ANALYTICAL PROGRAMME OF STUDIES

FALL SEMESTER	ECTS	SPRING SEMESTER	ECTS
FIRST YEAR			
MAS025 - Engineering Mathematics I	5	MAS026 - Engineering Mathematics II	5
LAN100 - General Advanced English	5	LAN104 - English for Technical Purposes	5
MME105 - Experimental and Statistical Analysis	5	MME107 - Introduction to Electromagnetism	5
MME106 - Introduction to Engineering	5	MME145 - Computer Aided Drafting	5
MME117 - Programming and Numerical Methods	5	MME155 - Material Science and Engineering I	5
MME125 - Statics	5	MME156 - Chemistry for Engineers	5
Total	30	*Total*	30
SECOND YEAR			
MAS027 - Engineering Mathematics III	5	MAS029 - Elements of Linear Algebra	5
MME215 - Thermodynamics I	5	MME216 - Incompressible Fluid Mechanics I	6
MME225 - Dynamics	5	MME217 - Heat Transfer	6
MME226 - Mechatronics I	5	MME227 - Vibrations	6
MME255 - Materials Science and Engineering II	5	MME228 - Mechatronics II	7
MME256 - Strength of Materials	5		
Total	30	*Total*	30
THIRD YEAR			
MME315 - Thermodynamics II	6	MME316 - Incompressible Fluid Mechanics II	6
MME317 - Numerical Methods	6	MME318 - Thermal Engines	6
MME325 - Modeling & Analysis of Dynamic Systems	6	MME327 - Control Engineering	6
MME345 - Machine Elements	6	MME346 - Mechanical Design	6
MME347 - Design and Manufacturing	6	MME348 - Manufacturing Processes	6
Total	30	*Total*	30
FORTH YEAR			
MME405 - Final Year Project I	4	MME406 - Final Year Project II	6
MME4… - Technical Elective Course	7	MME4… - Technical Elective Course	7
MME4… - Technical Elective Course	7	MME4… - Technical Elective Course	7
MME4… - Technical Elective Course	7	Elective Course	5
Elective Course	5	Elective Course	5
Total	30	*Total*	30

TECHNICAL ELECTIVE COURSES	ECTS
MME416 - Refrigeration, Heating and Air-conditioning	7
MME417 - Energy Systems	7
MME418 - Compressible Flow	7
MME419 - Modern Computational Tools for Engineers	7
MME426 - Vibrations Theory and Applications	7
MME427 - Dynamics of Machines and Mechanisms	7
MME436 - Cell and Tissue Mechanics	7
MME442 - Lasers and their Applications	7
MME451 - Linear Static and Dynamic Finite Element Analysis of Solids	7
MME456 - Properties of Polymers and Polymer Processing	7
MME457 - Metrology and Materials Characterization Techniques	7
MME458 - Materials for Energy and Environment	7
MME459 - Science, Technology and Manufacturing of Fiber Materials	7

COURSES DESCRIPTION

Compulsory Courses

MME105 - Experimental and Statistical Analysis I
No prerequisites - 5 ECTS
This experimental course aims to introduce the students to basic experimental techniques employed for the determination of physical parameters, to the statistical analysis of experimental data, graphical methods for data presentation and to the preparation of laboratory reports.

MME106 - Introduction to Engineering
No prerequisites - 5 ECTS
General introduction in the Mechanical and Manufacturing Engineering profession, basic principles of mechanical design, laws of nature (principle of conservation of mass, linear momentum, and energy), physical concepts and parameters such as forces, pressure, work, energy, heat transfer, analysis of simple systems/ problems from all areas of engineering.

MME107 - Introduction to Electromagnetism
No prerequisites - 5 ECTS
The aim of the course is the comprehension of basic concepts and phenomena of Electromagnetism, and development of students' ability in solving problems using calculus. Topics covered: Electric charge and matter; Electric field; Electrostatic potential; Capacitors and dielectrics; Electric current and resistance; DC circuits; Magnetism; Magnetic fields; Ampere's law; Faraday's law; Inductance and coils; Electromagnetic oscillations; AC circuits; Electromagnetic waves.

MME117 - Programming and Numerical Methods
No prerequisites - 5 ECTS
This course aims introducing the students to numerical computing using a personal computer, and will built their foundations in numerical methods and analysis. Students will be taught the basic principles in computer programming and numerical methods, using the Matlab, on a wide range of topics in numerical methods and analysis: linear algebra and tensor analysis, developing graphs and plots, root finding, numerical solution of linear and non-linear systems, numerical solution of eigenvalue problems, interpolation and approximation methods, numerical integration, numerical differentiation, complex numeric algebra, and an introduction using symbolic algebra. At the second part of the course, a brief introduction to programming with Fortran 90 will be carried out.

MME125 - Statics
No prerequisites - 5 ECTS
Statics of Particles, Rigid Bodies, Equilibrium of Rigid Bodies, Centroids and Centers of Gravity, Analysis of Structures, Forces in Beams and Cables, Friction, Moments of Inertia.

MME145 - Computer Aided Drafting
No prerequisites - 5 ECTS
The ability to create and interpret detailed and assembled drawings is a necessity for every engineer in order to communicate ideas. The course emphasizes the connection between drawings and three-dimensional geometric models with the design and manufacturing procedures of a product. Topics taught include: international conventions and standards; drawing scales; drawing line types; projection planes; views and view layout; isometric views; auxiliary views; sections; three-dimensional geometric modeling. All taught topics are implemented during a team project for the development of an integrated three-dimensional model of a mechanical device. Autodesk Mechanical and SolidWorks are used as software tools for the creation of drawings and geometric models.

MME155 - Material Science and Engineering I
No prerequisites - 5 ECTS
A course in understanding the structure-property relations of metals, ceramics and plastics, with emphasis on the mechanical properties. Topics include: Crystal structure; Material microstructure; Dislocations and defects; Phase diagrams and phase transformations; Processing and mechanical properties of metals, ceramics, polymers, and composites; Heat treatment of metals; Strain hardening; Fracture, fatigue and multi-axis loading; Creep and stress relaxation; Materials-related design issues, materials selection.

MME156 - Chemistry for Engineers
No prerequisites - 5 ECTS

Atomic structure and chemical bonds. Chemical Equations: Stoichiometry, moles, concentration, molarity, density, etc. Chemical equations involving acids and bases; chemical equations involving gases; combustion reactions. Redox reactions. Examples: Electrolysis, corrosion, photosynthesis, fuel cells. Chemical Thermodynamics: Entropy, enthalpy and free energy, standard enthalpy changes of formation and combustion. Equilibria: Equilibria in physical processes, characteristic features of a dynamic equilibrium, equilibria in chemical reactions, the equilibrium constant and the equilibrium law; factors affecting chemical equilibria. Ionic equilibria in aqueous solution. Reaction rates and influencing factors. Reaction rate and equilibria principles to industrial processes. Special topics: Petroleum and alkanes. Catalysis. Recycling.

MME215 - Thermodynamics I
No prerequisites - 5 ECTS

The fundamental conservation principles for mass, momentum and energy and the principle of the non-destruction of entropy are applied to the engineering analysis of open and closed thermodynamic systems. A well-organized engineering analysis through the method of "production accounting" is emphasized. Basic concepts such as work, heat, internal energy and entropy are clearly defined. The thermodynamic state postulate is introduced leading to the use of thermodynamic diagrams, tables and equations of state. The ideal gas model is discussed in detail including its range of applicability. Basic energy conversion and heating/refrigeration cycles are considered giving emphasis to energy availability and efficiency analysis.

MME216 - Incompressible Fluid Mechanics I
Prerequisites: MAS025 - 6 ECTS

Introduction and basic concepts and definitions. Application of the laws of nature in open and closed macroscopic systems. Applications in problems with practical interest. Differential description of the kinematics, fluid deformation and the laws of nature. Analysis using dimensional analysis. Analytic solution of simple problems. Boundary layer theory, external and internal flows.

MME217 - Heat Transfer
Prerequisites: MAS025 - 6 ECTS

Linear and volumetric expansion. Mechanisms of Heat Transfer (HT), Fourier, Newton and thermal radiation laws of HT. Conductivity and diffusion coefficients, emissivity. Electrical analog of HT, electrical resistance and equivalent thermal circuits. General differential equation of heat conservation. Steady conduction in one dimension with or without internal heat sources, analytical solutions of flat walls, cylinders and spheres. Steady conduction in two dimensions, shape factors, numerical solutions. HT from fins and extended surfaces. Transient HT, Heisler charts, semi-infinite solids. Lumped capacitance method, Biot and Fourier numbers. Forced and natural convection, Reynolds, Prandtl, Nusselt, Rayleigh and Grashof dimensionless numbers. Mixed convection, boiling and condensation. Heat exchangers. The course includes also laboratory exercises.

MME225 - Dynamics
Prerequisites: MME125 - 6 ECTS

This course introduces the student to the fundamental principles of dynamics and their application in the analysis of motion of particles and rigid bodies in two and three dimensions. Topics covered: (a) kinematics of particles, (b) kinetics of particles (Newton's second law, methods of energy and momentum, systems of particles), (c) kinematics of rigid bodies, (d) planar kinetics of rigid bodies (forces and acceleration, plane motion of rigid bodies, energy and momentum methods), and (e) introduction to dynamics of rigid bodies in three dimensions.

MME226 - Mechatronics I
Prerequisites: MME107, MAS025 - 5 ECTS

Analog electronics, circuit elements, active/passive, waveforms. DC circuit analysis: Thevenin, Nortons theorem, max power transfer theorem. AC Circuit analysis: Filters Low pass, high pass and band pass. Active devices: Diodes, bipolar transistors, types and operation. The half wave and full wave rectifier, photodiodes, thermistors. Bipolar transistor amplifiers, types and operation, circuit analysis. Introduction to gain, open loop, closed loop, feedback, transfer functions. First order systems, poles and zeros, stability criteria. Digital electronics, mosfets, jfets types and operation, square waveforms. Binary and hexadecimal arithmetic, Karnaugh maps. Logic gates NOT, OR, AND, NOR, NAND, XOR truth tables and circuits. Inverters, Half/full adders, sequential, combinational logic, flip flops, registers.

MME227 - Vibrations
Prerequisites: MAS025, MME225 - 6 ECTS

This is an introductory course on mechanical vibrations. One degree of freedom systems is used to explain: (a) the basic principles of modelling, (b) the second order differential equations that modelling yields, and (c) the relationship between

the system physical parameters and the differential equations. The notions of (un)damped natural frequency and resonance are defined using the system parameters and their real-life importance is thoroughly discussed. Two degree of freedom systems are studied in order to define the concept of mode shape. Finally, the wave equation as a model of mechanical elements with distributed elasticity and inertia is introduced.

MME228 - Mechatronics II
Prerequisites: MME226 - **6 ECTS**

Mechatronics II involves experiments covering dc and ac circuits, analogue and digital electronics and simple mechatronic systems. More specifically students carry out experiments on circuits involving resistances in series, parallel, potentiometers, resistances in series with capacitors or inductors making use of oscilloscopes and multi-meters in order to determine power factors, total resistance and study resonance by changing frequency. They study the diode under forward and reverse bias, operational amplifier circuits and digital circuits involving logic gates. Finally, they construct simple mechatronic systems using PLCs and small robots.

MME255 - Materials Science and Engineering II
Prerequisites: MME155 - 5 ECTS

This course is the second part of the series "Materials Science and Engineering" and the main objective is the understanding of the structure-physical properties relationship for the whole range of materials - metals, ceramics and polymers. The first part of the course briefly examines topics such as crystal structure and defects in metals and ceramics. Then the course focuses on the thermal, electrical, magnetic and optical properties of the aforementioned materials. The last part of the course discusses both how to select materials for engineering applications and economic, environmental and social issues related to the science and technology of materials. The course includes a series of demonstrations and experimental exercises.

MME256 - Strength of Materials
Prerequisites: MME125 - 5 ECTS

The aim of the Strength of Materials course is to teach the students the basic principles of the strength of materials towards the evaluation and calculation of the stress and strain condition in simple solid mechanics and simple-geometry structural analysis problems. The material taught in this course covers an introduction to solids, theoretical description of the fundamental notions in solid mechanics (stress and strain measures, stiffness, etc.), general theory of elasticity, Mohr's circle (2D and 3D), uniaxial stress analysis, uniform loading of plates, shells and pressure vessels, (elastic and elastoplastic) shaft torsion, (elastic and elastoplastic) beam bending, eccentric beam loading, as well as an outline of failure criteria in metals.

MME315 - Thermodynamics II
Prerequisites: MME215 - 6 ECTS

This course is a continuation of Thermodynamics I considering the design and performance of advanced energy conversion systems. The thermodynamics of nonreactive mixtures are introduced giving emphasis to air-water-vapor mixtures and applications to air conditioning systems: psychrometry, comfort zones, accounting for thermal loads, design of air conditioning systems. Introduction to the thermodynamics of compressible fluid flow follows: speed of sound, Mach number, regimes in compressible flow, one-dimensional steady isentropic flow, choking in isentropic flow, shock waves, isentropic flow in convergent-divergent passages, compressibility effects with friction and heat transfer. A design competition for the optimization of a thermodynamic system using thermodynamics software is included.

MME316 - Incompressible Fluid Mechanics II
Prerequisites: MME216 - 6 ECTS

Brief repetition of the basic concepts of fluid mechanics. Analysis of internal flow networks and external flows with application in aerodynamics. Introduction to rotational fluid mechanics. Conservation of angular momentum for close and open systems. Theoretical description and analysis of pumps and power engines.

MME317 - Numerical Methods
Prerequisites: MME117, MAS027, MAS029 - 6 ECTS

This course is an introduction to numerical methods for the solution of real engineering problems in the areas of vibrations, statics and dynamics, heat transfer, wave propagation, etc. Topics covered include numerical integration and optimization, and solution of ordinary and partial differential equations with Taylor series, Euler, Runge-Kutta, finite differences, and Crank-Nickolson methods. The course also covers solutions to initial and boundary value problems. It includes a programming component for writing algorithms for the numerical solutions in FORTRAN and use of the commercial software platform Matlab.

MMK318 - Thermal Engines
Prerequisites: MME315 - 6 ECTS

Types and technologies of thermal engines, thermodynamic cycles and performance Internal Combustion Engines (ICE), kinematics. Thermodynamic cycles and performance metrics. Timing, two-stroke and four-stroke ICE. Operating principles of Otto, Diesel, HCCI and gas turbines. Combustion of gas mixtures. Theoretical and actual cycles of reciprocating engines and gas turbines. Energy balance. Heat transfer, lubrication and cooling. Special conditions and problems of combustion of various fuels. Mixture Formation, load settings. Configuration of the combustion chambers and fuel injection. Pollutants & emissions. Turbocharging and supercharging. The course includes a series of laboratory exercises.

MME325 - Modeling and Analysis of Dynamic Systems
Prerequisites: MAS027, MME225 - 6 ECTS

The course introduces a unified approach for modeling real dynamic systems. Modeling is done with appropriate graphical or state-space equation models, in order to meet the requirements during the use of the models in design and automatic control. Methods of system analysis are used for calculating behavioral characteristics and for evaluating the accuracy of modeling assumptions. Topics taught: lumped parameter models; rigid body models; models with electric, fluid and thermal elements; interfaces; state-space equations; block diagrams; analysis of linear systems; Laplace transformation and transfer functions; time- and frequency-domain response; stability. The students learn to use computational analysis tools via Matlab/Simulink.

MME327- Control Engineering
Prerequisites: MME325 - 6 ECTS

Introduction to control systems including sensors and actuators. Control system analysis and design using differential equations and Laplace transforms. Order of systems, stability, poles and zeros, feedback control theory. Examples of control systems e.g. temperature control, water level control in boilers etc.

MME345 - Machine Elements
Prerequisite: MME256 - 6 ECTS

The aim of the course is to teach methods for the calculation, selection and use of components (machine elements) used in mechanical engineering. The course starts with the introduction of engineering design principles, and strengthening of necessary knowledge related to material properties, load and stress analysis, deformation and elasticity, and theories of material failure. Then the main machine elements are defined along with their properties and selection procedure. The following machine elements are studied: shafts; screws/nonpermanent joints; welding/permanent joints; springs; bearings; lubrication/journal bearings. The course includes a team project for the design of an engineering device and its 3D geometric modeling on a computer.

MME346 - Mechanical Design
Prerequisite: MME345 - 6 ECTS

This is a two-part course on machine elements and design. The topics of the machine elements part of the course are: gears and power transmission, strength of gears, principles of operation of clutches and brakes, and the theory of flexible machine elements such as belts and chains. In the design part of the course the design process will be discussed in detail· starting from design brief preparation, to the generation of ideas and concepts that could satisfy the need as described in the design brief and ending with the materialisation of the final product.

MME347 - Design and Manufacturing
Prerequisites: MME 145 - 6 ECTS

Introduction to modern Computer-aided Design and Manufacturing Technology, with emphasis on geometrical aspects (material aspects are covered in MME348). Design by CAD, representation of 2D/3D lines, surfaces and objects, geometric processing by homogeneous transformations. Rapid prototyping with material deposition - technologies, systems and applications. Machining processes, material removal, non-traditional technologies, manufacturing by CAM. Shaping by deformation/flow of foil and bulk material, CAE analysis. Surface patterning by lithography, coating and etching, micro- and nanotechnology. Metrology, microscopy, scanning and machine vision, instruments and image processing. Tolerances, fits, surface quality and defects. Assembly and transportation with automation, robotics and navigation systems, applications in design and manufacturing systems.

MME348 - Manufacturing Processes
Prerequisites: MME 347 - 6 ECTS

This course will take a broad look at the various Manufacturing Processes for available Engineering Materials. The lecture material will be reinforced by laboratory sessions and problem sets. Topics covered include: Introduction to Manufacturing Processes for engineering materials; Review of Fundamental Mechanics of Plastic Deformation; Structure and manufacturing properties of metals; Surface structure, treatments and tribology; Metal-casting and heat treatment processes; Bulk deformation processes: turning, milling, drilling, etc.; Material removal processes: abrasive, chemical, electrical and high-energy beams; Joining processes: soldering, brazing, welding, etc.; Micro- and nanofabrication.

MME405 - Final Year Project I
No prerequisites - 4 ECTS
It is elaborated in the course of an entire year and is compulsory for all fourth-year Mechanical and Manufacturing Engineering students. The project may be group or individual one. The faculty members suggest interesting topics at the end of each semester and students in consultation with their chosen advisors select one of them. The purpose of this project is that students solve an interesting engineering problem with a combination of analytical, computational and / or experimental means.

MME406 - Final Year Project II
Prerequisites: MME405 - 6 ECTS
Continuation of the course: MME405 - Final Year Project I.

Technical Elective Courses
MME416 - Refrigeration, Heating, and Air-conditioning
Prerequisite: MME 217, MME315 - 7 ECTS
Analysis and design of Air-conditioning Systems for maintaining comfort conditions in spaces of small and large buildings. Analysis of Refrigeration Systems for industrial applications. Topics covered: Climatological Data; Comfort conditions; Psychrometry; Solar Loads; Air-conditioning loads; Loads of Walls, Class Windows, Lighting, Human Heat, Devices; Refrigerants; Basic Refrigeration Cycles; Air Conditioning System: fan-coil units, air (variable flow or temperature), water/air, heat pump; Design of Air-conditioning System.

MME417 - Energy systems
Prerequisites: MME315 - 7 ECTS
Energy and power, energy balance, conversion efficiency. Conventional, renewable energy sources. Steam & gas turbines, Electric Motors, Generators. Cogeneration. Thermo-electrics and applications, fuel cells, operating principle and types, hydrogen as a fuel. Solar Energy and calculation of solar potential, solar geometry. Solar thermal systems. Photovoltaics, formulas, curves and operating performance. Wind energy and wind power, wind turbines, wind farms. Hydro energy. Biomass, Biogas. Geothermal, wave energy and marine currents. The course includes laboratory exercises.

MME418 - Compressible Flow
Prerequisites: MME215, MME315, MME317 - 7 ECTS
Compressible gas flow is a topic of interest in contemporary engineering applications, such as the transport and storage of natural gas. This course is an introduction to the fundamentals of the compressible flow of gases and includes the following topics: appropriate conservation laws; propagation of disturbances; isentropic flows; Mach number, speed of sound and regimes in compressible flow; one-dimensional steady compressible flow; choking in isentropic flow; isentropic flow in convergent-divergent passages; normal shock wave relations, oblique shock waves, weak and strong shocks, and shock wave structure; compressible flows in ducts with area changes, friction, or heat addition; unsteady compressible flows; Prandtl-Meyer function. The emphasis will be on physical understanding of the phenomena and basic analytical techniques.

MME419 - **Modern Computational Tools for Engineers**
Prerequisites: MME117, MME317 - 7 ECTS
Computational engineering refers to the process of translating the description of physical systems into models that can be analyzed using computers. The use of computational tools for analysis is part of the everyday routine of engineers. When properly used computational tools are a powerful ally that every engineer should be able to rely on. This course offers an introduction to object-oriented scientific programming as a paradigm for the design and development of effective scientific programs. Emphasis is placed on the tremendous capabilities unleashed in Fortran 2008/2015, which allows parallel programs to be developed and executed on personal computers with minimal overhead. The process of modeling of physical systems and the subsequent program design and development are treated as a unified process.

Programming skills are developed through a series of examples from various branches of Mechanical Engineering, such as fluid dynamics, energy storage conversion and transfer, and biomedical engineering.

MME426 - Vibrations Theory and Applications
Prerequisite: MME227 - 7 ECTS
The aims of this course are (a) to present the mechanics of linear vibrations through the notion of frequency response function and (b) to introduce the basic concepts pertaining to non-linear systems. It includes the following topics: structure of dynamics and dynamical examples from various scientific disciplines, generalized coordinates, vibrations of multi-degree and infinite degree of freedom systems, non-linear system behaviour characterization: limit cycles and chaos.

MME427 - Dynamics of Machines and Mechanisms
Prerequisite: MME325 - 7 ECTS
The objective of the course is to study the kinematics and dynamics of planar mechanisms. Knowledge gained in previous courses is reinforced by applying it to realistic kinematics and dynamics problems of machinery. After the successful completion of this course, students will have the general mathematical and computational skills to perform high-fidelity kinematics and dynamics analysis of machine elements including linkages, cams, and gears. Topics covered: rigid body kinematics and dynamics; graphical and analytical mechanism synthesis; geartrain and cam analysis; dynamics and analysis of reciprocating machines. Students learn to use generalized and specialized software for mechanisms' analysis, e.g. Matlab, SolidWorks, Working Model.

MME436 - Cell and Tissue Mechanics
No prerequisites - 7 ECTS
The aim of the course involves the study of the mechanical behavior of native human tissues, and how their mechanical properties are related to tissue function and pathology. Basic knowledge of mechanics (stresses, deformations, balance laws) will be employed to study the mechanical response of tissues such as arteries, heart valve leaflets, muscle tissue and bones. Subsequently, we will show how changes in the mechanical properties of these tissues can lead to diseases such as hypertension, and arteriosclerotic plaques. The course does not require knowledge of biology.

MME442 - Lasers and their Applications
Prerequisite: MME347, MME348 - 7 ECTS
Lasers are part of everyday tasks, such as reading grocery prices, measuring the size of a room, playing music on compact disks and printing or copying paper documents. This course will give an introduction to lasers, which play a key role in modern production processes, and their huge field of applications. Topics covered include: Laser background and general applications; Basic laser optics; Laser cutting, Laser welding; Laser surface treatment; Rapid prototyping and low-volume manufacture; Laser bending and forming; Laser cleaning; Laser automation and in-situ process sensing; etc. The lecture material will be reinforced by laboratory sessions and problem sets.

MME451 - Linear Static and Dynamic Finite Element Analysis of Solids
Prerequisites: MME317, MME256 or MME346 - 7 ECTS
This course aims to introduce the students to the realm of solid mechanics and structural analysis using computers, particularly using the Finite Element Method (FEM). The material of this introductory course identifies two major parts: the simulation and analysis using FEM of linear elastostatic boundary-value problems, and the modelling of transient (time-dependent) solid mechanics problems. It covers essential material for final year undergraduates and postgraduates in mechanical engineering, bioengineering and civil engineering. Students will attend laboratory workshops on commercially available FEM software.

MME 456 - Properties of Polymers and Polymer Processing
Prerequisite: MME155 - 7 ECTS
The course is divided into two parts. In the first part, the mechanical properties of polymers (e.g., elasticity, viscoelasticity, strength, etc.) and the effect of their structural and chemical characteristics on their mechanical behavior are discussed. The structure-properties correlation, the thermal transitions of polymers and how these are capable of affecting their properties, as well as the rheological characteristics of polymeric solutions and melts are analyzed. In the second part, different methods used in polymer processing such as mixing, reinforcement, molding, etc. are discussed.

MME457 - Metrology and Materials Characterization Techniques
No prerequisites - 7 ECTS

Measurements methodology. Metrology. Quality in measurements and testing. Reference materials. Accreditation. Analysis and structural characterization of materials at macro- micro- and nano-scale level. Materials properties techniques (mechanical, thermal, electrical, optical etc.). The course includes laboratory sessions on selected material characterization techniques.

MME458 - Materials for Energy and Environment
Prerequisites: MME255 - 7 ECTS

The course addresses questions such as: How will meet rising energy demands? What are our options? Are there viable long-term solutions for the future? In addition, the course introduces the students to the fundamental materials science at the heart of: renewable energy sources, non-renewable energy sources, future transportation systems, energy efficiency, and energy storage.

MME459 - Science, Technology and Manufacturing of Fiber Materials
Prerequisites: MME155, MME156 - 7 ECTS

This course emphasizes on glass and carbon fibers. After a historical overview, a detailed account of glass wool, different types of glass fibers and manufacturing tools and methods, processing and manufacturing of fiber-reinforced plastics with polymers, thermal and mechanical properties, and applications are given. Similarly, the course covers different types of carbon fibers, micro and nano, methods and materials for synthesis, materials and processing of carbon fiber-reinforced polymers, composite materials properties and their applications. The course also includes laboratory sessions on fiber reinforced plastics, measurement of properties etc.