Person code: 10522648 | Document ID: 200056/1 | Date of issue: 16/03/2020 | Register number: 0320-0640

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Last name(s)

MANESCHI

1.2 First name(s)

GIOVANNI MARIA

1.3 Date of birth (dd/mm/yyyy)

10/06/1996

1.4 Student identification number or code (if available)

844116

2 INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of the qualification and title conferred (in the original language)

Laurea in AEROSPACE ENGINEERING
Dottore

2.2 Main field(s) of study for the qualification

Industrial Engineering (L-9)
ISCED code: 0719

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

CALCULUS 1

Code: 081360
Credits: 10.00
Grade: 21
Date: 15/02/2016

Subject groups

MAT/05 MATHEMATICAL ANALYSIS, MAT/03 GEOMETRY

The programme

Real and complex numbers. Functions of one real variable. Elementary functions. Sequences and limits. Continuity and theorems on continuous functions. Differential calculus and applications to optimization problems. Taylor's formula. Graphs of functions. Integral calculus. Generalized integrals. First order ordinary differential equations. Vector calculus, scalar and vector products. Straight lines, cilrcles and spheres. Vector valued functions, plane and space curves, line integrals of the first kind.

METHODS OF TECHNICAL REPRESENTATION

Code: 081376
Credits: 7.00
Grade: 21
Date: 29/02/2016

Subject groups

ING-IND/15 DESIGN METHODS FOR INDUSTRIAL ENGINEERING

The programme

Introduction to the design process. Types of technical drawings. Standards. Graphic representation: orthographic projections, views , cuts and sections, dimensioning. Manufacturing and inspection of parts: general principles on materials and related designations, relation between technological process and shape; linear, geometric and surface tolerances. Morphology of machine elements (threaded elements, welding, bonding), transmission elements (shafts and axes, hubs, keys and splines, bearings), transformation of motion (belts, chaines, gearing). Laboratory activity: utilization of 3D solid modeler to produce models and drafts of parts and simple assemblies.

FUNDAMENTALS OF EXPERIMENTAL PHYSICS

Code: 081389
Credits: 12.00
Grade: 24
Date: 12/07/2016

Subject groups

FIS/01 EXPERIMENTAL PHYSICS

The programme

Physical quantities e their measurements. Kinematics of a particle: reference frames, position, velocity, acceleration. Dynamics of a particle: Newton's laws and their applications. Work, power, energy and conservation of mechanical energy. Gravitation. Periodic motion. Dynamics of particle systems and rigid body: conservation laws, collisions, rotational motion. Temperature, heat and work: equilibrium and thermodynamics transformations, ideal gases. First law of thermodynamics. Heat engines, cycles and thermal efficiency. Second law of thermodynamics. Coulomb's law, electric field. Gauss's law. Electric potential. Charges on conductors, capacitance, capacitors. Energy of the electric field. Dielectrics. Electric current and Ohm's law, electromotive force. Magnetic field. Sources and properties of the magnetic field, Ampe're's law. Magnetic materials.

FUNDAMENTALS OF AEROSPACE ENGINEERING

Code: 083265
Credits: 8.00
Grade: 26
Date: 02/09/2016

Subject groups

ING-IND/04 AEROSPACE STRUCTURES AND DESIGN

The programme

This introductory course to the degree in aerospace engineering covers several topics, which are organized as follows: Introduction to the aerospace world and environment. Architecture of aerospace vehicles. Aeromechanics fundamentals. Aerospace propulsion fundamentals. Steady flight mechanics and performances. Vehicle as a three-dimensional body and flight controls. On board systems. Maneuvers and loads. The rotorcraft. Aerospace structures fundamentals. Materials and aerospace technologies.

CHEMISTRY

Code: 081374
Credits: 7.00
Grade: 26
Date: 16/09/2016

Subject groups

CHIM/07 PRINCIPLES OF CHEMISTRY FOR APPLIED TECHNOLOGIES

The programme

Atomic structure. Electronic structure and the periodic table. Mole, molar mass. Chemical reactions and equations. Proportional relationships. Chemical bonding. Ionic bonds, covalent bonds. Shapes and properties of molecules. Types of intermolecular forces and condensed states of matter. Structure and properties of solids. The gaseous state. Liquids. Change of state. Thermodynamics. Energy, heat, work. Heat of reaction and enthalpy. Spontaneous processes, entropy and free energy. Chemical equilibrium. Factors that influence equilibrium. Chemical kinetics. Collision theory and reaction rate. Effect of temperature. Catalysis. Electrolyte solutions. Salts, acids, bases, pH. Ionic equilibria. Redox reactions. Standard reduction potentials. Electrochemical cells. Electrolysis. Preparation and refining of metals. Corrosion. Chemistry and environment. Air pollution. The photochemical smog and the acid rain. The ozone hole and the greenhouse effect.

CIRCUITS AND ELECTRONICS

Code: 083266
Credits: 10.00
Grade: 27
Date: 21/02/2017

Subject groups

ING-IND/31 ELECTRICAL ENGINEERING, ING-IND/32 POWER ELECTRONIC CONVERTERS, ELECTRICAL MACHINES AND DRIVES, ING-IND/33 ELECTRICAL POWER SYSTEMS

The programme

The course deals with the basic principles and applications of electrical engineering. The general part of the course is devoted to circuit theory, and therefore it provides the characterization of electrical and electronic components, the methods of analysis for resistive electrical networks, sinusoidal steady-state and dynamical networks, and circuits in the frequency domain. The application-oriented part of the course is devoted to electronics (examples of analysis and design of electronic circuits) and to electromechanical conversion of energy (electromechanical devices and basic principles of the main electrical machines).

PHYSICS OF WAVES

Code: 083406
Credits: 6.00
Grade: 30 L
Date: 27/06/2017

Subject groups

FIS/03 PHYSICS OF MATTER

The programme

Introduction to waves: d'Alembert's equation; plane waves; spherical waves; plane monochromatic waves; phase velocity; doppler effect; complex representation. Mechanical waves: sound waves in a column of air; longitudinal waves in an elastic rod; outlines about waves on a rope. Electromagnetic waves: Maxwell's equations; speed of light; polarization. Coherent sum of harmonic waves: interference; beatings and group velocity; stationary waves. Reflection and refraction. Diffraction.

AEROSPACE SYSTEMS

Code: 083404
Credits: 8.00
Grade: 23
Date: 18/07/2017

Subject groups

ING-IND/05 AEROSPACE EQUIPMENTS AND SYSTEMS

The programme

Features of most relevant components and their integration in aerospace systems. Layout and preliminary sizing of hydraulic, electrical, pneumatic, fuel, environmental, landing gear and flight control systems. Emergency systems, instruments and avionic systems.

CALCULUS 2

Code: 081372
Credits: 10.00
Grade: 21
Date: 11/09/2017

Subject groups

MAT/05 MATHEMATICAL ANALYSIS, MAT/03 GEOMETRY

The programme

Vector spaces. Matrices. Linear systems. Linear and quadratic function. Linear ordinary differential equations with constant coefficients. Number serie and Fourier series. Functions of several variables. Partial derivatives, directional derivatives, gradient. Implicit functions. Optimization problems: free and with constrains. Lagrange multipliers. Double and triple integrals. Work of a vector field. Conservative fields and potentials. Sufaces, surface integrals. Stokes and divergence theorems.

AEROSPACE MECHANICS

Code: 097455
Credits: 10.00
Grade: 22
Date: 04/09/2018

Subject groups

MAT/07 MATHEMATICAL PHYSICS, ING-IND/03 FLIGHT MECHANICS, ING-IND/04 AEROSPACE STRUCTURES AND DESIGN, ING-IND/05 AEROSPACE EQUIPMENTS AND SYSTEMS

The programme

The course aims at providing a general background about the concepts and methods of Classical Mechanics. Starting from the basic notions on Newtonian mechanics, which students have already acquired in previous courses, the mechanics of systems of constrained point masses and rigid bodies is rigorously developed. In the first part of the course, the study of mechanical systems is based on the balance equations for linear and angular momentum and kinetic energy. The concepts and methods of analytical mechanics are presented and applied in the second part of the course. The benefits and drawbacks of the two approaches are discussed. The chapter devoted to analytical mechanics also contains a presentation of the basic tools to study the stability of motion and equilibrium of mechanical systems, as well as an introduction to variational formulations of mechanics.

FUNDAMENTALS OF AUTOMATIC CONTROL

Code: 083401
Credits: 8.00
Grade: 18
Date: 09/01/2019

Subject groups

ING-INF/04 SYSTEMS AND CONTROL ENGINEERING

The programme

After an introduction where the control problem is introduced, the course works out the theory of dynamic systems: the notion of dynamic system in time domain is formalized and fundamental concepts are defined, like state variables, system linearity, motion, equilibrium and linearization around an equilibrium point. Structural properties (stability and some elements on controllability and observability) of dynamic systems are studied. Laplace and Fourier transforms are then introduced: based on these tools, the description of dynamic systems in terms of transfer functions is addressed. In particular, stability of systems and the relation between zeros and poles of the transfer function and the time responses are discussed. The study of dynamic systems is completed by the analysis of the frequency response, including Bode diagrams plotting. The study of the tools for simplification of the block diagrams introduces the discussion on feedback control systems, in terms of stability, dynamic and static performance. The design of the controller in the frequency domain is then worked out in detail, with particular reference to industrial controllers (PID). Root locus analysis is discussed as well. Discrete time systems theory, briefly developed in this course, introduces the last part, where the main properties and the design criteria for digital control systems are discussed. In particular methodologies for the digital implementation of an analogue controller are presented.

PRINCIPLES OF AEROSPACE EXPERIMENTATION

Code: 086225
Credits: 6.00
Grade: 26
Date: 11/01/2019

Subject groups

ING-IND/04 AEROSPACE STRUCTURES AND DESIGN

The programme

Basics in metrology: Needs for experimentation, The generalized instrument, Standards and requirements. Measurements methods in aerospace experimentation: fundamental principles in transduction. Fundamental techniques for basics measurements (length, displacement, strain, acceleration, force, pressure, temperature) Static and dynamic properties of instruments and transducers. Quality properties of instruments. Dynamic modelling of instruments. Basics in signal conditioning (filtering, amplification, partitioning) Analogic to digital conversion and data acquisition systems: A/D and D/A converter characteristics and performances. Sampling theoreme. Leakage. Acquisition systems layouts Statistical analysis of experimental data: Basics in probability and statistics. Density distribution. Infinite and finite statistics. Confidence level and interval. Rejection of questionable data. Data fitting. Design and management of measurement systems: Experimental Uncertainity Analysis. Design of simple measurement systems.

THERMODYNAMICS AND HEAT TRANSFER

Code: 083795
Credits: 10.00
Grade: 24
Date: 16/01/2019

Subject groups

ING-IND/10 THERMAL ENGINEERING AND INDUSTRIAL ENERGY SYSTEMS

The programme

The course introduces foundations and applications of engineering thermodynamics as well as basic concepts of heat transfer, and it is aimed to solve simple problems in modeling thermo-fluid-dynamic processes and energy systems. Main topics: fundamentals of thermodynamics, internal energy, available energy, entropy; properties of substances, state equations for ideal gases and incompressible liquids, heterogeneous systems; engineering thermodynamics: control volume, mass, energy and entropy balances, conversion devices (turbines, compressors, pumps, nozzles), cycles and processes for power and refrigeration plants (Otto, Brayton, Rankine, vapor-compression cycle); heat transfer mechanisms, the Fourier's equation, the one-dimensional steady-state solution for plane and cylindrical geometry; electrical analogy and equivalent thermal network; transient conduction (the lumped capacitance method); forced convection in internal and external flows, dimensionless numbers; thermal radiation, black body, gray surfaces, radiation exchanges.

AEROSPACE PROPULSION

Code: 086416
Credits: 7.00
Grade: 27
Date: 07/02/2019

Subject groups

ING-IND/07 AEROSPACE PROPULSION

The programme

The course aims to provide the fundamental knowledge of modern aerospace propulsion systems. After an introductory review of the main propulsion systems, for aeronautical and space applications, the system performance parameters are discussed in detail. A review of fundamental topics concerning fluid-dynamic, thermodynamic and energetic aspects of the propulsion systems is given in order to deep air inlets, combustion chambers, nozzles and turbomachines. The final part of the course is devoted to the detailed treatment of airbreathing and rocket motors.

FINAL DEGREE TEST (SPACE MISSION ANALYSIS)

Code: 093466
Credits: 1.00
Grade: 23
Date: 04/06/2019

Subject groups

ING-IND/05 AEROSPACE EQUIPMENTS AND SYSTEMS

The programme

The activity addresses the numerical analysis of satellite orbits, in order to characterize orbital trajectories and analyze orbital maneuvers. The presentation of the various topics is complemented by the student's implementation and use of simple numerical algorithms. Students will also have to prepare a report analysing the solution of one specific problem assigned.

FLUID DYNAMICS

Code: 086224
Credits: 10.00
Grade: 22
Date: 17/06/2019

Subject groups

ING-IND/06 FLUID DYNAMICS

The programme

The fundamentals of fluid dynamic phenomena and related models are given in this course. In the first part of the course, the laws and the physical and mathematical models governing the dynamics of fluids are derived on the basis of the knowledge supplied by previous courses in the fields of physics, mathematics, theoretical mechanics, numerical methods and applied thermodynamics. Starting from the most general mathematical model of the Navier-Stokes equations, which is analyzed and discussed in details, the classical simplified models of fluid dynamics are derived, based on dynamical approximations criteria, assumptions on the rheological and thermodynamic state equations of the specific fluid and flow conditions, or properties of the flow domain and boundary conditions. Steady and unsteady exact solutions of the Navier-Stokes equations, the Euler equations, the Prandtl's thin layer and the potential flow models are presented, the latter having particular impact on low speed aeronautical applications. The theoretical aspects of fluid dynamics are treated in constant touch with their practical, natural or industrial implications and supported by the physical insight supplied by the still unequalled films of the National Committee for Fluid Dynamics. Fellows will also be introduced to basic experimental techniques and will acquire capabilities in the prediction of the aerodynamic performances of airfoils.

APPLIED NUMERICAL ANALYSIS

Code: 083402
Credits: 10.00
Grade: 20
Date: 21/06/2019

Subject groups

MAT/05 MATHEMATICAL ANALYSIS, MAT/08 NUMERICAL ANALYSIS

The programme

The objective of this Course is to introduce some numerical methods for the solution of engineering problems, while growing, at the same time, a sufficient insight with a view to their employment. This aim will be pursued by completing the lectures with hands-on sessions in computer laboratories based on Matlab or Octave. The topics covered on the Course can be classified in six categories: numerical linear algebra; numerical solution of nonlinear equations and systems; approximation of functions and data; numerical integration and differentiation; ordinary differential equations; boundary-value problems. Moreover some basic issues on partial differential equations will be provided, covering both the theoretical and the numerical aspects. For all these topics, the corresponding implementation skills as well as some practical exemplifications will be furnished.

SIGNALS AND REMOTE SENSING SYSTEMS

Code: 093477
Credits: 6.00
Grade: 25
Date: 28/06/2019

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

The course provides students with the concepts and basic tools to understand the fundamentals of discrete and continuous signals in time and frequency domain. This knowledge is aimed at understanding the functioning and the most important applications of remote sensing radar systems operated onboard airborne or satellite platforms. The skills required are mainly those provided by basic courses in mathematics (calculus).

AEROSPACE TECHNOLOGIES AND MATERIALS

Code: 086419
Credits: 7.00
Grade: 25
Date: 15/07/2019

Subject groups

ING-IND/04 AEROSPACE STRUCTURES AND DESIGN, ING-IND/22 MATERIALS SCIENCE AND TECHNOLOGY

The programme

The course of Aerospace Technologies and Materials has the purpose to impart the basic concepts about the materials and the technologies adopted for the construction of aerospace vehicles. To this aim, the material and process selection strategies are preliminarily analyzed, as well as property limit and indices. Then, the main features of the principal families of materials used for aerospace construction are presented, paying special attention to metals, metal alloys and composite materials, as well as to the related technologies for the construction of detached components. Finally, the joining techniques are considered, together with the assembling organization and the overall production management. Besides, post-production issues, like non destructive inspection, repairing and maintenance procedures are dealt as well.

FINAL DEGREE TEST (AEROSPACE TECHNOLOGIES AND MATERIALS)

Code: 093465
Credits: 1.00
Grade: 25
Date: 24/07/2019

Subject groups

ING-IND/04 AEROSPACE STRUCTURES AND DESIGN

The programme

The course has the purpose to impart the basic concepts about organization quality and overall production management. Besides, post-production issues, like repairing and maintenance procedures are dealt as well.

INTRODUCTION TO SPACE MISSION ANALYSIS

Code: 093474
Credits: 2.00
Grade: --
Date: 26/08/2019

Subject groups

ING-IND/05 AEROSPACE EQUIPMENTS AND SYSTEMS

The programme

The course addresses the basic elements of orbital mechanics. Appropriate mathematical models and equations of motion are introduced, in order to characterize orbital trajectories, analyze orbital maneuvers and interplanetary mission planning. The presentation of the various topics is complemented by the student's implementation and use of simple numerical algorithms.

FINAL DEGREE TEST (AEROSPACE PROPULSION)

Code: 093454
Credits: 1.00
Grade: 30
Date: 15/09/2019

Subject groups

ING-IND/07 AEROSPACE PROPULSION

The programme

The activity addresses the critical analysis of main propulsion systems, for aeronautical and space applications, in order to characterize the overall system and its specific components. The presentation of the various topics is complemented by the student's implementation and use of simple numerical algorithms estimating characteristics, performances and sizing of an aerospace propulsion system or one of its main components. Students have to prepare a report developing the solution of one specific problem assigned.

DYNAMICS OF AEROSPACE SYSTEMS

Code: 052429
Credits: 8.00
Grade: 22
Date: 14/01/2020

Subject groups

ING-IND/13 APPLIED MECHANICS

The programme

The course provides basic modeling capabilities by illustrating how reality can be cast into physical models, which are translated in mathematical models and analyzed to provide approximate answers to the real problems. The foundations of the course are represented by kinematcis and analytical dynamics provided by theoretical mechanics, augmented by basic concepts of hydraulic and electric modeling, provided by aerospace systems and electrotechnics. The principles of control theory are applied to the resulting dynamical systems. Phenomena related to interaction between machinery parts are presented, including friction, tyre rolling and lubrication. The energetic approach to the description of single degree of freedom machines is presented as well. The actuation of coupled systems is analyzed from the point of view of their control. The process of continua discretization is introduced. The dynamics of discrete systems is analyzed from the point of view of small perturbations about a steady configuration, to address stability and response to periodic excitation. Single degree of freedom systems are considered first: free and forced response of damped and undamped systems are analyzed. Multiple degree of freedom systems allow the introduction of the concept of natural frequencies and modes of vibration. The course is concluded by basic notions of stability and response of systems subjected to non-conservative force fields, with applications to aeroelasticity.

FUNDAMENTALS OF ATMOSPHERIC FLIGHT MECHANICS

Code: 093484
Credits: 5.00
Grade: 23
Date: 22/01/2020

Subject groups

ING-IND/03 FLIGHT MECHANICS

The programme

The course addresses the basic elements of fixed-wing aircraft flight mechanics and of orbital mechanics. After the introduction of preliminary notions on the aircraft and the environment of flight, basic aerodynamics and aeronautical propulsion, the course covers the analysis of basic aircraft trim, control, static and dynamic stability, ending with the study of point and integral flight and airfield performances. The presentation of the various topics is complemented by the student's implementation and usage of simple numerical algorithms.

FUNDAMENTALS OF STRUCTURAL MECHANICS

Code:	086222
Credits:	10.00
Grade:	18
Date:	24/01/2020

Subject groups

ICAR/08 STRUCTURAL MECHANICS, ING-IND/04 AEROSPACE STRUCTURES AND DESIGN

The programme

Brief description of the topics The purpose of the course is to introduce aeronautical engineering students to Structural Mechanics. In the first part, the focus is set on equilibrium of structural systems. Beams are the main object of the analysis, but the generality of the discussed concepts (e.g. for continuum models) is constantly underlined. Basic concepts of solid mechanics are discussed: stresses, strain and constitutive laws. The general problem of thermo-elasticity is formulated and analytically solved in the case of the De Saint Venant solid, as an example of analytical solution. Elastic deformability of structural systems is analyzed and some approaches to solve statically undetermined, plane and spatial, problems are presented in conceptual and operative terms. The Virtual Work Principle (VWP) and the elasticity theorems are introduced. The VWP is applied to the solution of simple, elastic, plane and spatial frames. A special attention is given to the total potential energy theorem and its numerical importance. Beyond the linear elasticity limits, the third part of the course describes basic concepts on instability of elastic structures and strength criteria, introducing the bases of the classic plasticity