voltage and currents, temperature drift of input offset voltage and current. Applications and design of integrated circuits: active filters (Low pass- Band pass- Band reject), oscillators (phase shift- Wien Bridge- Colpitts), Schmitt trigger circuits (comparator- zero crossing detector- non inverting Schmitt trigger- limiters). A/D and D/A conveters. V/F and F/V converters. Design and applications of phase locked loops circuits. Voltage regulators (fixed- adjustable- switching). MOSFET digital circuits (NMOS and CMOS inverters and logic gates). Video amplifiers. Design project.

Prerequisites: EE 224

EE 229 Electronic Devices and Circuit Simulation **2Cr [1-0-3]**

This course exposes students to the design, fabrication and testing of a semiconductor chip in one semester. The students are responsible for all phases of the project, work in a group with a defined goal, draw on their entire technical background and produce an end result.

Circuit simulation, matrix solution, SPICE operation, types of analysis, nonconvergence. Using ORCAD PSICE mixed signal simulator. SPICE options, controlling the time step, output file formats, convergence options, MOS geometry options. Types of analysis, DC analysis, AC analysis, transient analysis and Fourier analysis. Stability and oscillators, the feed back loop, the phase shift oscillator, the wien-bridge oscillator, colpitts oscillator. Operational amplifier circuits, integrators, differentiators, active filters.

Prerequisites: EE 224

EE 230 Linear Systems and Signals* **4Cr [4-1-1]**

Course objectives Determine whether a signal has the following properties: discrete time, continuous time, power, energy, periodic, aperiodic, even, odd ,to Perform the following operations on signals, alone or in combination: amplitude scaling, addition, multiplication, differentiation, integration time scaling, reflection, time shifting , Identify and use the following elementary signals: exponentials, sinusoids, complex exponentials, exponentially damped sinusoids step functions, impulses, sifting and time scaling properties of impulses

Topics covered

Linearity, time invariance, system response, Fourier and Laplace transforms, common signals: impulse, step, ramp, sinusoids. System frequency-response, system time-response, convolution. Introduction to feedback systems.

Prerequisites: BE 204

*Not accredited for Electrical Engineering Students

EE 232 Electronics **4Cr [4-1-1]**

Course objectives Discuss semiconductors, conductors, and insulators and how they basically differ, Describe a diode circuits such as clippers, clampers, dc power supply, Describe storage elements, interfacing logic families, Discuss the basics of operational amplifiers, Describe circuit building blocks.

Topics covered

History and overview, electronic properties of materials, diodes and diode circuits, MOS transistors and biasing, MOS logic families, bipolar transistors and logic families, design parameters and issues, storage elements, interfacing logic families. Operational amplifier, circuit modeling and simulation. Integrated circuit building blocks.

Prerequisites: EE 215

** Not accredited for Electrical Engineering students.*

EE 241 Signals and Systems **3Cr [3-2-0]**

Continuous-time and discrete-time signals, linear time-invariant systems, Fourier series representation of periodic signals, the continuous-time Fourier transform, the discrete-time Fourier transform, time and frequency characterization of signals and systems, sampling, discrete-time modulation.

Prerequisites: BE 204

EE 251 Analog Communications **3Cr [3-1-1]**

This course tends to make the student recognize the meaning of:

Linear modulation, amplitude modulation, AM, DSB, SSB, VSB, modulators, demodulators. Exponential modulation. Frequency modulation, FM, NBFM, WBFM and phase modulation, PM, NBPM, modulators, demodulators. Multiplexing, FDM. Effects of noise. Pre-emphasis and de-emphasis techniques. Superhetrodyne receivers. Applications, AM and FM broadcasting, TV and video transmission, telephony multiplexing, stereophonic systems. A MATLAB simulation project.

Prerequisites: EE 241

EE 252 Communications Laboratory **1Cr [0-0-4]**

Laboratory experiments dealing with analog and digital modulation and multiplexing.

Course objectives

- To construct modulator and demodulator sytems for common communication system formats
- To gain hands on experience with the basics of analog and digital communication techniques
- To compare experimental and theoretical communication system performance

Prerequisites: EE 251

S. Haykin, "Digital Communication", 4th Ed., John wiley & Sons, 1988.

EE 253 Digital Communications for Electronic Engineers **3Cr [3-1-1]**

This subject aims to introduce topics of modulation, pulse-code techniques, and signal detection in noise, and learn about some practical operating systems using these methods and systems design tradeoffs.

This Course covers

Introduction to digital communications. Sampling techniques. Analog pulse modulation: PAM, PDM, PPM. Digital baseband modulation: Quantization, coding, PCM, DPCM, DM. Quantization noise. Passband signaling: ASK, PSK, FSK, QPSK, NCFSK, DPSK. Bandwidth requirements and performance in noise. Introduction to error correcting codes. Applications: Digital audio systems, digital telephony, video storage and recording.

Prerequisites: EE 251

EE 254 Communication Technology for Power Engineers* **4Cr [4-1-1]**

This subject aims to introduce topics of modulation, pulse-code techniques, and signal detection in noise, and learn about some practical operating systems using these methods and systems design tradeoffs.

This course covers:

Introduction to communication systems. Linear modulation: amplitude modulation, AM, DSB, SSB. Exponential Modulation: frequency modulation, FM, and phase modulation, PM. Multiplexing: FDM. Mixing. Super-hetrodyne receivers. Sampling techniques. Analog pulse modulation: PAM, PDM, PPM. Quantization, Source coding, PCM, DPCM, DM. Quantization noise. Passband modulation techniques, ASK, PSK, FSK, QPSK, NCFSK, DPSK. Bandwidth requirements and performance in noise. Applications: AM and FM broadcasting, digital audio systems, telephony, video storage and recording.

Prerequisites: EE 241

* Accredited Only For Power and Control Specialization Students.

EE 255 Digital Communications (1) **3Cr [3-1-1]**

This subject aims to introduce topics of modulation, pulse-code techniques, and signal detection in noise, and learn about some practical operating systems using these methods and systems design tradeoffs.

This course covers:

Introduction to digital communications. Sampling techniques. Analog pulse modulation: PAM, PDM, PPM. Noise effects on Analog pulse modulation. Digital baseband modulation:

quantization, coding. PCM, DPCM, DM. Quantization noise. A-law, μ-law companding. Noise effects on baseband digital communications. Matched Filters. Passband signaling, Binary digital modulation: ASK, PSK, FSK, Noise effects and Bit error rates. Applications: Digital telephony, video storage and recording, digital audio systems. MATLAB Simulation Project.

Prerequisites: EE 251

EE 256 Digital Communications (2) **3Cr [3-1-1]**

This is a first course digital communication system. The student will be able to understand and use signal space ideas to carry out probability-of-error calculations for various signaling schemes. The student will be able to determine maximum bit rates for zero-intersymbol interference (ISI) regimes and for controlled ISI regimes. The student will also be able to analyze the error-correcting and error-detecting capabilities of various linear codes.

This course contains: Geometric representation of signals: Signal space, Gram Schmidt orthogonalization, optimal receiver design, decision regions, probability of error. Advanced passband digital modulation: QPSK, OQPSK, π/4DQPSK, CPFSK, MSK, GMSK. M-ary Digital Modulation: MPSK, M-ary PAM MQAM, MFSK. Non-coherent techniques: NCFSK, DPSK. Power spectral density and bandwidth requirements. Optimal demodulation. Performance analysis for advanced passband digital communication systems in noise. Introduction to information theory. Channel capacity. Digital modulation comparison based on channel capacity. Introduction to error correcting codes. Introduction to spread spectrum techniques: DS, FH, TH, spreading codes. MATLAB Simulation Project.

Prerequisites: EE 255

EE 260 Electromagnetic Fields **3Cr [3-1-1]**

This is a second advanced course for undergraduates specializing in electromagnetic. The purpose of the course is to provide senior-level students with methods to analyze and understand advanced electromagnetic field problems that arise in various branches of engineering.

Topics covered:

Electrostatics: Coulomb's law; electric field; Gauss's law; divergence theorem; energy and potential; conductors and dielectrics; capacitors and capacitance. Magneto-statics: Biot-Savart law; Ampere's circuital law; Stokes theorem; magnetic forces, materials, and devices. Inductors and inductance. Faraday's law. Time varying fields. Maxwell's equations. Wave equation.

Prerequisites: BE 204, BE 122

EE 261 Electromagnetic Waves and Transmission Media **3Cr [3-1-1]**

This course will develop students' knowledge of 1) methods of guided (transmission lines and waveguides) and unguided (antennas and free-space links) electromagnetic wave transmission in communications and sensing systems, and 2) analytical tools used in the design of such systems.

Topics covered:

Introduction to plane waves: Plane wave solutions for the wave equation. Electromagnetic waves in complex media, dielectrics and conductors, polarization, reflection and transmission of waves, total reflection and total transmission, considerations for lossy media. High-frequency transmission lines: Distributed parameters model, lossy lines, distortionless lines, reflection and standing waves, input impedance, impedance transformation and matching. Waveguides: Rectangular and circular waveguides, TE and TM modes, power transmission and losses. Cavity resonators: Fields and modes in rectangular and cylindrical cavities, resonance frequencies, quality factors, effect of dielectric losses.

Prerequisites: EE 260

EE 262 Microwave Engineering **3Cr [3-1-1]**

This course tends to give students an understanding of basic microwave devices and the necessary background to perform simple design of microwave circuits.

Covered topics: Microwave transmission media. Coaxial and parallel wire lines, Microstrip lines. Smith chart. Impedance matching techniques. Impedance Transformers. Scattering: by cylinders and wedges. S-parameters. Passive microwave devices: Isolators, directional couplers, circulators, filters, attenuators, bends. Simple microwave circuits. Microwave active devices: Microwave tubes: klystrons, magnetrons. Microwave semiconductor devices: bipolar transistor, FET, tunnel diode, Gunn diodes, avalanche transit-time devices, parametric devices. Microwave radiation: dipoles, apertures and microstrip and printed circuit radiators.

Prerequisites: EE 261

EE 271 Energy Systems **3Cr [3-1-1]**

Course objectives: To enable students to:

Describe conventional methods of electrical power generation,
Understand the renewable energy resources and technologies as a power for sustainable future,
Gain a working knowledge of energy storage systems,
Understand the concepts of illumination systems,
Identify sources of artificial illumination,
Introduce and familiarize with storage batteries and UPS systems.

Topics covered:

The course introduces the fundamentals of modern energy conversion technologies in electrical energy generation using conventional energy resources: thermal, hydraulic and nuclear power plants. The renewable energy resources and technologies as a power for sustainable future are also covered. The course introduces basics of wind energy technology: basic definitions, types and constuction of wind turbines, wind farms, power extracted from the wind , the power coefficient, the maximum power, typical wind turbine power curves, environmental impact of wind turbines, wind Atlas of Egypt. It also covers basics of solar energy: terminology, types, solar constant, solar insolation, , parameters, solar power density and factors involved. thermal solar systems and solar PV systems. The course also covers the illumination systems: concept, quantitative measures, artificial lamps, luminaires, energy consevation and artificial illumination design . It also includes storage systems including storage batteries, fuel cells and UPS.

Prerequisites: None

EE 272 Electrical Power Engineering (1) **3Cr [3-1-1]**

The objective of this course is to:

Gain a working knowledge of generation, delivery, and utilization of electric power and energy systems, Identify the simulating model of transmission line distributed parameters, Understand the use of bundle conductors to mitigate corona discharge, Describe the electrical performance of the transmission system. The course also aims at teaching students how to select the proper sizing and installation of the capacitor compensator for the demand-side power factor correction.

Topics covered:

Electrical power system- *an overview:* Concepts of power in alternating current systems, Why the electrical power is transmitted at high-voltage level? DC 3-wire versus AC 4-wire transmission systems, the necessity of using AC-system to supply the electric power network, Why the uses of multi-phase supply systems instead of single-phase supply system? Structure of power systems, Interconnected power grid and Basic fundamentals of power system protection and control.

Overhead Transmission Line (OHTL) Parameters & Line Model.

Corona Discharge & Bundle Conductors System.

Steady State Electrical Performance of Transmission Line: Percentage line voltage regulation and transmission efficiency, Surge impedance loading, Complex power flow through transmission lines, Power transmission capability, and Transmission line reactive power control.

Power Factor Correction: What is Power Factor? Should I Be Concerned About Low Power Factor? Calculation of the Necessary Reactive Power and How much can I Save by Installing Power Capacitors?

Prerequisites: EE 271

EE 273 Electrical Power Engineering (2) **3Cr [3-1-1]**

The course aims at teaching students how to perform mechanical design of overhead lines: sag and tension calculations, variation of sag and tension with temperature. Understand the conceptual basics and modern technology of underground power cables. Introduce and familiarize with the low-voltage electric power distribution system. Design the low-voltage and medium-voltage distribution systems. Introduce and familiarize with the electric power distribution system equipment.

Topics covered:

Mechanical design of overhead lines: sag and tension calculations, variation of sag and tension with temperature and load, Aeolian vibration (impacts and mitigation).

Underground Cables: Core Conductor & Cable insulation, Cable Parameters, Power Loss In High Voltage Cables, Dielectric Losses of Metallic-sheathed power cables, Dielectric Stresses, Thermal Characteristics and Current Rating of Power Cables and Cable Ampacity (or *Current Carrying Capacity).*

Electrical power distribution: Distribution Systems Elements, Distribution Substation Layout, MV Voltage Network Configuration, Low-voltage Distribution Network Configuration, Load Study, Voltage Drop Calculations and Design of Primary Feeders.

Electrical Power Distribution Equipment: Fuses & Low-voltage Circuit Breakers, MV Circuit Breakers, Load-break Switches, and Isolators and Disconnecting Switches.

Prerequisites: EE 272

EE 274 Electrical Safety Engineering (1) **3Cr [3-1-1]**

The course aims at teaching students rules and standard regulations of electrical safety engineering. The course also presents electric shock accidents: hazards of electricity. effects of electricity on human beings and methods of protection. The course provides the necessity to follow the rules and restrictions of environmental rules and electrical codes belong to electrical safety.

Topics covered:

Course covers electrical accidents: classifications of causes, hazards of electricity shock touch voltage & step voltage calculations, contact voltage limits. The course also covers elements, materials and methods of protective grounding for electric safety. The course also presents necessity and methods of structure protection against lightning and electrostatic charges. The course also covers regulatory and legal safety requirements, standards, safety equipment and safety switching of power supply system.

Prerequisites: EE 273

EE 275 Power System Protection (1) **3Cr[3-1-1]**

The course aims at teaching necessities of power system protection in power systems.

The course also aims at presenting the elements of protective switchgear system. It also aims at teaching numerical algorithms and techniques for power system protection.

Topics covered:

Short-circuit calculations in power system networks: Per-unit system of calculations, Symmetrical as well as Unsymmetrical short-circuit analysis.

Protective switchgear elements including instrument transformers, relays, circuit breakers and high rupture capacity fuses.

Protective switchgear systems: the course covers fundamentals for primary and back-up protection. It also covers coordination by time grading. It also covers methods of power system protection including feeder protection of cables and overhead lines, transformer protection, bus bar protection, motor protection and generator protection.

Prerequisites: EE 273

EE 276 High Voltage Engineering (1) **3Cr[3-1-1]**

The course aims at teaching high voltage engineering technology in power systems. It also aims at teaching methods of measurement and testing of high voltage equipments in power systems.

Topics covered:

Conduction and breakdown mechanisms in gas dielectrics, liquid dielectrics and solid dielectric. Travelling voltage & current surges on HV transmission lines. Transient voltage & current surges in HV grids. Physics of lightning. OHTL protection against lightning. Over-voltage protection and insulation co-ordination in power systems. Power System Grounding. High voltage generators for testing in HV laboratory. Measurement of high voltages in HV laboratory. High voltage standard testings of electrical apparatus in HV laboratory.

Prerequisites: EE 260

EE 281 Transformers **3Cr[3-1-1]**

Topics covered:

Magnetic circuits and magnetic materials, magnetic circuits, hysteresis, sinusoidal excitation, permanent magnet. Single-phase transformers, introduction to transformers, no-load conditions, ideal transformers, transformer reactances and equivalent circuits, voltage regulation, losses and efficiency, testing, cooling. Transformers in three-phase circuits, connections, parallel operation, measurements on three-phase transformers. Per-unit system, transformer equivalent circuit in per-unit form. Special transformers, autotransformers, instrument transformers.

Prerequisites: EE 260, EE 291

EE 282 Electrical Machines (1) **3Cr[3-1-1]**

The course aims at presenting the theory of electromagnetic energy conversion for electrical machines. It also aims at teaching technology of dc machines and practical application of dc motors.

Topics covered:

The course covers principles of electromechanical energy conversion, conservation of energy, fields and relevant energy, applications. It also covers elementary concepts of rotating machines and torque production. The course covers DC machines: construction, winding, armature reaction, commutation, inter-poles, compensating winding. DC generators: types, characteristics, efficiency. DC motors, types, characteristics, speed control, starting, and efficiency.

Prerequisites: EE 260, EE 291

EE 283 Electrical Machines (2) **3Cr[3-1-1]**

The course aims at teaching technology of synchronous generators and parallel operation for load sharing in power plants.

Topics covered:

The course covers synchronous machines: construction, ac windings, rotating MMF of the stator armature winding, EMF generated per phase, winding factor, leakage reactance and equivalent circuit, power and torque, model parameter measurements, short-circuit ratio, voltage regulation, electrical load diagram and V-curves, parallel operation, synchronization. It also covers permanent-magnet alternators, single-phase synchronous alternators, the capability curve, salient-pole theory.

Prerequisites: EE 281

EE 286 Power Electronics (1) **3Cr[3-1-1]**

The course aims at teaching fundamentals of power electronics for application in electric drives and power system control.

Topics covered:

The course covers topics of Power semiconductor devices: diodes, thyristors, triacs, GTOs, power BJTs, power MOSFETs, IGBTs, etc. Rectifying circuits: single-phase half-wave, single-phase bridge, three-phase half-wave, six-phase half-wave, three-phase bridge. The course also covers topics of Converter operation: overlap, power factor, regulation and Converter control: linear firing angle, cosine wave crossing control, phase locked oscillator principle- DC line commutation: parallel capacitance, resonant turn-off, coupled pulse.

Prerequisites: EE 213

EE 290 Control Systems (1) **3Cr[3-1-1]**

The course aims at teaching fundamentals and methods of power system control for application in automated control systems in industrial plants.

Topics covered:

The course covers an introduction to control systems: necessity, classifications and mathematical background. The course covers topics of the basics of control system including: Open loop versus closed loop systems, Modeling of physical systems, Transfer function, Block diagram, and Signal flow graph. The course covers performance evaluation of the control system using both types of time response and frequency response . The course covers also analysis of Steady state error and stability of control systems. The course is concluded by design techniques for PID controllers.

Prerequisites: BE 204

EE 291 Electric Circuits **4Cr [4-1-1]**

This course tends to provide engineering students other than electrical engineers an introduction to basic circuit and logic concepts of Electrical and Computer Engineering. Provide these students the basic tools of circuit analysis and design that they will be expected to encounter in their profession, dealing especially with aspects of instrumentation, signal processing and power distribution.

Topics covered:

DC circuits : Circuit components. Network laws. Reduction methods. First order transients. AC Circuit Components. Phasors and steady state circuit analysis. Series and parallel resonance. Magnetic circuits. Balanced and unbalanced three-phase circuits.

Prerequisites: BE 102, BE 122

EE 292 Network Analysis **3Cr [3-1-1]**

This course provides an introduction to communication networks. The main focus of the course is on basic principles, modeling, and quantitative analysis.

Topics covered:

Network topology. Second order transient. Magnetically coupled circuits. Laplace transform and its application to network analysis. Fourier analysis techniques. Two-port networks. State variable analysis. Passive filters.

Prerequisites: EE 291

EE 293 Electrical Measurements and Instrumentation (1) **3Cr[3-1-1]**

The aim of this course is to provide the students with the fundamentals of electrical measurements, concept of measurement systems, field of applications of measurement systems, methods of measurements and different types of measuring instruments for non-electrical engineering students. The course also aims at covering methods of mesaurements of physical quantities using sensors and transducers. Fundamentals of data acquisition are also included. The course focus on different practical application of electrical measurents and instrumentation in petro-chemical systems.

The course covers fundamentals of electrical measurements: accuracy, sensitivity, resolution, random erros and loading effect errors. It also covers different types of analog measuring instruments: PMMC, iron, dynamometer and induction types for measurements of dc and ac voltage, current, electric power and energy (supply meter). Measurements of accurate and sensitive frequency and phase shift of ac voltage and current signals using CRO are also included in this course. It also covers measurements of low and high resistance measurements as well as measurements of inductance and capacitance parameters at different quality factors using bridge circuits. The course covers instrument transformers for voltage and current measurement in high-voltage substations and power systems. The course covers also basics of digital-type voltmeter and ammeter for voltage and current signals. Measurements of physical quantities using sensors or transducers and fundamentals of data acquisition in instrumentation systems are also included in this course.

* Not Accredited for Electrical Engineering Students.

Prerequisites: EE 208 and EE 291

EE 301 Embedded System Design **3Cr [3-1-1]**

The course begins by discussing several different representations of system and their behavior. The second part of the course deals with algorithms to determine numerical values for free parameters within a given model structure:

1. Hypothesize a model of the system, 2. Calculate an estimated output, 3. Compare the estimated output to the actual output, and 4. Use the error to improve the accuracy with which the model predicts the observed behavior of the actual system.

Topics covered:

Overview of embedded systems, design challenge, processor technology. IC technology, custom-single purpose processors. standard single-purpose processors: peripherals timers, counters, watchdog timers, UART, pulse width modulator, LCD controller, Keypad controller, ADC, real time clocks. Memory, common memory types, memory hierarchy and cache, advanced RAM, DRAM, EDO DRAM, SDRAM, memory management unit. Interfacing, serial protocols: I2C

bus, CAN bus, fire wire bus, USB, Parallel protocols. PCI and ARM bus. Wireless Protocols: IrdA, Bluetooth, IEEE802.11

Prerequisites: EE 206

EE 304 Microprocessor Based System Design **3Cr[3-1-1]**

Course objectives :

To design, program, and test advanced microprocessor-based systems for general-purpose and/or special-purpose applications.

Topics covered :

Intel based 8051 Microcontroller, comparison between microprocessor and microcontroller. Internal architecture, program memory, data memory, EEPROM memory, registers. Assembly language programming, instruction set, data types and directives, addressing modes. Internal peripherals, I/O port programming, timer/counter programming, Watchdog timer, interrupts, serial communication. Real world interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory Advanced topics: ARM processors and its applications.

Prerequisites: EE 202 and EE 206

EE 308 PC Interfacing and Applications **3Cr [3-1-1]**

This course tends to help under graduate engineers to be familiar with hardware and software components of PC in order to make its use easier in practical life.

The main topics of this course are:

PC motherboard and its components, computer memory, I/O cards for PC, ISA, PCI buses, displays and display adapters, IDE & SCSI Interfaces, disk drives. Serial ports, RS232 and RS485 protocols, baud rate, level shifting, communication distance, using UART chips. Centronix parallel port, printer protocol, handshaking, standard and extended modes. Universal serial bus interface (USB), protocol, different standards, plug and play. Timing, generating precise timing events using Assembly language. Interface to the external world using port extender chips, UARTs and USB controllers. Firewire IEEE 1394.

Prerequisites: EE 206

EE 310 Lasers and Photonics **3Cr [2-2-1]**

The proposed course in photonics provides the undergraduate with an introduction to the principles, practices and devices of optics as it applies to telecommunications, signal processing, sensors, etc. it will also serve as remedial course for new graduate students interested in photonics but unprepared for the graduate courses in this area

Covered Topics:

Principles of lasers, laser threshold and rate equations, resonator theory, transverse and longitudinal modes, homogeneous and inhomogeneous broadening. Laser types, gas, liquid, and solid lasers. Geometrical optics and imaging, physical optics, Fourier transform in optics, optical data processing and computing, holography, partial coherence, image system impulse response. Applications in communications, medicine, remote sensing, and material processing.

Prerequisites: EE 316

EE 316 Optical Electronics **3Cr[3-1-1]**

This course aims to introduce students to Fourier optics and its applications to holography, optical image reconstruction, spatial filter design and optical information processing.

Topics Covered:

LED sources, photovoltaic and coupling sources and detectors, Opto-triacs, IR transmitters, photodiodes. Lasers, optical laser oscillation, semiconductor laser diodes, phase noise, quantum well lasers, optical diodes, optical receivers, and quantum effect devices. Noise in fiber-optic systems, active and passive components, modulators and couplers, and applications in communication and sensing. Optical fibers, structure of single and multimode fibers, step and graded index fibers, modal theory of fiber propagation, ray theory of multimode fibers, fiber parameters, numerical aperture, couple mode theory, Applications: using IR transmitters and receivers, IRDA protocol.

Prerequisites: EE 228

EE 320 Design and Implementation of Electronic Circuits for Communications **2Cr [2-0-2]**

The objective of this course is to provide the students with hands-on experience in the design, analysis, testing, and comprehension of selected nonlinear electronic circuits by recognizing:

Transmitters, direct conversion receivers, superhetrodyne receivers, radio frequency amplifiers, automatic gain control techniques, voltage controlled oscillators, frequency selective networks, power amplifiers, phase locked loops, mixers.

Prerequisites: EE 253 or EE 255

EE 322 Mechatronic Design Laboratory **1Cr [0-0-4]**

The course aims at enhancing practical capability of students for adapting electronic devices in machinery systems in industrial plants.
The course covers Mechatronics and its scope and role of CNC Machines. The course presents simplified scientific background in Electronics for Mechanical Engineers including: conductors, insulators, active and passive components, silicon controlled rectifier, integrated circuits, digital

electronics, amplifiers, sensors and transducers. On the other hand the course presents simplified scientific background in Mechanical engineering systems for electronics engineers including: heat treatment, electrochemistry, electroplating, bearings, measuring systems, control systems, feedback elements, hydraulics. Electrical systems, AC & DC drives, spindle drives, motors, feed drives, servo principle, wiring, CNC systems, PLCs. Design and construction of a mechatronics systems incorporating sensors and intelligence.

Prerequisites: EE 213

EE 325 Introduction to Computer Networks **3Cr [3-1-1]**

This course is an advanced topic for an electrical engineer; it tends to give the student basic information related to computer networks.

The topics of this course are:

Data communications, protocols, guided transmission media, wireless transmission, flow control, error detection, error control, HDLC, Other data link control protocols. Switched networks, packet-switching principles, X.25, frame relay protocol architecture, LAN Architecture, Bus/Tree LANs, Ring LANs, Ethernet. Token ring and ATM protocol architecture, internetworking. Overview of ISDN, ISDN Channels, network management, network security, ISDN protocols, ADSL.

Prerequisites: EE 253 or EE 256

EE 326 Introduction to Robotics **3Cr [3-1-1]**

The course aims at teaching fundamental techniques for designing robotics for application in industrial systems.

The course covers Robot system elements: type of robots, co-ordinate systems, Robot arms, The range and use of Sensors, Micro-switches, resistance transducers, Piezo-electric, infra-red, laser. Intelligence, sensors, acoustic, speech, touch. It also cover topics of Ultra sonic, bar code readers and Arc sensing in graphic animation, Image, camera geometry, pattern identification. It also covers topic of Hydraulic and electrical system units including pumps, valves, solenoids, cylinders, stepper motors, encoders and AC motors. It also covers topic of Motors, gears, and mechanism design. The course is concluded by teaching Maze Solving, PID Controller, Advanced topics include Kalman Filters andTopological mapping.

Prerequisites: EE 290

EE 329 Biomedical Engineering **3Cr [3-1-1]**

It aims to enable the student to make accurate and safe measurements of signals from the human and apply these to therapy.

Topics Covered:

Measurement and recording of bioelectric signals: ECG, EMG, EEG, specific design characteristics, sources of noise and its removal. Measurement and recording of pressure, temperature, respiration rate, pulse rate and blood flow. Transducers, Strain gauge, piezo resistive transducer, thermistor. Biotelemetry, radio-telemetry of biological signal, signal source, antenna and frequency design considerations, example of single channel FM units. Bioelectrical signal analysis, Measurement system and diagnosis, general properties of signals, bioelectric signals source, neural cell, action potential, signal stationary and normality tests, finite time averaging, adaptive noise canceling, linear prediction, ARMA analysis, compression and diagnosis of electroencephalographic signals, adaptive segmentation.

Prerequisites: EE 228

EE 337 Micro-fabrication Technology **3Cr [3-2-0]**

The main goal is to provide the students with an understanding of the relation between physical structure and circuit behavior of semiconductor active devices. The emphasis is on simple models of the semiconductor, the discussion of the properties of potential barriers and field effect, with the MOSFET as the centerpiece of the course. Simple one-device circuits are used to introduce non-linear behavior, and make the connection to the device physics. The students will learn the relation between external circuit parameters (as used in SPICE) and the device internal structure. At the end of the course the students will know the basic mechanism of rectification, amplification and switching and their implementation with various types of semiconductor devices.

Topics Covered:

Integrated circuit device fabrication and surface micromachining. Lithography etching, thermal oxidation, impurity diffusion, ion implantation. Contacts and interconnections, process integration issues. Device design and mask layout, selection between physical structure and electrical/mechanical performance. MOS transistor will be studied.

Prerequisites: EE 228

EE 338 Digital Integrated Circuits **3Cr [3-1-1]**

Fundamental understanding of digital integrated circuits.

Topics covered

Logic gates characterization, power dissipation, propagation delay, noise immunity, voltage transfer characteristics, delay-power product. Logic Circuits Fundamentals: Analysis of basic BJT and CMOS inverters. Families of logic circuits, BJT logic circuit families (RTL, DTL , TTL), analysis of DTL and TTL gates, fan in and fan out. TTL manufactures specifications and comparisons. Emitter coupled logic family Characteristics (ECL) and Schottky gates. Design of

CMOS logic gate circuits. CMOS transistor sizing. Digital waveform generation, monostable, astable and bistable, crystal controlled generators. Storage devices and memories, Latches, flip flops, Shift registers, read/write memories, CMOS static RAM cell, basic ROM cells. A/D and D/A converters.

Prerequisites: EE 228

EE 342 Digital Signal Processing **3Cr[3-1-1]**

After learning this subject we are able to introduce an introduction to the theory of discrete time systems and applications.

Topics covered:

Sequence representation, the sampling process. Time-domain characterization of LTI discrete-time systems. Correlation of signals, periodic and random signals. Discrete Fourier transform, DFT, and properties. Z-Transform. Transforms of random signals. Frequency response, transfer functions, minimum and maximum-phase systems. Inverse systems, system identification. Discrete-time processing of random signals, matched filter. Computation of the DFT. The quantization process and errors.

Prerequisites: EE 241, BE 205

EE 343 Advanced Digital Signal Processing **3Cr [3-1-1]**

After learning this subject we are able to know Advanced digital signal processing methods to include: statistical and deterministic least squares filter design, finite length register effects and their optimization in digital filters, introduction to adaptive filtering, applications in beam forming and spectral estimation. included topics are:

Quantization. Phase and group delay characteristics. Digital FIR and IIR filter design. Switched capacitor filters. Spectral estimation (parametric and non-parametric methods, filter-bank methods, Yule-Walker method). Estimation of signals in noise, Wiener filters. Adaptive filters. The Eigen value problem, singular value decomposition, subspace techniques. Applications: speech analysis and synthesis. Signal detection in noise, DSP processors, MATLAB project.

Prerequisites: EE 342

EE 344 Digital Filters **3Cr[3-1-1]**

After learning this subject we are able to understand fundamentals of digital integrated circuits.

Topics covered:

Review of Z, DFT, FFT transforms. Analog filter design. Digital filter structure, block diagram representation, IIR and FIR tapped cascaded lattice structures. Digital filter design, bilinear transform method, spectral transformations of IIR filters, FIR filter design using windowed

Fourier series, design of FIR filters with least-mean-square error, constrained least-square design of FIR digital filters. Finite word length effect.

Prerequisites: EE 241

EE 345 Digital Image Processing **3Cr[3-1-1]**

This course is designed to give first-year graduate students and seniors in ECE a fundamental understanding of digital image processing techniques, including image enhancement, restoration, coding, and low level image analysis.

Topics covered:

Two-dimensional systems. Image sampling and quantization (2D sampling). Image enhancement and restoration, inverse filtering, wiener filtering, geometric transformations. Color image processing and transformations. Image segmentation. Wavelet Transform and Multiresolution processing, Wavelet Packets, wavelet denoising. Image compression, lossy and lossless compression, MPEG standard. Image Watermarking. Image indexing and recognition.

Prerequisites: EE 241

EE 346 Introduction to Computer Vision **3Cr [3-1-1]**

This course aims to help the students to be able to use computer in engineering purpose.

Topics covered

Applications of Computer vision, industrial inspection, Robotics and control, image analysis and recognition. Image processing, visual motion computation. Shape representation and recognition. Hardware peripheral, imaging devices, frame grabbers, display devices. Advanced Techniques, Fuzzy logic procedures in computer vision algorithms.

Prerequisites: EE 241

EE 347 Applications of Artificial Intelligence in Communications **3Cr [3-1-1]**

This course presents an overview of the theory and applications of artificial neural network and fuzzy systems to engineering applications with emphasis on signal processing and control. The objective of this course is on the understanding of various neural network and fuzzy systems models and the applications of these models to solve engineering problems.

Topics Covered

Introduction to problems and techniques of artificial intelligence (AI); search and game strategies; expert systems; implementing AI systems. Applications of Neural Networks in Communications. Applications of Genetic Algorithms in communications. Applications of Fuzzy logic techniques in communications.

Prerequisites: EE 241

EE 348 Artificial Neural Networks **3Cr [3-1-1]**

This course helps the student to solve a forward or a reversed problem using Artificial Neural Networks, by studying its internal structure and main functions.

Topics covered:

Physiological properties of neural networks. Mathematical modeling. Single and multilayer feed-forward networks. Radial-basis function networks. Learning: Back-propagation. Feedback networks. Hopfield networks. Self-organization. Applications to pattern recognition, associative memory, and classes of optimization problems in communications which may include: detection, error-correcting codes, traffic in ATM systems, design of antenna arrays, CDMA receivers, image compression. Random Neural Networks.

Prerequisites: EE 241

EE 350 Communication Systems **4Cr [4-1-1]**

This course is the most important for a communication engineer student. Its objective is to introduce basic concepts of digital communication, so that the student can understand how the recent wireless communication systems work.

Topics covered:

Multiplexing and multiple-access techniques, TDMA, FDMA, CDMA. Carrier and symbol timing synchronization, equalization for intersymbol interference channels. Switching and analog telephone networks. Introduction to teletraffic engineering, loss and delay systems, traffic distributions, Erlang's formula for blocking probability, applications. Description of some advanced systems, digital telephony, broadcasting and TV systems. Wireless communication systems, microwave line-of-site links, mobile communications, radar, wireless LANs.

Prerequisites: EE 253 or EE 255

EE 351 Satellite Communications **3Cr [2-2-1]**

This course aims to present basic knowledge about orbits and earth coverage also satellite construction which helps in wireless communication systems.

Topics covered:

Orbits and Earth Coverage: Orbital parameters, orbits classification-GEO, MEO, LEO, frequency allocations. Elevation and Azimuth angles Link budget: satellite antennas, propagation effects, atmospheric losses, frequency bands. Satellite construction: platforms, Satellite transponder, radio system technology, digital modulation and coding, multiple-access techniques and examples (SPADE, CEPT), transmitter and receiver design. Mobile satellite communication systems, direct satellite broadcasting, VSAT, DVB, Iridium system, Global Positioning System (GPS) and DGPS.

Prerequisites: EE 253 or EE 256

EE 352 Radar Systems **3Cr [3-1-1]**

This course gives the student the basic information needed about radars fundamentals.

Topics covered:

Radar fundamentals: Classification and principles of the radar system. Radar equation, waveforms, Resolution and ambiguity functions, Probability of detection and false alarm. Pulse-Doppler radar: FM radar. Radar signal Processing: Pulse compression, Chirp and phase coded radars. Synthetic aperture radar (SAR), moving target indication (MTI). Antenna requirements. Propagation effects. Radar cross-section. Applications in civil and military environments.

Prerequisites: EE 253 or EE 256

EE 353 Data Communication Networks **3Cr [3-1-1]**

This course provides an introduction to communication networks. The main focus of the course is on basic principles, modeling, and quantitative analysis.

Topics covered:

Basic concepts, network topology, categories of networks, network architecture. Physical layer, switching methods, transmission media. Local area networks, architecture and characteristics. Ethernet and IEEE 802.3, media access control (MAC). Performance evaluation of Ethernets, CSMA/CD protocol. Token ring networks. FDDI networks. Wireless LANs, IEEE 802.11. Internet addressing and subnetting. Network layer protocols (IP, ARP, and DHCP). Transmission control protocol (TCP). Data link control, automatic repeat request (ARQ), asynchronous transfer mode (ATM), internetworking with ATMs.

Prerequisites: EE 253 or EE 255

EE 354 Mobile Communication Systems **3Cr[3-1-1]**

This course aims to make the student recognize the evolution in mobile communication starting from 1st G until LTE systems.

Topics covered:

Limitations of conventional mobile telephone systems (MTS, IMTS) . Offered load and blocking probability, trunking efficiency. Introduction to cellular mobile systems, Concept of frequency reuse. Mobile radio environment, path loss and channel models. Raleigh fading and lognormal shadowing. Co-channel interference reduction. Cordless Telephony :Analogue systems; CT1,CT1+. Digital systems;CT2, DECT. Cellular mobile evolution: First Generation(1G): Analogue cellular systems; AMPS and TACS. Second Generation (2G): Digital cellular systems; GSM, DAMPS (CDMA), CDMAOne(IS-95). Second and Half Generation (2.5G) GPRS. Before the Third Generation (EDGE). Third Generation (3G): CDMA 2000, UMTS.

Prerequisites: EE 253 or EE 255

EE 355 Optical Fiber Communications 3Cr[3-1-1]

This course tends to give basic information about optical fiber communications by studying basic components and its operation.

Topics covered:

Light sources, light emitting diodes, lasers. Optical modulation, analog and digital modulation formats. Optical fibers, single and multimode fibers, step and graded index fibers, modal and ray theory of fiber propagation, fiber parameters. Power launching and coupling. Light detectors, semiconductor photodiode, *pin* and avalanche photodiodes. Noise and detection, shot noise process, signal-to-noise ratio, receiver front-end circuit design. System design. Introduction to optical networks, directional couplers, network topologies, optical multiple accessing. Simple optical network design.

Prerequisites: EE 316

EE 356 Optical Communication Networks 3Cr [3-1-1]

To introduce the principles and technology of fiber optics communication.

Topics covered:

Evolution of optical systems, telecommunication infrastructure. SONET configuration and protection. MPLS and optical networks, architecture of IP and MPLS-based optical transport networks, optical routers, 10 gigabit Ethernet. WDM concepts and components. WDM multiplexers, passive components, fiber couplers, scattering matrix representation, star couplers, Mach-Zehnder interferometer multiplexers, fiber grating filters, waveguide grating router, tunable optical filters. Optical amplifiers. Wavelength converters. Broadcast-and-select WDM networks, single-hop and multi-hop networks. Optical network transmission protocols.

Prerequisites: EE 355

EE 357 Multimedia Communication Systems 3Cr [3-1-1]

This course presents basic information about image, voice and data compression, also gives a hint on lasers.

Topics covered:

Multimedia signal characteristics: data, voice, image, video; bandwidth, data rate. Communication aspects: modulation, multiplexing, multi-rate transmission, Packets. Lossy and lossless data compression: Huffman coding, RLC, DCT. Voice and image compression, JPEG. Video Compression, MPEG. Cameras, projectors, TV/film transmission systems and equipment. Electronic editing and printing. Audio equipment. Digital video effects. Compact discs, video discs, Laser discs, and videos tapes. Electronic music. Multimedia products. Internet multimedia.

Prerequisites: EE 253 or EE 256

EE 358 Information Theory **3Cr[3-1-1]**

Objective: This is a first course digital communication systems. The student will be able to understand and use signal space ideas to carry out probability-of-error calculations for various signaling schemes. The student will be able to determine maximum bit rates for zero-intersymbol interference (ISI) regimes and for controlled ISI regimes. The student will also be able to analyze the error-correcting and error-detecting capabilities of various linear codes.

Topics covered:

The concepts of source, channel, and rate of transmission of information, entropy, relative entropy, mutual information, data processing inequality. Asymptotic equipartition property. Data compression, Kraft inequality, source coding, Shannon's first theorem, Huffman codes. Information theory and statistics, the method of types, hypothesis testing. Rate distortion theorem. Channel capacity, the channel coding theorem, binary symmetric channels, Shannon's second theorem. Differential entropy, Gaussian channels.

Prerequisites: EE 253 or EE 256

EE 359 Error Correcting Codes **3Cr[3-1-1]**

This course is designed to introduce the student to error- correcting codes, their construction and properties, encoding and decoding.

Topics covered:

Construction and properties of error correcting codes. Encoding and decoding techniques and information rate for various codes, Hamming distance, parity check matrices, syndromes. Basic channel coding techniques, block, linear, cyclic, and convolutional codes. Advanced channel coding techniques, Trellis codes, turbo codes, BCH codes, and RS codes.

Prerequisites: EE 253 or EE 256

EE 363 Microwave Measurements and Laboratory **2Cr [1-0-4]**

To become familiar with basic laboratory measurement procedures and concepts in transmission line and microwave circuits.

Topics covered:

Basic microwave measurement techniques: Power, impedance, s-parameters, frequency. Time domain reflectometery. Network analyzer applications: Characterization of devices and systems: passive and active components. Spectrum analyzers applications. Spectrum, modulation and noise measurements. EMC and interference measurements. Applications of other hardware and test equipment in the modern microwave laboratory which may include: Antenna measurements: gain, pattern, impedance, polarization; Radar measurements; Microwave link.

Prerequisites: EE 262

EE 364 Antenna Theory and Design **3Cr[3-1-1]**

This course aims to present basic concepts of antenna construction,function and utility,also helps the student to enhance the directivity and performance of antennas.

Topics covered:

Radiation fundamentals: Electromagnetic potentials, Complete field solutions of short dipoles. Far field approximation. Antenna parameters: Gain, directivity, radiation resistance, equivalent length, effective area, efficiency. Linear antennas: dipole, monopoles, folded dipoles. Traveling wave antennas. Loop and helical antennas. Antenna arrays: linear, planar and circular. Aperture antennas. Reflector antennas. Horn antennas. Microstrip and printed circuit antennas. Antenna design considerations. Antenna synthesis. Antenna measurements.

Prerequisites: EE 262

EE 365 Propagation of Electromagnetic Waves in Natural Media **3Cr [3-1-1]**

To provide theoretical analysis of transmission lines and microwave circuits, hands-on training on engineering tools such as Smith Chart, EDA software and RF instruments. Obtain engineering design experience through team-based design projects.

Topics covered:

Space wave propagation. Ground wave propagation: direct waves, surface waves, effect of spherical earth's surface, surface roughness, Fresnel zones. Propagation in the earth's troposphere; standard, sub and super refraction, fading, troposcatter propagation. Propagation in the earth's ionosphere: propagation in ionized media, reflection from ionospheric layers, effect of losses and earth's magnetic fields. Natural phenomena in the ionosphere and magnetosphere: scattering from meteors. Signal design for ionosphere communications.

Prerequisites: EE 262, EE 364

EE 366 Microwave Circuits **3Cr [3-1-1]**

This course is designed to give seniors in electrical engineering the ability to perform measurements on RF and microwave devices and characterize the devices.

Topics covered:

Review of microwave transmission media and passive microwave devices. Scattering parameters. Microwave network analysis. Impedance transformer design. Filter design. Hybrids and resonators. Microwave amplifier design. RF transceiver design. Microwave integrated circuits. Active microwave circuit design: Planar active microwave circuits, diode and transistor characteristics, mixers, amplifiers, oscillators, and frequency multipliers. Analysis of microwave circuits.

Prerequisites: EE 262

EE 367 Fundamentals of Acoustics **3Cr [3-1-1]**

Students will gain the ability to analyze and design a range of acousitcal systems from an engineering perspective (e.g., loadspeakers, microphones, certain classes of musical instruments).

Topics covered:

Acoustical wave equation, simple solutions. Plane and spherical acoustical waves. Sound power and loudness. Reflection, transmission. Absorption and attenuation of sound. Radiation and reception of acoustic waves. Cavities and waveguides. Resonators. Noise, signal detection, Hearing and speech.

Prerequisites: EE 251, EE 261

EE 368 Acoustical Waves and Devices **3Cr [3-1-1]**

Students will gain the ability to analyze and design a range of acousitcal systems from an engineering perspective (e.g., loadspeakers, microphones, certain classes of musical instruments).

Topics covered:

Electro-acoustics: microphones, loudspeakers; dynamic and piezoelectric types. Sound systems. Loudspeaker arrays. Room acoustics. Environmental acoustics and noise control. Underwater acoustics. Doppler effects. Applications to Sonar design. Ultrasonics and their applications in medicine. Microwave acoustics. Saw devices and their applications to pulse compression radars.

Prerequisites: EE 367

EE 369 Electrical Power for Mechanical Engineers* **3Cr [3-1-1]**

The course aims at teaching electrical power technology for mechanical engineer. It also aims at enhancing electric power knowledge accepted by mechanical engineer for proper management of electrical systems in mechanical machinery of industrial plants.
The course covers electric power technology of: Three-phase systems, Power Transformers, AC Synchronous Generators, AC Three-phase Induction Motors. It also covers basics and electric technology of: Power Cables, Mechanical design of overhead transmission lines, Switchgear components of Substations. alt also covers basics of Electric drives.
Prerequisites: EE 208
* Not Accredited For Electrical Engineering Students.

EE 371 Power Systems Analysis **3Cr[3-1-1]**

The course aims at teaching students the numerical algorithms and techniques for operation and control of interconnected power grids via Electrical Management Control systems (EMS). The course also aims at enhancing the scientific background for students regarding the symptoms and

bottleneck positions in the interconnected power system network that can cause voltage collapse and blackout anticipated accidents.

The course covers topics of power flow analysis and applications. It also covers the economic operation of power systems (optimal load scheduling problem). The course presents the fundamentals of power system planning including load forecasting, reliability and generation planning. Power system security: assessment and analysis of the effect of disturbing loads connected to the power systems are also covered in this course. The course also covers analytically the problems of power system stability and voltage stability for maintaining security operation under contingencies.

Prerequisites: EE 273

EE 372 Power System Planning **3Cr [3-1-1]**

The course aims at teaching students the numerical algorithms and techniques for power system planning for both short and long terms. It also aims at increasing student scientific background for modifying the grid structure in order to enhance its reliability and security against contingencies.

The course covers topics of load forecasting including short-term and long-term forecasting. The course covers topic of the reliability of power systems. Economics of power systems are covered in this course. The course is concluded by teaching generation, transmission, and distribution planning techniques

.Prerequisites: EE 371

EE 373 Transmission and Distribution Systems **3Cr [3-1-1]**

Course objectives:

To enable students to: Understand the reactive power (or VAR) control problem in interconnected power grids, Design of VAR compensators for HV & EHV transmission systems, Design HV and EXHV overhead transmission lines, Suggest methods for selection of line insulators under normal and polluted atmospheric conditions, Gain a working knowledge of overhead transmission line supporting structures and structure spotting, Describe the elements of substation layout, Gain a working knowledge of power factor compensation at load side demands.

Topics covered:

An overview for the rules and the analysis of the transmission system electrical performance: Surge Impedance Loading, Steady-state stability limit of the transmission line, Loadability of transmission lines.

Reactive power (or VAR) control problem in interconnected power grids: No-load (or light-loading) operation of EHV long TL, Objective of VAR control system in interconnected power

grid, Generation & Absorption of VAR powers under light and heavy load conditions, Methods of VAR Control, Design procedures using TCUL, synchronous condensers and phase shifting transformer, Series capacitor compensation for EHV TL, Flexible AC Transmission System (FACTS Technology).

Overhead transmission lines design: Selection of transmission voltage, Selection of conductors and OHGW, Aeolian vibration: impacts & mitigation, Selection of Line Insulators, Supporting Structures of OHTL.

Electric Power Distribution Substation Systems: Distribution substation layout, Types of distribution substations: Air and Gas-insulated, Bus/Switching configurations, Substation integration and automation.

.Prerequisites: EE 273

EE 374 Power Systems Quality **3Cr [3-1-1]**

The course aims at teaching the evolving issue of power supply quality (PQ) in power system networks. The course aims to enhance student scientific background and practical applications for sensing, analysis and mitigation techniques of PQ problems in power systems.

Topics covered:

The course presents an overview for types, sources and impacts of PQ problems in power systems including harmonics, voltage sags, swells, notches, etc. The course covers a detailed study for both power system harmonics and Voltage sags: sources, impacts, and mitigation techniques. The course also covers topics of Electromagnetic compatibility, monitoring and assessment of PQ problems.

Prerequisites: EE 373

EE 375 Electric Power System Operation and Control **3Cr [3-1-1]**

The course aims at teaching the techniques of power system control for security operation of the interconnected power systems against anticipated contingencies. The course aims also to present the use of SCAD systems in both Energy Management Control systems (EMS) & Dispatch centers for power distribution systems.

Topics covered:

The course covers the definition of control problems in interconnected power systems. It also covers modeling system components in power system dynamics simulation. The course covers the dual control problems of Excitation control systems-QV control channel and Generation control systems-Pf control channel. The course presents an overview study of energy management systems. The course is concluded by the application of Real time modeling: the SCADA system, for power system security monitoring and control.

Prerequisites: EE 371

EE 377 Power System Protection (2) **3Cr [3-1-1]**

The course aims at teaching advanced techniques of power system protection in power systems including relay coordination systems. The course also aims at presenting the use of digital-type relays and programming facilities for power system protection.

Topics covered:

The course covers in its first part topics of power system protective device coordination: time-current characteristic curves, data required, coordination procedure and coordination intervals. The course also covers topics of primary and medium-voltage coordination, low-voltage coordination, ground fault coordination. The course is concluded by solving typical power system structures and use of package software for calculation and relay settings.

The course covers in its second part an overview study for the digital relays including principles, types, operation, facilities, programming and applications.

Prerequisites: EE 275

EE 379 Power Distribution in Industrial and Commercial Buildings **3Cr [3-1-1]**

The course aims at teaching students how to design power distribution system for commercial and industrial plants. The course aims also at enhancing design capability and practical experience for graduated engineers in the market of consultation companies.

Topics covered:

The course covers topics: power sources and distribution systems, voltage considerations, bus bar arrangement, power distribution apparatus. The course also for commercial & industrial plants covers topics of: wiring installation and design, illumination system design, short-circuit & load flow analysis and relay setting calculations for protective switchgear system. The course covers lightning system protection, instrumentation and SCAD control systems. The course is concluded by case studies of typical commercial building and industrial plants.

Prerequisites: EE 275

EE 380 Electrical Machines (3) **3Cr[3-1-1]**

The course aims at teaching students technology and performance of three-phase induction motor. Understand operation modes, speed control and method of starting of three-phase induction motor

The course aims also at teaching technology of three phase induction generators for wind turbine applications and technology of modern fractional horse power motors for different industrial applications.

Topics covered:

The course covers topic of three -phase induction machines: construction, frequency of rotor voltages and currents, induction motor under load, circuit model of induction machine, power flow, efficiency, torque/speed characteristics, control of performance characteristics by rotor design, tests, starting, speed control, other modes of operation (generating and plugging), and circle diagram.

The course covers topic of using three -phase induction motor as generator power supply driven by wind turbine. It also includes various types of fractional horsepower motors: single-phase induction motor, switched reluctance motor, stepping motors and commutator-type motor. The course covers construction, operation and motor control as well as practical applications of each type.

Prerequisites: EE 283

EE 381 Advanced Analysis of Electrical Machines **3Cr [3-1-1]**

The course aims at teaching students advanced topics of electrical machine. It also aims at enhancing students scientific background for modern simulation and analysis of electric machine using matrix algebra for continual post graduate education.

Topics covered:

The course covers topic of: Application of matrix algebra to static electrical networks, Matrix equations of the basic rotating machines, Torque expressions- Linear transformations- DC and single-phase commutator machines (series, shunt and compound). It also covers topics of Steady-state performance of poly-phase machines: balanced poly-phase induction machine, unbalanced terminal voltage, Unbalanced two-phase induction machine: equivalent circuit, currents, torque. Single-phase operation of induction machine: equivalent circuit, currents, torque. Poly-phase synchronous machine: uniform air-gap and no-damper windings, salient-poles and no-damper windings and Effect of damper windings. All topics covered in the course are practiced using MATLAB for the simulation and performance analysis of various electrical machines.

Prerequisites: EE 380

EE 382 Power Electronics (2) **3Cr [3-1-1]**

The course aims at teaching students advanced topics of power electronics design and its application in industrial systems.
The course covers topic of Frequency conversion: cycloconverters, single-phase bridge inverter, three-phase bridge inverter, constant-current source inverter. It also covers topic of: AC voltage regulators: single-phase and three-phase and DC-DC switch-mode converters: control of dc-dc converters, step-down (Buck) converter, step-up (Boost) converter, Buck-Boost converter, Cuk dc-dc converter, full-bridge dc-dc converter. The course covers also topic of Power conditioners and uninterruptible power supplies (UPSs).

Prerequisites: EE 286

EE 384 Electrical Drives **3Cr [3-1-1]**

The course aims at teaching students topics of industrial applications of power electronics for speed control, starting and electric breaking of motor drivers.

Topics covered:

The course presents an overview study including: Definition of electric drives and its components, Types of loads, Speed control, Starting and Electric breaking of motor drivers. The course also covers topics of: Thermal considerations, Motor insulation. Rating and load cycles. It also includes motor selection for different mechanical systems and its applications in traction systems and electric lifts.

Prerequisites: EE 283

EE 385 Electrical Power and Machines* **4Cr [4-1-1]**

The course aims at teaching non-electrical students fundamentals and operation of electric power and machine technology.

Topics covered:

The course covers topics of Transformer principles, construction and electrical performance. It also covers topics of three-phase induction motors: types, starting and motor control. It also covers topics of DC motors: construction, types, starting and motor control. The course covers topic of three-phase synchronous generators and its applications in power stations. It also covers types, operation and application of fractional HP motors including: Single-phase induction motors, Universal motors and Stepper motors. The course includes topics of electric power technology: Electric power distribution, , Symmetrical short circuit and circuit breaker ratings, fundamentals of protective switchgear systems, and Grounding (both system and protective).

Prerequisites: EE 271, EE 291

* Not Accredited for Power and Control Specialization Students.

EE 386 Special Machines **3Cr [3-1-1]**

Stepper motors: classification, construction, excitation modes, specifications, characteristics, stepping modes- Switches-reluctance motors (SRM): basic operation, modeling and torque production, power converter circuit. Single-phase synchronous motors: reluctance motors, hysteresis motors. Universal motors. Servomotors. AC tacho-generators. Permanent magnet DC motors: application of permanent magnet materials, permanent magnet dc motors, and printed-circuit board motors. Induction generators- Linear induction motor (LIM). Linear synchronous motors (LSM).

Prerequisites: EE 380

EE 387 Microprocessor Based Process Control **3Cr [3-1-1]**

A control system for controlling the motion of a machine tool along spatial axes, comprising: bus means, including system data, address and control buses for communicating data, address and control information to the below specified components of the system; operating systems means for storing program instructions, containing prespecified part programs that require data, manually input thereto for commanding particular machine tool functions and movements.

Topics covered:

Measurement and signal conditioning. Data input and output. Interface software. Data processing. Microprocessor as digital controller.

Prerequisites: EE 390

EE 388 Electrical Measurements and Instrumentation (2) **3Cr [3-1-1]**

The course aims at teaching students advanced topics of electrical measurements and instrumentation design and its application in industrial systems.

Topics covered:

The course covers topics of: High voltage measurements and testing, Magnetic measurements, Optoelectronic measurements, Electronic instruments and Signal conditioning. It also covers topics of Data transmission and telemetry, Display devices and recorders and Data acquisition systems.

Prerequisites: EE 293

EE 389 PLC Applications in Industry **3Cr [3-1-1]**

The course aims at teaching students advanced topics of PLC design and its application in automated control systems of industrial power plants.

Topics covered:

The course covers topic of: Building blocks of automation, Automatic Production and Assembly, Automation hierarchical levels. It also presents basic functions of Machines in automated systems and data processing. The course also covers the topic of programmable logic control (PLC): Types, Construction, Interfacing, Communications and software programming.

Prerequisites: EE 377

EE 390 Control Systems (2) **3Cr[3-1-1]**

The course aims at teaching students advanced topics of control systems design and its application in automated control systems of industrial power plants.

Topics covered:

The course presents an overview for linear control theory. The course covers topic of control performance analysis using: Root locus method and Frequency response analysis. The course covers topic of control performance design using: Root locus design,. Frequency response design. Lead compensation, Lag compensation and PID controller design.

Prerequisites: EE 290

EE 391 Digital Control Systems **3Cr[3-1-1]**

Develop fundamentals associated with the analysis, design and simulation of automatic control systems.

Topics covered:

Discrete time systems, signal processing, the Z-transform, the pulse transfer function. Block diagram and discrete signal flow-graph. Stability analysis, time response, steady state error. Root locus in the Z-plane. Frequency response method. Discrete system design. Discrete time systems and random signals or noises.

Prerequisites: EE 390

EE 392 AI Applications in Control Systems **3Cr [3-1-1]**

This course aims at presenting AI techniques for enhancing the design performance of control systems. It also aims at solving large scale problems at high executing time.

Topics covered:

The course presents an overview to AI technique and AI Languages. It covers topics of: Neural network modeling and control, intelligent control, Heuristics and Knowledge representation. It also covers topic of Logic and Probabilistic reasoning. The course is concluded with applications of AI techniques in typical power systems.

Prerequisites: EE 390

EE 393 Microprocessor Control Systems **3Cr [3-1-1]**

The course aims at teaching the applications of IT techniques for automated control systems in power industry.

Topics covered:

The course covers topics of: On/Off controllers, digital controllers and programmable controllers. It also covers topics of performance control characteristics and operational procedure, direct and digital logic, addresses and registers- PID control. The course is concluded with the application of microprocessor based control techniques on typical models of industrial power systems.

Prerequisites: EE 390

EE 394 Nonlinear Control Systems **3Cr [3-1-1]**

This course aims at teaching control techniques for the stiff dynamics of power systems. It aims also at presenting methods for solving problems with large scale disturbances known as transient stability problems.

Topics covered:

The course presents an overview about types of nonlinearities and Linearization. It covers methods of solution under topics of: Describing function method of analysis, phase plane method of analysis, and Lyapunov stability theory. The course presents basics of optimal control theory and applications.

Prerequisites: EE 390

EE 395 State-Space Methods in Control Systems **3Cr [3-1-1]**

Topics covered:

State space method of analysis. The state representation. Canonical forms. Solution of the state equation. Controllability and observability. Pole placement. State feedback. The State observer. Introduction to digital control.

Prerequisites: EE 390

EE 396 Optimal Control **3Cr [3-1-1]**

This course deals with the problem of finding a control law for a given system such that a certain optimality criterion is achieved. An optimal control is a set of differential equations describing the paths of the control variables that minimize the cost functional.

Topics covered:

The main topics are: Unconstrained optimization problem. Linear quadratic optimal control problem. Necessary and Sufficient Conditions for Optimality. Constrained optimization problems. Time optimal control problem.

Prerequisites: EE 390

EE 397 Fuzzy-logic Control **3Cr [3-1-1]**

This course tends to find a mathematical system that analyzes analog input values in terms of logical variables that take on continuous values between 0 and 1, in contrast to classical or digital logic, which operates on discrete values of either 0 or 1 (true or false).

Topics covered:

Fuzzy sets, Fuzzy relations. Membership functions. Fuzzy to crisp conversion. Fuzzy logic. Fuzzy rule based system. Fuzzy logic control systems and applications.

Prerequisites: EE 389

EE 398 System Identification and Adaptive Control **3Cr [3-1-1]**

The System Identification and Control Technical Committee is responsible for promoting, co-coordinating and organizing activities in the areas of system identification and adaptive control. The system identification scope includes all aspects of system modeling and identification.

Topics covered:

Non parametric methods: Transient analysis, Frequency analysis, Correlation methods, Spectral analysis. Model parameterizations. Least squares model Fitting. Recursive identification techniques. Experimental design. Self tuning regulators. Model-reference adaptive systems.

Prerequisites: EE 290

EE 399 State-Space Methods in Digital Control Systems **3Cr [3-1-1]**

Topics covered:

Signal processing. The difference equation state space method. Canonical forms. Solution of the state equation. Controllability and observability. State feedback. Pole placement. Observers.

Prerequisites: EE 202, EE 290

EE 400-1 Graduation Project **3Cr[2-0-4]**

Students - on individual or small-group basis – use all of their knowledge and previous design and analysis experience into one major project in the field of specialization. Projects are industry-based.

Prerequisites: Department approval at 9th Semester

EE 400-2 Graduation Project **3Cr[2-0-4]**

Completion of the requirements of EE 400-2 in addition to new requirements, presentation and discussion.

Prerequisites: EE 400-1

pres. CE 100 < CE 132
CE 121
UEC 01 → Computer (1)
UEC 01E → ~ (2)

3/5 وصف المقررات الدراسية لقسم هندسة الحاسب بلائحة الكلية المعتمدة للطلاب الملتحقين بالفصل الدراسى خريف 2011/2010 و الخريجين فى الفصل الدراسى ربيع 2015

UEC 01 Computer Skills and Programming Concepts (1) **2Cr [2-1-1]**

This course tends to provide Year-1 students of all university's faculties with a brief introduction to the world of computers including: numbering systems and digital data representation, computer system architecture, storage and input/output systems, Operating systems and Utility Systems, software applications, problem solving techniques and their applications using Flow Charts. To enable students to:

i) Understand the concepts and terminologies of computer science.
ii) Identify the role computation can play in solving problems.
iii) Develop algorithmic thinking.
iv) Explore the various topics of basic computer science.
v) Write small algorithms to accomplish useful goals.

Pre-requisites: None

UEC 01E Computer Skills and Programming Concepts (2) **2Cr [2-1-1]**

This course tends to introduce Year-1 students of faculty of Engineering as a university requirement to the concepts and terminologies of Computer Programming using HLL (Basic or C). The course gives an overview of Databases and Database Management Systems: What are the databases and the advantages for using them? Database concepts, key characteristics about the data in a database, Database classifications and models, practicing on database. The course also introduces students to the internet and the internet services, e.g. Visual Basic Net.

Pre-requisites: UEC 01

CE 121 Introduction to Digital Logic Design **4Cr [4-1-1]**

Course Description:

Computer arithmetic: binary addition and subtraction, binary multiplication and division, negative numbers, number systems. Boolean algebra. Boolean functions, canonical and standard forms, digital logic gates. Simplification of Boolean functions: K-map method, tabulation method, flip-flops design, state diagrams and tables, design methodology. Design of: registers and counters. Introduction to FPGA and VHDL (RTL).

Pre-requisites: CE 100 Computer fundamentals

CE 132: Structured Programming **4Cr [4-1-1]**

Course Description:

The Structured Programming course introduces Computer Engineering students to Computer configuration, algorithms, flowcharts, Operators, repetition, functions, Structures and unions, pointers and files. It is an Introduction to object oriented programming, Classes, member

function, constructor and, destructors functions, function overloading. Students practice Programming using C++/ Java.

Pre-requisites: CE 100 Computer fundamentals

CE171: Discrete Mathematics **4Cr[4-2-0]**

Course Description:

The Discrete Mathematics course is a review of linear algebra concepts, propositional and predicate logic: methods of theorem proving, strong and weak induction, finite and infinite sets, set operations, combinatorics including permutations and combinations, discrete probability, binomial distribution and graph theory.

Pre-requisites: BE 102: Engineering Mathematics (2)

***CE 201: Computer Programming** **4Cr[3-1-2]**

Course Description:

The Computer Programming course introduces Electrical Engineering students to Algorithms and basic problem-solving, Programming language paradigms, compilers, program structure, input, output, conditionals, loops, functions, recursion, arrays, pointers, structures, and abstract data types. Students practice Programming using C language.

Pre-requisites: CE100

* For Electrical Department students.

***CE 202: Data Structures** **2Cr [2-1-0]**

Course Description:

The Data Structure course aims to introduce Electrical Engineering students to Applications, definitions and types of data structures, Pseudo-code, big-O notation, Implementation of linked lists, stacks, queues and vectors, Trees, basic algorithms, binary trees, Priority queues, heaps, dictionaries, hash tables, ordered dictionary ADT, look-up tables, skip lists, Sorting, merging and graphs.

Pre-requisites: CE 201.

* For Electrical Department students.

CE 211 Computer Organization **4Cr [4-1-1]**

Course Description:

Machine architecture: design abstractions, a recent chip. Instruction set design. Assessing and understanding performance: CPU performance, evaluating performance, SPEC examples. Processor Micro-architecture: data-path design, multi-cycle design, exceptions,

microprogramming, micro-architecture of a recent processor. Pipelined design: pipelined control, data hazards and forwarding, stalls, branch hazards, exceptions, recent processor pipeline. Memory hierarchy: basics of cache design, cache performance, virtual memory, recent memory hierarchies. Buses and interfacing, Performance.

Pre-requisites: CE 222: Advanced Digital Logic Design

CE222: Advanced Digital Logic Design **4Cr [4-1-1]**

Course Description:

This course is concerned with the design and the implementation of digital systems: Multi-level circuits, PLA, combinational logic structures, memory logic design, synchronous and asynchronous sequential machines. It presents various medium scale integration (MSI) circuits, combinational and sequential programmable logic devices such as ROMs, PLAs, PALs and the design of application specific integrated circuits (ASCIs) using schematic diagram and VHDL . It explores different types of control units.

Pre-requisites: CE 121

CE 233 Algorithms and Data Structures **4Cr [4-1-1]**

Course Description:

Specification, representation, and manipulation of data structures: lists, arrays, stacks, queues, trees, strings, symbol tables, Huffman codes, optimal search trees, pattern matching, priority queues, heaps, hash tables. Storage allocation, garbage collection, compaction, reference counts. Indexing and B trees. List and string processing languages. Introduction to Analysis of algorithms.

Pre-requisites: CE 132: Structured Programming & CE 171: Discrete Mathematics.

CE 234 Object Oriented Programming **4Cr [4-1-1]**

Course Description:

Object-Oriented Concepts: encapsulation and information-hiding, separation of behavior and implementation, generalization and specialization: objects, scope, attributes, operations and methods, object Identification, object vs. value semantics, classes, object type Identification, class scope, instance creation, inheritance, visibility, polymorphism and virtual method tables. Design methodologies: introducing UML. Introduction to event-driven and concurrent programming and to web programming. Java, c++ and c# overviewed and compared.

Pre-requisites: CE 132: Structured Programming.

CE 235 Advanced Algorithms and Data Structures **4Cr [4-1-1]**

Course Description:

Techniques for analyzing the time and space complexity of algorithms, amortized analysis. Applications: sorting, searching, pattern-matching, graph problems. General design methodologies for problem solving: divide-and-conquer, dynamic programming, prune-and-search, depth first and breadth first search algorithms. Introduction to parallel algorithms: analysis and design. Recent topics in the field.

Pre-requisites: CE 233: Algorithms and Data Structures

CE 241 Systems Programming **4Cr [4-1-1]**

Course Description:

Machine architecture: instruction formats, operations, registers, memory, addressing modes. Basic assembler design: design methodology, relocation, basic two-pass design. Advanced assembler design: expressions, complex addressing modes, relocation, literals, program blocks, multi-pass design, one-pass design. Loaders and linkers: absolute loaders, bootstrap loaders, linking loaders, linkages editors, dynamic linking. Macro processors: design of a basic macro processor, recursive design for nested macro definitions, conditional macro expansion. Introduction to APIs.

Pre-requisites: CE 132: Structured Programming.

CE 312 Embedded Systems **4Cr [4-1-1]**

Course Description:

History and overview, embedded microcontrollers, embedded programs, real-time systems, low-power computing, reliable system design, design methodologies, tool support, interfacing and mixed-signal systems, computer system overview, life cycle, requirements analysis and elicitation, specification, architectural design, testing, maintenance, project management.

Pre-requisites: CE 211, CE 241

CE 313: Computer Architecture **4Cr [4-2-0]**

Course Description:

Quantitative design approach, computer design problem, technology trends, cost trends, measuring and reporting performance, quantitative principles. Multimedia instruction set design. Addressing modes, operands, operations, control-flow, encoding. Superscalar design: concepts, dynamic scheduling, dynamic hardware branch prediction, multiple-issue design, hardware speculation, recent micro architecture, thread-level parallelism. Memory hierarchy design: cache performance, techniques to reduce cache misses and cache penalties. Multiprocessors: symmetric shared memory architectures, distributed shared memory architectures, synchronization, memory consistency, multithreading.

Pre-requisites: CE 211.

CE 342 Operating Systems **4Cr [4-1-1]**

Course Description:

History and overview, process concept, concurrency, scheduling and dispatching, memory management, disk scheduling, file systems, virtual machine architecture, security and protection, performance analysis, case studies of operating systems , current trends in operating systems.

Pre-requisites: CE 211: Computer Organization & CE 241: Systems Programming

CE 343 Workflow Management **4Cr [4-1-1]**

Course Description:

Modeling workflows, management of workflows, analyzing workflows, architecture of workflow systems, standards, Examples.

Pre-requisites: CE 233 & CE 234

CE 351: Database Management Systems **4Cr [4-1-1]**

Course Description:

Overview of file techniques: organization and access techniques. Introduction to DBMS architecture and environment, structured top down database development lifecycle, data modeling and data flow diagrams. Database organizations: hierarchical, network and relational, relational algebra, ANSI SQL, relational database design, integrity and security of database systems, recovery and concurrency control, query optimization, tuning of physical database design, introduction to Object Oriented DBMS, current trends in DBMS.

Pre-requisites: CE 235, CE 234, CE 342

CE 352: Software Engineering **4Cr [4-2-0]**

Course Description:

Issues relevant to the development of large software systems, such as specifications, design and synthesis of reliable software: proof of correctness, self-checking software, reconfiguration, recovery, fault-tolerant systems, system reliability modeling. Models of software life cycle, software maturity framework, strategies of implementing software, software process assessment, project planning tools, software configuration management, managing software quality and usability, leadership principles, professional and ethical issues, recent methodologies.

Pre-requisites: CE 351: Database Management Systems

CE 353 Distributed Systems & Web Services **4Cr [4-1-1]**

Course Description:

IPC and RPC standards: CORBA and RMI, web services for B2B projects. XML overview, SOAP protocol, UDDI and WSDL, security issues, middle ware products and multi-tier architecture, new trends. An e-business course project is required.

Pre-requisites: CE234: Object Oriented Programming & HU162: Human Computer Interaction.

CE 359 Programming Languages & Translators **4Cr [4-2-0]**

Course Description:

Introduction: translation : interpretation and compilation. Principles of language compilation. Introduction to formal languages. Lexical analysis, top down and bottom up parsing, code generation and optimization. Error handling and symbol table management. Run-time storage management. Programming language design.

Pre-requisites: CE 241: Systems Programming & CE 171: Discrete Mathematics

CE 361 Data and Computer Communications **4Cr [4-2-0]**

Course Description:

Introduction, information and coding, data transmission, transmission media, encoding techniques: analog and digital, digital communication techniques, data link control, multiplexing.

Pre-requisites: BE208: Applied Probability and Statistics & EE230: Linear Signals and Systems.

CE 362: Digital Signal Processing **4Cr [4-1-1]**

Course Description:

Digital processing of signals, sampling, difference equations, discrete-time Fourier transforms, discrete and fast Fourier transforms, digital filters, applications in audio, image and video processing. Digital systems provide larger flexibility and better accuracy at a lower cost, compared to analogue systems.

Pre-requisites: EE 230: Linear Signals and Systems.

CE363: Communications and Computer Networks **4Cr [4-1-1]**

Course Description:

The overall goal of the course is to give the student basic knowledge and skills in local area networks, wide area networks, network architecture layers and corresponding network layer protocols and transport layer protocols, applications, Wireless LANs, the Internet, current trends

in the field. Moreover, the course will create a foundation for further studies in IP based LANs and WANs.

Pre-requisites: CE 361: Data and Computer Communications

CE 365 Computer Security **4Cr [4-1-1]**

Course Description:

Cryptography, computer security, computer threats, computer networks security. Computer networks threats, Web and email security, Web and email threats, E-commerce security.

Pre-requisites: CE 361: Data and Computer Communications & CE 342: Operating Systems

CE 372: Computational Models **4Cr [4-2-0]**

Course Description:

Regular languages, finite-state automata, and regular expressions: determinism and non determinism, Chomsky hierarchy, context-free grammars, and push-down automata, Turing machines and recursively enumerable languages: Church's thesis, decidability and the halting problem and computability. The P and NP classes and space classes.

Pre-requisites: CE 235: Advanced Algorithms and Data Structures.

CE 381 Computer Graphics and Visualization **4Cr [4-1-1]**

Fundamental principles and techniques for computer graphics. Basic raster algorithms. Scene representation. OpenGL, coordinate manipulations, perspective, basics of illumination and shading, color models, texture maps, fundamentals of scene constructions.

Prerequisites: CE 234: Object Oriented Programming

CE 382 Introduction to Biomedical Engineering **2Cr [2-2-0]**

Course Description:

Introduction: mathematical modeling, physiological systems: linear system approximation, stochastic modeling, models for: cardiopulmonary system, myocardial mechanics, respiratory mechanics, ECG models, introduction to bioinformatics, recent topics.

Pre-requisites: CE235, EE 232

CE 383 Intelligent Systems **2Cr [2-1-1]**

Course Description:

General problem-solving techniques, search techniques, knowledge representation, planning, introduction to machine learning, neural networks, natural language processing. The student must master LISP and PROLOG languages.

Pre-requisites: CE 235: Advanced Algorithms and Data Structures & CE 234: Object Oriented Programming

CE384: Modelling and Simulation **2Cr [2-1-1]**

Course Description:

This course is an introduction to the fundamentals of system modeling and simulation techniques. It explores simulation definitions, history, background and languages. Conceptualization, implementation, testing, verification and validation of the simulation model are also inspected. In addition, the course studies different types of systems (continuous, discrete time and discrete event, deterministic and stochastic processes). Stochastic features (Monte Carlo, generation of random statistical variables with different probability distributions) are underlined. Furthermore, Data collection, generation, reduction and analysis are studied. At the end of the course, some applications, such as analytic and simulation techniques for the performance analysis of computer architecture, operating systems and robotics, are studies as well as recent paradigms and applications.

Pre-requisites: CE 233, CE 342, BE 208.

CE 385: E-business **2Cr [2-2-0]**

Course Description:

The course examines the field of E-business and related fields: e-commerce, e-payment, e-government, E-marketing, e-procurement. Applicable models, process of building a successful E-business, online monetary transactions, integration of computer hardware and software for E-business functionality, Internet security and customer relationship management. A comprehensive course project is required.

Pre-requisites: CE 234: Object Oriented Programming

CE 386 Multimedia Systems **4Cr [4-1-1]**

Course Description:

Introduction to multimedia, authoring tools, multimedia data representation, images, audio, video, multimedia data compression: standards, multimedia networks, example applications, current trends.

Pre-requisites: CE 361 & CE 234:

CE 387 Decision Support Systems **4Cr [4-1-1]**

Course Description:

Definition of DSS, Differences between DSS and management information systems, Phases of data preparation, Data warehousing, Online analytical processing, Data mining. Current trends in DSS.

Pre-requisites: CE 351: Database Management Systems.

CE 388 Introduction to Mechatronics **4Cr [4-1-1]**

Overview and historical introduction, physical system modeling, sensors and actuators, data acquisition, control, case study (automotive), current trends.

Prerequisites: EE 290, CE 222, BE 112.

CE 400-1 Graduating Project (1) **3Cr [2-0-4]**

Pre-requisites: Department approval at 9th Semester

CE 400-2 Graduating Project (2) **4Cr [2-0-6]**

Pre-requisites: CE400-1

Course Description:

Comprehensive project spanning two semesters, students undertake a project which involves addressing a significant technical problem under the guidance of a supervisor. Students are expected to demonstrate an ability to apply a disciplined approach in addressing the solution to the problem. Group cooperation and project management are key issues. Students produce a final thesis on the work and this together with a demonstration of the working system will form the assessment.

Lab: Hands on suitable H/W components and S/W tools, packages and libraries

Course Intended Objectives:

The objectives of the underlying course are as follows:

- Prove and to strengthen the knowledge acquired along the Program in an interdisciplinary project.
- provide students with a realistic design experience in which they can integrate and capitalize on the basic disciplines they have learned during their academic program to synthesize a new product, device or process.

4/5 وصف المقررات الدراسية لقسم هندسة البتروكيماويات بلائحة الكلية المعتمدة للطلاب الملتحقين بالفصل الدراسى خريف 2011/2010 و الخريجين فى الفصل الدراسى ربيع 2015

PE 200 Chemical Engineering Thermodynamics I **3[3-2-0]**

Thermodynamics concepts and definitions, zero and first laws of Thermodynamics (Closed and open systems) and their applications. An introduction to second law.

Prerequisite: BE 122

PE 201 Introduction to Petrochemical Industries **3[3-0-0]**

Raw materials for petrochemical industries, Preparation and manufacture of gas and liquid hydrocarbons, Separation methods of paraffin's aromatics and xylenes. Preparation of methanol, alcohols and ammonia, production of detergents, plastics and synthetic rubber.

Prerequisite: PE 210

PE 210 Organic Chemistry I **3[2-0-3]**

The principle of organic chemistry including structure, physical and chemical properties of several important functional classes, reaction mechanics and chemical consideration. relationships between structures, properties and chemical activities. Hydrocarbons, aliphatic and aromatics, classes of organic compounds encountered in petroleum, Gas and petrochemicals.

Prerequisite: BE 131

PE 213 Organic Chemistry II **3[2-0-3]**

A continuation of organic chemistry reaction mechanism and synthesis pathway sulphonations, nitration, oxidations, and polymerization.The specific classes of compounds derivatives.

Prerequisite: PE 210

PE 214 Inorganic & Analytical Chemistry **3[2-0-3]**

Atomic structure of elements, graduation of elements properties (Modern periodic table), nature of bonds, chemical calculations, hydrogen and its compounds, alkali metals, Group I(A), Group II(A), Group III(A), Group IV(A), Group V(A), Group VII(A), Transition elements , catalytic properties. An Introduction to analytical chemistry, quantitative analysis using gravimetric analysis, titration methods, precipitation titration using silver nitrate, acid/base titration (principles and applications), oxidation/reduction titration (argentimetry) and pH measurement.

Prerequisite: BE 131