

**1****INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION****1.1****Last name(s)**

BONVICINI

**1.2****First name(s)**

GIORGIO

**1.3****Date of birth (dd/mm/yyyy)**

23/05/1997

**1.4****Student identification number or code (if available)**

944999

**2****INFORMATION IDENTIFYING THE QUALIFICATION****2.1****Name of the qualification and title conferred (in the original language)**Laurea magistrale in MECHANICAL ENGINEERING  
Dottore magistrale**2.2****Main field(s) of study for the qualification**Mechanical engineering (LM-33)  
ISCED code: 0715**2.3****Name (in original language) and status of the awarding institution**

Politecnico di Milano (Istituzione statale), Piazza Leonardo da Vinci 32, 20133 Milano

**Description of curriculum****APPLIED METALLURGY**

Code: 095838  
Credits: 6.00  
Grade: 26  
Date: 16/01/2020

**Subject groups**

ING-IND/21 METALLURGY

**The programme**

The course aims at deepening the study of the metallic materials and their treatments with special reference to the steels and special alloys, stainless steels and tool steels, aluminium alloys and copper alloys, also taking into account their typical applications in mechanical engineering fields. A further and fundamental objective of the course is the introduction of the main damage phenomena of the metallic materials (fatigue, brittleness, corrosion, wear and creep), relating such aspects to metallurgy and making, transformation and joint processing of metallic materials. Synthesis of the subjects: Carbon steels and low alloy steels, stainless steels and tool steels; bearing steels and steels for wire and rope applications; aluminum alloys for plastic deformation and for heat treatment; copper and copper alloys; degradation and service failure of structural materials. Steelmaking and transformation processes and joint processes (Course held in English).

**ADVANCED MANUFACTURING PROCESSES**

Code: 095840  
Credits: 10.00  
Grade: 30 L  
Date: 24/01/2020

**Subject groups**

ING-IND/16 MANUFACTURING TECHNOLOGY AND SYSTEMS

**The programme**

Basic issues on unconventional manufacturing processes: physical principles, modeling, applications. Laser technology: generation and properties of laser beams, laser-matter interaction, processes (cutting, welding, heat treatment, engraving, cladding), laser systems. Water jet technology: generation and properties of high-pressure liquid jets, process variables and quality, pressure intensifiers. Other processes based on thermal energy (plasma cutting, electrodischarge machining, electron beam / ion beam machining) and on mechanical energy (ultrasonic machining). Chemical and electrochemical machining. Micro-machining technology: material removal processes on a micro scale, machines, chip formation models. Selection and cost estimation of unconventional manufacturing processes (Course held in english)

**CONTROL AND ACTUATING DEVICES FOR MECHANICAL SYSTEMS**

Code: 095837  
Credits: 9.00  
Grade: 30 L  
Date: 03/02/2020

**Subject groups**

ING-IND/13 APPLIED MECHANICS, ING-IND/32 POWER ELECTRONIC CONVERTERS, ELECTRICAL MACHINES AND DRIVES, ING-INF/04 SYSTEMS AND CONTROL ENGINEERING

**The programme**

The fundamental elements concerning the modelling and analysis of mechanical systems integrated with actuating devices and control units are presented. The problem of the system stability is analysed in detail and models of mechatronic systems are developed, by integrating the mechanical model with the actuator one (electric, hydraulic, or pneumatic). (Course held in English)

**DESIGN AND MANAGEMENT OF PRODUCTION SYSTEMS**

Code: 095844  
Credits: 10.00  
Grade: 26  
Date: 15/06/2020

**Subject groups**

ING-IND/17 INDUSTRIAL MECHANICAL SYSTEMS ENGINEERING

**The programme**

The course deals with the topic of configuration and management of production systems. The first section presents models and techniques concerning the configuration of process plants, job shops and assembly systems. The second section introduces a set of techniques and tools for production planning and control, and material requirements planning. The program is divided in two sections, devoted respectively to the configuration and management of production systems. In the first section, a taxonomy of the most common production system is introduced, together with a model to assess manufacturing performances and operating conditions. Then, the topics of configuration, sizing, buffering of production flow are presented, with a special concern on process industry, manufacturing and assembly systems. In the second section, an introductory review on the production planning and control process is presented; hence, techniques, models and tools are presented devoted to the phases of demand forecasting, aggregate production planning, material requirements planning, stock management and production scheduling. A special issue on Japanese manufacturing technique is also included. (Course held in English)

**MACHINE DESIGN 2**

Code: 095841  
Credits: 10.00  
Grade: 30 L  
Date: 23/06/2020

**Subject groups**

ING-IND/14 MECHANICAL DESIGN AND MACHINE CONSTRUCTION

**The programme**

Static and fatigue strength of components of various materials in axial tension, compression, bending, torsion and shear without and with stress concentration and cracks. Elastic and elastoplastic theory of plates and shells. Strength, deflection, stability and wear in components of mechanical systems and their reliability. Design of a mechanical system with static loading. Design of a mechanical system with fatigue loading. (Course held in English)

**MEASUREMENTS**

Code: 095843  
Credits: 5.00  
Grade: 28  
Date: 09/07/2020

**Subject groups**

ING-IND/12 MECHANICAL AND THERMAL MEASUREMENTS

**The programme**

Main themes of this course are related to the A/D conversion, acquisition of experimental data and the most suitable data analysis technique. Data classification and analysis in the time domain are introduced and explained. Data processing techniques in frequency domain such as the Fourier Transform and its applications (Auto-spectra, cross-spectra and coherence functions) and Frequency Response estimators are presented and applied during laboratory activities. (Course held in English)

**MECHANICAL SYSTEM DYNAMICS**

Code: 095842  
Credits: 5.00  
Grade: 27  
Date: 17/07/2020

**Subject groups**

ING-IND/13 APPLIED MECHANICS

**The programme**

Advanced concepts and techniques on dynamic system vibrations are provided by the course, with specific reference to multi-degree of freedom discrete systems and continuum systems vibrations. Analysis and modelling tools applicable to complex rigid bodies systems (multi-body techniques) and deformable systems (finite-elements techniques) are made available to the students. At the purpose of fulfilling the advanced educational path on the system dynamics, some essential concepts related to non-linear systems dynamics will be addressed together with some application examples concerning the dynamics of machines and structures under the action of non-conservative force fields. (Course held in English)

**ENERGY SYSTEMS LM**

Code: 095839  
Credits: 7.00  
Grade: 29  
Date: 08/09/2020

**Subject groups**

ING-IND/09 ENERGY SYSTEMS AND POWER GENERATION

**The programme**

Fuels and combustion. Mechanisms of formation of the main pollutants. Techniques for control of pollutants during combustion and exhaust gases treatment. Measure of pollutant concentration in gaseous streams. Second law analysis of power cycles. Analysis of processes for electric power generation by means of steam cycles, gas turbines, combined cycles: Thermodynamic and technological characteristics, design and economic aspects, performance achievable, fuels and environmental impact, off-design operations. Boilers. Heat exchangers and heat rejection to ambient (water open loop, dry cooling, cooling towers). Cogeneration: energy savings, evaluation indexes, plant technologies, operating curves, economic feasibility. Refrigerant fluid and refrigerating cycles.

**THESIS PREPARATION: HORIZONTAL COMPETENCIES**

Code: 052444  
Credits: 2.00  
Grade: --  
Date: 14/11/2020

**Subject groups**

Unavailable

**The programme**

Graduation thesis and final exam - Master of Science in Mechanical Engineering

**ROBOTIC SYSTEMS DESIGN**

Code: 053419  
Credits: 6.00  
Grade: 29  
Date: 12/01/2021

**Subject groups**

ING-IND/13 APPLIED MECHANICS

**The programme**

The course is mainly for students of the "Laurea Specialistica in Ingegneria Meccanica". It provides a basic knowledge of Industrial Robotics, seen from the user-programmer-integrator standpoint, and briefly addresses also service (mobile) robots. The course makes extensive use of practical lab experiments, in order to allow students to check "in the field" the correspondence between learned theory and the real world.

**AUTOMATIC CONTROL A**

Code: 097520  
Credits: 10.00  
Grade: 29  
Date: 20/01/2021

**Subject groups**

ING-INF/04 SYSTEMS AND CONTROL ENGINEERING

**The programme**

After a general introduction and the discussion of some elements of systems' theory, the design of the controller in the frequency domain will be addressed, emphasizing the role of feedback in determining static and dynamic performance of the control system. It will then be shown how the design can be carried out in time domain as well, through the technique of pole placement, even in problems where a reference signal has to be tracked. Some elements of discrete time systems' theory will introduce the digital implementation (i.e. based on a digital system endowed with a processor) of the controller. Electronic technologies for control systems will be covered in the course (with particular reference to analog and digital signal processing) as well as motion control problems, i.e. motion planning and closed loop control in position servos. Some advanced motion control techniques will be addressed as well, that are in principle able to take fully into account the effects of the elastic coupling between motor and load. A part of the course will be finally devoted to those aspects of a control system which are related to information technology: the architectures of control systems, the communication networks, the logic control (PLC) and real time systems will be discussed.

**FUNCTIONAL MECHANICAL DESIGN**

Code: 097499  
Credits: 6.00  
Grade: 28  
Date: 29/06/2021

**Subject groups**

ING-IND/13 APPLIED MECHANICS

**The programme**

The course is oriented mainly to students attending the "Laurea Specialistica in Ingegneria Meccanica". It provides the guidelines to the functional mechanical design of machines and mechanism. The course focuses on the design of the motion, on the synthesis and analysis of cam mechanisms and linkages. Theoretical arguments discussed during the lessons are supported by practical examples and industrial cases.

**SMART STRUCTURES AND DEVICES**

Code: 094910  
Credits: 6.00  
Grade: 30 L  
Date: 01/07/2021

**Subject groups**

ING-IND/13 APPLIED MECHANICS

**The programme**

This course is an advanced module on identification and control of mechatronic systems, with special emphasis on modeling techniques of the integrated system (including mechanical system, control unit, sensors and actuators). Modern control theory applied to both lumped and distributed parameter structures and machines is presented. Many examples taken from industrial applications are illustrated in the course.

**MECHATRONIC SYSTEMS AND LABORATORY A**

Code: 097519  
Credits: 10.00  
Grade: 30  
Date: 07/07/2021

**Subject groups**

ING-IND/13 APPLIED MECHANICS

**The programme**

The course presents the methodologies to identify and control the mechatronic systems. More in details, the modeling techniques of the integrated mechatronic system (including mechanical system, control laws and actuating device) have been proposed: The modern control theory applied to both lumped and distributed parameters structures and machines is presented. Laboratory experiences in the field of vibration, motion, robot, drive, plant etc. control are presented. Finally, some industrial application are analyzed in the field of flexible structure (robot and civil structures).

**THESIS WORK AND FINAL DEFENCE**

Code: 052442  
Credits: 18.00  
Grade: --  
Date: 12/04/2022

**Subject groups**

Unavailable

**The programme**

Graduation thesis and final exam - Master of Science in Mechanical Engineering





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