

B.Sc. in Mechanical Engineering Mechatronics Study Plan

■ University Compulsory Courses 16 C.H

Page (64)

■ University Elective Courses 9 C.H

Pages (64 & 65)

■ Faculty Compulsory Courses 32 C.H

| Line No. | Code | Course | |
|----------|----------|------------------------------------|---|
| 224000 | CHE400CH | PROFESSIONAL ETHICS FOR ENGINEERS | 1 |
| 242020 | EE202EE | COMMUNICATION SKILLS FOR ENGINEERS | 2 |
| 901010 | MATH101 | CALCULUS(I) | 3 |
| 901020 | MATH102 | CALCULUS (2) | 3 |
| 902010 | MATH201 | INTERMEDIATE ANALYSIS | 3 |
| 902030 | MATH203 | ORDINARY DIFFERENTIAL EQUATIONS | 3 |
| 911010 | CHEM101 | GENERAL CHEMISTRY(I) | 3 |
| 911020 | CHEM102 | GENERAL CHEMISTRY (2) | 3 |
| 911072 | CHEM107B | GENERAL CHEMISTRY LAB | 1 |
| 921010 | PHY101 | GENERAL PHYSICS (1) | 3 |
| 921020 | PHY102 | GENERAL PHYSICS (2) | 3 |
| 921072 | PHY107B | GENERAL PHYSICS (LAB) | 1 |
| 1731150 | CS115 | C++ PROGRAMMING LANGUAGES | 3 |

■ Department Compulsory Courses 75 C.H

| Line No. | Code | Course | |
|----------|--------|--------------------------------------|---|
| 223400 | CHE340 | THERMODYNAMICS | 3 |
| 232011 | CE201A | STATICS | 3 |
| 243031 | EE303 | PRINCIPLES OF ELECTRICAL ENGINEERING | 3 |
| 243042 | EE304 | ELECTRIC DRIVE | 3 |
| 243051 | EE305 | NUMERICAL METHODS FOR ENGINEERS | 3 |
| 243063 | EE306C | ELECTRICAL ENGINEERING LAB | 1 |
| 251010 | ME101 | ENGINEERING WORKSHOPS | 2 |
| 251011 | ME101A | ENGINEERING WORKSHOP (LAB) | 0 |
| 252013 | ME201B | ENGINEERING DRAWING B | 2 |
| 252023 | ME202C | MECHANICAL DRAWING | 2 |
| 252122 | ME212B | DYNAMICS | 3 |
| 252143 | ME214C | STRENGTH OF MATERIALS | 3 |
| 253053 | ME305C | APPLIED MATH FOR ENGINEERS | 3 |
| 253110 | ME311 | MECHANICS OF MACHINES | 3 |
| 253230 | ME323 | STRENGTH OF MATERIALS LAB | 1 |
| 253323 | ME3321 | MACHINE DESIGN (1) | 3 |
| 253433 | ME343C | FLUID MECHANICS | 3 |
| 254212 | ME421B | MACHINE DESIGN (2) | 3 |
| 254453 | ME445C | THERMALOFUIDS LAB | 1 |
| 254511 | ME451A | HEAT TRANSFER (1) | 3 |
| 254623 | ME462C | AUTOMATIC CONTROL (1) | 3 |
| 254633 | ME463C | MECHANICAL VIBRATIONS | 3 |
| 254711 | ME471A | INTRUMENTAION | 3 |

| | | | |
|--------|--------|-------------------------------------|---|
| 254723 | ME472C | INTURUMENTATION AND DYNAMIC SYSTEMS | 1 |
| 254920 | ME492 | AUTOMATIC CONTROL 1 | 3 |
| 255911 | ME591A | GRADUATION PROJECT (1) | 1 |
| 255921 | ME592A | GRADUATION PROJECT | 3 |
| 255933 | ME593C | PROJECTS IN MECHANICAL DESIGN | 2 |
| 293410 | IE341 | ENGINEERING ECONOMY | 2 |
| 293610 | IE361 | ENGINEERING MATERIALS | 3 |
| 293640 | IE364 | MANUFACTURING PROCESSES (1) | 3 |

■ Specialization Compulsory Course 18 C.H

| Line No. | Code | Course | |
|----------|--------|---|---|
| 243213 | EE321C | FUNDAMENTALS OF ELECTRONICS (NON EE STUDENTS) | 3 |
| 254253 | ME425C | MICROCONTROLLERS APPLICATION | 3 |
| 254463 | ME446C | MECHATRONICS LAB 1 | 1 |
| 254643 | ME464C | AUTOMATIC CONTROL 11 MECHATRONICS SYSTEMS | 3 |
| 255433 | ME543C | INTERGRATION | 3 |
| 255453 | ME5452 | MECHATRONICS LAB 11 | 1 |
| 1712540 | CPE254 | DIGITAL LOGIC DESIGN AND COMPUTER ARCHITECTURE (NON-CIE STUDENTS) | 3 |
| 1712550 | CPE255 | DIGITAL LOGIC DESIGN LAB (NON-CPE-STUDENTS) | 1 |

■ Specialization Elective Courses 9 C.H

| Line No. | Code | Course | |
|----------|--------|---|---|
| 25549 | ME549I | INTRODUCTION TO INTELLIGENT SYSTEMS | 3 |
| 25594 | ME594G | SPECIAL TOPIICS IN THERMAL POWER | 1 |
| 25596 | ME596A | SPECIAL TOPICS IN MECHATRONICS | 3 |
| 253421 | ME342A | THERMODYNAMICS (2) | 3 |
| 254610 | ME461 | PRODUCTICN PROCESSES | 3 |
| 255003 | ME500C | INTRODUCTION TO MICRO - ELECTRO - MECHANICAL-SY | 3 |
| 255023 | ME502C | INFORMATIION TECHNOLOGY FOR MECHANTRIOINCS | 3 |
| 255033 | ME503C | MODELING SIMULATION AND ANALYSIS OF PHYSICAL SYSTE | 3 |
| 255053 | ME505C | FININTE ELEMENTS ANAYLSIS | 3 |
| 255063 | ME506C | INTRODUCTION TO AERONAUTICS ENGINEERING(NON AERONANTICS | 3 |
| 255073 | ME507C | INTRODUCTION TO MECHATRONICS (NON - MECHATRONICS | 3 |
| 255083 | ME508C | AIR POLLUTION | 3 |
| 255131 | ME513A | COMPOSITES | 3 |
| 255140 | ME514 | MECHANICS OF MATERIAL (2) | 3 |
| 255190 | ME519 | SPECIAL TOPICS IN MECHANICAL DESIGN | 3 |

| | | | |
|--------|--------|--|---|
| 255210 | ME521 | COMPUTER AIDED DESIGN | 3 |
| 255230 | ME523 | ENGINEERING STATISTICS AND RELIABILITY | 3 |
| 255263 | ME526C | REAL TIME SYSTEMS | 3 |
| 255321 | ME532A | INTERNAL COMBUSTION ENGINES | 3 |
| 255330 | ME533 | HEATING, VENTILATION, AND AIR CONDITIONING | 3 |
| 255380 | ME538 | WATER DESALINATION | 3 |
| 255401 | ME540A | REFRIGERATION | 3 |
| 255463 | ME546C | AIRCRAFT SENSORS AND ACTUATORS | 3 |
| 255473 | ME547C | ROBOTICS | 3 |
| 255613 | ME561C | FLUID POWER CONTROL | 3 |
| 255623 | ME562C | ACOUSTICS | 3 |
| 255641 | ME564A | ENGINEERING MATERIALS | 3 |
| 255720 | ME572 | QUALITY CONTROL AND RELIABILITY | 3 |
| 255760 | ME576 | SENSING AND NAVIGATION IN ROBOTICS | 3 |
| 255840 | ME584 | DESIGN OF MECHATRONIC SYSTEMS I | 3 |
| 255860 | ME586 | SYSTEM MODELING AND SIMULATION | 3 |
| 255870 | ME587 | ROBOTICS IN MANUFACTURING SYSTEMS | 3 |
| 255890 | ME589A | SPECIAL TOPICS IN MECHATRONICS | 3 |
| 255943 | ME594C | SPECIAL TOPICS IN THERMAL POWER | 2 |
| 255951 | ME595A | SPECIAL TOPICS IN AERONAUTICS | 1 |
| 255952 | ME595B | SPECIAL TOPICS IN AERONAUTICS | 2 |
| 255953 | ME595C | SPECIAL TOPICS IN AERONAUTICS | 3 |
| 255961 | ME596G | SPECIAL TOPICS IN MECHATRONICS | 1 |
| 295553 | IE555C | SAFETY ENGINEERING AND MANAGEMENT | 3 |
| 295570 | IE557 | INTRODUCTION TO PROJECT MANAGEMENT | 3 |
| 295740 | IE574 | RELIABILITY AND MAINTENANCE MANAGEMENT | 3 |

TOTAL

159 C.H

*** For prerequisite & equivalent courses see the Courses' Description.**

B.Sc. in Mechanical Engineering Thermal Power Study Plan

■ University Compulsory Courses 16 C.H

Page (64)

■ University Elective Courses 9 C.H

Pages (64 & 65)

■ Faculty Compulsory Courses 32 C.H

| Line No. | Code | Course | |
|----------|----------|------------------------------------|---|
| 224000 | CHE400CH | PROFESSIONAL ETHICS FOR ENGINEERS | 1 |
| 242020 | EE202EE | COMMUNICATION SKILLS FOR ENGINEERS | 2 |
| 901010 | MATH101 | CALCULUS(1) | 3 |
| 901020 | MATH102 | CALCULUS (2) | 3 |
| 902010 | MATH201 | INTERMEDIATE ANALYSIS | 3 |
| 902030 | MATH203 | ORDINARY DIFFERENTIAL EQUATIONS | 3 |
| 911010 | CHEM101 | GENERAL CHEMISTRY(1) | 3 |
| 911020 | CHEM102 | GENERAL CHEMISTRY (2) | 3 |
| 911072 | CHEM107B | GENERAL CHEMISTRY LAB | 1 |
| 921010 | PHY101 | GENERAL PHYSICS (1) | 3 |
| 921020 | PHY102 | GENERAL PHYSICS (2) | 3 |
| 921072 | PHY107B | GENERAL PHYSICS (LAB) | 1 |
| 1731150 | CS115 | C++ PROGRAMMING LANGUAGES | 3 |

■ Department Compulsory Courses 75 C.H

| Line No. | Code | Course | |
|----------|--------|--------------------------------------|---|
| 223400 | CHE340 | THERMODYNAMICS | 3 |
| 232011 | CE201A | STATICS | 3 |
| 243031 | EE303 | PRINCIPLES OF ELECTRICAL ENGINEERING | 3 |
| 243042 | EE304 | ELECTRIC DRIVE | 3 |
| 243051 | EE305 | NUMERICAL METHODS FOR ENGINEERS | 3 |
| 243063 | EE306C | ELECTRICAL ENGINEERING LAB | 1 |
| 251010 | ME101 | ENGINEERING WORKSHOPS | 2 |
| 251011 | ME101A | ENGINEERING WORKSHOP (LAB) | 0 |
| 252013 | ME201B | ENGINEERING DRAWING B | 2 |
| 252023 | ME202C | MECHANICAL DRAWING | 2 |
| 252122 | ME212B | DYNAMICS | 3 |
| 252143 | ME214C | STRENGTH OF MATERIALS | 3 |
| 253053 | ME305C | APPLIED MATH FOR ENGINEERS | 3 |
| 253110 | ME311 | MECHANICS OF MACHINES | 3 |
| 253123 | ME312C | MECHANICS OF MATERIALS | 1 |
| 253323 | ME3321 | MACHINE DESIGN (1) | 3 |
| 253433 | ME343C | FLUID MECHANICS | 3 |
| 254333 | ME4332 | MECHANICAL DESIGN (2) | 3 |
| 254453 | ME445C | THERMAL FLUIDS LAB | 1 |
| 254511 | ME451A | HEAT TRANSFER (1) | 3 |
| 254623 | ME462C | AUTOMATIC CONTROL (1) | 3 |
| 254633 | ME463C | MECHANICAL VIBRATIONS | 3 |
| 254711 | ME471A | INSTRUMENTATION | 3 |
| 254723 | ME472C | INSTRUMENTATION AND DYNAMIC SYSTEMS | 1 |
| 254920 | ME492 | AUTOMATIC CONTROL 1 | 3 |
| 255911 | ME591A | GRADUATION PROJECT (1) | 1 |

| | | | |
|--------|--------|-------------------------------|---|
| 255921 | ME592A | GRADUATION PROJECT | 3 |
| 255933 | ME593C | PROJECTS IN MECHANICAL DESIGN | 2 |
| 293410 | IE341 | ENGINEERING ECONOMY | 2 |
| 293610 | IE361 | ENGINEERING MATERIALS | 3 |
| 293640 | IE364 | MANUFACTURING PROCESSES (1) | 3 |

■ Specialization Compulsory Courses 12 C.H

| Line No. | Code | Course | |
|----------|--------|--|---|
| 253222 | ME322B | ENGINEERING THERMODYNAMICS | 3 |
| 254442 | ME444B | FLUID MECHANICS FOR MECHANICAL ENGINEERS | 3 |
| 254522 | ME4522 | HEAT TRANSFER (2) | 3 |
| 255332 | ME5331 | DESIGN OF THERMAL SYSTEMS | 3 |

■ Specialization Elective Courses 15 C.H

| Line No. | Code | Course | |
|----------|--------|---|---|
| 25594 | ME594G | SPECIAL TOPICS IN THERMAL POWER | 1 |
| 25595 | ME595G | SPECIAL TOPICS IN AERONAUTICS | 1 |
| 255053 | ME505C | FINITE ELEMENTS ANALYSIS | 3 |
| 255063 | ME506C | INTRODUCTION TO AERONAUTICS ENGINEERING(NON AER) | 3 |
| 255073 | ME507C | INTRODUCTION TO MECHATRONICS (NON - MECHATRONICS) | 3 |
| 255083 | ME508C | AIR POLLUTION | 3 |
| 255140 | ME514 | MECHANICS OF MATERIAL (2) | 3 |
| 255242 | ME524B | FUEL AND COMBUSTION | 3 |
| 255272 | ME527B | INTERNAL COMBUSTION ENGINES | 3 |
| 255282 | ME528B | THERMAL POWER PLANTS | 3 |
| 255292 | ME529B | INDUSTRIAL HEAT EXCHANGERS | 3 |
| 255380 | ME538 | WATER DESALINATION | 3 |
| 255401 | ME540A | REFRIGERATION | 3 |
| 255442 | ME544B | TURBOMACHINERY | 3 |
| 255463 | ME546C | AIRCRAFT SENSORS AND ACTUATORS | 3 |
| 255482 | ME548B | AUTOTRONICS | 3 |
| 255493 | ME549A | SPECIAL TOPICS IN THERMAL POWER | 3 |
| 255512 | ME551A | SUSTAINABLE ENERGY CONVERSION | 3 |
| 255521 | ME552A | PROPULSION | 3 |
| 255531 | ME553A | FLIGHT DYNAMICS (1) | 3 |
| 255541 | ME554A | AERODYNAMICS (2) | 3 |
| 255561 | ME556A | AIRCRAFT DESIGN | 3 |
| 255623 | ME562C | ACOUSTICS | 3 |
| 255641 | ME564A | ENGINEERING MATERIALS | 3 |
| 255812 | ME581A | HEATING VENTILATION AND AIR CONDITIONING | 3 |
| 255820 | ME582 | FLUID POWER CONTROL | 3 |
| 255840 | ME584 | DESIGN OF MECHATRONIC SYSTEMS I | 3 |
| 255860 | ME586 | SYSTEM MODELING AND SIMULATION | 3 |
| 255870 | ME587 | ROBOTICS IN MANUFACTURING SYSTEMS | 3 |

| | | | |
|--------------|--------|---|----------------|
| 255890 | ME589A | SPECIAL TOPICS IN MECHATRONIC | 3 |
| 255943 | ME594C | SPECIAL TOPICS IN THERMAL MPOWER | 2 |
| 255952 | ME595B | SPECIAL TOPICS IN AERONAUTICS | 2 |
| 255961 | ME596G | SPECIAL TOPICS IN MECHATRONICS | 1 |
| 255963 | ME596B | SPECIAL TOPICS IN MECHATRONICS | 2 |
| 295553 | IE555C | SAFETY ENGINEERING AND MANAGEMENT | 3 |
| 295570 | IE557 | INTRODUCTION TO PROJECT MANAGEMENT | 3 |
| 295740 | IE574 | RELIABILITY AND MAINTENANCE MANAGEMENT | 3 |
| TOTAL | | | 159 C.H |

**** For prerequisite & equivalent courses see
the Courses' Description.***

B.Sc. in Mechanical Engineering

Courses' Description

ME 101 Engineering Workshops 2C.H

Development of basic skills in fields of hand filing, turning, welding, piping and plumbing, carpentry, sand casting, glass works, sheet metal fabrication, and household electric circuits. Theories related to metal machining, measurements, metal forming, sand casting, and welding. *Pre: none*

ME 201 Engineering Drawing B 2C.H

Instruments and their use, graphical geometry, lettering, orthographic and isometric drawing and sketching, sectional views. Introduction to descriptive geometry. Surface intersections and developments. Computer graphics. *Pre: CIS 100*

ME 202 Mechanical Drawing 2C.H

Auxiliary views. Temporary fasteners and springs; their construction and standards. Power screws and welded symbols. Dimensioning, tolerance, limits and fits using ISO system. Detail and working drawings. Assembly drawings. *Pre: ME 201*

ME 211 Fundamentals of Automobile Engineering (for non ME students) 3C.H

Engine performance, engine operating systems, automobile transmission systems (clutches, gear boxes universal joints, back axle and differential). Brakes, front axle and steering mechanism. Suspensions. Automotive electric systems, electronics and control. Engine main components design. *Pre: none*

ME 212 Dynamics 3C.H

Dynamics of particles, two- and three-dimensional dynamics of rigid bodies, moment of inertia, work and energy, impulse and momentum for rigid bodies. *Pre: CE 201*

ME 214 Strength of Materials 3C.H

Concepts of stress and strain. Stresses and displacements of axially loaded members. The state of stress and strain; Normal, bending, shear, and torsion stresses. Mechanical properties of materials, combined stresses, composite sections. Deflections: integration Method, Moment area method, Buckling of columns. *Pre: CE 201.*

ME 215 Engineering Mechanics 3C.H (for none ME students)

Statics of particles, rigid bodies. Equilibrium of rigid bodies. Distributed forces. Moment of inertia. Rigid bodies kinematics. Rigid bodies kinetics. Newton's second law. Work and energy for rigid bodies. Impulse and momentum for rigid bodies, oscillations. *Pre: Phys 101*

ME 305 Applied Mathematics for Engineers 3C.H

Laplace transformation, complex variables and complex integration. Applications to solutions of ordinary differential equations. Fourier series, half range expansion. Solutions of partial differential equations using separation of variables and Laplace transformation techniques, probability, permutations and combinations. *Pre: Math 201, Math 203*

ME 311 Mechanics of Machinery 3C.H

Kinematic analysis of mechanisms. Velocity and acceleration polygons. Static and inertia force analysis of

machinery. Dynamic analysis of cams, gear and gear trains. Balancing of machines. *Pre: ME 212*

ME 312 Mechanics of Materials Lab. 1C.H

Strength of material experiments including: hardness, Tensile, compression, impact. Torsion. Creep. Buckling and fatigue tests. Experiments on thin pressure vessels, non-destructive testing, heat treatment, and casting. *Pre: ME 214, IE361*

ME 322 Engineering Thermodynamics 3C.H

Availability and Irreversibility. Vapor and air-standard power and refrigeration cycles. Thermodynamic relations. Ideal and real mixtures and solutions. Chemical reactions and combustion. *Pre: ChE 340*

ME 332 Machine Design I 3C.H

Introduction to design process. Design considerations. Tolerances, fits and surface finish. Stress analysis and deflection of mechanical elements. Energy methods. Statistical considerations in machine design. Failure of machine elements. Fatigue. *Pre: ME 214, ME 202*

ME 343 Fluid Mechanics 3C.H

Fluid and their properties. Fluid Statics. Kinematics of fluid flow. Conservation equations and their applications. Euler's equation applications, Bernoulli's equation applications, Dimensional analysis and similarity. Pipe flows, Calculations of head losses. *Pre: Phys 101, Math 203*

ME 414 Aircraft Structures I 3C.H

Basics of elasticity. Bending, buckling, and Vibration of Euler-Bernoulli beam. Aerodynamic loads. Functions of structural components. Fabrication of structural components. Principles of stressed skin construction; bending, shear, and torsion of open and closed thin-walled, single and multi-cell, cross-section beams, including shear center and structural idealization. *Pre: ME 214*

ME 425 Microcontrollers Applications 3C.H

Introduction to microcontroller-based systems for embedded control applications. Topics include microcontroller programming interfacing, and interrupt handling, application of microcontrollers in process control, automation, instrumentation, and communication. *Pre: CS 115, CPE 255*

ME 433 Machine Design II 3C.H

Design of screws, fasteners and connections. Welded joints, mechanical springs, spur gears, shafts, belts, chains and rolling bearings. Lubrication and journal bearings. *Pre: ME 332*

ME 443 Aerodynamics I 3C.H

Basics of aerodynamics: the concept of lift and drag, stream function and potential velocity function. Incompressible-inviscid flow theory: flow about bodies, superposition of flows, source panel method, kutts-Joukowski theorem. Aerodynamic characteristics of airfoils: airfoil geometry parameters, vortex panel method, kutta condition, thin-airfoil theory, high-lift airfoil section. Wings of finite span: lifting-line theory, trailing vortices and downwash, vortex-induced drag, vortex-lattice method. Effects of boundary layer interaction. *Pre: ME 343*

ME 444 Fluid Mechanics for Mechanical Engineers 3 C.H

Potential flow theory. Boundary layer theory. Basics of Turbomachinery. Gas dynamics and applications. *Pre: ME 343*

ME 445 Thermofluid Lab. 1C.H

Experiments on thermo-fluid systems including: pipe flows, flow meters, hydrostatic forces, pump performance, jet forces, thermal conductivity, heat transfer coefficients, heat exchanger performance, air-conditioning processes, refrigeration cycles, boiling and condensation, and steam devices. *Pre/Co.: ME 451*

ME 446 Mechatronics Lab I 1C.H

Microcontroller programming interfacing and applications on classical control concepts and mechatronics system design. *Pre: ME 425, ME 462*

ME 451 Heat Transfer I 3C.H

Modes of heat transfer. One dimensional conduction, steady and transient analysis. Introduction to convection. Convection heat transfer in external flows. Radiation heat transfer. Introduction to mass transfer. *Pre: ME 343, ME 305*

ME 452 Heat Transfer II 3C.H

Forced convection heat transfer in internal flows. Free convection heat transfer. Boiling and condensation. Heat exchangers. Radiation heat exchange. *Pre: ME 451*

ME 462 Automatic Control I 3C.H

System modeling. Transfer functions, block diagrams and signal flow graph. Time domain analysis, transient response, steady-state error, stability and sensitivity. Routh's stability criterion. Root locus. Frequency domain analysis, Nyquist criterion, Bode plots and Nicholas charts. Control system design by compensation. *Pre/Co.: ME 463*

ME 463 Mechanical Vibrations 3C.H

Properties of oscillatory motion. Derivation of governing differential equations. Free and damped vibrations. Harmonically excited motion, rotating and reciprocating unbalance, support motion. Vibration measurements. Vibration isolation. Transient vibrations. Free and forced vibrations in multi-degrees-of-freedom systems. Vibration absorbers. Continuous systems. *Pre: ME 305, ME 212*

ME 464 Automatic Control II 3C.H

Introduction to signals and systems continuous and discrete -time signals difference equations, z-transform; sampled-data systems, sample and hold, discrete models including state-space; discrete equivalents of continuous-time systems; stability analysis; controllability and observability of sampled-data systems; design specifications; controller design using transform techniques, design using state-space methods; generalized sample-data hold functions; and introduction to optimal control. *Pre: ME 462*

ME 471 Instrumentation 3C.H

Analysis of experimental data. statistics; mean and variance, Basic electronic measurement and sensing devices, Displacement, area, force, torque, pressure, strain, flow, temperature, and thermal and transport properties measurements. Data acquisition and processing. *Pre: ME 343, EE 303*

ME 472 Instrumentation & Dynamic Systems Lab. 1C.H

System response and performance. Dynamic and vibration measurements of systems. Strain and temperature measurements. Operational amplifiers. Data acquisition. *Pre: ME 471, ME463*

ME 492 Engineering Training 3C.H

Eight weeks of practical training in an institution (university, company, ...etc) that is accredited by the mechanical engineering department and faculty of engineering at JUST for training purposes in the field of mechanical engineering. *Pre: Completion of 117 credit hours*

ME 500 Introduction to Micro-Electro-Mechanical-Systems (MEMS) 3C.H

Overview of MEMS and Microsystems; history and industry perspective. Scaling laws in miniaturization. Working principles of Microsystems; microsensors and microactuators. Microsystems design, modeling and fabrication processes. Studies on several classes of devices including mechanical MEMS, Bio-MEMS, microfluidics, RF MEMS, microrobotics *Pre: ME 343, IE 361, ME 451*

ME 501 Water Desalination 3C.H

Water analysis and treatment. Analysis and design of different types of desalination processes. Distillation processes: multi-stage, multi-effect distillation, and vapor compression. Membrane processes: electro-dialysis and reverse osmosis. Desalination by freezing. *Pre: ME 451*

ME 502 Information Technology for Mechatronics 3C.H

Computer vision operating systems, computer networking internet programming and application: tele-monitoring. *Pre: ME 425*

ME 503 Modeling, Simulation and Analysis Of Physical Systems 3C.H

Definition and classification of dynamic systems and components. State-variables and input-output models. Modeling of system components: electrical, mechanical, fluid, and thermal. Modeling of multi-domain systems. Nonlinear systems and linear representations of nonlinear components. Simulation techniques. Analysis and solution techniques for linear systems. Transfer functions and block diagrams. MATLAB based case studies. *Pre: ME 462*

ME 504 Composite Materials 3C.H

Introduction. Application of composite materials in aerospace industry. Fiber reinforced composites. Stress, strain, and strength of composite laminate. Failure criterion. Environmental effect. Design of composite structure. *Pre: ME 414*

ME 505 Finite Elements Analysis 3C.H

Basic concepts of the finite element method. Spring, bar, beam and triangular elements. Plane stress and plane strain models. Axisymmetric elements. 3D stress analysis. Applications to heat transfer, fluid mechanics, vibrations and thermal stresses. *Pre: EE 305*

ME 506 Introduction to Aeronautics Engineering (non Aeronautics Students) 3C.H

Basic concepts in fluid mechanics and aerodynamics. Stability and controllability of flight vehicles. Lift and drag forces. Aircraft propulsive systems. Performance characteristics of typical aircraft. *Pre: 5th Year Standing*

ME 507 Introduction to Mechatronics (non Mechatronics Students) 3C.H

Introduces technologies involved in mechatronics (Intelligent Electro Mechanical Systems) and techniques necessary to apply this technology to mechatronics system design. Topics: electronics, A/D, D/A converters, op-amps, filters, power devices, software program

design, hardware and DC motors and stepper motors, solenoids, and sensing. *Pre: ME 471*

ME 508 Air Pollution 3C.H

Air pollution sources and effects. Air pollution meteorology; measurements and monitoring. Control of Air pollution. Air pollution standards and regulations. *Pre: ME 322*

ME 514 Mechanics of Materials II 3C.H

Introduction to plastic behavior of materials. Bending of curved beams. Flat plates. Buckling of eccentric loaded columns. Shear center. Unsymmetrical bending. Energy methods. Beams on elastic foundations. Dynamic loading. *Pre: ME 214*

ME 516 Aeroelasticity 3C.H

Wing divergence control reversal. Lift effectiveness. Swept wing aero elasticity. Vibrations of structure unsteady aerodynamic forces and moment. Flutter of a single degree of freedom system. Methods of flutter analysis. *Pre: ME 443, ME 463*

ME 517 Flight Dynamics and Stability I 3C.H

Introduction to stability and control of flight vehicles. Flight dynamic equations of unsteady motion. Inertial and aerodynamic coupling. Stability and control of longitudinal and lateral-directional motions. Dynamic stability and control. *Pre: ME 443*

ME 518 Aircraft Structures II 3C.H

Energy principles, matrix analysis of structures, introduction to finite element methods. Application to aircraft structural elements. Introduction to composite material in aircrafts and introduction to classical laminated plate theory. Elementary aerolasticity. *Pre: ME414*

ME 519 Flight Dynamics and Stability II 3C.H

Review of six degree of freedom vehicle model. Integration of the aerodynamics and propulsive inputs. Nonlinear analysis and computer simulation. Introduction to three dimensional motion under central fields. Solution to orbital motion. Helicopter flight dynamics. *Pre: ME 517*

ME 524 Fuel and Combustion 3C.H

Fuel properties and handling. Combustion thermodynamics. Chemical equilibrium. Introduction to chemical kinetics. Combustion in internal combustion engines. *Pre: ME 322*

ME 525 Propulsion 3C.H

An integrated approach to the application of engineering principles to propulsion systems. Topics include: piston props, turboprops, turbojets, turbofans, turbo shaft, ramjets, scramjets and rocket engines, beside intakes, compressors, fans, combustors, turbines and propelling nozzles. *Pre: ME 443*

ME 526 Real Time Systems 3C.H

sample rate selection, pre-filtering, quantization effects and computational delay; scheduling theory and priority assignment to control processes, timing of control loops, effects of missed deadlines; time based characteristics of sensors and devices, embedded processors, processor/device interface, real time operating systems, real time programming of mechatronics systems. *Pre: ME 425, ME 462*

ME 527 Internal Combustion Engines 3C.H

Internal combustion engines: Cycles, performance, fuel metering, ignition system, and Supercharging. Lab demonstrations. *Pre: ME 322*

ME 528 Thermal Power Plants 3C.H

Review of Rankine cycle regeneration and reheat. Combustion processes. Real vapor cycle, gas turbine cycle, and combined cycle. Steam turbine power plants components. Plant selection and economics. Load curves. *Pre: ME 322*

ME 529 Industrial Heat Exchangers 3C.H

Types of Heat Exchangers: Shell-and-Tube and Gasketed-plate heat exchangers. Exchanger selection. Heat transfer and pressure losses. Fouling. Heat transfer augmentation. Thermal design. Applications. Material and cost. *Pre: ME 452*

ME 532A Aircraft Design 3C.H

Preliminary design of a modern airplane to satisfy a given set of requirements. Estimation of size, selection of configuration, weight and balance, and performance of airplane. Satisfaction of stability, control, and handling quality requirements. *Pre: ME 443, ME 542*

ME 533A Design of Thermal Systems 3C.H

Modeling of thermal systems. Basic optimization techniques such as Langrange multipliers, dynamic programming, geometric programming, linear programming and calculus of variation. Case studies. *Pre: EE 305, ME 452*

ME 541 Aerodynamics II 3C.H

Dynamics of a compressible flow field, Prandtl-Meyer flow, Mach lines and characteristics, Linearized compressible subsonic flow: flow about a thin wing, swept wings at transonic speed Two-dimensional, supersonic flows over wings and airplane configuration: conical-flow method, singularity-distribution method . High-lift configurations: multielement airfoils, Drag reduction methods: laminar-flow control. Aerodynamics design tools. *Pre: ME 443*

ME 542 Aeronautic Lab. 1C.H

Basic measurements of aerodynamic forces and pressure distribution using low speed wind tunnel. Supersonic flow, flight demonstration, tunnel experiments. Aerospace propulsion (gasturbines), ramjets, etc.). Basic aircraft sensors. *Pre/Co. : ME 443*

ME 543 Mechatronics Systems Integration 3C.H

Design and analysis of mechatronics and automation systems. Selection and integration of actuators, sensors, hardware, and software. Computer vision. Programming and software design for mechatronics systems. Modeling and simulation. Design of logic control systems. Finite state machine methods. Feedback control and trajectory generation. Safety logic systems. Case studies including automation systems, mobile robots, and unmanned vehicle systems. *Pre: ME 425, ME 462*

ME 544 Turbomachinery 3C.H

Types of turbomachinery, energy transfer between fluid and rotor. Axial machines and centrifugal machines. Pumps, compressors, and turbines. Gas-turbine power plant and applications. *Pre: ME 322, ME 444*

ME 545 Mechatronics Lab II 1C.H

This Lab. will introduce the students to the concept of low cost automation using electro-pneumatic, electro-hydraulic systems, sensors, actuators and PLCs to automate industrial processes, Data acquisition, and intelligent control. *Co: ME 543*

ME 546 Aircraft Sensors & Actuators 3C.H

Study of control systems components and mathematical models. Amplifiers, DC servomotors, reaction mass actuators. Accelerometers, potentiometers, shaft

encoders and resolvers, proximity sensors, force transducers, piezoceramic materials, gyroscopes, air-data systems, heading sensors, GPS receivers.

Pre: ME 471

ME 547 Robotics 3C.H

Overview of the field of robotics and their applications; Types, locomotion, kinematics, dynamics, planning, control and design of manipulators and mobile (wheeled) robots; Robotics perception (sensors) and actuators; Multi-robotics systems. *Pre: ME 462*

ME 548 Autotronics 3C.H

Fundamentals of engine and vehicle systems, Review of Electrics and Electronics, control and instrumentation, sensors and actuators, electronic engine control, vehicle motion control. *Pre: ME 462, ME 471*

ME 549 Introduction to Intelligent Systems 3C.H

Classical logic and Fuzzy logic, fuzzy sets and fuzzy systems, fuzzy operations and inference, fuzzy control and applications, Introduction to Neural networks and Adaptive Neuro Fuzzy Inference System. *Pre: ME 462*

ME 551A Sustainable Energy Conversion 3C.H

Sustainable energy resources: Solar, wind, geothermal, ocean, biogas, and hydropower. Oilshale. Energy storage. Introduction to direct energy conversion.

Pre: ME 322

ME 561 Fluid Power Control 3C.H

Fundamentals of fluid power (hydraulic and pneumatic) and its components. Pipes, compressors, pumps, motors and control. In addition, complex components, such as servo actuators and electro-hydraulic servo valves will be discussed functions and terminology. Basic circuit design, symbols, and schematic diagrams.

Pre: ME 462, ME 343

ME 562 Acoustics 3C.H

One dimensional acoustic waves. Sound radiation and sources. Plane and spherical waves propagation. Duct acoustics. Wave transmission and reflection from solids. Noise control. *Pre: ME 463*

ME 563 Aircraft Performance 2C.H

Fundamentals of propeller and jet aircraft performance. Steady and accelerated flight. Equations of motion. Level flight. Gliding, climbing, drift down. Takeoff and landing. Range and endurance. Payload-range diagram. Maneuvering. Turning and pull-ups. Stall and spin behavior. *Pre: ME 443*

ME 581A Heating, Ventilation, and Air Conditioning 3C.H

Air-conditioning processes; psychrometric and humid air calculations. Air quality and comfort conditions, Heating and cooling-load calculations. Air handling units and air distribution systems. *Pre: 5th year standing*

ME 582A Refrigeration 3C.H

The vapor compression cycle. Alternative cycles: The absorption cycle, multiple effect cycles, ejector cycles, expansion cycles, electric and magnetic cycles. Refrigerants: the properties, refrigerant mixtures. Refrigeration system components. *Pre: 5th year standing*

ME 591 Graduation Project I 1C.H

Provides students the opportunity to individually explore a mechanical engineering problem or issue within their field of study and apply their education to solving the problem for the benefit of the local community and society as a whole. Students produce a short report that

documents the application of previous learning, experience and knowledge to the problem at hand, and evaluates the results. *Pre: Completion of 114 C.H*

ME 592 Graduation Project II 3C.H

Students perform the experimental and practical phases associated with solving the mechanical engineering problem addressed in Graduation Capstone Project I. Students produce a full technical report that documents the research, design, results, analysis, and recommendations of the study, followed by a final presentation and defense. *Pre: ME 591*

ME 593 Projects in Mechanical Design 2C.H

Introduction to computer aided engineering environment. Solid modeling. Introduction to Finite Element Methods. Optimum design. Computer applications in mechanical design. *Pre: ME 433*

ME 594A Special Topics in Thermal Power 3 C.H

Pre Department approval

ME 594B Special Topics in Thermal Power 2 C.H

Pre Department approval

ME 594C Special Topics in Thermal Power 1 C.H

Pre Department approval

ME 595A Special Topics in Aeronautics 3 C.H

Pre Department approval

ME 595B Special Topics in Aeronautics 2 C.H

Pre Department approval

ME 595C Special Topics in Aeronautics 1 C.H

Pre Department approval

ME 596A Special Topics in Mechatronics 3 C.H

Pre Department approval

ME 596B Special Topics in Mechatronics 2 C.H

Pre Department approval

ME 596C Special Topics in Mechatronics 1 C.H

Pre Department approval