DIPLOMA SUPPLEMENT ATTACHMENT

POLITECNICO MILANO 1863

Person code: 10659771 | Document ID: 219801/1 | Date of issue: 03/10/2021 | Register number: 0921-0781

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Last name(s)

MORO

1.2 First name(s)

GABRIELE

1.3 Date of birth (dd/mm/yyyy)

08/07/1999

1.4 Student identification number or code (if available)

911510

2 INFORMATION IDENTIFYING THE QUALIFICATION

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

Laurea in MATHEMATICAL 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

MATHEMATICAL ANALYSIS I

Code: 083215
Credits: 10.00
Grade: 23
Date: 31/01/2019

Subject groups

MAT/05 MATHEMATICAL ANALYSIS

The programme

Basics of logic and set theory. Numerical sets (integer, rational, real, complex numbers) and their structures. Planar and spatial vectors; straight lines and planes. Sequences. Real functions of one real variable: limits, continuity, derivative and differential, monotone and convex functions, maxima and minima, Taylor's formula. The Riemann integral and integration methods. Numerical series and series of functions.

CHEMISTRY

Code: 083217
Credits: 7.00
Grade: 24
Date: 07/02/2019

Subject groups

CHIM/07 PRINCIPLES OF CHEMISTRY FOR APPLIED TECHNOLOGIES

The programme

Elements and compounds, mole, molar mass, chemical reactions and equations. Electronic structure of atoms and the periodic table. Chemical bonding. Structure and properties of ionic and covalent compounds. Intermolecular forces. States of matter and phase diagrams. Metals: properties and bonding. Chemical thermodynamics: enthalpy, entropy and Gibbs free energy. Chemical equilibrium. Chemical reaction kinetics. Reactions in aqueous solutions: acid-base and red-ox reactions. Electrochemistry : electrochemical cells, electrolysis and corrosion. The structure of solids: the crystalline state, amorphous solids. Organic compounds and carbon chemistry: functional groups. Polymeric materials structure and properties. Materials for optics and electronics.

BUSINESS ECONOMICS AND ORGANIZATION D

Code: 061204
Credits: 10.00
Grade: 27
Date: 17/06/2019

Subject groups

ING-IND/35 BUSINESS AND MANAGEMENT ENGINEERING

The programme

The firm: aims and context. Monitoring, planning and control tools: analysis and interpretation of the balance sheet, balance indexes, cost accounting and costing systems; investment analysis; elements of budgeting and budget variance analysis. Business management: economic value of a firm as a measure of that firm's results; main typologies of markets; business areas; decisional context, competitive differentials and basic competitive strategies. Business processes and functions; customer care process and marketing process; new product and technology development; supply management; operations. Elements of organisational designing; work division, articulation and co-ordination; main typologies of organisation and organisational methodologies.

EXPERIMENTAL PHYSICS I

Code: 083024
Credits: 10.00
Grade: 28
Date: 28/06/2019

Subject groups

FIS/01 EXPERIMENTAL PHYSICS

The programme

Physical quantities. Kinematics of point-like particles. Dynamics: Newton's laws of motion. Fundamental interactions. Work, power, energy. Systems of particles. Gravitation. Elements of dynamics of a rigid body. Properties of the materials. Elements of fluid mechanics. Kinetic theory of gases. Thermodynamics: Elements of thermology. First and second laws of thermodynamics. Carnot cycle and thermal engines. Entropy.

LINEAR ALGEBRA AND GEOMETRY

Code: 083214
Credits: 5.00
Grade: 23
Date: 10/07/2019

Subject groups

MAT/03 GEOMETRY

The programme

Linear systems and matrices. Vector spaces and linear maps. Euclidean vector spaces. Eigenvalues and eigenvectors. Quadratic forms. Applications to conics and quadrics.

COMPUTER SCIENCE A

Code: 061202
Credits: 10.00
Grade: 21
Date: 09/09/2019

Subject groups

ING-INF/05 INFORMATION PROCESSING SYSTEMS

The programme

Introductory concepts: computers architecture, algorithms, programs, languages, programming chain. C language. Base structure of a program. Variables: base types, constant, operators and type conversion. Conditional instruction: logical expressions, cycles. Functions: value and reference parameters, visibility rules, local and global variables, recursion. Vectors and matrices: data storage and access, strings. Pointers and dynamic memory: pointers as function parameters. Structures: assignment, structures as function parameters, comparison, pointers and structures. Dynamic data structures: simple list, queue, stack, double linked list, trees. Files: binary and text files, life cycle of a file. The C++ language. Objects-oriented programming: classes, methods and attributes. Visibility rules of methods and attributes. Methods and operators overloading. Constructor and destructor. Dynamic objects. Inheritance. Polymorphism. Dynamic binding. Dynamic lists and objects.

STATISTICS

Code: 083229
Credits: 5.00
Grade: 26
Date: 13/09/2019

Subject groups

SECS-S/01 STATISTICS

The programme

Data summary and presentation. Discrete and continuous random variables: probability density function, cumulative distribution function, mean, variance. Central limit theorem. Normal Approximation. Point estimation. Confidence intervals. Hypotesis testing for one sample or two samples. Linear models: simple and multiple regression.

MATHEMATICAL ANALYSIS II

Code: 096350
Credits: 10.00
Grade: 26
Date: 23/01/2020

Subject groups

MAT/05 MATHEMATICAL ANALYSIS

The programme

Functions of several real variables (scalar fields): continuity, gradient, differentiability. Maxima and minima. Implicit functions. Lagrange multipliers. Double and triple integrals. Curves in 2-D and 3-D, surfaces in 3-D. Line and surface integrals of a scalar field. Vector fields in 2-D and 3-D: rotation and divergence; line integral of a vector field; potential function and conservative fields; Gauss' and Stokes' theorems. Ordinary differential equations: initial value problems; solutions of first-order equations, of higher-order linear equations, etc.

ELECTRICAL ENGINEERING

Code: 083223
Credits: 10.00
Grade: 19
Date: 07/02/2020

Subject groups

ING-IND/31 ELECTRICAL ENGINEERING

The programme

Electric circuits. Charge, current, voltage, power, energy. Kirchhoff laws. Circuit elements: resistors and sources. DC circuit analysis : general methods, . Thevenin and Norton equivalent circuits. Inductors and capacitors. First-order RC e RL circuits. Sinusoidal Steady-State analysis (AC). The phasor method. Impedance and admittance. AC steady-state power. Resonant circuits. Non-linear elements. Linear two-ports. Second-order RLC circuits. Three-phase circuits. Electric and magnetic fields. Material properties. Magnetic circuits. Hysteresis. Mutual inductance. Ideal and real transformer. Forces in magnetic and electric fields. Principles of electrical machines.

EXPERIMENTAL PHYSICS II

Code: 083224
Credits: 10.00
Grade: 20
Date: 21/02/2020

Subject groups

FIS/01 EXPERIMENTAL PHYSICS

The programme

Coulomb's law and the electric field. Gauss' law and the electric potential. Conductors and dielectric materials. Electric current. Magnetic field. Behaviour of magnetic materials. Electromagnetic induction and Faraday-Neumann-Lenz law. Maxwell-Faraday law. Maxwell's equations. Electromagnetic waves. Poynting vector. Optical phenomena and light spectrum. Interference and diffraction. Light dispersion. Elements of geometrical optics.

FUNDAMENTALS OF AUTOMATIC CONTROL

Code: 083225
Credits: 10.00
Grade: 25
Date: 25/06/2020

Subject groups

ING-INF/04 SYSTEMS AND CONTROL ENGINEERING

The programme

Dynamic systems: Introduction to dynamic systems. State-space and input-output representations. Continuous-time and discrete-time linear time-invariant systems. Equilibrium. Free response, forced response and superposition. Stability. Linearization. Reachability and observability. Laplace and Zeta transform. Transfer function. Block diagrams. Impulse and step response. Frequency response. Bode plots. Polar plots. Filters. Time delay. Control systems: Introduction to control problems. Open-loop and closed-loop control. Steady-state and transient requirements. Stability of feedback systems. Robust stability. Gain and phase margins. Frequency analysis of feedback control systems. Bandwidth. Disturbance attenuation. Steady-state performance.

PROBABILITY

Code: 085924
Credits: 10.00
Grade: 24
Date: 09/07/2020

Subject groups

MAT/06 PROBABILITY AND STATISTICS

The programme

Probability. Random variables and their laws. Expectation. Random vectors. Independence. Characteristic functions. Gaussian laws. Conditional expectations and laws. Convergence of random variables. Law of large numbers. Central limit theorem. Applications.

NUMERICAL MATHEMATICS

Code: 052488
Credits: 10.00
Grade: 29
Date: 02/09/2020

Subject groups

MAT/08 NUMERICAL ANALYSIS

The programme

Floating point arithmetic. Numerical methods for linear systems: direct and iterative methods. Approximation of matrix eigenvalues and eigenvectors. Numerical methods for nonlinear equations. Interpolation. Numerical integration. Numerical methods for ordinary differential equations. Algorithms implementation by MATLAB.

MATHEMATICAL ANALYSIS III

Code: 085925
Credits: 5.00
Grade: 27
Date: 13/01/2021

Subject groups

MAT/05 MATHEMATICAL ANALYSIS

The programme

Analytic functions. Basics of unctional analysis. Distributions. Fourier and Laplace transform. Fourier series of periodic signals. Transform method for ordinary and partial differential equations. Separation of variables.

THERMODYNAMICS AND ENERGETIC PROCESSES

Code:	097575
Credits:	10.00
Grade:	30
Date:	21/01/2021

Subject groups

ING-IND/10 THERMAL ENGINEERING AND INDUSTRIAL ENERGY SYSTEMS

The programme

The course consists of two main parts: the former is devoted to the basic principles of engineering thermodynamics and heat transfer. Course content: Introduction to applied thermodynamics, first and second principle of thermodynamics and balance equations for closed and open systems. Properties of substances and processes, in particular models of ideal gas and ideal liquid. Study of energy conversion cycles. Moist air. Basic heat transfer with outlines of fluid dynamics. Conduction, introduction to forced and natural convection, radiation. Heat exchangers: classification and basic design.

RATIONAL AND CONTINUUM MECHANICS

Code:	052490
Credits:	10.00
Grade:	28
Date:	28/01/2021

Subject groups

MAT/07 MATHEMATICAL PHYSICS

The programme

Rigid body kinematics. Inertia properties of rigid bodies. Balance equations. Relative Mechanics. Principle of virtual works. Lagrange equations. Equilibrium stability. Variational formulation of the motion equations. Elements of differential and tensor calculus. Kinematics. Analysis of deformations and motions. Stress. Caucly Theorem. Balance equations. Constitutive equations. Finite elasticity. Linear elasticity. Fluid mechanics. Viscous fluids. Navier-Stokes equation.

INTRODUCTION TO OPERATIONS RESEARCH

Code: 083220
Credits: 5.00
Grade: 19
Date: 18/02/2021

Subject groups

MAT/09 OPERATIONS RESEARCH

The programme

The course covers some core methodologies of Operations Research which allow to tackle complex decision problems, with a particular emphasis on modeling and algorithmic aspects. Topics: network optimization (algorithms for trees, paths and flows), linear programming (algorithm, duality) and integer linear programming (Branch&Bound and cutting plane methods).

FINAL WORK

Code: 054068
Credits: 3.00
Grade: --
Date: 24/05/2021

Subject groups

Unavailable

The programme

The training aims are focused on the learning of basic communication, in different forms (written report, oral presentation), with particular attention to the enhancement of synthesis skills and communicative efficacy.

MATHEMATICAL FINANCE I

Code: 052491
Credits: 10.00
Grade: 24
Date: 15/06/2021

Subject groups

SECS-S/06 MATHEMATICAL METHODS OF ECONOMICS, FINANCE AND ACTUARIAL SCIENCES

The programme

The purpose of the course is to give a presentation of modern financial markets theory with emphasis on portfolio choices and equilibrium/no arbitrage asset pricing models. Two period (CAPM and APT) and multiperiod models are presented. A discussion on empirical evidence of models is provided.

MODELS AND METHODS FOR STATISTICAL INFERENCE

Code: 054067
Credits: 10.00
Grade: 23
Date: 13/07/2021

Subject groups

MAT/06 PROBABILITY AND STATISTICS, SECS-S/01 STATISTICS

The programme

The course aims to introduce students to statistical data analysis. It is intended to provide basic knowledge of inferential statistics. The main topics of the course will be: estimation, hypothesis testing, asymptotics, linear models, analysis of variance, generalized linear models, non parametric methods, survival analysis.

MECHANICS OF ELASTIC STRUCTURES

Code: 073469
Credits: 10.00
Grade: 30 L
Date: 08/09/2021

Subject groups

ICAR/08 STRUCTURAL MECHANICS

The programme

Statics of statically determined structures of prismatic bars. Mechanics of elastic deformable bodies. Geometric properties of areas. Yielding and failure criteria of engineering materials. De Saint Venants probleme (prismatic bars). Flexural displacements of straight bars. Virtual work theoreme and its application to the calculus of displacements and redundant reactions. Energetic theorems of elastic structures. Elastic stability (hint).Exercises regarding all arguments explained in the lessons will be developed during the hours devoted to the exercitations. Similar exercises will constitute the arguments of the classroom tasks.