria, magnetic computation, losses computation, thermal computation.
- Outline of the design of the drive control with speed loop and position loop, according to some electrical machine topologies, block scheme, regulator gains choice.
- Solutions of electrical motors and converters suitable for fault-tolerant applications (temporary or permanent faults).

SATELLITE NAVIGATION

Master degree in Aerospace Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st / 2nd Year - 2nd Semester
Lecturer: Prof. Alessandro Caporali
Credits: 9 ECTS

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- Understanding coordinates, coordinate systems, least squares.
- The propagation of microwaves through the ionosphere and troposphere. Multipath.
- Architecture of a GNSS: the Space Segment, the Control Segment and the User Segment. GPS vs. GLONASS vs. Galileo: code, phase and navigation message. The Time To First Fix. Assisted GPS. EGNOS and WAAS.
- How to compute the coordinates and clock offsets of the GNSS satellites from broadcast ephemeris or postprocessed products.
- The pseudorange data and how to invert them to estimate user coordinates and their accuracy.
- Tracking user coordinates in time: The state transition matrix; epochwise estimates by least squares vs. filtering. Kalman filter formulation. Estimation of coordinates, velocity and acceleration. Inclusion of stochastic error models into the filter.
- How to pack everything into a product: a Google Earth navigator vs. a navigator based on vector cartography.

BIOFUELS AND SUSTAINABLE INDUSTRIAL PROCESSES

Master degree in Chemical and Process Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Fabrizio Bezzo
Credits: 6 ECTS

34

- Open issues in the search for alternative energy for transport
- An overview on production systems: bioethanol (I and II generation), biodiesel (including production form microalgae), biogas
- Scheduling batch processes
- The effect of uncertainty in assessing bioenergy systems: impact on profitability analysis
- Energy integration for sustainable production processes: pinch analysis.
- Pinch analysis and process design: distillation columns, evaporation systems, integration between process and heat and power systems
- Water system design for process sustainability: targeting maximum water reuse and minimum wastewater treatment
- Water consumption in bioenergy processes.

FLUID DYNAMICS SIMULATION

Master degree in Chemical and Process Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Fabrizio Bezzo
Credits: 6 ECTS

35

- Introduction to computational fluid dynamics (CFD). CFD application to the design of process industry equipment.
- Modelling approaches for turbulent flows.
- Introduction to the finite volume method for the solution of conservation equations.
- CFD modelling for the simulation of multiphase and reacting flows.
- Design and scale-up of mixing equipment for homogeneous, multiphase and reactive systems.
- Introduction to Ansys Fluent software.

MULTIPHASE THERMODYNAMICS AND TRANSPORT PHENOMENA

Master degree in Chemical and Process Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Dr. Nicola Elvassore
Credits: 9 ECTS

36

- Introduction to statistical mechanics.
- Multiscale thermodynamics; form microscale to macroscale.
- Techniques of molecular simulations: Montecarlo and molecular dynamics.
- Thermodynamic models and equations of state from intermolecular interaction potentials. Cubic equations of state and perturbed hard sphere equations of state for pure fluids and mixtures. Computational methods for solving equations of state problems.
- The phase-equilibrium problem; vapor-liquid equilibria, liquid-liquid equilibria, solid-liquid equilibria.
- Thermodynamics of systems containing associating fluids, polymers, membranes, hydrogels and electrolytes.
- Thermodynamic of colloidal systems.
- Osmotic pressure and thermodynamics of biological systems.
- Non-equilibrium thermodynamics in multiphase systems.

SEPARATION UNIT OPERATIONS AND PROCESS SIMULATION

Master degree in Chemical and Process Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Prof. Alberto Bertucco
Credits: 12 ECTS

37

- Methods for the calculation of vapor-liquid, liquid-liquid and vapor-liquid-liquid equilibria of both binary and multicomponent systems, and their relevance for the design of separation unit operations with both liquid and gaseous mixtures.
- Design and operation of separation processes: flash, distillation, absorption, stripping, solvent extraction. Apparatus and equipments for thermal separation units involving simultaneous mass and heat transfer: flash drums, distillation towers, absorption and stripping columns. Sizing and rating of sieve trays columns and of packed columns. Equipment for solvent extraction systems: mixer-settlers and continuous extraction columns.
- Block flow diagrams and process flow diagrams in process simulation. Definition, structure and functioning of kinetics, mass/heat transfer and thermodynamics models. Selection of simulation models. Commercial simulators: ASPEN+ and PROII. Simulation and analysis of unit operations and complex chemical processes with recycles.

UNIT OPERATIONS FOR THE FOOD AND PHARMACEUTICAL INDUSTRIES

Master degree in Chemical and Process Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Andrea Claudio Santomaso
Credits: 6 ECTS

38

- Powdered materials and granules as raw materials and final products in the food and pharmaceutical industries.
- Properties and characterization of finely divided solid materials.
- Solid-solid and solid-fluid interactions.
- Distributed properties (size and shape). Bulk properties characterization: density, porosity, flowability, wettability.
- Sizing and size separation: choice and design principles of sifting and screening devices.
- Static analysis of stresses in solids (Mohr -coulomb failure criterion).
- Storage of powders: stresses in silos; design of silos and hoppers according to Jenike procedure; flow function and flow factors.
- Kinematics and dynamic analysis: rheology of granular materials and powders.
- Mixing and segregation of solids: industrial mixers; choice and scale-up of mixers. Sampling.
- Granulation: agglomeration mechanisms; industrial granulators; choice and scale-up of mixers.
- Comminution: physical principles of size reduction; energy required in milling; choice of milling devices.
- Crystallization: principles of crystals formation; type of industrial crystallizers; choice and design criteria.

COMPUTATIONAL ELECTRICAL ENGINEERING

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Piergiorgio Alotto
Credits: 9 ECTS

39

- Elettromagnetism: Maxwell's partial differential equations in terms of potentials, constiutive equations, boundary and interface conditions in terms of potentials, symmetries.
- Finite differences: Regular and irregular grids, curved boundaries, Theta method.
- Finite elements: Triangular and quadrilateral elements, shape functions, weighted residual and variational formulations, applications to 2D, axisymmetric and 3D problems, pre- and postprocessing, applications and critical review.
- Electrical networks: Matrix description of topology, matrix representation of one-port and two-port components, linear networks in DC and steady-state AC, tableau analysis and nodal analysis, transient analysis of linear networks.
- Finite difference time domain method.
- Automatic optimization of electromagnetic devices: Main classes of methods, sensitivity, Pareto optimality.

ELECTRICAL AND ELECTROMAGNETIC MICRO/NANODEVICES

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Daniele Desideri
Credits: 9 ECTS

40

- Introduction. Insights into electromagnetic fields and into materials.
- Electrical and electromagnetic modelling and applications of: micro/nanostructured materials for electromagnetic shielding; ferroelectric and piezoelectric materials; energy harvesting; micro-sensors; micro-nano interconnections and circuits; carbon nanotubes and graphene.
- Realization and characterization of thin films with gas phase deposition: chemical vapour deposition (CVD) and physical vapour deposition (PVD); magnetron sputtering; measurement techniques on thin films.

ELECTRICAL MACHINE DESIGN

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Nicola Bianchi
Credits: 9 ECTS

41

- Design and analysis of electric machines. Design of electrical machines for standard applications. Design of single- and three-phase reactors and transformers, with air and oil cooling system. Synchronous machines. Induction motors. DC motors.
- Design of electrical machines for electrical drives. DC motors with wound rotor and permanent magnet rotor. Brushless motors. Induction motors. Synchronous reluctance motors. Switched reluctance motors. Additional losses and stress due to the electronic converter supply.
- Innovative tools and techniques for the electrical machine design. Optimization techniques as design tools. Applications of electromagnetic field computation tools (Laboratory of finite element analysis of electrical machines).

ELECTRICITY MARKET ECONOMICS

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Arturo Lorenzoni
Credits: 6 ECTS

42

- Price regulation; organisation of the electricity industry.
- Plant despatch and merit order: generation in a competitive market.
- Contracts.
- The operation of the power exchange and the capacity market.
- The transmission line: benefits of the interconnection and optimal transmission capacity. Congestion management.
- Markets for the environment: green certificates, carbon credits, energy efficiency. Financial products for the power market.
- Electricity prices: comparing different contracts. Principles of finance for hedging electricity contracts.

ELECTROMAGNETIC PROCESSING OF MATERIALS

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Michele Forzan
Credits: 6 ECTS

43

- Induction heating systems. Design of an inductor.
- Arc furnaces, resistors ovens, heating by direct current, radiofrequency and microwaves heating.
- Practical laboratory tests or computer models.

INDUSTRIAL PLASMA TECHNOLOGIES

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Piergiorgio Sonato
Credits: 6 ECTS

44

- Discharges in the plasma: dark discharge, breakdown, corona discharge, glow discharge, arc, capacitive and inductive discharges.
- Fundamentals of plasma physics, main plasma parameters, interaction between particles, diffusion and mobility, fluid motion of charged particles, Townsend theory on the ionization, Paschen curve.
- Plasma diagnostics, electrostatic probes.
- Plasma torches: welding and cutting torches, metallurgy and waste treatment torches.
- Surface modifications and coatings by plasma, physical vapour deposition, chemical vapour deposition, plasma enhanced vapour deposition, magnetron sputtering, plasma sterilization.
- Plasma processes in the semiconductor technology, plasma etching.
- Plasma display panels, plasma lighting systems.
- MHD conversion. Spatial propulsion.
- Laboratories: vacuum technology, DC discharges: electrical parameters and plasma parameters, magnetron sputtering: Paschen curve measurement, visit to the space propulsion laboratory.

ROAD ELECTRIC VEHICLES

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Giuseppe Buja
Credits: 6 ECTS

45

- Course introduction (program, outline of electric vehicles history).
- Environmental and energy challenges for road transportation: combustion vs. electromobility.
- Fundamentals of road propulsion (longitudinal and lateral dynamics, driving cycles, energy analysis).
- Electric vehicles classification (Full, Hybrid; Battery, Fuel cell).
- Architecture of the fully electric vehicles.
- Electric drive vs. internal combustion engine propulsion (characteristics, brushless DC drives).
- Technology and characteristics of storage/ generation devices of electric energy [batteries (Pb, NiMH, Li), supercapacitors, fuel cells and hydrogen tanks].
- Hybrid electric vehicles [architectures and energy management, characteristics of the basic architectures (series, parallel and series-parallel)].
- Charging infrastructures (battery charger, V2G capabilities, standards).
- Stability control systems (ABS and TC, ESP).
- Drive-by-wire systems (architectures, components).
- Study cases: design and demonstration (electric scooter, city car and bike).

SYSTEMS FOR AUTOMATION

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Giuseppe Buja
Credits: 9 ECTS

46

- Course introduction (program, outline of electric systems for automation).
- Instantaneous power theory (power theories, p-q powers, current equations and their space and complex representation, p-q power calculation for distorted and unbalanced three-phase systems).
- Grid-connected converter control [devices, converter modelling, sensors, grid synchronization, system architecture, voltage/current control, active power delivery and utility disturbances compensation].
- Microprocessor control systems MCS [structure, operation and modelling of a MCS, outline of digital control (discretization techniques, z-transform)].
- Industrial communication networks (digital communication techniques, ISO/OSI model, physical and data link layers, CAN protocol).
- Mechanical systems (mathematical description, electromechanical analogies, inertial coupling and mechanical resonances).
- Motion system modelling [drive modelling, mechanical sensors (accelerometers, tachometers, encoders)].
- Motion system control (power rate, current/ torque control, acceleration control, speed control, position control, design by Matlab/ Simulink).
- Dependability theory and functional safety standards (dependability fundamentals, fault-tolerance, functional safety fundamentals, SIL).

THERMONUCLEAR FUSION

Master degree in Electrical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Paolo Bettini
Credits: 6 ECTS

47

- World Energy and the Role for Fusion: the existing energy options.
- Introduction to Plasma Physics and Controlled Fusion.
- Electromagnetic fields and forces, charged particle trajectories, fluid equations, ideal MHD.
- Plasma confinement: magnetic confinement, axisymmetric toroidal equilibrium.
- Cylindrical configurations: Z-pinch, theta-pinch, screw-pinch. Toroidal configurations: Tokamaks, RFPs.
- Magnetic field calculations, magnet design and optimization, coil forces, superconducting coils.
- Power supplies, energy storage and transfer systems.
- Plasma Heating: Ohmic Heating (OH), Neutral Beam Injection (NBI), Radio Frequency (RF) heating.
- Plasma facing components: Blanket, Divertor.
- Diagnostics: Magnetic measurements, active wave diagnostics.
- Fusion Power plants: DEMO.

BIOFUELS AND SUSTAINABLE INDUSTRIAL PROCESSES

Master degree in Energy Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Fabrizio Bezzo
Credits: 6 ECTS

48

- Open issues in the search for alternative energy for transport
- An overview on production systems: bioethanol (I and II generation), biodiesel (including production form microalgae), biogas
- Scheduling batch processes
- The effect of uncertainty in assessing bioenergy systems: impact on profitability analysis
- Energy integration for sustainable production processes: pinch analysis.
- Pinch analysis and process design: distillation columns, evaporation systems, integration between process and heat and power systems
- Water system design for process sustainability: targeting maximum water reuse and minimum wastewater treatment
- Water consumption in bioenergy processes.

ENERGY AND BUILDINGS

Master degree in Energy Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 6 ECTS

49

- Indoor environmental quality (comfort, ventilation and lighting). Determination of weather conditions for the energy calculation of a building.
- Determination of main characteristics and problems related to building envelope: insulation, thermal bridges, condensation.
- Determination of main characteristics and problems related to glazing surfaces: lighting transmission, solar energy transmisison, shading, daylighting and glare.
- Thermal balance of a room (steady state and dynamic). Determination of heating, domestic hot water, cooling and consumptions of a building. Energy and environmental certification and labelling. The concept of multi-energy systems and zero emission buildings.

ELECTROMAGNETIC PROCESSING OF MATERIALS

Master degree in Materials Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Dr. Michele Forzan
Credits: 9 ECTS

50

- Induction heating systems. Design of an inductor.
- Arc furnaces, resistors ovens, heating by direct current, radiofrequency and microwaves heating.
- Practical laboratory tests or computer models.

GLASS SCIENCE AND TECHNOLOGY

Master degree in Materials Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Paolo Colombo
Credits: 6 ECTS

51

- Glass Structure: definition of glass. Glass transition range. Vetrification conditions: structural and kinetic theories. Phase separation.
- Structure of inorganic glasses and proposed models. Brief introduction to non-oxide glasses.
- Properties: rheological properties (viscosity); thermal properties (specific heat, thermal conductivity, thermal expansion); chemical properties (glass surface, acid and alkaline attack, water attack and weathering); electrical properties (ionic and electronic conductivity, semiconductor glasses); optical properties (refraction, reflection, absorption, transmission, colored glasses, photochromic glasses, photosensitive glasses, electrochromic glasses, optical fibers).
- Glass technology: raw materials and calculation of batch composition.
- Types of industrial furnaces. Melting, homogeneizing, fining and conditioning. Annealing.
- Flat glass: sheet glass, plate glass, float glass. Fusion process.
- Container glass: blow-blow and press-blow. Main characteristics of glass containers.

IRONMAKING AND STEELMAKING

Master degree in Materials Engineering
Department of Industrial Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Manuele Dabalà
Credits: 6 ECTS

52

- Raw material for iron and steel production: an overview on iron ore extraction and enrichment processes; coals, limestone.
- Process physicochemical fundamentals.
- Physicochemicals of blast furnace process: the reduction of iron ores.
- Overview of Blast Furnace Process.
- Balances of Blast Furnace.
- Physicochemicals of oxygen steelmaking process.
- Overview of oxygen steelmaking process.
- Balances of BOF converter.
- Electric Steelmaking: the Electric Arc Furnace.
- Secondary steelmaking.
- Vacuum processes.
- High alloyed steelmaking: Stainless steel production, AOD process.
- Continuous Casting: overview and controls of microstructure.
- Remelting processes.
- Foundry: Overview and processes for moulding.

NANOSTRUCTURED MATERIALS

Master degree in Materials Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Alessandro Martucci
Credits: 9 ECTS

53

- Physical chemistry of solid surface: surface energy, electrostatic and steric stabilization.
- Chemical synthesis of nanoparticles (metals, semiconductors, oxides), physical properties, applications.
- Chemical synthesis of nanorods, nanowires and nanotubes, physical properties and applications.
- Thin films depositions.
- Nanostructures fabricated by physical techniques: lithography and microfabbrication.
- Nanocomposites: synthesis and properties.

INTEGRATED DESIGN OF PRODUCT, PROCESS AND PRODUCTION SYSTEMS

Master degree in Mechanical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 6 ECTS

54

MODELLING AND SIMULATION OF MECHANICAL SYSTEMS

Master degree in Mechanical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Roberto Lot
Credits: 6 ECTS

55

- Theory of multibody systems: kinematic and dynamic analysis, algorithmic and numerical implications.
- Elements of 3D geometrical modelling (with CATIA).
- Multibody modelling bricks: kinematic joints, contact models, shock models, friction models, tire models.
- Modelling of complex mechanical systems: model design and management, sub-modelling, system control.
- Implementation and discussion of many cases study (with LMS Virtual Lab Motion).

QUALITY OF INDUSTRIAL PRODUCTION

Master degree in Mechanical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Enrico Savio
Credits: 6 ECTS

56

- Introduction to quality systems. Quality assurance of manufacturing processes: testing of machine tools, statistical process control, evaluation of process capabilities.
- Surface metrology. Verification of roughness in industrial practice. Advanced mapping of surface geometry, nanometrology of surfaces and microparts.
- Dimensional and form metrology. Coordinate measuring machines and systems. Non-contact metrology. Computed tomography for dimensional metrology.
- Product conformity assessment: tolerance verification, decision rules in acceptance testing, procedures for the quantification of measurement uncertainty. Quality assurance of measuring systems.

Note: the course includes 16 hours of hands-on experiments; measured data to be analysed by the student as homework and discussed at the final colloquium.

SPORTS ENGINEERING AND REHABILITATION DEVICES

Master degree in Mechanical Engineering
Department of Industrial Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Nicola Petrone
Credits: 6 ECTS

57

Fundamentals:

- Basic knowledge of anatomy and physiology of the musculoskeletal system.
- Quantitative anthropometry.
- Modelling equilibrium and motion of the segments of the human body.
- Analysis of gait and running.

Methodologies:

- Sensors and systems for the evaluation of kinematic, kinetic and physiological parameters during the sport exercise: motion capture systems, force platforms, pressure insoles, electromyography.
- Design and calibration of strain gauge multi-component load cells for the collection of functional loads at the human body – equipment interfaces.
- Musculoskeletal simulation codes.
- Design of a research project for the statistical evaluation of sport and rehabilitation devices.

Applications:

- Classification of sport equipment and rehabilitation devices.
- Identification of performance, comfort and safety parameters of sport – rehabilitation equipment.
- Knowledge of safety standards, implementation of standard tests methods.
- Functional evaluation of sport equipment, orthoses, assistive technologies, prostheses and training or rehabilitation machines.

TELECOMMUNICATIONS NETWORKS

Master degree in Automation Engineering
Department of Information Engineering
Language: English
Teaching period: 1st / 2nd Year - 1st Semester
Lecturer: Dr. Andrea Zanella
Credits: 9 ECTS

58

The module aims at providing both practical and methodological tools for network design, analysis and planning. Some preliminary lessons will review the basic technical aspects of networking, such as terminology, standards, protocols structure, communication devices, and so on. The major part of the course is devoted to the study of the most prominent networking protocols and algorithms, with reference to state of the art technologies. In particular, the course will be introductory to the architecture and the protocols of Internet, and to the performance analysis of the most common link control and transmission control protocols. Some of the topics that will be considered by the course are the following:

- Data traffic sources: multimedia streams and content (characterization and modeling)
- Circuit switched networks:basics of Telephone and long-distance networks
- Packet switched networks: basics of data networks (Ethernet, WiFi, Bluetooth)
- ISO/OSI and TCP/IP protocol stacks:protocols and interfaces (MAC, DLL, NET, TRAN)/li>
- Quality of Service: Congestion control and Scheduling algorithms
- Application layer: basics of DNS, SMPT, FTP, HTTP, P2P.

COMPUTER NETWORKS

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Dr. Andrea Zanella
Credits: 9 ECTS

- Quick review of basic networking and performance analysis concepts, such as terminology, standards, protocols structure, communication devices, and queueing theory.
- Study of the most prominent networking protocols and algorithms, with reference to state of the art technologies.
- Introduction to the Internet architecture and protocols, and to the performance analysis of the most common medium access control, link layer and transport protocols.
- Laboratory: Static routing, Cisco router operating system (IOS), RIP (with Quagga & router), Socket programming, TCP & UDP (flow control, congestion control, IP fragmentation), Firewall.

COMPUTER NETWORK MANAGEMENT

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: To be appointed
Credits: 9 ECTS

INNOVATION AND PROJECT MANAGEMENT

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Moreno Muffatto
Credits: 6 ECTS

61

- Characteristics of a project. The basic parameters of the project (scope, resources, time, cost, quality). The phases of the project life cycle. Stakeholders and their influence on the project. The areas of knowledge in the management of a project (scope, time, cost, quality, risk, human resources, communication, procurement, integration). Project planning. Project Quality Management. Project Risk Management. The organizational dimension in project management. Creation and management of the project team. The relationship aspects in project management (communication, team building, leadership). The economic and financial dimension of the project (evaluation criteria, the economic control of the project). Monitoring and control of the project. Project closure and lessons learned.
- Types of innovation projects. The sources of innovation. The process of developing a new product (phases and methodologies). The creativity dimension in the development of a new product / service. The protection of intellectual property (patents, trademarks, etc.). Organizational and management development team. Innovative processes and relationships between companies. Communication and marketing of innovation.
- Innovation projects and new business creation. The entrepreneurial dimension of a project. The recognition of a business opportunity. The identification and development of a business model. Business development.

NETWORK MODELLING

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Michele Zorzi
Credits: 9 ECTS

62

- Probability theory review.
- Markov chains, their limiting behaviour.
- Poisson processes; renewal processes; applications and examples.

NETWORK SECURITY

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Nicola Laurenti
Credits: 6 ECTS

63

- Basic security notions and definitions.
- Unconditional vs computational security.
- Cryptographic and non cryptographic security mechanisms.
- Network security protocols at different layers.
- Further security issues for wireless, ad hoc and mobile networks.

WIRELESS SYSTEMS AND NETWORKS

Master degree in Computer Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Michele Rossi
Credits: 9 ECTS

64

The course aims at providing some advanced knowledge on protocol stacks for wireless communications, including the analysis of distributed wireless networks, state of the art wireless technologies and current trends. The topics that will be covered will range from link layer technology to routing over ad hoc wireless networks and application layer coding. Selected topics will be presented using recent research papers from the literature as a source of reference. In the first part of the course, the student will be introduced to the technology used in modern ISO/OSI stacks, characterizing the performance of the single layers and then of the protocol stack as a whole. In the second half of the course, the focus will be on distributed ad hoc network architectures, with particular emphasis on distributed Wi-Fi networks (IEEE802.11 a/g/h/n) and wireless sensor networks (IEEE 802.15.4). The corresponding technologies (IEEE 802.11 and 802.15.4) will be introduced in detail (PHY/MAC/routing), characterizing their performance through suitable mathematical tools. The course will be research oriented and, at the end of it, the student will have a clear view on modern protocol technology, and will be able to carry out its performance evaluation through tractable mathematical tools. Some of the topics that will be considered by the course are:

- Hybrid ARQ systems: mathematical modeling and performance evaluation.
- Application layer coding: fountain codes, theory and applications.
- IEEE 802.11 a/g/h/n and IEEE 802.15.4:

channel access technology, adaptive modulation and coding techniques, dynamic rate control algorithms.
- Routing over multi-hop networks: description and performance evaluation of selected routing algorithms in multi-hop wireless networks.
- Wireless sensor networks: relevant channel access and routing algorithms, analytical models and their performance analysis, study of systems powered by energy harvesting sources.

INNOVATION AND PROJECT MANAGEMENT

Master degree in Electronical Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Moreno Muffatto
Credits: 6 ECTS

- Characteristics of a project. The basic parameters of the project (scope, resources, time, cost, quality). The phases of the project life cycle. Stakeholders and their influence on the project. The areas of knowledge in the management of a project (scope, time, cost, quality, risk, human resources, communication, procurement, integration). Project planning. Project Quality Management. Project Risk Management. The organizational dimension in project management. Creation and management of the project team. The relationship aspects in project management (communication, team building, leadership). The economic and financial dimension of the project (evaluation criteria, the economic control of the project). Monitoring and control of the project. Project closure and lessons learned.
- Types of innovation projects. The sources of innovation. The process of developing a new product (phases and methodologies). The creativity dimension in the development of a new product / service. The protection of intellectual property (patents, trademarks, etc.). Organizational and management development team. Innovative processes and relationships between companies. Communication and marketing of innovation.
- Innovation projects and new business creation. The entrepreneurial dimension of a project. The recognition of a business opportunity. The identification and development of a business model. Business development.

POWER ELECTRONICS 2

Master degree in Electronical Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Luca Corradini
Credits: 6 ECTS

66

- Fourth order DC-DC converters Cuk and SEPIC.
- State-space models of switched-mode power converters. State-space averaging techniques in CCM and DCM.
- Fundamentals of digital control of switched-mode power converters: introduction, main elements of a digitally controlled converter; modelling of naturally-sampled and uniformly-sampled Pulse-Width Modulators; discrete-time modelling of converters and controller design: continuous-time methods and discretization-based methods; overview of the exact discrete-time converter modelling.
- Single-phase inverters: overview and main modulation techniques.
- High-quality Power Factor Correctors (PFC): main topologies and control techniques; small-signal modelling in CCM and DCM.
- Three-phase inverters: square-wave and PWM modulations, control of the load neutral point; alpha-beta transform and Space Vector Modulation.
- Use of MATLAB/Simulink for system-level simulation and design of converters.

ADVANCED COMMUNICATION TECHNIQUES

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: To be appointed
Credits: 6 ECTS

67

- Introduction, dispersive channel model, filterbank modulation.
- Orthogonal Frequency Division Multiplexing (OFDM). Zero padding OFDM. Choice of symbol size. Waterfilling.
- Time and Frequency Synchronization for OFDM. Channel estimation for OFDM. LS and MMSE Estimations. Expectation-minimization blind channel estimation.
- Peak to average power reduction (PAPR): the problem. Clipping for PAPR. Tone reservation and tone injection. Single carrier-frequency division multiple access (SC-FDMA)
- Matlab and C tools for simulation of communication systems.
- Multiple input multiple output (MIMO) channel model and examples – MIMO capacity. MISO capacity. Single input multiple output (SIMO) capacity- Pairwise error prob. Space-time block codes (STBC). Alamouti STBC–Maximum likelihood (ML) decoding of Alamouti. Extension of Alamouti code.
- Spatial multiplexing (SM) minimum mean square error receiver ML detection for SM Sphere decoder.

CHANNEL CODES AND CAPACITY

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Tomaso Erseghe
Credits: 9 ECTS

68

- Hard versus soft decoding of block codes.
- Introduction to linear codes.
- Comparing codes performance via bit error rate and spectral efficiency.
- Convolutional codes: properties, performance, and efficient decoding using the Viterbi algorithm.
- Codes on graphs: convolutional, turbo, LDPC, repeat-accumulate, BICM, and trellis codes.
- Decoding via message passing algorithms.
- Analytical study of message passing performance for LDPCs.
- Shannon's capacity theorem: proof of direct and converse theorems.
- Capacity for Gaussian, waveform, and parallel channels.
- Capacity and coding for MIMO and multiple-antenna systems.
- Introduction to network information theory and network coding.

COMPUTER VISION AND 3D GRAPHICS

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Guido Maria Cortelazzo
Credits: 6 ECTS

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The course offers a guided tour of the computer vision and computer graphics topics needed for current virtual and augmented reality applications.
The course rationale is the introduction of the notions and techniques to go a) from 3D scenes to images by way of real imaging systems; b) from images to 3D scene models; a) and from 3D models to images by way of virtual cameras. Part a) explains the operation and the mathematical models of current imaging systems (e.g., video-cameras, Time of Flight systems, kinect) in the language of computational photography. Part b) covers two topics: 3D recontruction from images (with special focus on stereo and active stereo systems) and the 3D modeling pipeline (i.e., the procedures to obtain full 3D models from depth maps). Part (c) presents the rendering methods as approximate solution of the rendering equation.
Some of the topics considered by the course are:

- Image formation: mathematical models of cameras and Time of Flight systems.
- Camera calibration: procedures for metrical measurements from images.
- Computational stereopsis: 3D scene structure derived from 2 or more images obtained from calibrated cameras.
- Structure from motion: 3D scene structure derived from 1 or more calibrated moving cameras.
- Un-calibrated 3D reconstruction: 3D scene structure derived from un-calibrated cameras.

- 3D registration: pairwise and global registration (or SLAM) of depth-maps into a point cloud.
- 3D data integration and geometrical simplification: integration of overlapping point clouds into tessellated surfaces and their simplification.
- Rendering methods: ray casting, ray tracing, radiosity and rasterization.

DIGITAL TRANSMISSION

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Nevio Benvenuto
Credits: 9 ECTS

- Basedband and passband (baseband equivalent model) digital transmission systems.
- Wiener filter. Applications to channel estimation and spectral estimation by prediction.
- Adaptive transversal filters: LMS and RLS algorithms.
- Radio link: discrete time equivalent models, random models, simulation models.
- Transmission over dispersive channels: intersymbol interference (ISI), Nyquist criterion for the absence of ISI, performance evaluation in the presence of ISI.
- Equalization: linear and non linear (cancelation based).
- Optimum data detection: Viterbi algorithm and Forward-Backward algorithm.
- Synchronization: timing and carrier phase recovery for baseband and passband systems.
- Multicarrier systems (OFDM): architecture, orthogonality conditions, performance and efficient implementation.

INNOVATION AND PROJECT MANAGEMENT

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Moreno Muffatto
Credits: 6 ECTS

71

- Characteristics of a project. The basic parameters of the project (scope, resources, time, cost, quality). The phases of the project life cycle. Stakeholders and their influence on the project. The areas of knowledge in the management of a project (scope, time, cost, quality, risk, human resources, communication, procurement, integration). Project planning. Project Quality Management. Project Risk Management. The organizational dimension in project management. Creation and management of the project team. The relationship aspects in project management (communication, team building, leadership). The economic and financial dimension of the project (evaluation criteria, the economic control of the project). Monitoring and control of the project. Project closure and lessons learned.
- Types of innovation projects. The sources of innovation. The process of developing a new product (phases and methodologies). The creativity dimension in the development of a new product / service. The protection of intellectual property (patents, trademarks, etc.). Organizational and management development team. Innovative processes and relationships between companies. Communication and marketing of innovation.
- Innovation projects and new business creation. The entrepreneurial dimension of a project. The recognition of a business opportunity. The identification and development of a business model. Business development.

NETWORK ANALYSIS AND SIMULATION

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Michele Zorzi
Credits: 6 ECTS

72

- Theoretical foundations of simulation, confidence interval; simulation tools.
- Analytical tools for network analysis.
- Simulation lab.
- Study of innovative schemes as published in recent scientific papers.
- Course project.

NETWORK MODELLING

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 1st Year - 2nd Semester
Lecturer: Prof. Michele Zorzi
Credits: 9 ECTS

73

- Probability theory review.
- Markov chains, their limiting behaviour.
- Poisson processes; renewal processes; applications and examples.

NETWORK SECURITY

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Nicola Laurenti
Credits: 6 ECTS

74

- Basic security notions and definitions.
- Unconditional vs computational security.
- Cryptographic and non cryptographic security mechanisms.
- Network security protocols at different layers.
- Further security issues for wireless, ad hoc and mobile networks.

OPTICAL AND QUANTUM COMMUNICATIONS

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Roberto Corvaja
Credits: 6 ECTS

75

- Optical communication systems.
- Characteristics of the optical fibre.
- Impulses in the optical digital link.
- Poisson processes and shot noise characterization.
- Error probability.
- Optical amplification.
- Coherent optical transmission.
- Introduction to quantum mechanics.
- Hilbert spaces, operators and projectors.
- Quantum measurements.
- Quantum decision theory.
- Coherent states.
- Quantum telecommunication systems.
- Applications of Q-TLC.

PHOTONICS DEVICES

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Marco Santagiustina
Credits: 6 ECTS

76

- Introduction to the applications of photonic devices.
- Guided optics: planar waveguides and optical fibres.
- Anisotropic media: birefringence and polarization mode dispersion.
- Nonlinear media: cubic nonlinearity.
- Active and passive devices.
- Optical amplifiers: doped fibre, semiconductor, Raman, Brillouin and parametric.
- Optical sensors for monitoring civil structures, environment, biosensors.

SOURCE CODING

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Giancarlo Calvagno
Credits: 6 ECTS

77

- Lossless coding: Entropy. Uniquely decodable codes. Fists Shannon theorem. Typical set. Asymptotic equipartition property. Huffman coding, arithmetic coding and Ziv-Lempel coding. Context based adaptive coding.
- Lossy coding: Differential entropy. Typical set for continuous random variables. Rate-distortion function R(D) and distortion-rate function D(R). Gaussian case. Shannon lower bound. Scalar quantization. Vector quantization. Predictive coding. Transform coding. Subband coding. Optimal bit allocation. Coding gains and asymptotic values.
- Applications to multimedia signal compression (audio, images, video): Multimedia signals redundancy. Objective redundancy and perceptual redundancy. MPEG3 (MP3), JPEG, JPEG2000, MPEG2 and H.264/AVC standards.

TELECOMMUNICATIONS NETWORKS

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 1st Year - 1st Semester
Lecturer: Dr. Andrea Zanella
Credits: 9 ECTS

78

The module aims at providing both practical and methodological tools for network design, analysis and planning. Some preliminary lessons will review the basic technical aspects of networking, such as terminology, standards, protocols structure, communication devices, and so on. The major part of the course is devoted to the study of the most prominent networking protocols and algorithms, with reference to state of the art technologies. In particular, the course will be introductory to the architecture and the protocols of Internet, and to the performance analysis of the most common link control and transmission control protocols. Some of the topics that will be considered by the course are the following:

- Data traffic sources: multimedia streams and content (characterization and modeling)
- Circuit switched networks: basics of Telephone and long-distance networks
- Packet switched networks: basics of data networks (Ethernet, WiFi, Bluetooth)
- ISO/OSI and TCP/IP protocol stacks: protocols and interfaces (MAC, DLL, NET, TRAN)/li>
- Quality of Service: Congestion control and Scheduling algorithms
- Application layer: basics of DNS, SMPT, FTP, HTTP, P2P.

WIRELESS SYSTEMS AND NETWORKS

Master degree in Telecommunications Engineering
Department of Information Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Michele Rossi
Credits: 9 ECTS

The course aims at providing some advanced knowledge on protocol stacks for wireless communications, including the analysis of distributed wireless networks, state of the art wireless technologies and current trends. The topics that will be covered will range from link layer technology to routing over ad hoc wireless networks and application layer coding. Selected topics will be presented using recent research papers from the literature as a source of reference. In the first part of the course, the student will be introduced to the technology used in modern ISO/OSI stacks, characterizing the performance of the single layers and then of the protocol stack as a whole. In the second half of the course, the focus will be on distributed ad hoc network architectures, with particular emphasis on distributed Wi-Fi networks (IEEE802.11 a/g/h/n) and wireless sensor networks (IEEE 802.15.4). The corresponding technologies (IEEE 802.11 and 802.15.4) will be introduced in detail (PHY/MAC/routing), characterizing their performance through suitable mathematical tools. The course will be research oriented and, at the end of it, the student will have a clear view on modern protocol technology, and will be able to carry out its performance evaluation through tractable mathematical tools. Some of the topics that will be considered by the course are:

- Hybrid ARQ systems: mathematical modeling and performance evaluation.
- Application layer coding: fountain codes, theory and applications.
- IEEE 802.11 a/g/h/n and IEEE 802.15.4: channel access technology, adaptive modulation and coding techniques, dynamic rate control algorithms.
- Routing over multi-hop networks: description and performance evaluation of selected routing algorithms in multi-hop wireless networks.
- Wireless sensor networks: relevant channel access and routing algorithms, analytical models and their performance analysis, study of systems powered by energy harvesting sources.

BUSINESS STRATEGY

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Prof. Anna Nosella
Credits: 6 ECTS

80

- The concept of strategy, mission and vision.
- Tools for the Analysis of Firm's Strategy (as is): Five Forces Analysis -Analysis of the forces affecting competition in a market; Positioning Analysis; Generic competitive strategies; Value Chain analysis; Resource Based View of the Firm – Determination resources significant in generating firm profits and the extent to which resources are adapted to the firm's external environment; Organization structure and management system
- Strategies for growth (to be): Direction of growth: market penetration, globalization, vertical integration, horizontal integration; External growth vs. internal growth: Corporate finance, M&A, the Private Equity support; Blue Ocean Strategy; Balanced score Cards
- Business plan
- Strategy tools: Negotiation Strategy.

INNOVATION IN PROCESSES FOR METALLIC PRODUCTS

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Dr. Giulio Timelli
Credits: 6 ECTS

81

- The impact of innovation in the iron and steel industries, in the blast furnaces and electric furnaces. Innovative processes in cast iron foundry (austempering ductile iron).
- Innovative thin rolled metal products for automotive applications (High Strength Steels, Advanced High Strength Steels, Ultra High Strength Steels).
- Powder metallurgy: mechanical, chemical and electro-chemical methods for powder production. Cost analysis of products realized by powder metallurgy and comparison with traditional processes.
- Innovative processes in aluminium foundry: vacuum die casting, thixocasting, rheocasting, squeeze casting, lost foam.
- Innovative treatments of metal surfaces (coatings production with flame and plasma techniques, PVD and CVD processes, painting and anodizing).
- Metal Matrix Composites (MMC).
- Nanomaterials: characteristics and properties. Material and process selection.
- Practice with the use of the Cambridge Engineering Selector.
- Life Cycle Assessment and Life Cycle Costs. Assessment of costs in metallurgical processes.
- Numerical simulation of metallurgical processes.

OPERATIONS RESEARCH APPLICATIONS

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Giorgio Romanin Jacur
Credits: 6 ECTS

82

- Elementary queueing theory, theory and actual applications.
- Discrete simulation, general principles and applications by means of a specific software. Network programming techniques, theory and actual applications. Graph Theory: maximum flow problem, knapsack problem, location problems, Euler circuits and Chinese postman problem, travelling salesman problem.

PRODUCT VARIETY MANAGEMENT

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Cipriano Forza
Credits: 9 ECTS

83

- Mass customization. Drivers of product variety and customization. Mass customization definition. Overview of mass customization enablers.
- The product configuration process. Total and partial configurability. Traditional approaches to configuration. Configuration system architecture. Commercial product modeling. How to evaluate a sales configurator. Technical product modeling. Generic bills of materials. Models to determine product cost, price and code, graphic representation of customized products. Choosing the optimal degree of automation of a product configuration system. Selecting and implementing a product configurator. Organizational impacts of implementing a product configurator.
- Form postponement types and market contingencies. Organizational changes for form postponement.
- Modularization of a product family. Relationships between product configuration, component standardization, product modularization and form postponement.
- The information systems support for Mass Customization. How to integrate PDM, CRM and product configurator.
- The information-processing view (IPV) of organization design. Analyzing product configurator introduction and form postponement application through the lens of IPV.

QUALITY AND METROLOGY IN MANUFACTURING

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Simone Carmignato
Credits: 6 ECTS

84

- Introduction to quality management systems. Accreditation and certification. Measurement management systems, requirements for measurement processes and measuring equipment. Calibration of measuring systems. Traceability of measurements. Quality assurance, statistical process control, process capability. Geometrical products specifications and verification. Methods for determination of measurement uncertainty.
- Dimensional and geometrical metrology: simple and advanced measuring systems. Coordinate metrology: coordinate measuring systems, tactile probing, optical methods and x-ray methods. Metrological rooms. Surface metrology: roughness end surface texture characterization, 3D surface characterization, micro- and nano-measuring systems.

SERVICE OPERATIONS MANAGEMENT

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Andrea Vinelli
Credits: 6 ECTS

85

- Service Operations Management: an introduction. Challenges facing service operations managers. Different types of service processes. The nature and the power of the service concept. Focused and unfocused service operations.
- Customer and supplier relationships. Customer segmentation and retention. Customer Relationship Management. Key Account Management.
- Service Quality: defining expectations and service quality factors. Customer satisfaction. Managing through intermediaries. The nature of service processes: volume and variety; commodity and capability. The customer experience.
- Service people: managing and motivating service providers. The role of scripts and levels of employee discretion.
- Resource utilisation: service capacity management. Defining capacity strategies. The coping zone. How network technology and information are transforming services.

STATISTICAL METHODS AND APPLICATIONS

Master degree in Engineering and Management (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Luigi Salmaso
Credits: 6 ECTS

86

- Elements of univariate and multivariate statistical methods. Elements of descriptive statistics: frequency, indices of synthesis (position, variability and shape) and graphical representations (histogram, boxplot, scatterplot). Elements of probability theory: discrete and continuous probability distributions.
  Elements of statistical inference: sampling distributions, point and interval estimation, hypothesis testing, simple and multiple linear regression.
- Design and analysis of experiments and Conjoint Analysis: One-way ANOVA, Multi-Way ANOVA, Factorial Designs and Optimal Designs. Response Surface Methodology. Full profile and choice based conjoint analysis.
- Nonparametric statistics: Resampling methods: univariate and multivariate permutation tests.

DESIGN WITH COMPOSITE MATERIALS

Master degree in Product Innovation Engineering (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 1st Semester
Lecturer: Prof. Marino Quaresimin
Credits: 6 ECTS

87

- General characteristics of polymer composites, outline of the main production processes and comparison with other structural materials.
- Theory of elasticity for anisotropic bodies.
- Micromechanical analysis, elastic properties and strength of unidirectional lamina.
- Classical lamination theory.
- Criteria of static failure. Resistance and stiffness oriented design of composite structures.
- Notch and edge effects in composite structures.
- Thermal stresses.
- Sandwich Structures.
- Experimental characterization of composite laminates and NDT.
- Strategies for numerical analysis of composite structures – Examples of applications.

QUALITY AND METROLOGY IN MANUFACTURING

Master degree in Product Innovation Engineering (Vicenza campus)
Department of Management and Engineering
Language: English
Teaching period: 2nd Year - 2nd Semester
Lecturer: Dr. Simone Carmignato
Credits: 6 ECTS

- Introduction to quality management systems. Accreditation and certification. Measurement management systems, requirements for measurement processes and measuring equipment. Calibration of measuring systems. Traceability of measurements. Quality assurance, statistical process control, process capability. Geometrical products specifications and verification. Methods for determination of measurement uncertainty.
- Dimensional and geometrical metrology: simple and advanced measuring systems. Coordinate metrology: coordinate measuring systems, tactile probing, optical methods and x-ray methods. Metrological rooms. Surface metrology: roughness end surface texture characterization, 3D surface characterization, micro- and nano-measuring systems.

University of Padova
School of Engineering

CATALOGUE OF COURSES HELD IN ENGLISH
FOR ERASMUS, FOREIGN AND ITALIAN STUDENTS
2013 > 2014

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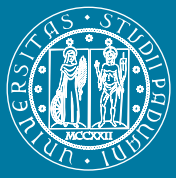

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