DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

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INTRODUCTION

Mechanical and Manufacturing Engineering is a key discipline that impacts on nearly every aspect of daily life and is at the heart of all technological developments.

The Department of Mechanical and Manufacturing Engineering (MME) was founded in 2001 and is one of the four departments in the Faculty of Engineering at the University of Cyprus. The first undergraduate students were admitted in September 2003 and graduated in June 2007. The first graduate students were admitted in January 2005. More than 200 undergraduate students and 60 graduate students at Masters and PhD level are currently enrolled in the MME program. Every year about 60 new students are admitted to the undergraduate program.

The faculty of the Department consists of experienced and distinguished professors with expertise in a wide range of research fields.

The Department offers a four-year undergraduate degree program, which is designed based on international standards as well as the peculiarities of the country, and places emphasis on cutting-edge technologies.

The educational system used by the Department provides high quality education and cultivates entrepreneurial spirit in its students, in order that they become confident in promoting innovative ideas, with the aim of generating a new high-technology-based industry in Cyprus.

Research and innovation are encouraged in an environment that fosters cooperation among students, faculty, industry, and research organizations.

The Department offers: ***B.Sc. in Mechanical and Manufacturing Engineering*** *and* ***Minor in Biomedical Engineering***.

MECHANICAL AND MANUFACTURING ENGINEERING

The University of Cyprus programs of studies are based on the European Credit Transfer and Accumulation System - ECTS. To obtain a B.Sc. degree in Mechanical and Manufacturing Engineering, a minimum number of 240 credit units (ECTS) must be completed. Out of this minimum number of credit units, 15 ECTS should be earned for elective courses (not included in the student's specialisation) from two different faculties of the University and 10 ECTS should be earned for English language courses.

The program is designed to produce highly qualified graduates with a strong background in the fundamentals of the field, societal sensitivity and the independence of thought required for a successful career in Mechanical and Manufacturing Engineering. The curriculum follows a deductive approach to learning. This approach stems from the fact that all physical phenomena important to Mechanical and Manufacturing Engineers are governed by a set of simple physical laws. To meet an actual need posed by society, a successful mechanical engineer is expected to use these laws to describe the problem of interest and then, by using his/her experience devise a solution. The solution is most often obtained through a combination of analytical, computational, and experimental means. Therefore, the curriculum educates students in basic physics while reinforcing their mathematical skills and their ability to use computations and experimentation to obtain solutions at the stage of design.

A significant component of the educational system followed by the Department is to produce creative and entrepreneurial students who will be willing to further develop their ideas into commercial products.

FINAL YEAR PROJECT

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.

AREAS OF CONCENTRATION

Students enrolled in the Mechanical and Manufacturing Engineering programme should take a minimum of 5 elective courses (30 ECTS) from the list of technical elective courses. Elective courses from the following areas are offered: Mechanical Engineering, Manufacturing Engineering, Biomedical and Engineering and Materials Science and Engineering.

AREAS OF RESEARCH

Research in the Department of Mechanical and Manufacturing Engineering covers a wide range of fields such as:

- Biomedical Engineering
- Computational Mechanics
- Materials Science and Engineering
- Mechanical System Modelling and Controls
- Micro- and Nano-technology
- Robotics
- Thermofluid Mechanics and Energy Systems

COURSES DESCRIPTION

Compulsory Courses

MME105-Experimental and Statistical Analysis I – 5 ECTS

No prerequisites

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

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 – 5 ECTS

No prerequisites

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

MME125- Statics – 5 ECTS

No prerequisites

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 – 5 ECTS

No prerequisites

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 – 5 ECTS

No prerequisites

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 – 5 ECTS

No prerequisites

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 – 5 ECTS

No prerequisites

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 – 6 ECTS

Prerequisites: MAS025

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 – 6 ECTS

Prerequisites: MAS025

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 laboratory exercises

MME218- Programming and Numerical Methods – 5 ECTS

No prerequisites

The course involves an introduction to computer programming using FORTRAN and MATLAB. Examples from various engineering fields are used to develop programming algorithms. The first part of the course is focusing on the teaching of basic programming commands in FORTRAN. Subsequently, engineering problems the students have dealt with in the course Mechanics-I will be solved with the use developing computer algorithms. The last part of the course is an introduction to the computational package MATLAB.

MME225- Dynamics – 5 ECTS

Prerequisites: MME125

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) iintroduction to dynamics of rigid bodies in three dimensions.

MME226-Mechatronics I - 5 ECTS

Prerequisites: MME107, MAS025

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 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 - 6 ECTS

Prerequisites: MAS025, MME225

This is an introductory course on mechanical vibrations. One degree of freedom systems are 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 - 6 ECTS

Prerequisites: MME226,

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 multimeters 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 - 5 ECTS

Prerequisites: MME155

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 – 5 ECTS

Prerequisites: MME125

Elastic behavior; three dimensional stress and strain. Deformation energy and work. Engineering theory of bending and torsion. Composite loading of prismatic beam. Skew bending, bending with axial load. Section core – inert area. Shearing of thin-wall sections due to bending. Torsion of thin-wall sections. Elasto-plastic behavior, uniaxial behavior. Elasto-plastic bending and torsion. Plastic analysis of beams. Von Mises yield criterion. Mohr-Coulomb failure criterion.

MME315-Thermodynamics II – 6 ECTS

Prerequisites: MME215

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 – 6 ECTS

Prerequisites: MME216

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 - 6 ECTS

Prerequisites: MME218, MAS027, MAS029

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 established packages like MatLab.

MMK318-Thermal Engines - 6 ECTS

Prerequisites: MME315

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 – 6 ECTS

Prerequisites: MAS027, MME225

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 transforms – transfer functions; time and frequency domain response; stability. The students learn to use computational analysis tools via Matlab/Simulink.

MME327- Control Engineering – 6 ECTS

Prerequisites: MME325

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 – 6 ECTS

Prerequisite: MME256

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 - 6 ECTS

Prerequisite: MME345

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 – 6 ECTS

Prerequisites: MME 145

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 of Design and Manufacturing Systems.

MME348-Manufacturing Processes – 6 ECTS

Prerequisites: MME 347

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 – 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 – 6 ECTS

Prerequisites: MME405

Continuation of the course *"Final Year Project I"*

Technical Elective Courses

MME416- Refrigeration, Heating, and Air-conditioning - 7 ECTS

Prerequisite: MME 217, MME315

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 - 7 ECTS

Prerequisites: MME315

Energy and power, energy balance, conversion efficiency. Conventional, renewable energy sources. Steam & gas turbines, Electric Motors, Generators. Cogeneration. Thermoelectrics 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 - 7 ECTS

Prerequisites: MME215, MME315, MME317

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 – 7 ECTS

Prerequisites: MME117, MME317

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* (OOSP) 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 - 7 ECTS

Prerequisite: MME227

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 - 7 ECTS

Prerequisite: MME325

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 - 7 ECTS
No prerequisites
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 – 7 ECTS
Prerequisite: MME347, MME348
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

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 - 7 ECTS
Prerequisite: MME155
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 - 7 ECTS
No prerequisites
Measurements methodology. Metrology. Quality in measurements and testing. Reference materials. Accreditation. Analysis and structural characterization f materials at macro- micro- and nano-scale level.

Materials properties techniques (mechanical, thermal, electrical, optical etc). The course includes labs on selected techniques.

MME458-Materials for Energy and Environment - 7 ECTS

Prerequisites: MME255

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, Nonrenewable energy sources, Future transportation systems, Energy efficiency, and Energy storage.

MME459- Science, technology and manufacturing of fiber materials – 7 ECTS

Prerequisites: MME155, MME156

This course will emphasize on glass and carbon fibers. After a historical overview a detailed account of (a) glass wool (b) different types of glass fibers and manufacturing tools, methods (c) processing and manufacturing of fiber reinforced plastics with polymers (d) thermal, mechanical properties and applications will be given. Similarly the course will cover (a) different types of carbon fibers, micro and nano, methods and materials for synthesis (b) materials and processing of carbon fiber reinforced polymers (c) properties and applications. The course will include laboratory sessions on fiber reinforced plastics, measurement of properties etc. Midterm (30%), final exam (40%) and lab sessions (30%).

ANALYTICAL PROGRAMME OF STUDIES

FIRST YEAR			
FALL SEMESTER	**ECTS**	**SPRING SEMESTER**	**ECTS**
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
MAS029 - Elements of Linear Algebra	5	MME155- Material Science and Engineering I	5
MME125- Statics	5	MME156- Chemistry for Engineers	5
	30		30
SECOND YEAR			
MAS027- Engineering Mathematics III	5	MME218- Programming and Numerical Methods	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		
	30		30
THIRD YEAR			
MME315-Thermodynamics II	6	MME316- Incompressible Fluid Mechanics II	6
MME317- Numerical Methods	6	MME318- Thermal Engines	6
MME325- Modeling and 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
	30		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
	30		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