Department of Electrical Engineering

Chairman: Samir A. Al-Baiyat

Faculty:

Abdel-Magid	Bettayeb	Elhakeem	Al-Semari
Abdul-Jauwad	Baher	El-Hennawey	Al-Shehri
Abdur-Rahim	Boraie	Al-Jamid	Shwedhi
Abuelma'atti	Chokri	Johar	Al-Sunaidi
Abu Al-Saud	Dawoud	Kassas	Al-Suwailem
Al-Akhdhar	Al-Duwaish	Kousa	Ubaid
Al-Ali	Fahmy	Maghrabi	Yahya
Alattar	Farag	Masoudi	Yamani
El-Amin	Habiballah	Moid	Zedan
Al-Bader	Halawani	Penbeci	
Al-Baiyat	Hamid	Ragheb	
Bakhashwain	Al-Hamouz	Saati	
Balghonaim	Hassan	Al-Saggaf	

Many of the products and services utilized all over the world are based on the work of electrical engineers. The availability of electric power for domestic and industrial use, the extensive, fast and reliable communications between countries, and the large computational capacity achieved with modern computers are only some examples of the contributions of electrical engineers to human advancement. In addition to this, contributions by electrical engineers to the development of concepts in communications, simulation, analysis and control are applied in areas such as economics, management, psychology, and physiology.

In training of students, the electrical engineering program emphasizes three aspects. First, classroom subjects in science such as mathematics, physics, and chemistry enable the student to develop the necessary analytical ability and the underlying scientific principles. This aspect is complemented by subjects in the humanities. Second, classroom subjects in electrical engineering cover common material and allow the student to emphasize certain electrical engineering disciplines through the choice of Department electives. Third, laboratory classes expose the students to the instrumentation, design, and construction of electrical and electronic devices and circuits. This aspect is complemented by a summer employment program in which the student undergoes industrial training.

After completing the undergraduate program in electrical engineering, the student is qualified to take up responsible employment or further develop his studies by enrolling in a graduate program. Numerous work opportunities for electrical engineers exist in the Kingdom, where graduates may work in the areas of communications - including telephony, telegraphy, and point-to-point radio and television as well as the areas of power engineering, electrical installation, broadcasting, microwave, satellite, and mobile communications. Graduates are also required by industry for work in information processing and computers and in systems analysis. Other opportunities exist in industrial electronics, instrumentation, manufacturing technology, and microwaves.

Requirements for the B.S. degree in Electrical Engineering Sciences

(a) General Education Requirements (69 credits)		**Credit-Hours**
Communication Skills	ENGL 214, IAS 200,300	7
English	ENGL 101, 102	6
Computer Programming	ICS 101	3
Interdisciplinary Engineering courses	SE 301, ME 203	6
Mathematics	MATH101, 102, 201, 202, 302	17
Physics	PHYS 101, 102, 203	11
Chemistry	CHEM 101	4
Islamic courses	IAS 111, 222, 333, 400, 4xx	10
Physical Education	PE 101, 102	2
General Studies	XXXxxx (Elective from CIM)	3
		69

(b) Core Requirements (48 credits)		**Credit-Hours**
Digital Logic Circuit Design	EE 200	4
Electric Circuits	EE 201, 205	7
Electronics	EE 203, 303	8
Signals and Systems	EE 207	3
Probabilistic Methods in EE	EE 315	3
Electromagnetics	EE 340	4
Electric Energy Engineering	EE 360	4
Communication Engineering	EE 370	4
Control Engineering	EE 380	4
Digital Systems Engineering	EE 390	4
Senior Design Project	EE 411	3
		48

(c) Electives (16 credits)	**Credit-Hours**
Electrical Engineering Electives	13
Technical Elective	3
	16

(d) Summer Training(Pass/Fail; nil credit)

Each student must participate in eight weeks summer training program after which a formal written report must be submitted.

(e) Total Requirements (133 credits)

The total required credits for the B.S. degree in Electrical Engineering Science is 133 Semester-credit-hours (SCH).

Electrical Engineering Sciences Curriculum

COURSE TITLE			LT	LB	CR	COURSE TITLE			LT	LB	CR
First year (Preparatory)											
ENGL	001	Preparatory English I	15	5	8	ENGL	002	Preparatory English II	15	5	8
MATH	001	Preparatory Math I	3	1	4	MATH	002	Preparatory Math II	3	1	4
ME	001	Preparatory Shop I	0	2	1	ME	002	Preparatory Shop II	0	2	1
PE	001	Prep Physical Educ I	0	2	1	PE	002	Prep Physical Educ II	0	2	1
			18	10	14				18	10	14

Total Credits required in Preparatory Program: 28

Second year (Freshman)											
CHEM	101	General Chemistry	3	4	4	ENGL	102	English Composition II	3	0	3
ENGL	101	English Composition I	3	0	3	IAS	200	Objective Writing	2	0	2
IAS	111	Islamic Ideology	2	0	2	ICS	101	Computer Programming	2	3	3
MATH	101	Calculus I	4	0	4	MATH	102	Calculus II	4	0	4
PE	101	Physical Education I	0	2	1	PE	102	Physical Education II	0	2	1
PHYS	101	General Physics I	3	3	4	PHYS	102	General Physics II	3	3	4
			15	9	18				14	8	17
Third year (Sophomore)											
EE	200	Digital Logic Ct. Design	3	3	4	EE	203	Electronics I	3	3	4
EE	201	Electric Circuits I	3	3	4	EE	205	Electric Circuits II	3	0	3
MATH	201	Calculus III	3	0	3	EE	207	Signals & Systems	3	0	3
ME	203	Thermodynamics	3	0	3	ENGL	214	Technical Report Writing	3	0	3
PHYS	203	E&M Props. of materials	3	0	3	IAS	222	The Quran & Sunnah	2	0	2
			15	6	17	MATH	202	Elem Diff. Equations	3	0	3
									17	3	18
Fourth year (Junior)											
EE	303	Electronics II	3	3	4	EE	315	Probabilistic Methods in EE.	3	0	3
EE	360	Elect. Energy Eng.	3	3	4	EE	340	Electromagnetics	3	3	4
EE	380	Control Eng.	3	3	4	EE	370	Communication Eng.	3	3	4
IAS	300	Arabic Terminology	2	0	2	EE	390	Digital Systems Eng.	3	3	4
MATH	302	Applied Math.for Engnrs.	3	0	3	IAS	333	The Islamic System	2	0	2
			14	9	17				14	9	17
Fifth year (Senior)											
EE	411	Senior Design Project	1	6	3	EE	4xx	Elective III	3	0	3
EE	4xx	EE Elective I	3	0	3	EE	4xx	Elective IV	3	3	4
EE	4xx	EE Elective II	3	0	3	IAS	4xx	IAS Elective	2	0	2
IAS	400	Technical Arabic Syntax	2	0	2	XE	xxx	Technical Elective	3	0	3
SE	301	Numerical Methods	3	0	3	XX	xxx	Elective from CIM	3	0	3
			12	6	14				14	3	15

Total credits required in Degree Program: 133

Note: One summer after either the third or fourth year must be spent in industry, after which a formal written report must be submitted.

Department of Applied Electrical Engineering

Chairman: Samir A. Al-Baiyat

Faculty:

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Balghonaim	Hassan	Al-Saggaf	

The contributions of electrical engineering to modern society is a fact underlying a large number of products and services. Most modern appliances are electrically-powered. Moreover, services such as global communications and large computing facilities are electronically-based. At present, equipment used in medical diagnosis and treatment relying on electrical engineering principles is finding widening applications. In addition to these examples, electrical engineering concepts deriving from such disciplines as control theory and information theory have had applications in economics, management, physiology, energy, and biomedicine.

The applied electrical engineering program, while emphasizing applications of devices and circuits, has three aspects: first, classroom subjects in basic sciences such as chemistry, physics, and mathematics, as well as Islamic and Arabic studies; second, classroom subjects in the area of electrical engineering which cover major subjects while allowing the student to emphasize a certain area of electrical engineering such as control theory, electrical power, digital systems, and communications (which the student achieves through the list of electives offered to him); third, laboratory classes in which experimental work is done, utilizing a large number of instruments. A prominent characteristic of applied electrical engineering is the requirement that students spend one semester in industry. This requirement is satisfied through the cooperative work program.

After completing the undergraduate program in applied engineering, the student is qualified to take up responsible employment. Numerous work opportunities for applied electrical engineers exist in the Kingdom, where graduates may work in the areas of communications, including telephony, telegraphy, radio, and television, much of which incorporates the expanding field of microwaves. The areas of power engineering, electrical installation, broadcasting, and education also provide career opportunities. A large number of graduates are also required by industry for work in information processing and computers as well as systems analysis. Other opportunities exist in industrial electronics, instrumentation, manufacturing technology, and microwaves.

Requirements for the B.S. Degree in Applied Electrical Engineering

(a) General Education Requirements (66 credits)		**Credit-Hours**
Communication Skills	ENGL214, IAS 200,300	7
English	ENGL 101, 102	6
Computer Programming	ICS 101	3
Interdisciplinary Engineering courses	SE 301, ME 203	6
Mathematics	MATH101, 102, 201, 202, 302	17
Physics	PHYS 101, 102	8
Chemistry	CHEM 101	4
Islamic courses	IAS 111, 222, 333, 400, 4xx	10
Physical Education	PE 101, 102	2
General Studies	XXX xxx (Elective from CIM)	3
		66

(b) Core Requirements (45 credits)		**Credit-Hours**
Digital Logic Circuit Design	EE 200	4
Electric Circuits	EE 201, 205	7
Electronics	EE 203, 303	8
Signals and Systems	EE 207	3
Probabilistic Methods in EE	EE 315	3
Electromagnetics	EE 340	4
Electric Energy Engineering	EE 360	4
Communication Engineering	EE 370	4
Control Engineering	EE 380	4
Digital Systems Engineering	EE 390	4
		45

(c) Electives (13 credits)	**Credit-Hours**
Electrical Engineering Electives	10
Technical Elective	3
	13

(d) Co-operative Work Requirements **9**

Each student must participate in a 28-week program of industrial experience after which a formal written report must be submitted, EE 351, ‘Co-operative Work’.

(e) Total Requirements (133 credits)

The total required credits for the B.S. degree in Applied Electrical Engineering Science is 133 Semester-credit-hours.

Applied Electrical Engineering Curriculum

COURSE TITLE			LT	LB	CR	COURSE TITLE			LT	LB	CR
First year (Preparatory)											
ENGL	001	Preparatory English I	15	5	8	ENGL	002	Preparatory English II	15	5	8
MATH	001	Preparatory Math I	3	1	4	MATH	002	Preparatory Math II	3	1	4
ME	001	Preparatory Shop I	0	2	1	ME	002	Preparatory Shop II	0	2	1
PE	001	Prep Physical Educ I	0	2	1	PE	002	Prep Physical Educ II	0	2	1
			18	10	14				18	10	14

Total Credits required in Preparatory Program: 28

Second year (Freshman)											
CHEM	101	General Chemistry	3	4	4	ENGL	102	English Composition II	3	0	3
ENGL	101	English Composition I	3	0	3	IAS	200	Objective Writing	2	0	2
IAS	111	Islamic Ideology	2	0	2	ICS	101	Computer Programming	2	3	3
MATH	101	Calculus I	4	0	4	MATH	102	Calculus II	4	0	4
PE	101	Physical Education I	0	2	1	PE	102	Physical Education II	0	2	1
PHYS	101	General Physics I	3	3	4	PHYS	102	General Physics II	3	3	4
			15	9	18				14	8	17
Third year (Sophomore)											
EE	200	Digital Logic Ct. Design	3	3	4	EE	203	Electronics I	3	3	4
EE	201	Electric Circuits I	3	3	4	EE	205	Electric Circuits II	3	0	3
ENGL	214	Technical Report Writing	3	0	3	EE	207	Signals & Systems	3	0	3
IAS	222	The Quran & Sunnah	2	0	2	IAS	300	Arabic Terminology	2	0	2
MATH	201	Calculus III	3	0	3	MATH	202	Elem Diff Equations	3	0	3
ME	203	Thermodynamics	3	0	3	SE	301	Numerical Methods	3	0	3
			17	6	19				17	3	18
Fourth year (Junior)											
EE	303	Electronics II	3	3	4	EE	315	Probabilistic methods in EE	3	0	3
EE	360	Elect. Energy Eng.	3	3	4	EE	340	Electromagnetics	3	3	4
EE	380	Control Eng.	3	3	4	EE	370	Communication Eng.	3	3	4
IAS	333	The Islamic System	2	0	2	EE	390	Digital Systems Eng.	3	3	4
MATH	302	Applied Math. For Engnrs.	3	0	3	IAS	400	Technical Arabic Syntax	2	0	2
			14	9	17				14	9	17

Summer Session

EE 350 Cooperative Work 0 0 0

Fifth year (Senior)											
EE 351		Continue of Cooperative work	0	0	9	EE	4xx	Elective I	3	0	3
						EE	4xx	Elective II	3	0	3
						EE	4xx	Elective III	3	3	4
						IAS	4xx	IAS Elective	2	0	2
						XE	xxx	Technical Elective	3	0	3
						XX	xxx	Elective from CIM	3	0	3
			0	0	9				17	3	18

Total credits required in Degree Program: 133

New Electrical Engineering Course Description

EE 200 - Digital Logic Circuit Design (3-3-4)

Number systems & codes. Logic gates. Boolean Algebra. Karnaugh maps. Analysis and synthesis of combinational systems. Decoders, multiplexers, adders and subtractors, PLA's. Types of flip-flops. Memory concept. Counters. Registers. Introduction to sequential circuit design.

Prerequisites: MATH 102 and PHYS 102

EE 201 - Electric Circuits I (3-3-4)

Basic laws: Ohm's, KVL, KCL. Resistive networks. Circuit analysis techniques: nodal and mesh analysis. Network theorems: Thevenin's, Norton's, source transformations, superposition, maximum power transfer. Energy storage elements. Phasor technique for steady-state sinusoidal response. Important power concepts of ac circuits. Transient analysis of first-order circuits.

Prerequisites: MATH 102 and PHYS 102

EE 203 - Electronics I (3-3-4)

Diodes: models and circuit analysis. Diode applications (rectifiers and others). Transistors: bipolar junction, junction field effect and metal-oxide-semiconductor field effect (BJT, JFET & MOSFET). DC and small signal AC analysis. Amplifier configurations. Differential Amplifiers. Digital logic families (TTL, ECL, I^2L, and CMOS circuits).

Prerequisite: EE201

EE 204 - Fundamentals of Electrical Circuits (Non EE students)(2-3-3)

Basic laws: Ohm's, KVL,KCL. Resistive networks, mesh and node equations. Network theorems. Inductance and capacitance. Sinusoidal analysis and phasor methods. Power concepts of AC circuits. Polyphase circuits.

Prerequisites: MATH 102 and PHYS 102

EE 205 - Electric Circuits II (3-0-3)

Analysis of three-phase networks. Time domain solutions of second order circuits. State equations for linear circuits. Computer-aided circuit analysis. Frequency domain analysis and Bode plots. Network analysis in the S-domain. Mutual inductance and transformers. Two port networks.

Prerequisite: EE 201

EE 207 - Signals and Systems (3-0-3)

Fourier series. Fourier transform. Laplace transform. Linear circuits and systems concepts. Impulse response. Convolution. Transfer function. Frequency response. State space representation. Introduction to sampling of analog signals. Introduction to difference equations and z-transform.

Corequisite: EE 205 (Not to be taken for credit with SE 315)

EE 208 - Electrical Systems (Architectural Engineering students) (2-3-3)

Basic electrical concepts: Ohm's law, Kirchoff's laws, DC and AC, resistance, inductance, capacitance, three phase systems. Electrical symbols. Outlets, conductor sizes, types and determination of number of circuits required. Wiring plans for single and multiple family dwellings, commercial and institutional structures.

Prerequisites: MATH 102 and PHYS 102

EE 303 - Electronics II (3-3-4)

Amplifier frequency response. Linear and nonlinear op amp applications. Nonideal characteristics of op amps. Multistage amplifiers. Active filters. Feedback: Circuit topologies and analysis. Oscillators.

Prerequisite: EE 203

EE 306- Electromechanical Devices (Non EE-Students) (2-3-3)

Magnetic circuits. Transformers. Concepts of electric machines. DC generators and motors operation. 3 phase Induction motors. Motor starting. Synchronous machines. Parallel operation. Fractional Horsepower Motors.

Prerequisite: EE 204

EE 315 - Probabilistic Methods in Electrical Engineering (3-0-3)

Fundamentals of probability theory. Single and multiple discrete and continuous random variables. Probability density function. Gaussian and other distributions. Functions of random variables. Joint and conditional probabilities. Moments and statistical averages. Central limit theorem. Random processes. Stationarity and ergodicity. Correlation function. Power spectrum density. Gaussian and Poisson random processes. Response of linear systems to random signals.

Prerequisite: EE 207 (Not to be taken for credit with STAT 315)

EE 340 - Electromagnetics (3-3-4)

Coulomb's law. Gauss's law. Electric potential. Electric boundary conditions. Electric dipoles. Resistance, capacitance. Laplace's equation, Biot-Savart law, Ampere's law. Scalar and vector potentials. Magnetic boundary conditions, inductance. Time varying fields, Maxwell's equations. Plane wave propagation. Reflection and refraction. Poynting vector. Introduction to transmission line theory. Concept of radiation.

Prerequisite: EE 201 and MATH 302

EE 351 - Electrical Engineering Cooperative Work (AEE only) (0-0-9)

A continuous period of 28 weeks spent in the industry working in any of the fields of electrical engineering. During this training period, the student is exposed to the profession of electrical engineering through working in many of its fields. The student is required to submit ,and present, a formal written report of his work.

Prerequisite: ENGL 214 and the completion of 90 credit hours including all 300 level EE courses.

EE 360 - Electric Energy Engineering (3-3-4)

Magnetic circuits. Transformers. Concepts of electric machines, DC machines: motor and generator operation, speed control of motors, motor starting. Induction Machines: Motor Starting. Synchronous Machines. Parallel operation. Per-Unit Systems. Transmission Lines: parameters, current and voltage relations for short, medium and long lines, Performance characteristics, Transmission lines. Cables.

Prerequisite: EE 205

EE 370 - Communications Engineering I (3-3-4)

Transmission of signals through linear systems. Hilbert transform. Representation of band-pass signals and systems. Amplitude modulation (AM, DSBSC, SSB, VSB). Signal spectrum. Angle modulation (PM, FM). Review of sampling theory. Pulse analog modulation. Pulse code modulation. Introduction to digital modulation schemes.

Prerequisites: EE 207 and EE203

EE 380 - Control Engineering I (3-3-4)

Introduction to feedback control systems. Block diagram and signal flow Graph representation. Mathematical modeling of physical systems. Stability of linear control systems. Time-domain and frequency-domain analysis tools and performance assessment. Lead and lag compensator design. Proportional, integral, and derivative control.

Prerequisite: EE 207

EE 390 - Digital Systems Engineering (3-3-4)

Microprocessor hardware and software Models. Instruction sets. Assembly language programming and debugging. Memory and input/output mapping. Input and output instructions. Input/output Interfacing. Introduction to interrupts.

Prerequisites: ICS 101 and EE 200

EE 399 - Summer Training (EE only) (0-0-0)

A continuous period of 8 weeks of summer training spent in the industry working in any of the fields of electrical engineering. The training should be carried out in an organization with an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.

Prerequisites: ENGL 214, Junior standing and approval of the department.

EE 400 - Introduction to Telephone Switching and Telegraphic Analysis (3-3-4)

The telephone network: organization, routing. Local area design. The telephone set. Teletraffic analysis: blocking probability, traffic measurement, switch sizing. Switching techniques: crossbar, space and time switching. Telephone transmission: frequency and time multiplexing standards, transmission media, drop and insert concept. Conventional and common channel signaling. Current and future trends: cellular phones, ISDN, broadband ISDN and ATM switching.

Prerequisites: EE 315 and EE 370

EE 402 - Control Engineering II (3-0-3)

Review of stability criteria and techniques. Linear feedback system design and compensation methods. Introduction to nonlinear control systems: the describing function and phase plane analysis. Stability criteria for nonlinear systems. On off control systems and optimum switching. Introduction to optimal control theory. Simulations.

Prerequisite: EE 380

EE 403 - Semiconductor Devices (3-0-3)

Characteristics of semiconductors. Classification of the various junctions. Characterization of bipolar devices. MOS devices. Charge-transfer devices. Integrated devices. Opto-electric devices. Impatt photovoltaic effect. Solar cells.

Prerequisites: PHYS 203 and EE 203

EE 405 - Microwave Transmission (3-3-4)

Characteristics of HF transmission lines. Lossless and lossy transmission lines. Microstrip transmission lines. Smith chart. Impedance matching techniques. Theory of waveguides (rectangular and circular). Microwave components and cavity resonators. Introduction to radio wave propagation.

Prerequisite: EE 340

EE 406 - Digital Signal Processing (3-0-3)

Classification of signals and their mathematical representation. Discrete-time systems classification. Linear shift-invariant system response, difference equations, convolution sum, and frequency response. Discrete Fourier transform. z-transform and its application to system analysis. Realization forms. Sampling and aliasing. Finite-impulse response (FIR). Design windowing technique. Introduction to infinite-impulse-response (IIR). Filter design techniques.

Prerequisite: EE 370

EE 407 - Microwave Engineering (3-3-4)

Introduction to rectangular waveguides. Limitations of low-frequency components. Microwave materials (semiconductors, ferrites, etc.). Microwave tubes and solid-state devices: klystrons, magnetron, Gunn, Impatt, etc. Microwave circuit design. Directional couplers. Power dividers, equalizers, phase shifters. Microwave integrated circuit design: filters and amplifiers. Applications of microwaves.

Prerequisite: EE 340

EE 411 - Senior Design Project (1-6-3)

A comprehensive course that integrates various components of the curriculum in a comprehensive engineering design experience. Design of a complete project including establishment of objectives and criteria, formulation of design problem statements, preparation of engineering designs. The design may involve experimentation, realization and/or computer project are essential requirements for completion of the course. Team design projects, where appropriate, are highly encouraged.

Prerequisite: Senior Standing

EE 415 - Analog Integrated Circuits Analysis And Design (3-0-3)

Integrated circuit devices and concepts. Review of single stage BJT and FET amplifiers. Biasing circuits, current mirrors and sources. Design of input stages, differential pairs, active loads, gain stages and level shifting. Output

stages, power dissipation and current protection. Design of low power amplifiers. Analysis of typical op amp circuits and audio amplifiers. Non-linear op amp applications. Design of comparators, A/D and D/A converters.

Prerequisite: EE 303

EE 416 - Analog Filter Design (3-0-3)

Properties of network functions. Design of lossless two-port networks. Filter characteristics approximation; Butterworth, Chebyshev, Elliptic, and Bessel approximations. Frequency transformation. Design of active RC filters using operational amplifiers. Nonideal effects. Design using OTA's and "MOSFET-C" circuits. Introduction to switched capacitor filters.

Prerequisite: EE 207 and EE 303

EE 417 - Communication Engineering II (3-0-3)

Noise in telecommunication systems. Representation of white and narrow-band noise. Transmission of noise through linear filters. Performance of continuous wave modulation (full-AM, DSBSC, SSB, and FM) in the presence of additive white Gaussian noise. Digital waveform coding (DM, PCM, DPCM, and ADPCM). Digital communication systems. Noise effects and probability of error in digital communication systems. Matched filter.

Prerequisites: EE 315 and EE 370

EE 418 - Introduction to Satellite Communications (3-0-3)

Overview of satellite systems. Orbits and launching methods. Communication satellite subsystems. Modulation schemes and satellite multiple access (FDMA, TDMA, CDMA, and SDMA). Space link analysis. Satellite antennas. Applications of satellites.

Prerequisites : EE 340 and EE 370.

EE 420 - Optical Fiber Communications (3-3-4)

Optical fiber waveguides: ray and mode theories. Step-index and graded-index fibers. Transmission characteristics of optical fibers; losses and dispersion. Methods of manufacture of optical fibers and cables. Connection of optical fibers. Measurements of attenuation, dispersion, refractive index profile, numerical aperture, diameter and field. Optical sources, the semiconductor laser and the light emitting diode. Optical detectors. Optical fiber system. Digital and analog systems. Design of a simple optical fiber communication link.

Prerequisites: EE 340, EE 370

EE 422 - Antenna Theory (3-3-4)

Types of antenna. Antenna fundamental parameters. Transmission formula and radar range equation. Radiation integrals. Linear wire antennas. Antenna arrays. Synthesis of far field patterns by array factors. Design of Dolph-Chebyshev arrays. Broadband antennas and matching techniques. Methods of antenna measurements.

Prerequisite: EE 340

EE 429 - Microcomputer Organization (3-3-4)

Microprocessor architectures. Design of ALU. Overview of 32 and 64 bit processors. Advanced assembly language programming. Memory mapping. Advanced input/output interfacing. Programmable timers. Analog-to-digital and digital-to-analog interfacing. BIOS and DOS interrupts. High-level language interface. Data acquisition. Design projects.

Prerequisite: EE 390

EE 430 - Information Theory and Coding (3-0-3)

Concept of information and its measurement. Entropy source coding theorem. Huffman codes, LZW, arithmetic codes. Introduction to rate distortion theory. Channel coding theorem, channel capacity. Block codes: detection and correction. Linear codes, cyclic codes, hamming codes, BCH codes, encoding, and decoding algorithms. Introduction to convolutional codes

Prerequisite: EE 315 and EE 370

EE 432 -Digital Control Systems (3-3-4)

Transducer fundamentals. Basic sampling concepts. Sample and hold circuits and analog multiplexers. Data conversion systems. Data loggers and acquisition systems. Application of microcomputers to closed-loop industrial systems.

Prerequisite: EE 380

EE 433 - Applied Control Engineering (3-3-4)

Introduction to process control. Feedback and feed forward control configurations. Modeling of dynamic systems: Time delays, high order systems, multivariable systems. Process identification. Analysis and controller design performances. PID controller tuning. Intelligent controller tuning. Advanced control techniques. Process interaction and decoupling control. Introduction to distributed computer control systems and digital control issues.

Prerequisite: EE 380

EE 434 - Industrial Instrumentation (2-3-3)

Instrumentation and control. Signal and data acquisition and processing. Interfacing techniques. Physio-chemical principles of instrumentation. Force, torque, and pressure measurements. Temperature, flow, moisture, and humidity sensors. Digital transducers. Calibration techniques. Errors in measurements. Introduction to actuators. Norms and standardization. Introduction to intelligent instrumentation.

Prerequisites: EE 200, EE 303 and EE 380

EE 437 - Electrical Installation (2-3-3)

Distribution system. Load characteristics. Conductors and cables. Installation methods. Design of electrical systems for residential, commercial, and industrial installations. Electrical safety. Grounding. Protection equipment. Voltage drop calculations. Electrical drawing.

Prerequisite: EE 360

EE 445 - Industrial Electronics (3-3-4)

555 timers. Optoelectronic sensors. Microswitches. Ultrasonic transducers. Thermal sensors. Strain gauges and instrumentation amplifiers. UJT, PUT, multilayer diodes. SCRS and TRIACS. Triggering and power control techniques. Solid state relays. Practical applications.

Prerequisite: EE 303

EE 446 - Programmable Logic Controllers (2-3-3)

Basic concepts of microcontrollers. The structure of programmable logic controllers: I/O, relays, counters and timers. Ladder diagram concept. PLC's intermediate and advanced functions, PLC's instruction sets and data manipulations. PLC's industrial applications in the process control.

Prerequisite: Senior Standing

EE 455 Analog Communication Electronics (3-3-4)

Functional blocks of analog communication systems. Design of mixers, converters, RF and IF amplifiers, AM detectors, and FM discriminators. Functional blocks of monochrome TV receivers. Design of video IF amplifiers, video amplifiers, sync. separators, horizontal and vertical oscillators and AFC. Functional blocks of color TV receivers. Color signal representation and processing.

Prerequisites: EE 303 and EE 370

EE 456 Digital Communication Electronics (3-3-4)

Functional blocks of digital communication systems: PAM, PWM, PPM and PCM. Design of S/H circuits, A/D and D/A converters, and timing (clock generator) circuits. Circuit design using PLL, VCO and multipliers. Design of PAM, PPM, PWM andPCM transmitters and detectors. Special circuits for phase shift keying.

Prerequisite: EE 303 and 370

EE 460 - Power Electronics (3-3-4)

Review of power semiconductor devices: diodes, thyristors, transistors BJTS and MOSFETS. Diode characteristics. Diode circuit rectifiers. Thyristors characteristics. Principles of thyristor controlled rectifiers. AC voltage controllers. Thyristors commutation techniques. Power transistor characteristics. DC choppers. Pulse-width-modulation techniques for inverters. Resonant pulse inverters. (All design and analysis concepts are supported by computer aided .design analysis).

Prerequisite: EE 360

EE 462 - Electrical Machines (3-3-4)

Electro-mechanical energy conversion principles. Generalized machine concepts. Steady state operation of DC, synchronous and induction machines. DC machine Dynamics. Fractional Horse power AC motors. Special types of machines.

Prerequisite: EE 360 and EE 380

EE 463 - Power System Analysis (3-0-3)

Basic concepts of power systems. Per-Unit system. System modeling. Network calculations. Load flow analysis. Economic operation of power systems. Symmetrical three-phase faults. Symmetrical components. Unsymmetrical faults. Introduction to power system stability.

Prerequisite: EE 360

EE 464 - High Voltage Engineering (2-3-3)

Ionization and decay processes. Photo-ionization, thermal ionization. Townsend ionization coefficient. Electric breakdown in gases. Surge breakdown voltage-time lag . Corona discharges under switching surges. Breakdown in solid and dielectric. Generation of high voltage. Attenuation voltage. Transient voltage. Direct voltage.

Prerequisite: EE 360

EE 465 - Power Transmission & Distribution (3-0-3)

Fundamental concepts for transmission lines· Transmission line parameters and constants· Underground cables· Construction of overhead lines· Sag and tension analysis and mechanical design. Transient overvoltage on transmission lines · Reactive compensation and natural loading.

Prerequisite: EE 360

EE 466 - Power System Protection (3-0-3)

Introduction to protective relaying. Relay operating principles. Current and potential transformers. Overcurrent differential, distance and pilot protection · Protection of generators, motors, transformers, busbars and transmission lines. Protection aspects of power system phenomena.

Prerequisite: EE 360

EE 470 - Introduction to Optical Electronics (3-0-3)

Spontaneous and induced transitions. Absorption and amplification of radiation. Atomic susceptibility. Rate equations. Gain saturation. Fabry-Perot lasers. Mode locking. Q-switching. Waveguide modes. Semiconductor physics review. Gain and absorption in semiconductors laser media. Heterostructures. Modulation and bandwidth. The semiconductor photodiode. Avalanche diode. Detection. Noise in optical detection. Traveling wave amplification. Design of optical digital data transmission system.

Prerequisite: PHYS 203 and EE 340

EE 499 - Special Topics in Electrical Engineering (3-0-3)

The contents of this course will be in one of the areas of interest in electrical engineering. The specific contents of the course will be given in detail at least one semester in advance of that in which it is offered.

Prerequisite: (Senior standing or consent of the instructor)