Electrical Engineering

Electrical Engineering

First Year

FIRST TERM

PME1106 Engineering Mathematics (2) a (3+2)

Differentiation and integration of functions of several variables (definition , limits, continuity)- Partial derivatives -Total differential and its applications in maximum and minimum values (absolute- local - constraint) - Equation of tangent plan , and normal on the surface -Taylor and Maclurin of function of several variables - Differential equation and applications - Definitions - Theorems - Method of solution of first ordered differential equations - Norderdered differential equations - Non-homogenous and its solution by differential operatores -Particular solution of non-homogenous equation by differential operators -undefinite coefficients - Variation of Constants Multiple integrals - Eulur equation -Laplace transform -Electrical applications .

EPM1101 Electrical Circuits (1) (4+2)

Elements and quantities in electrical circuits (R, L, C, I and V) – DC voltage source - AC voltage source - Constant current source - Constant voltage source – Sources transformation - Resistive circuits simplifications - Series - Parallel – Star/Delta - Sinusoidal waveform – Amplitude - Frequency – Average - RMS – Sinusoidal steady state analysis - Impedance - Admittance - AC circuits – Phasors – Complex power calculation - Power factor - Network theorems applied to AC circuits – Network theorems applied to DC circuits – Resonance in electrical circuits – Electric filters – Two-port networks.

EEC/EPM1160 Electrical and Electronic Materials (3+1)

Crystals: Crystal lattices - Miller indices - Crystal directions and planes - Crystal growth - Epitaxial growth - Energy bands and charge carriers - Semiconductors : Bending forces and energy bands - Charge carriers in semiconductor - Carrier concentrations —Drift of carriers in electric and magnetic fields. Excess carrier concentrations in semiconductors Optical absorption, Luminescence, Photoconductivity - Carrier lifetime. Diffusion of carriers - Applications (phototransistors - solar cells - lasers - leds —etc...). Dielectric materials under static fields- Static dielectric constant - Polarization and dielectric constant - Ferro-electricity- Spontaneous polarization – Piezoelectricity - Dielectrics under alternating fields: Frequency Dependence of electronic polarizability - Ionic polarization as a function of frequency - polarization-Diamagnetism and paramagnetism-Ferromagnetism-Thermal effects: Dielectric losses. Magnetic materials: Dipole moments -Microscopic bases for magnetic Thermoelectricity - Thermo-magnetic effects - Superconductivity - The josphson junction.

CCE1102 : Fundamentals of Logic Design (4+1)

Logic-gate networks - Karnaugh maps - Quine-McCluskey method - Combinational networks – Multiplexers – Demultiplexers – Decoders – Encoders - Programmable logic - Sequential networks - Flip-flops – Counters – Registers - State graphs - Moore-type networks - Mealy-type networks.

Design Principles (4+1)

Logicgate networks - Karnaugh maps - Quine-McCluskey method - Combinational networks – Multiplexers – Demultiplexers – Decoders – Encoders - Programmable logic - Sequential networks - Flip-flops – Counters – Registers - State graphs - Moore-type networks - Mealy-type networks.

EEC1101 Electronics (1) (4+2)

Overview of energy bands - Carrier concentration and carrier transport phenomena. Junction diodes and their characteristics and applications - Bipolar devices: Transistor action —Static and dynamic characteristics - The thyristor. Unipolar devices: Metal-semiconductor contacts - The junction field effect transistor (JFET) - MOS diode - MOSFET basic characteristics - Photonic devices: Radiative transitions and optical absorption - Light emitting diodes (led) - Semiconductor lasers, Photo-detectors, Solar cells - Laser characteristics and accessories - Low-power and high power laser applications —Integrated circuit technology : crystal growth and epitaxy - Oxidation and film deposition —Diffusion and ion implantation - Lithography and etching - Integrated devices.

CCE1103 : Computer Programming(1) (2+2)

Overview of programming languages - Programming basics - Loops and decision making - Control schemes - Functions and subroutines - Arrays, Strings, and Pointers- Structures, Unions, Bit manipulations, and Enumerations - Software design principles: Modularity, Abstraction, and Information hiding - Programming approaches: Structured approach, Modular approach, and Object-oriented approach.

Electrical Engineering

First Year

SECOND TERM

PME1106 Engineering Mathematics (2) b (3+2)

Laplace transform and its applications in solving differential equations - System of linear differential equations of constant coefficients . and its solution by matrices - Applications . Partial differential equations (definitions - properties and normal forms) - Methods of solutions of partial differential – of equations (D,Alembert method , method of separation of variables) –Applications – Heat transfer- Laplace equation -Orthogonal functions , Expansion of periodic functions by Fourier series . Barsval equity, the sum of some numerical series - Other applications - Vector analysis - Theorems of line and surface integrals (Green-stocks - Gauss).

EPM1202 Electrical Measurements (4+2)

Definitions (accuracy, resolution, precision and tolerance) – Measurement errors – Statistical analysis - Units and dimensions –Dynamic response - Moving coil instruments – Moving iron instruments – Electro dynamic instruments – Electro-static instruments – Induction-type instruments – Measurement of current, voltage, resistance, power, energy, frequency and power factor – DC bridges – AC bridges – Transducers - Measurements of physical quantities – Cathode ray oscilloscope.

EEC1203 Electronics(2) (4+2)

Review of transport phenomena in semiconductors - Generation and recombination mechanisms - High field effects - P-N junction (High injection effects - Switching performance) - Ebers-Moll model - Gummel Poon model - BJT small signal model —High frequency effects - Applications in power conversion (Thyristors - Diacs - Triacs) - Bipolar device simulators - noise in devices.

EPM1203 Electrical Circuits (2) (3+2)

Transient analysis of RL, RC and RLC circuits – Three phase circuits – Magnetically coupled circuits – Operational amplifier circuits - Locus of phasor diagrams at variable frequency – Analysis of electric circuits with non-sinusoidal AC – Fourier series.

CCE1204 : Computer Programming(2) (2+2)

Characteristics of object-oriented languages - Functions - Objects and Classes- Operator overloading - Inheritance and Reusability - Virtual functions - Streams and Files - Multifile programs - Templates and Exceptions - Standard template library - Engineering applications.

CCE1205 Computer Hardware (3+1)

Computer types- Input devices: Keyboard, mouse, trackball, joystick, touchpad, and scanners- Output devices: video display, flat-panel display, printers, graphic accelerators - Random Access Memory (RAM) - Static RAM (SRAM) - Dynamic RAM (DRAM) - Asynchronous DRAM - Synchronous DRAM - Read-Only Memory (ROM) – PROM – EPROM – EEPROM - Flash memory - Cache memory - Magnetic hard disks- Optical disks - Magnetic tape systems - Central processing unit - Arithmetic/logic unit - Assembly language - Memory operations - Input/output operations - Encoding of machine instructions.

Electrical Power & Machines Engineering

Electrical Power and Machines Engineering

Second Year

FIRST TERM

EPME2109 Engineering Mathematics (3) a (3+2)

Curve fitting – Interpolation and extrapolation using different methods – Numerical solution for linear and nonlinear algebraic equations – Numerical Methods for solution of ordinary differential equations and some partial differential equations – Solution of three dimensional laplac's equation using separation of variables in spherical and cylindrical coordinates. Application in Numerical analysis of RLC (over damping, under damping, critical damping and resonance)

EPM2104 Electromagnetic Fields (3+2)

Vector analysis – Coulomb's law - Electric field intensity – Electric flux – Gauss's law – Divergence – Electrical energy and potential – Conductors – resistance – Dielectrics – Image method – Capacitance – Field plotting – Poisson's equation – Laplace equation – Steady magnetic fields – Ampere's law – Stock's theorem – Magnetic forces – Magnetic materials – Inductance – Self inductance – Mutual inductance – Magnetic circuits – Time varying magnetic fields – Maxwell's equations.

EPM2105 Electrical Power Engineering (1) (3+3)

Elements of power systems -Electrical design of overhead transmission lines – Steady state -Performance of overhead transmission lines (short – medium - long) – Towers and electrical insulators – Mechanical design of overhead lines –Distribution networks (DC distribution – AC distribution)

EPM2106 Energy Conversion (4+2)

Energy sources - Conversion of electrical energy into mechanical energy and vice versa - Energy and co-energy – Mechanical forces, torque, transformer emf's, and motional emf's in singly excited and multiply excited electromagnetic systems – Effect of saliencies – MMF in concentrated and distributed coils – Energy relations in electromagnetic systems with applications to conventional types of rotating machines (DC – Induction – Synchronous - Reluctance– Stepper) - Design aspects of AC machines, output coefficient, electric loading and magnetic loading.

MEP2141 Mechanical Engineering (3+1)

Properties of fluids – Ideal fluids – Pressure – Parometer – Measuring of pressures – Fluid static – Fluids flow – Bernoulli equation and its application – Types of pumps and efficiency calculations – gas properties – First law of convection and radiation – Intrenal combustion Engines (definitions and classifications) – Air stander cycles – Combustion of sparke ignition engines – Compression ignition engines – Effective engine efficiency – Two stroke engines – Four stroke engines .

CSE2155 Civil Engineering (3+1)

Distance measurements by tapes and electronic devices - Therodolites and applications in angle measurements - Calculation of levels and transversal and longitudinal cross sections – Traverse calculations and setting out of buildings – Adjusting vertically of building – Elements of structure analysis of statically determinate structures – Foundations of concrete –and steel structures – Effects of heavy machines vibrations on building structures .

Electrical Power and Machines Engineering

Second Year

SECOND TERM

PMEE2209 Engineering Mathematics (3) b (3+2)

Functions of complex Variables Integration – Cauchy Riemann theorem for integration – Real integrals using complex integration around closed curves) – Series solution for second order ordinary differential equations using power series Legrendere equation – Application of power series, Legendre and Bessel equations in solving the different cases RLC circuit .

EPM2207 Electrical Power Engineering (2) (4+4)

Power Circle Diagrames – Representation of Power Systems and Per-Unit Quantities - Network Equations and Solutions – Control of Voltage and Reactive Power - Economics of Power Factor – High-voltage D.C. Overhead Transmission Lines – Introduction to Underground Cables .

EPM2208 Electrical Machines (1) (4+4)

DC machine construction - DC field windings – DC armature windings – Armature reaction - Commutation – Inter poles – Compensating windings – Internal generated voltage and induced torque equations - DC generator connections – Magnetization curve - Characteristics - DC Motor connections and characteristics - Speed control of shunt and separately excited DC motors: Field control, Armature voltage control – DC motor starting techniques - Electromagnetic braking – Efficiency - Ratings.- Design aspects of DC machines.

EPM2209 Power Electronics (1) (3+2)

Power electronic components – Characteristics of power semiconductor devices: Diodes, Thyristors, Triac , GTO, BJT, MOSFET, IGBT and MOSIGT - Types of power electronic circuits – Computer simulation of power electronic systems -Single phase half wave rectifiers – Full wave rectifiers – Three phase rectifiers - Commutation techniques.

MEP2244 Mechanical Power Stations (2+1)

Different types of power stations – second law of thermodynamics and its applications – Steam power cycles – Types of steam power plants – Cycles and gas power plants – Applications types of boiler used in power plants –stations-Steam turbines .

EPM22H3 Technical Reports (1+1)

Elements of reports – Comprehencing the different meaning of words and verbs of some meaning – Principles for writing engineering reports – Logical bases for engineering writing – Careful presentation with minimum simple words and using them carefully – Elimination of unwanted phrases – Using comparisons and index – Using figures and tables – Main contents of reports – Exercises on writing engineering reports .

Electrical Power and Machines Engineering

Third Year

FIRST TERM

PMEE3114 Engineering Mathematics (4) (2+2)

Basic theorem in probability and conditional probability with applications – Random variables – Functions of random variables – Distribution functions – Statistical measurements (mean and Vonana) – Discrete distributions (binominal – Poisson – Hypergeometric) – Continuous distributions (normal – t distribution – 2 distribution) – Methods of estimation of parameters – Testing of hypothises – Confidence level for measures of parameters – data correlation .

EPM3110 Generation and Economy of Electrical Energy (3+3)

Electrical load curves – Different types of electrical power stations – Economics of electrical power stations –Tariffs – Optimal operation of electrical power systems – Economic operation of electrical power systems – Division of loads between generators – Renewable energy sources – Safety systems in power stations - Power stations and the environment.

EPM3111 Electrical Machines (2) (4+4)

Transformer types - Construction - Ideal transformer – Practical single phase transformer – Equivalent circuits – Magnetizing current - Determination of transformer's parameters from open circuit test and short circuit test data – Losses – Efficiency - Voltage regulation – Cooling methods of power transformer - Auto transformer – three phase transformers - Connections – Instrument transformers – Design aspects of transformers: Main dimensions- Magnetic cores, Windings and insulation grades.

CCE3170 Automatic control Principals (3+2)

Principles of control systems – Control systems architecture – Control measurements – Computers as control system – Balance – Locus of roots – Nyquist and bode plots – PID controllers – State space – Computer aided analysis and design of control systems .

EPM3112 High Voltage Engineering (3+1)

Applications of high voltages in electric power systems – High voltage fields computational methods – Generation and measurement of high Voltage (alternating – direct – impulse) - Electrical breakdown in gases ,liquids and solids - Corona discharge - Phenomenon of over voltage in Power systems and their protection – Wave propagation over lines and equipment – Electrostatic field of extra high voltage Lines – Power – Frequency voltage control and over voltages - Underground cables -High voltage cables - Earthing systems .

EEC3143 Electrical Communications (2+1)

Spectral analysis – Random variables and processes – Fliters transmission line – Amplitude and frequency modulation demodulation of amplitude and frequency signals – Mathematical Representation of light – Transmitters and receivers of radio and TV – Pulse communication – Data transition and digital communications systems .

EEC3144 Digital Instruments and Measuring Systems (2+1)

Data transformers – Noise effect – Optical fiber measurement digital devices – oscilloscopes digital devices – Sensors and circuits of signal variation – Digital and analog transformers – and analog digital – Voltage / frequency transformers – Volt / frequency Automatic measurement systems – Electromechanical measurement systems – Electromagnetic devices – Instruments of digital protection – remote control sensing – Digital devices used in power systems 1D and 3D device used by laser – Spectral analysis of signals .

EEC3145 Visual and Acoustic Broad Casting Engineering (2+1)

Broued casting systems – Audio and recording restoration TV systems – TV camera – Moncrone TV receivers basics of colour TV – Colour TV receivers – Remote centrals – Video amplifiers – Gain

Electrical Power and Machines Engineering

Third Year

SECOND TERM

EPM3213 Power Electronics (2) (2+2)

AC to DC converters – AC regulators – Cycloconverters - Chopper circuits: Buck regulator, Boost regulator, Buk-Boost regulators, and cuk regulators – Converter operation - Pulse circuits – Three phase voltage source inverter - Stepped inverters – six step inverter - PWM inverters – Current source inverters - Voltage source inverters – Firing circuits – Control units – Protection - Heat sinks – Isolation.

EPM3214 Power System Analysis (4+3)

Symmetrical components –Symmetrical Three phase faults - unsymmetrical faults – Network matrices (network topology –System admittance matrices - System impedance matrices) - Load flow Solutions and control –Transient phenomena in electrical .

Power systems –Simplified criteria of Transient stability in limited electrical power systems – Dynamic stability of electrical power systems .

EPM3215 Electrical Machines (3) (4+4)

AC armature windings: winding factors, distribution factor and pitch factor - Rotating magnetic field - Three phase induction motor types: Cage rotor and wound rotor with slip rings - Construction, principles of operation, slip, modes of operation, equivalent circuits from winding resistance measurement test, no-load test and blocked rotor test - Power balance equations – Torque/slip curves – Speed control methods – Starting methods – Double revolving field theory - Single phase induction motor: Equivalent circuits, starting methods (split-phase, capacitor start, capacitor start-capacitor run and performance calculations) – Electric loading – Magnetic loading - Design aspects of a three phase induction motor.

EPM3216 Control Of Electrical Power System (1) (3+2)

Controllability and observability – Performance measures -Nonlinear control and the describing function –Parameter estimation and linear parametric model identification by least squares - Multivariable control –Robust control – Intelligent control – Control integration –Sampled data systems – Z-Transform and its properties –Inverse of Z-Transform – Closed loop performance and stability – Digital PID control design – Pole placement digital control – Applications in electrical power system

CCE3271 Microprocessor (3+1)

Microprocessor and microcomputers – Microprocessor architecture – Addressing modes – M.P. Instructions (data , arithmetic and logic – program control) – M.P. programming – Memory interfacing – Interrupts – Direct memory accessing – Interface system – DIA , AID – Input / Output interfacing Microprocessor based control system .

EPM32H4 Feasibility Study of Project (2+-)

The faculty Council approves the contents of this subject upon the request of the department at the beginning of each year Academic .

Electrical Power and Machines Engineering

Fourth Year

FIRST TERM

EPM4117 Electrical Machines (4) (4+4)

Construction – Synchronous speed – Armature reaction - Armature leakage reactance – Equivalent circuit of synchronous generators – Voltage regulation for unity, lagging and leading power factor loads – Determination of parameters – Parallel operation – Synchronizing torque - Equivalent circuit of synchronous motors – V-curves – Motor starting - Excitation systems, effect of salient poles, losses and efficiency and power angle curves of synchronous machines – Reluctance motors - Synchronous Condenser – Design aspects of synchronous machines.

EPM4118 Protection OF Electrical Power System (3+2)

Requirements of power system protection – Protection equipments - Fault indication methods – Unit protection – Non-unit protection – Relay classification considering the construction - Relay classification considering the function - Relay classification considering the time delay – Overcurrent protection application for distribution system – Radial feeder protection – Ring feeder protection - Differential protection – Stability – Sensitivity – Generator and transformer protection - Distance protection –Magnitude comparator – Phase comparator – Distance relays characteristics and designs – Distance protection for overhead lines.

EPM4119 Applications of Computer in Electrical Power Systems (3+2)

Introduction – Power system matrices (input and transfer matrices - admittance matrices of the bus bars – impedance matrices –circuit represenation) - Programming (large system simulation and programming – power flow studies concepts and methods – approximate and fast methods – separation methods - distribution factors –transfer methods – optimal performance generation control - error analysis –simulation of power -system components) – Application of some computer packages .

EPM4120 General Theory of Electrical Machines (3+1)

Two reactance theory - dq representations of primitive machines – Power angle characteristics of salient pole machines – Reluctance torque – Representation of primitive synchronous machines - Representation of primitive induction machines - Representation of primitive dc machines – Dynamics of dc machines – AC machines transients and dynamics - Synchronous generator transients - Reactances and time

constants from sudden three phase short circuit test data - Swing equation - Equal area criterion for transient stability – Induction machine dynamics.

EPM4121 Electrical Installations (3+1)

Standard specifications – Egyptian and international codes – Design of internal and external illumination systems – Rationalizing the energy in illumination systems - Selection of electrical instruments and equipments - Distribution bus-bars – Main and bransh distribution boards – Control equipments –Devices , instruments , intakes and fuses – Earthing – Electrical transformer room -Ground-cables installation – Overhead-lines installation – Domestic installations – Electrical safety

EPM4122 New and Renewable Energy Systems (3+1)

Introduction to renewable energies – New and traditional types of batteries – Nuclear fusion energy - Solar energy –Solar photo-cells - Wind energy –Biomass Energy –Ocean heat energy – Wave and tidal energy - Geothermal Energy – New trends for generation of electrical energy - Methods of energy storage.

EPM4123 DC Electrical Power Transmission (3+1)

Introduction – Comparison between DC and AC – Properties of DC transmission, distribution and utilization – Protective equipments – Analysis of fault during operation and methods of clearing – Economic – considerations – Design methods .

EPM4124 Electrical Machines Dynamics (3+1)

Methods of representing conventional electrical machines (DC machines – Induction machines – Synchronous machines) – Transients – Using computer packages – Characteristics of electrical machines – Applications on some special machines (brushes – switched reluctance) .

EPM4125 Control Methods Using Power Electronics (3+1)

Modeling of semiconductors – Methods of simulation – Programmable logic – control vector and scalar control for AC machines .

EPM4026 Project (3+1)

Different projects in one of the different fields of specifications are prepared by the department each year and students are distributed to choose one of these according to the regulation put by the department .

Electrical Power and Machines Engineering

Fourth Year

SECOND TERM

EPM4227 Electrical drives (4+2)

Different loads characteristics – Four quadrant torque speed curve - Traction drives – Different duty cycles – Ratings – Tractive effort – Traction motors - DC drives: Basic equations, Methods of speed control using armature voltage control or field control or combined armature and field – Closed loop control – Chopper control of PM DC motors - Induction motor drives - Basic equations and control – Braking - Plugging – Synchronous motor drives: Frequency control and voltage control – Selection of drives.

EPM4228 Control of Electrical power systems (2) (3+2)

Components and model of a power system - Power and frequency control for synchronous generators – Excitation and voltage control – Reactive power control for transmission and distribution networks - Controller design for electrical power systems – Using SCADA system for control in power plants and networks.

EPM4229 Applications of protection Electrical (3+2)

Digital protection – Methods for digital protection –Digital protection algorithms - Generator protection- Differential protection – Over and under-frequency protection – Stator ground fault protection – Over-excitation protection – Field lose protection – Field ground fault protection – Unbalance protection -Transformer protection – Transformer over-current protection –Differential protection for transformer – Tertiary transformer protection –Special problem for transformer protection -Motor protection – Busbar protection - High voltage transmission lines protection.

EPM4230 Special Electrical Machines (4+1)

Unbalanced 2 -Phase induction motors – Shaded pole motors – Hysterisis motors - Universal motors – Permanent magnet motors – DC brushless motors – Stepper motors – Servo motors – Switched reluctance drive systems – Tachometers - Synchronous.

EPM4231 PLC in Electrical Systems (3+2)

Applications of a microprocessor in speed control of electrical machines - Applications of a microprocessor in reactive power control of power systems

EPM4232 Design and Planning of Power Systems Electrical (3+1)

Planning of power systems – Optimal load forecasting –The utility perspective – Generation planning - Manual generation planning - Automated generation planning - Capacity resource planning – Integrated demand – supply planning – Planning under uncertainty – Bulk power transmission planning (transmission planning methodology - steady –state transmission system models) – Reliability , Safety and security – Optimal mathematical methods for planning.

EPM4233 Applications of Computers in Electrical Machines (3+1)

Computer modeling – Computer simulation for steady state and transient analysis of electrical machines using computer Packages.

EPM4026 Project (3+1)

Students prepare project's report presented by the student should include the details of the analysis and design satisfying the concerned code requirements, the computer applications, engineering drawing of his design and practical work. Throughout the project report and at oral the exam the student should prove his complete understanding of the elements of the project and his capability to apply them in his future engineering career .

Electronics and Electrical Communications Engineering

Electronics and Electrical Communication Engineering

Second Year

FIRST TERM

PME 2110 Engineering Mathematics (3) a (3+2)

Linear and non-linear solution of equations – numeric differentiation – numeric integration – numerical methods for the solution of differential and ordinary equations .

EEC 2103 Electronic Circuits (1) (3+3)

Revision : methods of determining the operation of bipolar transistor- biasing voltage stabilities – current / voltage or voltage / current feedback – stability coefficients of small signal transistors models, T parameter , Y parameter , Z parameter – analysis of sound signals power amplifiers : RC coupling , transformers coupling –sound signals power amplifier – requirements of power transistors amplifiers – class A (direct coupling – transformers coupling) push –pull operation – class A , class B – operational amplifiers : differences , characteristics of operational amplifiers , frequency response – applications (summing – integration – differentiation) – volt / current transformers , volt / current transformers , comparison Schmitt circuits , oscillators (sinusoidal, rectangular, wien bridges, phase angle) .

EPM 2142 Electromagnetic Fields (3+2)

Vector analysis – Coulomb's law - Electric field intensity – Electric flux – Gauss's law – Divergence – Electrical energy and potential – Conductors – resistance – Dielectrics – Image method – Capacitance – Field plotting – Poisson's equation – Laplace equation – Steady magnetic fields – Ampere's law – Stock's theorem – Magnetic forces – Magnetic materials – Inductance – Self inductance – Mutual inductance – Magnetic circuits – Time varying magnetic fields – Maxwell's equations.

EEC2104 Communication Theory (3+3)

Spectral analysis; Fourier series - Fourier transformation – Correlation between waveforms - Random variables and processes - Amplitude modulation (AM) systems – AM demodulators - frequency modulation (FM) systems - FM generation - FM demodulators - Noise in AM systems - Noise in FM systems.

EEC2105 Electronic Measurements(1) (3+3)

Oscilloscopes - Storage and sampling oscilloscopes - Probes and connectors - Digital voltmeters - Testing of linear systems - Impedance measurement - Frequency and time measurement - Phase measurement - Transducers - Spectrum analyzer - Power measurement - Automated measurement systems - Data acquisition - Recording techniques.

EEC21H3 Technical Reports (2+0)

Principals of technical writing- Report structure- Linguistic style for technical writing- Applications on Engineering reports preparation.
Second Term

Electronics and Electrical Communication Engineering

Second Year

SECOND TERM

PME 2210 Engineering Mathematics (3) b (2+2)

Vector analysis – Fourier's series – Special functions – Partial differential equation using variable separation and its applications – Numerical solutions of partial differential equations

EEC2206 Electronic Circuits (2) (3+3)

Audio frequency power amplifiers - Different classes of amplifiers - Feedback amplifiers - stability - Operational amplifiers - Instrumentation amplifiers - Isolation amplifiers —BiFET and BiMOS amplifiers - Linear and nonlinear applications; Regulated power supplies - Schmidt trigger - Computational analog circuits - Oscillators - Relaxation oscillators.

EEC2207 Communication Engineering (3+3)

Introduction - Distortion of signal transmission - Analog transmission - pulse transmission - Digital transmission - Linear modulation - Frequency conversion — Detection - Frequency division multiplexing - Exponential modulation - FM spectral analysis - Transmitters and receivers - Sampling and pulse modulation - Time division multiplexing - Common broadcasting systems.

EEC2208 Electromagnetic Waves(1) (3+2)

Guided waves: Waves between two conducting parallel plates - TE and TM waves and their characteristics - Velocities of propagation - attenuation and quality factor - Wave impedance - Basic closed wave-guides: TE and TM waves and their characteristics in rectangular wave-guides - Wave solution in cylindrical coordinates - TE and TM waves in circular wave-guides - Attenuation and quality factor of the wave-guide - Boundary perturbation (elliptical boundary) - Dielectric planar wave-guides: surface Waves - Modes of TE and TM waves in planar dielectric guide - Symmetric and asymmetrical slab —Power propagation in the guide - Confinement factor - Dispersion in the guide - Optical fiber: the field analysis of the step index fiber - The dispersion relation, Hybrid modes ER and HE, Cutoff relations - The linearly polarized modes - Mode group number and propagation constants - Power propagation in the hybrid modes - Bulk material dispersion of silica - Analytical derivative of single mode dispersion in SI fiber - Dispersion in multi-mode fibers - Fiber bandwidth - Characteristics of single mode fiber - Its propagation constant - Design of parameters - Attenuation in fibers.

CCE 2251 Control Engineering (3+1)

Systems control concept - Control components - Control measurements - Role of the computer as a controller – Stability - Root locus - Nyquist diagram - Bode plots- Control electronics - PID controller - State-variable approach - Eigenstructure assignment - Computer-aided analysis and design of control systems.

EEC2209 Electronic Measurements(2) (3+2)

The student performs testing measurements in two domains: Electronic circuits: BJT and FET amplifier characterization - Logic circuits - Transistor hybrid parameters - Analog and digital circuit simulation (SPICE) - Multi-vibrator - Operational amplifiers and its applications - oscillators - Feedback amplifiers - power amplifiers - Active filters —Power supplies circuits. Communication systems: AM and FM modulation - AM and FM transmitters - AM and FM receivers.

Electronics and Electrical Communication Engineering

Third Year

FIRST TERM

PME 3115 Engineering Mathematics (4) (3+3)

Laplas's transformation – Fourier transformation – solutions of ordinary partial differential equations using power series – Special functions: Laginder – Bessel – Determinate problems in partial differential equations in three variables – Applications

EEC3110 Wave Propagation and Antennas(1) (3+3)

Multiple refection of EM waves between intinite parallel plate, rectangular waveguides, TE and TM modes, Cutoff frequency and propagation parameters, power transmitted wall losses and dielectric losses, Circular waveguides, TEand TM modes, Cutoff frequency and propagation parameters, power transmitted, wall losses, and dielectric losses, Cavity resonators, modes, qualityfactor, effect of delectric loss,, Circular cavity,

EEC 3111 Digital Electronics Communication Systems (3+3)

CMOS inverter: Noise margin, propagation delay , power dissipation , CMO combinational circuits : Static design , pass transistors and transmission gates, Dynamic design, COMS sequential circuits : Latches, Flip-flops, Counters, Finite state , Machines, Pipelined structure, Non-bistable CMOS circuits : Monostable, Ring oscillator.

EEC3112 Optical Electronics (3+3)

Interaction of radiation and atomic systems - Theory of laser oscillation: Fabry-Perot laser, Oscillation - . Frequency - Power output - Some laser systems - Electro-optic modulation of laser - OPTO-electronic semiconductor devices - DC. and AC characteristics - PIN and avalanche photodiodes - Applications: OPTO isolator types —Parameters and characteristics - circuit applications - Solar cells - LCD's.

EPM3146 Electrical Machines (3+2)

Transformer types - Construction - Ideal transformer – Practical single phase transformer – Equivalent circuits – Magnetizing current - Determination of transformer's parameters from open circuit test and short circuit test data – Losses – Efficiency - Voltage regulation – Cooling methods of power transformer - Auto transformer – three phase transformers - Connections – Instrument transformers –

Design aspects of transformers: main dimensions, magnetic cores, windings and insulation grades.

EPM3147 Power Electronics (3+2)

Power electronic components – Characteristics of Power semiconductor devices: Diodes, Thyristors, Triac , GTO, BJT, MOSFET, IGBT and MOSIGT - Types of power electronic circuits – Computer simulation of power electronic systems -Single phase half wave rectifiers – Full wave rectifiers – Three phase rectifiers - Commutation techniques.

CCE3152 PLC and Distributed System (3+2)

Programmable logic Control and Application to Distributed Systems .

CCE3153 Artificial Neural Networks (3+1)

What is a neural network? - Models and architecture - Learning techniques - Single-layer networks - Multi-layer networks - Associative memory and feedback networks – Statistical networks - Self-organizing networks - Applications.

EEC31H4 Management and Marketing (2+0)

Introduction and main concepts [types of expenses – Analysis of break-even point] – Time value of money and interest rates – Comparisons between investment alternatives – Maketing analysis of general projects – Depreciation – Systems of decision making

Electronics and Electrical Communication Engineering

Third Year

SECOND TERM

EEC3213 Optical Communication (3+2)

Overview of optical fiber communications - Optical fiber power launching and coupling - Optical receiver operation digital and analog - Detectors and preamplifiers - Digital transmission systems - Point to point links - System considerations - Power and rise time budgets - Analog systems - Carrier to noise ratio - Multi-channel transmission techniques - Coherent optical fiber communication - WDM multiplexing

EEC 3214 Electromagnetic Waves(2) (3+2)

Wave equation. Unfiorm plane waves, wave propagation in free space, perfect dielectric, lossy and good conductors, skin effect, surface impedance. Normal incidence, reflection coeffictent and standing wave pattern. Input impedance, oblique incidence reflection coefficients for horizontalf and parallel polarization Brewster angle, types of polarization transmission lines types, prarameters, equations, voitage and currents, matched and mismatched lines, Use of smith chart, single, double and triple stub matching. 1/4 transformers, baluns.

EEC 3215 Microprocessor and Application in Communication Systems (2+3)

Introduction to microprocessors, architecture, microprocessor hardware, Assembly language fundamentals, programming , Microprocessor system , timing in microprocessors, interrupts service procedures, Microprocessor timing specifications, interfacing, programmable chips, Data acquisition systems. Applications of closed loop, I/O hardware alternatives , Developments tools, Troubleshooting case studies

EEC3216 Biomedical Electronics (2+2)

Medical instrument-vital transmission principles-vital transmission of electrical potential andapplication-principles of design and application of filters- measurements of blood pressure-lab. Analysis instruments-medical computer systems-principole of design and amplification-X ray- XT ray-magnetic principles of electrical safety in medical instruments.

EEC3217 Television Engineering (2+2)

Fundamental of television-analog high definition TV(HDTV) - television signals-color TV-digital video coding- digital video interface- digital image processing- 2D digital filtering-video data compression- digital video production broadcasting digital video.

EEC3218 Digital Signal Processing And Applications (2+2)

Discrete Fourier transform FF1', Z Transform - Digital Filters - Adaptive filters — Applications of adaptive filters - Echo cancellers and suppressors - Digital signal processing of speech - Digital image processing - Applications of digital signal processing to radar - Sonar signal processing - Digital signal processing in Geophysics

EEC 3219 Large Scale Integrated Circuits and Applications (2+2)

Choice of circuit technologies, process technologies associated with various types of components. Fabrication of VLSI, two basic MOS technologies, and other available technologies oxidation, photon growing, chemical etching diffusion, techniques. Design for testability techniques and design of testable system.

EEC3220 Digital Communication Systems (3+3)

Digital communication systems - Base band system design - Digital modulation ASK —FSK and PSK - Noise - Noise phenomena - Receiver noise - System noise calculation - Band pass noise - Repeater systems - Noise in CW modulation - Interference - Noise in linear modulation - Noise in exponential modulation - Comparison of CW modulation systems - Noise in digital systems - Matched filters - Errors in digital systems— Regenerative repeaters - Introduction to information theory - Some examples of communication systems - Satellite communication systems - Mobile communication systems.

EEC3221 Acoustics and Ultrasonic (3+2)

Plane and spherical acoustic waves-simple acoustic sources and applications-acoustic energy transformers- speakers types and systems- microphones types and systems-acoustics measurements-acoustic and sonic-environmental acoustics in open area environmental acoustics in closed area-ultrasonic applications

Electronics and Electrical Communication Engineering

Fourth Year

FIRST TERM

EEC4122 Satellite Communication Systems (4+3)

Communication satellite systems - Orbiting satellites - The satellite channel - Satellite electronics - Frequency division multiple access - Time division multiple access - And code division multiple access - On Board processing.

EEC 4123 Wave Propagation and Antennas (2) (3+3)

Communication with radio-wave – Fundamentals of electromagnetic radiating antenna and antenna impedance: Some basic antenna parameters - Dipoles, Arrays and long wire antenna - Biconical antennas - Folded dipole antenna - Baluns - Array pattern synthesis: Feed network for arrays - Phased arrays - Aperture type antenna — Application of field equivalence principles to aperture radiation - Open wave-guides and horn antennas - Receiving antennas: reciprocity theorem and effective area for antennas —Antenna noise temperature - Propagation: surface wave propagation – Ionosphere propagation - Microwave and millimeter wave propagation - Introduction to microstrip antenna.

EEC4124 Telecommunication Networks (3+3)

Introduction - Transmission principles - Transmission media - Lines and radio - Four wire circuits - Crosstalk - Transmission systems - Switching systems - Space switching - Time switching - Signaling and call establishment - Number plan - Routing plan - Charging plan and signaling plan - Exchange systems - Call establishment - Call termination – Teletraffic engineering - Unit of telephone traffic - Traffic measurement —Lost call systems - Queuing systems - Overflow systems - Data transmission over the public telephone network - Private data networks - Public data networks - Error detecting and correcting codes - International standards.

EEC 4125 Radar and Sonar Systems (3+2)

Radar fundamentals - Physics and overview of electromagnetic scattering - Exact prediction techniques - High - Frequency RCS prediction techniques - Phenomenological examples of radar cross section - Radar cross section reduction - Radar absorbing materials - Radar absorber measurement techniques - Antenna RCS and RCSR - RCS measurement requirements - Outdoor RCS test ranges - indoor RCS ranges —High - Pocket RCS estimation - Data presentation and reduction.

EEC 4126 Data Security (3+2)

Threat and comp., A Hack methods, detection (computer Architecture), Des & IDES Model, identifications, Authentication, encryption, keys and Management protocols, privilege and roies, security kernel Network data base). Security evaluation & orange book overview.

EEC4127 Microelectronics and Applications (3+2)

Integrated circuits implementation , vertical implementation , design rules , design of I . C bulk, opposite metal oxide negative semiconductor as a base unit for digital circuits : Noise , propagation delay time of power lost ., Metal gates circuits / negative semiconductor and metal / oxide synchronous semiconductor , Gallium circuits , digital Arsenide , complete injection gates , transistors gates / transistors . Emitter gates connected to digital oxide circuits / bipolar semiconductor design of memory circuits , Read only memory , storage memory and random read , rows and columns encoding circuits , building of programmable sets .

EEC 4128 Very large Scale Integrated Circuits and their Applications (3+2)

Introduction , using spice in Modeling of metal oxide semi conductor – Industrial technology – static and dynamic characteristics of reflectors – Implementation steps – successive logic circuits and metal oxide semiconductor circuits .

EEC 4029 Project (1+3)

The student deals with the analysis and design of a complete engineering system using the fundamentals , principles and skills he gained during his study the project's report presented by the student Include the details of the analysis and design satisfying the concerned code requirements, the computer applications engineering drawing of his design . Throughout the project report and at oral the exam the student should prove his complete understanding of the elements of the project and his capability to apply them in his future engineering career

EEC 41H5 project management (2+0)

Planning in the different project stages – different method of preparing the time schedules Construction project organization by owner and contractor points- planning of construction project- Various methods for preparation of time programs of construction project- Types of construction contracts and bidding methods- Cash-flow for construction project- Cost estimation of construction project and bidding preparation- Bidding competition control- Follow up of construction project- Conditions of construction contracts .

Electronics and Electrical Communication Engineering

Fourth Year

SECOND TERM

EEC4230 Mobile Communication Systems (4+2)

Introduction - Effect of Mobility on communication systems - VHF and UHF propagation in Land - Mobile communication - Assessment of deterministic propagation models —Empirical results for deterministic propagation model - Probability of signal outage —Threshold crossing rate and average fade/nonfade duration - Average bit error rate in mobile channels with cochannel interface - Random Multiple access to mobile radio channels - Spatial distributions in mobile slotted ALOHA Networks - Design and planning of cellular voice networks - Performance of digital cellular Networks.

EEC 4231 Computer Communication Networks (3+2)

Messages and switching - Layering - Physical layer - Data link layer - Network layer - Transport layer - Session layer - Presentation layer - Application layer - Delay models in data networks - Multi - access communication - Slotted multi - Access - Carrier sensing - Multi - Access reservations - Packet radio networks - Radio in data networks - Flow control - Examples of data communication networks – Internetworking - Integrated services digital network.

EEC 4232 Microwave Engineering (3+2)

Microwave electronic tubes: klystron - Velocity modulation - Bunching - Reflex klystron - efficiency - Traveling wave amplifiers - Wave modes - Microwave characteristics - Backward wave amplifiers - microwave crossed field devices — magnetrons, M-Carcinotrons - Principle of operation - Characteristics - Parametric amplifiers: varactors - Manley-Rowe relations - Parametric up-converters - Negative resistance parametric amplifiers - Transferred electron devices: Gunn-effect diodes —Operation - Modes - Microwave generation and amplification - Avalanche transit time devices: avalanche multiplication - IMPATT diodes - Trapatt devices - Power output and efficiency - Design of microwave semiconductor amplifier and oscillators: design considerations – Design examples.

EEC 4233 Microwave Integrated Circuits (3+2)

Micrometric Electronic devices with multiple waves – studying of semiconductor with negative resistance which used at Microwave frequencies , parametric amplifiers transistors used at micrometric frequencies – integrated circuits used in implementation of high frequency amplifiers and oscillators

EEC 4234 Optical Networks (3+2)

Introduction in optical networks – Modulation and recovery of optical signals – paths determination of optical networks Information – optical packages and photons Methods of going networks – control and management of optical networks .

EEC4235 Multimedia and Image Processing . (3+2)

Motion picture cameras and projector, Telecine camera ,TV/transmission systems& equipment, Electronic editing and printing , digital video effects, compact discs and video tapes, Electronic music, Multimedia

EEC 4236 Advanced Communication Systems (3+2)

Data networks – spread spectrum – Radar and remote signals satellite communication – mobile communication – computer communication .

EEC4237 Information Theory (3+2)

Basic concepts of probability - Bay's theorem - Random variables - Memory-less finite schemes - Properties of entropy function - Set theory interpretation of Shannon's fundamental inequalities - Redundancy - Efficiency and channel capacity - Entropy of a Markov source - channel capacity - Elements of encoding - Shannon-Fano encoding —Fundamentals theorem of discrete noiseless coding - Continuous channel - Gaussian noisy channels - Fundamental theorem of continuous memory-less channels - Error correcting codes - Convolutional codes - block coding.

EEC4029 Project (-+4)

Students Complete their projects which they started in First Term .

Computers and Control Engineering

Computers and Control Engineering

Second Year

FIRST TERM

CCE2106 Data Structures and Algorithms (4+2)

Abstract data types, classes, and objects – Lists –Stacks – Queues – Tables – Hash tables for fast retrieval – Trees – Graph Algorithm analysis – Recursion – Searching – Binary search – Depth-first search – Breadth-first search – Sorting – Heap sort – Merge sort – Quick sort – External sorting – Graph algorithms – shortest-path algorithms – Newton flow problems – Minimum spanning tree – Algorithm design – Greedy algorithms – Dynamic programming – Randomized algorithms – Backtracking algorithms .

CCE2107 Digital Systems (4+1)

Specification and analysis of logic systems – Combinational system design – Sequential system design – Finite state machines – Essentials of Microcontrollers – Computer-aided analysis and design of digital systems .

CCE2108 Microprocessors and Interfacing Systems (3+2)

The microprocessor and its role in the microprocessor architecture – Addressing modes – Data movement instructions – Arithmetic and logic instructions - Program control instructions – Programming the microprocessor – Memory interfacing – Interrupts – Direct memory access – Digital Interfacing – Analog interfacing – Sensors and transducers – D/A and A/D converters – Input/ output interfacing – Microprocessor – based control .

EEC2146 Electronic Circuits and Measurements (3+2)

Feedback amplifier : Feed back concept , general characteristics of negative feedback amplifiers , oscillators : (sinusoidal, shift phase angle, resonance circuits, and its crystal type) multivibrators : of stabilized cases (constant biased voltage and that selfed excitation) , Schmitt circuits (emitter coupling) , Radio frequency voltage amplifiers, Radio frequency power amplifiers , voltage controllers, Basic requirements types (parallel , senses , stabilized emitter coupling common feedback , Feedback voltage stabilizer) Feeding units on the base of connecting and disconnecting of successive capacitors – sawtooth wave generators – Analogue tuning circuits, information transformers – Automatic measurement systems recovery of law amplitude high noisy signal, Spectro-analyzer of signals, Analogue measurement devices, Data transformers – Digital devices – Power transformers , Electronic power element .

EPM2143 Energy Conversion (3+1)

Fundamentals of Electromechanical Energy Conversion – Electric Transformers –DC Machines – Three phase Induction Machines – Three Phase Synchronous Machines – Two phase Servomotors – Control of Electrical Motors – Reluctance Motors – Stepper Motor – Linear Machines – Universal Motor – Sylsen System – Hysteresis Motor .

PME2111 Engineering Mathematics (3) a (4+1)

Numerical solutions of linear and nonlinear algebraic equations – Numerical differentiation – Numerical integration – Numerical solutions of ordinary and partial differential equations – Discrete mathematics : Number theory and mathematical induction , Relations , Functions , Graph theory .

Computers and Control Engineering

Second Year

SECOND TERM

CCE2209 Computer Architecture (4+2)

Input/output organization – Interrupts Direct memory access – Synchronous and asynchronous buses – Parallel and serial ports – Different memory architectures – Cashes on the processor chip – Arithmetic operations – Basic Processing unit – Execution of instructions – Multiple-bus organization – Hardware control – Microprogrammed control – Pipelining on instruction set design – Superscalar processors – Large computer systems – Forms of parallel processing – Array processors – Structure of general purpose multiprocessors – Interconnection networks – Memory organization in multiprocessors – Program parallelism and shared variables – Multicomputers – Embedded systems .

CCE2210 Signals and Systems (4+2)

Definition of signals and systems – Continuous-time linear systems – Concept of feedback – Laplace transform – Transfer functions – Block diagrams – Signal flow graphs – state-variable models – Steady-state analysis – Transient analysis – Eigenstructure (Eigenvalues , Eigenvectors, Jordan forms) – Sampling of continuous-time signals – z-transform – Introduction to discrete- time linear system .

CCE2211 Computer Graphics (3+2)

Fundamentals of computer graphics – Graphics hardware – Graphics algorithms – Analysis of two and three- dimensional graphics – Ray tracing – Representation of curves and surfaces – Solid modeling – Illumination and shading models – Graphics programming .

EEC2247 Communication Systems (4+2)

Introduction to communication systems – Analysis of analog modulation – demodulation – Samples theory – Pulse amplitude Modulation – Pulse modulation – time division multiplexing – digital multiplexing – coupling functions – transport of random operations through variable filters with time – power spectrum capacity (density) distortion : Gaussian operations – Center limit theory – white noise – narrow band noise – Effect of noise on modulation systems of steady state wave DSB – SC envelope demodulation – amplitude modulation modification limits of amplitude modulated systems – Frequency modulation in base range – line spectrum adaptive filters – error proportion in Base range interference nyquist condition in base range without distortion – spectrum of exponential complete spectrum function .

PME2211 Engineering Mathematics (3) b (4+1)

Complex-variable analysis – Legendre and Bessel functions – Solution of boundary-value problems – Fuzzy sets : Basic concepts , Fuzzy set operations , fuzzy relations and their calculus – Fuzzy numbers – Linguistic variables, Mathematical fundamentals of fuzzy logic .

CCE22H3 Society Information Technology (2+-)

Information Technology and features of a new society – The human and the computer – Issues of security, privacy, and ethics – Computer virus – Protection strategies of equipment , networks, programs, and data – Programme licenses – Computer laws and legislation – Services offered by the internet to humanity – Mechanization of administrative work – Computer non-engineering applications – Software projects .

Computers and Control Engineering

Third Year

FIRST TERM

CCE3112 Database Systems (4+2)

Information and data – Database and database management systems – Relational data model – Relational algebra – Relational calculus – Structured Query Language (SQL) – Database conceptual design – Database logical design – Database technology .

CCE3113 Language and Compliers (4+2)

Imperative programming languages – Functional programming languages – Logic programming languages – Object-oriented languages – Complier structures –Lexical analysis – Syntax analysis – Semantic analysis – Pattern matching and parsing – Code generation – Optimization .

CCE3114 Operating Systems (3+2)

Concepts and functions of an operating system – Operating system structure – Process description and control – Mutual exclusion and synchronization – Deadlocks and starvation – Memory management – Input / output management – File management – Distributed operating systems .

CCE3115 Control Engineering (3+2)

Systems control concept – Control components – Control measurements – Role of the computer as a controller – Stability – Root locus – Nyquist diagram – Bode plots – Control electronics – PID controller – State-variable approach – Eigenstructure assignment – Computer-aided analysis and design of control systems .

CCE3116 Digital Signal Processing (3+1)

Classification of signals – Discrete-time signals and systems – Frequency analysis of signals and systems – The discrete Fourier transform – Fast Fourier transform algorithms – Implementation of discrete-time systems – Design of digital filters – Sampling and reconstruction of signals – Multirate digital signal processing – linear prediction and optimum linear filters – Power spectrum estimation

CCE3117 Fundamentals of Stochastic Processes (3+1)

Probability theory : probability definition and measure, classical and relative frequency definitions of probability, sampling and combinational analysis, conditional distribution functions, density functions , independence of random variables – Functions of random variables : single and multi-variable functions, expected values, moments, fundamental theorem of expectation, characteristic functions, sequences of random variables and convergence – introduction to Stochastic process .

Computers and Control Engineering

Third Year

SECOND TERM

CCE3218 Software Engineering (4+2)

Computer-based systems engineering – Software processes – Software requirements – System modeling – Software prototyping – Architectural design – Object-oriented design – User interface design – Dependability – Verification and validation – Software testing – Software cost estimation – Software re-engineering .

CCE3219 Artificial Intelligence and Expert Systems (4+2)

Concepts of artificial intelligence (AI) – Symbolic programming – Representation and logic – Search – Learning – Problem solving – Planning – AI languages – Knowledge representation – Rule-based systems – Expert system principles and programming – Methods of inference – Uncertainty – Expert system design – Natural language processing

CCE3220 Digital Control (4+2)

Overview of computer-controlled systems – Digital control systems analysis – Effect of sampling – Frequency response-stability – Controllability – Observability – State-feedback control – Output-feedback control – Digital controller design – Optimal control methods – Digital filters – Microprocessor applications

CCE3221 Modeling and Simulation (3+2)

Basics of modeling and simulation – Model types – Modeling complex systems – modeling and simulation of computer components – Simulation languages – General-purpose simulation packages – Object-oriented simulation – Techniques for increasing model validity and credibility – Random-variable generators – Statistical analysis – Optimization

CCE3222 Multimedia Systems (3+2)

Fundamentals of multimedia systems – Digital representation of multimedia information – Storage and communication – Digital cameras – data compression : Huffman code, run-length code, adaptive code – Compression enhancement techniques : Predictive coding , Differential PCM, Adaptive DPCM, Transform coding-Standards (JPEG , MPEG, H.323) – Applications

CCE3223 Programmable Logic Controllers (3+2)

The programmable logic controller (PLC) and industrial control – PLC architectures – PLC programming – ladder diagrams – Timers – Counters – Arithmetic functions – Data manipulation – Data communication – Numerical control – Safety measures – Maintenance and fault finding

CCE3224 Computer Aided Design (3+2)

Overview of computer aided design (CAD) tools in the study of computer and control systems – CAD for digital systems : Hardware description languages such as VHDL , Basic language concepts, Modeling and simulation, Synthesis and design – CAD for control systems : MATLAB toolboxes , optimization methods for design , Eigenstructure assignment in linear multivariable systems via state-variable feedback , Robustness control systems

CCE3225 Operations Research (3+2)

Overview of operation research – Linear programming Dynamic programming – Probabilistic models – Queuing systems – Simulation – Optimization theory – Engineering applications

CCE32H4 Decision Support Systems (2+-)

Quantitative decision making – Replacement – Maintenance, simulation – Expert programs – Decision analysis – Computer-aided project management – Tabulation – resource analysis – Information management techniques – Decision support systems – Implementation of information systems

Computers and Control Engineering

Fourth Year

FIRST TERM

CCE4126 Computer Networks (4+2)

Introduction to networking methodologies – Network technologies and topologies – Layered architecture and protocol models – Transmission media characteristics – Error detection and correction – Automatic repeat request and flow control – Medium access control – Local area networks and bridges – Routing and switching – Addressing and internetworking – Methodologies of network applications – Client/Server model – Concurrency programming – Interprocess communications – Remote procedure calls – Distributed file systems and distributed computing – Mobile software agents – Case studies

CCE4127 Microcontroller Systems (3+1)

Microcontroller vs. microprocessors and microcomputers – Overview of microcontroller-based products – Microcontroller families – Main components – Memory map – Programming model – Instruction set – Program design – Designing and writing program modules – Commands of monitor program – Utility subroutines – Interrupt vectors – Microcontroller programming in high-level languages (C , C++) – Microcontroller analog-to-digital (A/D) converters – Interfacing a analog signals to microcontroller (A/D) converters – Software control of input / output interfacing devices

CCE4128 Fuzzy Control (3+2)

Definition of a fuzzy system – Fuzzy sets – Linguistic variables – Fuzzy logic – Approximation properties of fuzzy systems – Design of fuzzy systems from input/ output data – Fuzzy controllers – Fuzzy control of linear systems – fuzzy control of nonlinear systems

CCE4129 Neural Networks (3+2)

What is a neural network ? – Models and architecture – Learning techniques – Signal-layer networks – Multi-layer networks – Associative memory and feedback networks – Statistical networks – self-organizing networks – Applications

CCE4130 Pattern Recognition and Digital Image Processing (4+1)

Scope of pattern recognition – Feature extraction and analysis – Clustering – Statistical pattern recognition – Principles of image processing – Image representation and transformation – Image enhancement – Image restoration – Colour image processing

CCE4131 Distributed Systems (3+2)

Characterization of distributed systems – Principles of distributed system design – Interprocess communication – Distributed databases – Distributed operating systems – File service – Name service – time and coordination – replication – Shared data and transactions – Concurrency control – recovery and fault tolerance – Distributed shared memory – Languages for distributed computing

CCE4132 Real-time Systems (3+2)

Characterization of real-time systems – Clocks – Petri Nets – Communicating Sequential Processes (CSP) – Software partitioning – task allocation – Scheduling – Fault tolerance – Reliability evaluation techniques – Engineering applications

CCE4133 Adaptive Control (3+2)

Overview of adaptive systems , model reference adaptive systems, and self-regulators – Stability – Algebraic systems – Dynamical systems – State variables – Adaptive observers – Adaptive controller structures – Persistent excitation in adaptive systems – Error models – Robust adaptive control – Applications of adaptive control

CCE4134 Stochastic Control (3+2)

Stochastic processes – Linear system response to stochastic processes – Gaussian processes – Markovian processes and stochastic differential equations – Optimal state-variable estimation – Kalman filters – Stochastic observers – Combined estimation and control systems – Linear quadratic Gaussian problem – Sensitivity analysis of combined estimation and control algorithms – Engineering applications

Computers and Control Engineering

Fourth Year

SECOND TERM

CCE4235 Information System Design (3+1)

Life cycle of information systems: Feasibility study, Collection and analysis or requirements, planning, Implementation, Validation and testing, operation, prototyping – Database servers: Transaction processing Concurrency control, Memory buffer management, Reliability control, Physical access structure, Query optimization – Physical database design – Application programs – User interfaces – Information retrieval systems – Information networks – Information Systems on the world wide web – Design examples of integrated information systems

CCE4236 Computer network Security (3+1)

Overview of information security – Legislation and ethics – Computer virus and anti-virus programs – Data scrambling and nonlinear transformations – Cryptographic algorithms – Authentication protocols, logging and authorization – Message integrity protocols – Digital signatures – Firewalls – Examples of security protocols

CCE4237 Control and Instrumentation in industrial Processes (4+2)

Types of industrial processes – modeling and simulation of industrial processes – Digital instrumentation – Smart sensors – Digital signal conditioning – Computer interfacing for data acquisition – Distributed digital control systems – Applications of microcontrollers – Software design – Supervisory control and data acquisition (SCADA) system – Examples for computer control systems design in industrial processes

CCE4238 Computer Vision (3+2)

Image processing and computer vision – Image modeling and analysis – Image understanding – Motion estimation – Morphologic image processing – Wavelets and multi-resolution processing

CCE4239 Data Mining (3+2)

Introduction to data mining and machine learning – Input: Concepts, instances, Attributes – Output (knowledge representation) : Decision tables algorithms – Real machine learning schemes – Engineering the input and output: Attribute selection, Automatic data cleaning , Combining multiplying models – Learning from massive data sets – text mining – Mining the world wide web

CCE4240 Electronic Commerce (3+2)

Overview of electronic commerce (e-commerce) – Internet marketing – Electronic payment systems – online publication – Business models and applications – Marketing strategies and programs – e-commerce security – Building e-commerce applications and infrastructure

CCE4241 Computer System Evaluation (3+2)

Analytical for evaluating the performance and reliability of computer systems – Reliability evaluation: Classification and representation of faults, Stochastic process models, Coherent systems – Performance evaluation: Work load characterization, Performance criteria – Scheduling, Markvian queuing models, Networks of queues – Unified Performance-reliability evaluation – Simulation

CCE4242 Robotic Systems (3+2)

Introduction to robots – Study of descriptions, transformations, and orientations – Manipulator kinematics – Inverse manipulator kinematics – Velocities – Static forces – manipulator dynamics – Trajectory generation – position control of manipulators – Force control of manipulators – Hybrid position-force control scheme – robot programming languages – Industrial applications

CCE4243 Mobile Computing (3+2)

Basics of mobile computing – Systems architecture – Medium access control protocols – Wireless local area networks – Connection and location management – Routing protocols – mobile IP/ wireless TCP – Roaming and mobile handoff – wireless application protocol (WAP) – Security and authentication – Examples of mobile systems (AMPS – GSM – IS-54 – UMTS – IS-95 – IS-132 – GPRS – EDGE)

CCE4244 Project (2+4)

The student is to design and implement an engineering project in one of the following specialization fields:

- Computer and network engineering
- Software engineering and information technology
- Computer-controlled systems

The student is to present a comprehensive report on his project, including details of the design techniques, circuit diagrams, computer algorithms, and results of experimental work.

Mechanical Engineering

Mechanical Engineering

First Year

FIRST TERM

PME 1107 Engineering Mathematics (2) a (4+2)

Differentiation and integration of functions of several variables (definition , limits, continuity)- Partial derivatives -Total differential and its applications in maximum and minimum values (absolute- local - constraint) - Equation of tangent plan , and normal on the surface -Taylor and Maclurin of function of several variables - Differential equation and applications - Definitions - Theorems - Method of solution of first ordered differential equations – N-order differential equations - Non-homogenous and its solution by differential operators -Particular solution of non-homogenous equation by differential operators -undefinite coefficients - Variation of Constants - Euler equation Mechanical applications .

PME 1108 Engineering Physics (2) (2+2)

Light: light nature – light diffusion – Waves characteristics – Light interference – light diffraction – Diffraction theories – Measurement of particle size using light methods

Sound: sound fundamentals – sound waves – sound intensity – Pulses – Doppler phenomena – Reflection and refraction of sound – Ultrasonic schema – Application of ultrasonic in the measurements

MPD 1103 Mechanical Drawing (2+5)

Derivation of projections and cross sections of various machine parts – Drawing of all types of fasteners – Assembly drawing – Derivation of projections and sections of machine parts assemblies – Symbols of surface finish – Fits and tolerance – Presentation of welded joints – Free hand sketch

MPD 1104 Engineering Materials (3+3)

Polycrystalline metals – Microstructure of metals – Production of single crystal – Solidification of pure metal – Polycrystalline metal – Thermal equilibrium diagrams – Non-ferrous alloys and applications – Powder metallurgy – Iron-carbon phase diagram – Ferrous alloys and applications – Heat treatment of steel – Cast iron – Polymers – Ceramics – Composites

MPD 1105 Production Engineering (3+2)

Materials of cutting tools – Cooling liquids – Mechanics of cutting – Cutting operations [turning - milling - shaping - drilling - grinding] each has: parameters of cutting operation and fixation of work piece and tool – Estimation of machining time – Forming processes [forging and hammering - rolling - extrusion - drawing with its methods] – Field visits

MEP 11H3 Engineering Thinking (2+0)

Fundamentals of thinking - Physiological and biological sides of thinking - Thinking models – The patterns of thinking - Kinds of thinking – The relationship among the style of thinking - Main strategies for different persons which limited by their style – The qualities which individuals own according to their styles of thinking.

Mechanical Engineering

First Year

SECOND TERM

PME 1207 Engineering Mathematics (2) b (4+2)

Laplace transform and its applications in solving differential equations - System of linear differential equations of constant coefficients . and its solution by matrices - Applications . Partial differential equations (definitions - properties and normal forms) - Methods of solutions of partial differential – equations (D,Alembert method , method of separation of variables) –Applications – Heat transfer- Laplace equation -Orthognal functions , Expansion of periodic functions by Fourier series . Barsval equality, Sum of some numerical series - Other applications - Vector analysis - Theorem of line and surface integrals (Green-stocks - Gauss).

EPM 1241 Electrical and Electronic Engineering (3+2)

Elements of Electrical Circuits – D.C. Circuits – Network Theorems to D.C. Circuits – Alternating Current Circuits –Application of Network Theorems to Alternating Current Circuits –Electric Power in Alternating Current Circuits – Power Factor – Semiconductor – Junction Diodes – Transistor – Amplifiers .

MEP 1201 Applied Mechanics (3+2)

Center of gravity and distributed force –Machinery static loads analysis – Sliding and rolling friction – Mechanical efficiency –Moment of inertia (area & mass)–Solid body kinematics– Force , mass and acceleration – Velocity diagrams of mechanisms – Work & energy – Impulse and momentum – Gyroscopic effects and mechanical governor–Beams and trusses.

MPD 1206 Strength and Materials Testing (3+3)

Mechanical behavior of metals under stresses – Stress-strain curve for metals – Statical and dynamical behavior of metals under various types of forces [Tension – Compression – Bending – Shear – Torsion] – Hardness test – Impact properties – Fatigue properties – Fracture dynamics – Chemical and physical properties [Electrochemical – Corrosion – Magnetic – Electrical – Thermal] – Non-destructive tests

MEP 1202 Thermodynamics (1) (3+3)

Basic concepts and definitions – System and control volume – Property and state – Processes and cycles – Work and heat transfer – Work definition – Work at a moving boundary – Other forms of work – Definition of heat transfer – Comparison between work and heat – Ideal gases – State equation and the relation between pressure, temperature and specific volume – Specific heat a constant pressure and volume – tables of thermodynamics – Pure substances – Phase equilibrium – Temperature – Specific volume diagram – Properties of pure substances –First law of thermodynamics – First law for closed and open systems – Application of first law on processes – Internal energy – Enthalpy – Conservation of mass – Steady state, steady flow process – Uniform state – Uniform flow processes – Gas mixtures – Atmospheric air – Combustion products – Reciprocating compressors – compressor cycle on a p-v diagram – Calculation of compressor work –Multi stage compressor – Intercooling.

MEP 12H4 Technical Reports (2+ -)

Definition of technical writing –Types of readers and reader adoption– Technical correspondence– Abstracts– Outlines– Defining terms– Technical (formal) report– Describing mechanisms – Graphic aids– Finding Information– Other topics.

Production Engineering and Mechanical Design

Production Engineering and Mechanical Design

Second Year
FIRST TERM

PME 2112 Engineering Mathematics (3) (4+2)

Functions of complex variables (definitions – limits – continuity – Derivative – Cauchy Riemann Equations – Taylor expansion – Integration – Cauchy Riemann theorem for integration – Real integrals using complex integration around closed curves) – Conformal mapping and it, application to boundary value problems for Laplace's equation in plane.

Series solution for second order ordinary differential equations using power series – Legendere equation – Bessel's equation – Legendere and Bessel's expansion of functions – Solution of three dimensional Laplace's equation using separation of variables in spherical and cylindrical coordinates.

MPD 2107 Stress Analysis (3+3)

Fundamentals of machine design – Factor of safety – Design of welded joints and rivets – Stress and Strain [Concept of stress and strain – Stress and strain at a point – Stress and strain transformation – Stress-strain relations] – Maximum shear stress and strain – Graphical representation of stress and strain using Mohr's circle – Stresses in cylinders – Stresses on curved beams – Statically indeterminate beam problems – Impact and thermal stresses – Theories of failure

MPD 2108 Metal Casting (3+3)

Introduction –Liquid metals – Fluid dynamics – Principles of solidification – Alloyed castings – Sand casting [Patterns – Molding techniques – Forces acting on flask – Cast equipments – Cupola charge calculations – Sands used in casting – Pouring system – Risers – Design of castings – Structure and properties of castings – Defects of sand castings] – Other cast processes – Quality control in cast processes

MPD 2109 Theory of Machines (3+2)

Mechanisms – Velocity and acceleration diagrams – Analysis of dynamic forces – Cams – Flywheels – Gear train – Balancing of reciprocating and rotating masses - Applications

MEP 2150 Fluid Mechanics (3+2)

Fundamentals of fluid mechanics – Fluid static – Fluid kinetics – Fluid dynamics – Bernoulli's equation and its applications – Real fluid flow in pipes – Hydrodynamic similitude and dimensional analysis – Hydraulic machines – Definitions – Pumps and their types – Fans and compressors - Turbines

MPD 21H3 Engineering Economy (2 + -)

Introduction and main concepts [types of expenses – Analysis of break-even point] – Time value of money and interest rates – Comparisons between investment alternatives – Economic analysis of general projects – Depreciation – Systems of decision making

Production Engineering and Mechanical Design

Second Year

SECOND TERM

MPD 2210 Machine Design (1) (3+4)

Shafts and axles – Power screw – Keys – Clutches – springs – Couplings – Bolts – Chains and ropes – Belts

MPD 2211 Joining of Materials (3+2)

Classification of welding processes – Oxyacetylene welding [equipment – process – safety] Arc welding [equipment – technology – used electrodes – welding arc – submerged arc] – Plasma welding – Laser welding – Resistance welding – Brazing – Soldering – Testing of weldability – Industrial safety in welding

MEP 2251 Heat Transfer (2+2)

Introduction – Methods of heat transfer (conduction, conversion and radiation) – Heat transfer by conduction – Generalized heat conduction equation – One dimensional steady heat conduction – Heat conduction under variable thermal conductivity – Shape factor – Fius and extended surfaces – Heat transfer by radiation – Thermal loads – Non dimensional groups – Heat exchangers

EPM 2244 Electrical Machines (3+2)

Fundamentals of Electromechanical Energy Conversion –Electric Transformers – D.C. Machines – Three Phase Induction Machines – Three Phase Synchronous Machines - Special Electrical Machines .

MPD 2212 Metrology Measuring Equipment (2+2)

Concepts and importance of metrological measurements – International standards in dimensional measurements – General systems of measurements – Identification of measurement – Basics of measuring methods – General systems and their main components – Calibration – Types of measuring equipments – Mechanical design of measuring equipments – Accessories used in measuring devices - Statistical treatment of measured readings

MPD 2213 Furnaces and Heat Treatment (3+2)

Classification of furnaces – Heat transfer and furnaces design – Electric furnaces – Fuel furnaces- Features of heat treatment process - Heat treatment of steel - Heat treatment of cast iron - Heat treatment of non-ferrous metals

Production Engineering and Mechanical Design

Third Year

FIRST TERM

MPD 3014 Machine Design (2) (2+3)

Power transmission elements – Design of variable speed drives – Theory of hydrodynamic lubrication – Systems of lubrication and greasing – Hydrostatic lubricating

MPD 3115 Theory of Vibrations (3+3)

Introduction – Systems of single degrees of freedom – Damping of free vibrations – Forced vibrations and their applications at unbalance – Isolating vibrations – Measuring devices – Lagrange equations – Systems of two degrees of freedom – Systems of multi degrees of freedom – Characteristics of vibrating systems – Numerical methods in solving multi degrees of vibrating systems

MPD 3116 Theory of Metal Cutting (3+3)

Concepts of metal cutting –Tool geometry – Chip formation – Mechanics of metal cutting – Cutting forces – Power consumption – Heat in metal cutting – Cooling fluids – Materials of cutting tool – Cutting tool life – Failure of cutting tool

MPD 3117 Theory of Metal Forming (3+3)

Basic study of plasticity [von-Mises – Tresca yield functions] – Effect of temperature and strain rate on stress and strain – Mechanical and metallurgical aspects in plasticity – Hot forming and cold forming – Methods of solving problems [Ideal work – Strip method or force equilibrium – Upper bound theorem – Slip-line fields – FEM] – Friction and tribology in metal forming – Applications of forming theory [forging (theoretical study of plastic zone) – rolling (analytical and theoretical study) – extrusion – drawing (wire drawing – sheet drawing]

MPD 3118 Machine Tools (2+2)

Performance index of machine tools – Rigidity of machine tool and accuracy of production (Machine – Fixture – Workpiece – Tools) – Frame parts of machine tools – Joints of machine tools – Testing of machine tools

MEP 3152 New and Renewal Energy (2+1)

Introduction – Energy resources – Solar energy – Collection of solar energy – Thermal solar systems – Wind energy – Theory of wind turbines – Wind energy – Conversion systems – Biomass energy – Biogas production – Hydraulic energy – Hydraulic turbines – Energy storage

MEP 3153 Refrigeration and Air Conditioning (2+1)

Systems components – Refrigerants – Air refrigeration systems – Simple and multi refrigeration cycles – Thermal load calculation – Psychometric chart

MEP 3154 Internal Combustion Engines (2+1)

Internal combustion engines – Definitions and Classifications – Fuel air standard cycle – Actual cycle and its deviation from standard cycle – Combustion in spark ignition engine – Diesel engine – Effective efficiency two and four stroke engines – Engine performance

Production Engineering and Mechanical Design

Third Year
SECOND TERM

MPD 3219 Machine Design (3) (2+3)
Design of bearings [sliding – rolling] – Gear design [spur – bevel – helical – worm] – Optimum design – Design of brakes

MPD 3220 Forming Machines (3+3)
Introduction on the casted tools and dies and methods on how they are produced – Hammers – Mechanical presses – Hydraulic presses [Hydraulic pump – electric circuit – fluid circuit – valves]

MPD 3221 Machining Technology (3+3)
Machining allowances – Machining on turret lathes – Reaming – Cutting of gears [hopping –shaping] – Finishing processes [surface grinding – cylindrical grinding – eccentric grinding – internal grinding] – Electrical grinding – High precision finishing processes

MPD 3222 Forming Technology (3+3)
Forging in open and closed dies for different shapes – Drawing rollers in rolling process – Types of extrusion – Wire drawing on passes – Heat treatment of wire between passes – Tube drawing and welding – Non-conventional forming processes [explosive forming – rubber forming]

MPD 3223 Automatic Control in Mechanical Systems (3+2)
Introduction of automatic control [Definitions and nomenclatures – examples of control systems] – Mathematical model for dynamic systems [mechanical – hydraulic – electrical electromechanical and pneumatic systems] – Block diagrams – Signal flow diagrams – Analysis of transient response – Error in steady state – Repeated response –Stability of linear control systems – Engineering locus of roots

MPD 32H4 Laws and Legislation (2+-)
Law [Definition – relation between law and social sciences – classification of law] – Industrial legislation [work law – work contracts] – Right theory [rights identification – Right elements – right sources] – Legal work elements

Production Engineering and Mechanical Design

Fourth Year

FIRST TERM

MPD 4124 Industrial Organization (3+2)

Production systems and productivity – Management systems – Salary and benefits systems – Plant layout – Plant light systems – Ventilation and air-conditioning systems – Control of noise in plants

MPD 4125 Plant Layout (3+2)

Plant organization - Planning systems – Database and their types – Plant area and its relation with machines and various activities – Material handling equipment – Industrial safety – Case study

MPD 4126 Metrology (2+4)

Linear and angular measurements – Slip gages -Screw measurements – Measuring of gears, flatness, straightness, parallelism and roundness – Surface finish – Optical interference – Laser measurements

MPD 4127 Non-Traditional Machining (3+2)

Electrochemical machining (ECM) – Electro discharge machining (EDM) – Ultrasonic machining – Laser beam machining – Super plastic forming – Hydrostatic forming – Forming processes with high power – Mutiaxis machine tools – NC and CNC machine tools

MPD 4128 Composite Materials (3+2)

Introduction – Fibers and their types – Composing – Fibers and plastics – Open sand closed dies processes to produce plastic composites – Composites with metallic base - Composites with ceramic base – Other composites (concrete – asphalt – wood)

MPD 4129 Mecatronics (3+2)

Increasing rule of electronics in mechanical engineering – Circuits of solid state [diode – transistor – field effect transistor] power electronics – Microprocessors – Applications on automatic control in machine tools

MPD 4130 Numerical Control of Machine Tools (3+2)

Basics of machine tools – Control of machine tools – Constructing of machine tools – Manufacturing modes – Basics of CNC machining – Machine programming [lathe – milling – drill

MPD 4031 Project (1+3)

The students are grouped and carvout a practical projects in the production engineering.

Production Engineering and Mechanical Design

Fourth Year

SECOND TERM

MPD 4232 Operations Research (3+2)

Introduction on the initiation of operations research and its applications – Linear programming – Transportation problem – Assignment problem – Queuing theory – Networks

MPD 4233 Tools Design and Production Facilities (3+4)

Design of cutting tools – Basics of design of jigs and fixtures – Die design (blanking dies – bending dies – deep drawing dies) – Molds for injection of plastics – Computer aided design

MPD 4234 Statistics and Quality Control (2+2)

Quality definition – Quality control – Standards and ISO – Department of quality control at plant – Quality costs – Relation between design quality and costs – Types of database – Repeated Table – Histogram – Ogeef diagram – Scatter scales (mathematical and graphical solutions) – Normal distribution and applications – Up-normal distribution – Poisson's distribution and applications – Probabilities (Probability laws and applications) – Binomial theorem and applications – Inspection methods – 100% inspection – Sampling [ideal sample – methods and associated risks – applications] – Application of plan for sample inspection (acceptance region – uncertain region – reject region) – Quality accepted levels – Percentage of defect acceptance or quality limit – Product risk – Consumer risk – design of special inspection plan (one sample , two samples , multi samples , subsequent samples , estimation of diagram for plan of sample inspection) – Schemes of quality control : Jobs of schemes of quality control – Schemes – Data analysis signed on schemes and suggestion of reason for deviation

MPD 4235 Jigs and Fixtures (3+2)

Introduction in tool design – Jobs and types of jigs and fixtures – Principles of adjusting and fixing of product – Principles of fastening – Economics – Tools

MPD 4236 Industrial Robots (3+2)

Mechanisms and their types – Using mechanisms in industry – Power transmission mechanisms – Technology of robots – Programming of robots – applications

MPD 4237 Total Quality (3+2)

Introduction – Total quality as an integrated administrative concept – Elements of constructing total quality [Identifying of management system , operations , and limits] – ISO 9000 and international certificate – Integration of industrial experiences to assure of management success – Initiation of structure of teams and working groups – Quality study of special operations

MPD 4238 Use of Computer in Manufacturing (3+2)

Introduction – Computer aided manufacturing (CAM) – Design of systems on computer – Adapting of systems and design of manufacturing systems tools – Case study.

MPD 4031 Project (-+4)

The students finish their projects from first term.

Mechanical Power Engineering

Mechanical Power Engineering

Second Year

FIRST TERM

PME 2113 Engineering Mathematics (3) (3+2)

Functions of complex variables (definitions – limits – continuity – Derivative – Caucy Riemann Equations – Taylor expansion – Integration – Cauchy Riemann theorem for integration – Real integrals using complex integration around closed curves) – Conformal mapping and it, application to boundary value problems for Laplace's equation in plane -Series solution for second order ordinary differential equations using power series – Legendere equation – Bessel's equation – Legendere and Bessel's expansion of functions – Solution of three dimensional Laplace's equation using separation of variables in spherical and cylindrical coordinates.

MPD 2150 Machine Design (3+3)

Fundamentals of machine design – Factor of safety – Design of welded joints and rivets – Stress and strain – Graphical representation of stress and strain using Mohr's circle – Stresses in cylinders – Stresses in curves beams – Stress analysis of statically determinate beams – Thermal stresses – Shafts and axles – Clutches – Springs – Couplings – Bolts – Chains and belts.

MPD 2151 Theory of Machines (3+2)

Mechanisms – Velocity and acceleration diagrams – Analysis of dynamic forces – Cams – Flywheels – Gear train – Balancing of reciprocating and rotating masses - Applications

MEP 2103 Fluid Mechanics (1) a (3+3)

Introduction – Definition of fluid and fluid mechanics – Basic properties of fluids – fluid statics – Kinematics of fluid motion- Physical system and control volume – Law of mass conservation for 1-D& 2-D steady flow - The Reynolds transport theorem – Flow of an incompressible ideal fluid (1-D & 2-D). Euler & Bernoulli equation – Stream function and velocity potential – The impulse momentum principle (linear & angular) – Applications

MEP2104 Thermodynamics (2) (3+2)

Second law of thermodynamics –Qualitative difference between work and heat – Cyclic heat engines –Heat reservoirs – Kelvin-Planck and Clauius statements – Refrigerator and heat pump – Reversibity and irreversibility – Carnot cycle and its efficiency – Reversed heat engine – Entropy: (Reversible path, Clasuis theorem, Entropy-Temperature diagram –The inequality of Clausius –Entropy increase– Energy: (energy in closed and open system, energy losses and its representation on diagrams) – derivation of the cycle efficiency and applications for the following cycles: (Rankine cycle, regeneration and Reheat, vapor compression cycle, Otto cycle, diesel cycle, dual cycle, Brayton cycle, Sterling and Ericson cycle and air standard refrigeration cycle – Second law analysis: (Thermodynamic relations, Maxwell relations, Clayperon relation as application of one of the Maxwell relation in the two phase region) models for real gases: (Compressibility factor, Van der Waals equation).

MEP 21H5 Engineering Economic (2+1)

Basic principles of engineering economic – Production and management law and fundamentals of economic science – Profit and money circulation – Costs-preliminary economical feasibility study – Other topics.

Mechanical Power Engineering

Second Year

SECOND TERM

EPM 2245 Electrical Machines (3+2)

Fundamentals of Electromechanical Energy Conversion –Electric Transformers – D.C. Machines – Three Phase Induction Machines – Three Phase Synchronous Machines - Special Electrical Machines .

MED 2252 Production Engineering (3+2)

Different casting process – Metals joining – Gear cutting – Nonconventional processes – Sheet metal working – Finishing processes.

MEP 2205 Measuring Instruments (3+2)

Performance characteristics of measuring instruments – calibration – fixed and random error – error estimation – sensitivity – linearity – Dynamic characteristics – Experiments: (Calibration of manometers, Pressure measurements, - Transient response of pressure measurement instruments, - Mechanical Pressure Transducer, Manometers, Elastic pressure measurements, Electrical pressure transducer, Inductive transducer, Piezo electric transducer, Strain gauge transducer and Experiments with the pressure measurements bench) – Flow measurements – Orifices – Nozzles – Venturei – Turbine flow meter – Magnetic flow meters – rotameter – Positive displacement flow meters – Ultrasonic meters – Experiments on flow measurements bench – velocity measurements – Particle Image Velocimetery - Pitot tube – laser Doppler anemometers – hot wire anemometer – Experimental with Particle Image Velocimetery – Temperature measurements – Thermal expansion thermometers – Resistance thermometers – Semi conductor thermometers – The thermocouples – Thermal Radiation thermometers – Experiments with temperature measurements bench – Analysis of combustion products – Probes – Sample conditioning – Gas analysis equipment for measuring O2, CO, CO2 UHC, NOX AND SOX Gas chromatography – Experimental on steam Boiler.

MEP 2206 Heat Transfer (1) (3+3)

Introduction: Modes of heat transfer (conduction, convection and radiation) Energy balance on a surface – Heat transfer by conduction – generalized heat conduction equation – One dimensional heat conduction – Thermal insulation – Heat conduction with internal heat generation – plane walls and cylinders – Heat transfer from fins – Heat conduction with variable thermal conductivity – shape factor –Unsteady heat conduction.

MEP 2203 Fluid Mechanics (1) b (3+3)

Flow of real fluids : Laminar and turbulent flow – External flows: Laminar and turbulent boundary layers, lift and drag forces – von Karman momentum integral equation of boundary layer –Flow separation &secondary flow – Internal flows: Shear stress and head loss; General energy equation for steady incompressible flow ; Separation & secondary flow – The Navier Stokes equations for 2-D incompressible flow – Similitude; Dimensional analysis-Similarity criteria & Normalization of equation of motion – Flow in pipes: Laminar and turbulent flow in smooth and rough Pipes; Darcy – Weisbach equation - Pipe friction factor, Mody diagram; local losses in pipelines.

MEP 22H6 Industrial Safety and Legislation (2+1)

Industrial safety concepts and its importance safety precautions against fire and chemical hazards protection against negative behavior and explosives- safety and health occupational - design of emergency systems. Stairs, ramps, fire alarm and fire extinguishing -Industrial organization labor legislation low - other topics.

Mechanical Power Engineering

Third Year

FIRST TERM

MPD 3153Theory of Vibrations (3+2)

Introduction – Systems of single degrees of freedom – Damping of free vibrations – Forced vibrations and their applications at unbalance – Isolation of vibrations – Measuring devices – Lagrange equations – Systems of two degrees of freedom – Systems of multi degrees of freedom – Characteristics of vibrating systems – Numerical methods in solving multi degrees of vibrating systems

MEP 3107 Refrigeration and Air Conditioning a (3+2)

Introduction- history- Air refrigeration cycles- vapor compression refrigeration cycles (simple and multi- store systems) - Refrigerants- Basic cycles components for vapor compression cycle- Absorption refrigeration- other topics.

MEP 3108 Heat Transfer (2) (3+2)

Heat transfer by convection – Thermal and hydrodynamic boundary layers – Dimensional analysis – Free convection – Forced convection – Boiling – Condensation – Thermal radiation – Radiation Laws-Thermal radiation heat transfer between black and gray bodies -Radiation from gases and vapors Heat exchange (Types & Performance)– Mass transfer: (Mass transfer by diffusion in a stationary binary mixture, Fundamental Equations for diffusion, Equal molecular diffusion between the two components, Diffusion for one component only and Mass transfer by stationary diffusion between liquids and gases for laminar and turbulent flow).

MEP 3109 Heat Engines a (3+2)

Definitions – Classification of I.C.E. The fuel-air standard cycle – Deviations between the actual cycle and the fuel air standard cycle – Combustion in I.C.E – Combustion chambers – Fuel properties and its impact on engine performance - Friction and lubrication – Effect of engine operating conditions on friction loss – Engine performance at constant speed. Cooling loss – Effect of engine operating conditions on cooling loss – The engine actual cycle – Engine air capacity.

MEP 3110 Fluid Mechanics (2) (3+2)

Navier Stokes equations for 3-D flow-Applications for incompressible flow: Quite flow, Poiseuille flow, Hagen-Poiseuille flow – Boundary layer equations – flow past immersed bodies – viscous flow in ducts – An introduction to turbulent flow – introduction to compressible flow: speed of sound , isentropic flow with area changes, flow through nozzles, stagnation and critical conditions, maximum mass flow rate, Compressible Bernoulli equation,

MPD 3154 Composite Material (3+2)

Introduction – Fiber types – polymers – Fiber and plastics – open and closed dies for plastic polymer production – metal base polymers – ceramic base polymers – other polymers types – application of composite materials in mechanical power systems and their parts.

MPD 3155 Quality Control and Quality Assurance (3+2)

Industrial Statistics: Data representation – statistical measures – quality control methods – quality acceptance plans by samples acceptance – quality control charts – case study.

MEP 3113 Advanced Fluid Mechanics (3+2)

Tensor analysis – Stress tensor – Rate of strain tensor – Three dimensional full Navier Stokes equation – Flows with very low Reynolds number (creeping flows) – Flows with very high Reynolds number – Unsteady flows – An introduction to turbulent flows – Reynolds equations of motion – Measurement of turbulence.

Mechanical Power Engineering

Third Year

SECOND TERM

EPM 3248 Electric Power (3+2)

Introduction to Electric Power Systems – Power Plants (Thermal Power Plants – Hydro Electric Plants – Diesel and Gas Turbine Plants) – Overhead Transmission Lines – Underground Cables - Mechanical Design of Overhead Lines – Distribution Systems – High Voltage Engineering - Protection Systems

MEP 3207 Refrigeration and Air Conditioning b (3+2)

Introduction for air conditioning - Humid air and Psychometrics - Thermal comfort- Cooling load calculations - Air conditioning systems - Basic Air conditioning equipments- Duct Design - Pipe sizing - other topics.

MEP 3209 Heat Engines b (3+2)

The two stroke engine – Scavenging processes – The scavenging coefficients – Engine power of the four stroke engine – Engine volumetric efficiency – Engine performance at constant and variable speeds. Engine fuel feeding systems: (Spark Ignition Engines, the carburetor, engine mixture requirements for best performance, the simple carburetor and methods of automatic mixture control to fulfill mixture requirements for best control) – Fuel injection: (types of systems and components) – compression ignition engines: (Injection systems, types and components, Performance and tests) – Supercharging: (Methods, Matching of engine and supercharger) – ignition: (System types and components, Conventional and electronic) – Governors: (Types, components and performance map).

MEP 3214 Thermal Power Stations (3+2)

Power stations and their classifications – Thermal power stations : types; comparison; range and field of applications – Gas turbines power plants: ideal cycle / Brayton cycle) – Calculation of ideal cycles – Variation of power & efficiency with pressure ratio and temperature – Actual cycles.

MEP 3215 Gas Dynamics (3+2)

Steady flow energy equation – Euler equation – Speed of sound and Mach number – flow with friction, heat transfer and area changes – The area - velocity relationship – flow at constant area duct – Theory of characteristics – The shock wave – The normal shock relation for the perfect gas – Experimental methods in gas dynamics.

MEP 3216 Combustion (3+2)

Fundamentals: Definitions – Atomic and molecular structure – Heat of formation and bond energy – Adiabatic flame temperature – Chemical reactions – Flame propagation – Chemical equilibrium – Detonation and deflagration – Applications: (Boilers, types construction, burners, draft furnaces design; combustion chambers types) – Special combustion cases – Measurement techniques.

MEP3217 New and Renewable Energy (3+2)

Introduction – Energy resources – Solar energy – Collection of solar energy – Thermal solar systems – Wind energy – Theory of wind turbines – Wind energy conversion systems – Biomass energy – Biogas production - Hydraulic energy – Hydraulic turbines – Energy storage – Other topics.

MEP 3218 Computer Applications in Mechanical Power (3+2)

Introduction to computer Advanced languages – Computer applications in the following fields: Boilers and furnaces, thermal design, control operation; pumps and pumping, design algorithms, performance analysis & control, air conditioning and refrigeration, design, analysis & control.

Mechanical Power Engineering

Fourth Year

FIRST TERM

MEP 4119 Environmental Studies (3+2)

Introduction to environmental science – scientific principles – environmental impacts of systems – environmental Relations – Environmental ethics – energy recourse and impacts of its utilization – Effect of projects on wild life–case study – laws for environment protection and application – solid waste handling (Types, collection , processing, recycling) – pollution of Exhaust gases (types, impacts, measurements, treatment), Noise (sources, measurements, treatment) – pollution of water and its treatment – thermal pollution – other topics .

MEP 4120 Hydraulic Machines a (3+2)

Definitions and classifications – Principles of operations – Performance of hydraulic machines: centrifugal, mixed and axial pump system curves – Pump connections in parallel and series – Cavitations in pumps – Selection of pumps – Some practical problems: priming ,starting and control.

MEP 4121 Automatic Control of Mechanical System (3+3)

Introduction: Definitions – Control terminology – Classification of control systems – Mathematical derivation of systems governing equations: (Mechanical, electrical, hydraulic, pneumatic, thermal) Laplace transform and its inverse – Application to solution of ordinary differential equations – Transfer function – Partial fraction expansions – System time response: first and second order system subjected to step, impulse or periodic input functions) – System classification and coefficients – Control actions and industrial controllers: On-Off and PID controllers – Pneumatic, Hydraulic and electronic controllers) – Frequency response: (Bode plots, polar plot, M and N circles) Nyquist stability criteria: stability analysis – Nichols chart analysis and design and closed loop frequency response) – System composition: (lead, Lag and lead-lag) .

MEP 4122 Fuel systems (3+2)

Requirements of automotive ICE from the fuel system – Petrol fuel management: Specific requirement at part loads and higher loads – Metering the air-fuel mixture according to quantity – Formation of the air-fuel mixture – Transporting of the air-mixture – Distributing of the air-fuel mixture – Carburetors principles and systems – Design and metering principles – Transient system: Starting, Idling – Modern carburetors: Electric and electronic ones – Petrol injection: Diesel Injection: Specific requirements concerning diesel engines characteristics – Fuel injection process: Mechanical and electronic techniques for generating high injection pressure. Diesel injection systems: Unit injectors system. Governors: Mechanical governors, Electronic actuator – Diesel injection testing.

MEP 4123 Operations Research of Mechanical Power Systems (3+2)

Introduction – Resources models – Nets - Different solution methods for assignment determination operation plans – case study.

MEP 4124 Logistic Support in Mechanical Power Systems (3+2)

Infuence of different operational parameters on system performance during operation - Methods and devices for evaluation of system technical conditions – Methods of restoring good technical conditions and increasing system reliability – planning of required amount of spare parts inventory considerations – Integrated logistic system – Measures of logistics.

MEP 4125 Computational Fluid Dynamics

Fundamental of finite difference method - finite volume method – Partial differential equations – Applications of the mentioned methods to solve equations of fluid mechanics and heat transfer – Numerical methods for boundary layer flow solution – Numerical methods for solution of Navier – stokes equations – Finite element methods and its application.

MEP 4126 Mechatronics (3+2)

Introduction to electronic circuits – Amplifiers – Counters – Voltage regulators – Timer – Transistors – Logic gates – Lead displays – Digital / Analogue and Analogue / Digital conversion – Data acquisition systems – Application of control circuits to

perform the following: (Speed measurements, Displacement, Level and Velocity measurements, Temperature and pressure monitoring, Control of opening and closing value, Use of stepper motors Electronic ignition and injection in engines and Other applications) Introduction to robotics

MEP4127 Advanced Studies in Refrigeration and Air Conditioning (3+2)

Introduction: Refrigeration cycles and cooling refrigerant pipes – Design of cooling and freezing storage systems –Ice production systems – Refrigeration application in industry – Control in refrigeration system – Control in Air conditioning devices – Main components of air distribution – Air handling unit Ventilation and air distribution – Air handling units – Central air conditioning – other topics.

MEP 4028 Project (1+3)

The Students are Grouped and Carryout an applied Projects in the Mechanical Power Engineering.

Mechanical Power Engineering

Fourth Year

SECOND TERM

MEP 4229 Hydraulic and Pneumatic Circuits (3+3)

Hydraulic symbols – Hydraulic elements (Pumps, hydraulic motors, hydraulic cylinders, Actuators, Accumulators, Valves, Filters, tanks ….) – Hydraulic control circuits – hydraulic transmition – Fundamentals of Pneumatic circuits design – Applications.

MEP 4230 Energy plants (3+2)

Introduction; (Conventional and renewable energies, Energy conversion systems, Central stations, Generation and Transmission and distribution of Electric energy)— Variable load: (load curves and factors, Spinning and cold reserve, Effect of variable load on design and performance of power plants) Base and variable load units — Energy storage—Regulation of central station units — Steam turbine governors — Speed-load characteristics -— Units in parallel — Station performance —Input-output characteristics — Integrated heat rate — Optimum load division between units — Testing and operation — Reliability tests — Acceptance tests — Guarantee figures — Starting and stopping of units — Synchronization — Lubrication — Emergency governors — Protection— Automatic trimming — Nuclear power plants: (Principles, Types of reactors. Calculations and Safety) — Cost of energy — Fixed and variable costs — Selection of units — Power plants and the environment.

MEP 4220 Hydraulic Machines (b) (3+2)

Positive displacement pumps- Piston reciprocating pumps - Cavitations in piston pumps – Rotary positive pumps- Jet pumps-Hydraulic turbines: Definitions and clarification -pelton wheel turbine – Francis turbine - propeller and Kaplan turbines – performance of turbines with variation of speed and loads- cavitations in hydraulic turbines – centrifugal and axial compressors .

MEP 4231 Environmental Engineering . (3+2)

Introduction-Natural environmental equilibrium-Environmental control: methods of reducing exhaust gases pollution (mechanical , chemical , and thermal treatment), Optimum design of chimney-Air population effects (green house effect, 03 on layer degradation, smoke fog, Acidic rain, climate change) water pollution control – crude oil pollution – Radiation pollution control.

MEP 4232 Gas Turbine Engines (3+2)

Classification of gas turbine engines : simple turbojet engine, Double spool turbojet engine, turboprop & Turboshaft engines, Turbofan engine – Operation and Basic schemes – Thermal cycles analysis and engines performances –Engines basic parts.

MEP 4233 Steam Turbines (3+2)

Heat cycles of steam turbine plants – Energy - Conversion in turbine stage – Determination of dimensions of turbine stage – Internal relative efficiency – Multistage steam turbines-Calculation of steam path of multistage turbines- turbine performance – Governing of steam turbines – Operation of steam turbine plants.

MEP 4234 Water Distillation and Water pumping (3+2)

Introduction – Fundamentals of water distillation- Water Distillation Methods (thermal, electrical, chemical , reverse othmoses) Distillation using renewable energy- Economic of water distillation - Governing equations for water pumping – Planning and design of pipe networks- Pump selection – Examples and applications.

MEP 4235 Robotics (3+2)

Types and classification – Robotics applications in engineering systems – Power robotics – Robotics technology – Robotics – Programming- Robotics application in mechanical power systems.

MEP 4236 Maintenance of Equipments (3+2)

Maintenance economics - Types of maintenance : Corrective, preventive, predictive – Maintenance data- Repair by welding - chemical defects – Maintenance plans.

MEP 4028 Project (1+3)

The Students Finish Their Projects from the First Term.