Electrical Engineering Program

Introduction

The Electrical Engineering Department offers concentrations in two areas: Communications and Instrumentation. The program is designed to prepare and educate future engineers for technical and management positions in the industry. This is done by preparing students to find engineering solutions to critical problems by reshaping the environment around them to meet human needs, all while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current and practical engineering knowledge. Because of the rapid evolution of electronics technology, most undergraduate courses emphasize fundamental aspects of a given topic or field. Upper-level courses that deal with specialized topics incorporate practical cutting-edge material. Independent work is highly valued, offering opportunities for juniors and seniors to study specialized topics in detail; to participate in the research program of a faculty member; to learn and apply creative problem-solving skills; and to achieve a sense of accomplishment by carrying out a project from start to finish.

Vision

The Electrical Engineering Department is committed to providing an excellent education for Electrical Engineering students while contributing to the national economy through innovative research, technology development and transfer to industry.

Mission

The mission of the Electrical Engineering Department is to provide high quality education for students through a program that offers challenging hands-on laboratory and design components in conjunction with a thorough foundation in theory, to equip students with the skills to be life-long contributors to their profession and society, and to build a strong outreach program that engages with industry, the challenges of innovative research, and development in Electrical Engineering.

Program Educational Objectives

1. The program educational objectives for the Electrical Engineering program describe accomplishments that graduates are expected to attain after graduation:
2. Serve competently the needs of industry and academia by demonstrating high-quality knowledge, research, and skills in the area of Electrical Engineering.
3. Pursue professional development through professional study and self-learning with full gratitude of the importance of professional and ethical responsibility.
4. Contribute to the welfare of society through the responsible practice of engineering, leadership, and teamwork.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. The following are the student outcomes of the Electrical Engineering program:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Communicate effectively with a range of audiences.
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Overview of the Curriculum

Course Coding

The Electrical Engineering courses are numbered in such a manner to recognize each course according to the area of specialization, the year level, and the sequence in which it will be offered. The symbol EE stands for Electrical Engineering and each course number is made up of 3 digits.

Symbol	Description
GE	General Engineering (Engineering Fundamentals)
EE	Electrical Engineering (Engineering Depths)

The following table shows that the digit in the hundreds place denotes the year level of the course according to student's study plan:

First Digit	Level of Course
1	First year
2	Second year
3	Third year
4	Fourth year

The following table shows that the digit in the tens place denotes the course's field/specialization:

Second Digit	Field/Specialization
0	General Engineering
2	Electric Circuits and Electronics
3	Digital systems and Signals
4	Sensors and Instrumentation
5	Communications
6	Control
7	Electromagnetics, Electromechanical Energy Conversion and Power systems
8	Special Topics
9	Graduation Project and Engineering Training

The digit in the ones position denotes the sequence number of the course in a certain field/specialization in a given year.

Example: EE 471 stands for

Code	Hundreds Position	Tens Position	Ones Position
EE	**4**	**7**	**1**
Department (Electrical Engineering)	Level (Fourth year)	Specialization (Power systems)	First course offered in power systems

Undergraduate Curriculum of Electrical Engineering Program

The total credit hours required for the Bachelor's degree of Electrical Engineering is 137 credit hours excluding the preparatory year. These credit hours are divided into four different categories. The categories are listed as follows:

University requirement	**14** Credit Hours
College of Engineering requirement	**50** Credit Hours
Department requirement	**73** Credit Hours
Total Credit Hours:	**137** Credit Hours

- University requirement (Quran, Tawheed,..etc)
- College of Engineering requirements include:
  1- Mathematics and Basic Sciences. (33 credit hours)
  2- General Engineering. (14 credit hours)
  3- Technical writing in English. (3 credit hours)
- Department requirement includes core courses and Technical Electives. (73 credit hours)

1- General Engineering

The following courses are required as *General Engineering* courses in the undergraduate curriculum of the Electrical Engineering program.

Code	Course Title	Credits	Prerequisite	Corequisite
GE 103	Engineering Graphics and Design	3	None	
CS 108	Computer Programming	3	MATH 115	
GE 100	Introduction to Engineering	0	None	
GE 302	Professional Ethics for Engineers	2	GE 399	
GE 303	Engineering Economy	3	MATH 236	
GE 399	Engineering Training	0	Completion of 90 Credits	
GE 401	Project Management	3	STAT 215	
Total Credit Hours:		**14**		

2- Electrical Engineering Requirements

The course requirements of the Electrical Engineering Department are divided into two parts. The first part consists of compulsory courses which have a total of 64 credit hours. The second part comprises of technical elective courses which has a total number of 9 credit hours. Details of these requirements, including the areas of the technical elective courses, are listed below:

A. Electrical Engineering Core Courses

The following 73 credit hours must be taken by all students in the Electrical Engineering program:

Code	Course Name	Credit Hours	Prerequisite	Corequisite
EE 201	Basics of Electrical Engineering Applications Lab	1	CS 108	EE 221
EE 221	Fundamentals of Electric Circuits	3	MATH 116, PHYS 118, PHYS120, GE100	
EE 222	Electrical Circuits Analysis	3	EE 221	
EE 223	Fundamentals of Electronic Devices	3	EE 221	
EE 226	Electric Circuits Lab	1	EE 221, ENGL 200	EE 222
EE 231	Digital Logic Circuits	3	MATH 116, GE100	
EE 232	Signals and Systems	3	EE 221, EE 201	
EE 233	Digital Logic Circuits Lab	1	ENGL 200	EE 231
EE 271	Electromagnetics I	3	MATH 207, PHYS 118, MATH 228	
EE 321	Electronic Devices & Applications	3	EE 223	
EE 324	Electronic Devices & Applications Lab	1		EE 321
EE 331	Digital Systems	3	EE 231, EE 233, EE 223, CS 108	
EE 342	Sensors and Transducers	2	EE 222	
EE 350	Communication Engineering I	3	EE 232, MATH 236, STAT 215, EE 223	
EE 352	Communication Engineering I Lab	1		EE 353
EE 353	Communication Engineering II	3	EE 350	

Code	Course Name	Credit Hours	Prerequisite	Corequisite
EE 361	Introduction to Control Systems	3	EE 232, EE 342	
EE362	Introduction to Instrumentation & Control Lab	1		EE 361
EE 373	Electromagnetics II	3	EE 271	
EE 431	Digital Signal Processing	3	EE 232, MATH 346	
EE 453	Telecommunication Networks	3	EE 353	
EE 454	Communication Engineering II Lab	1	EE 352	
EE 463	Digital Control Systems	3	EE 361, EE 342	
EE 470	Electromechanical Energy Conversion	3	EE 373, EE 222	
EE 471	Power systems	3	EE 470	
EE 493	Graduation Project I	2	GE 103, Completion of 100 Credit hours.	
EE 494	Graduation Project II	2	EE 493	
EE 4xx	Elective I	3	Refer to the elective courses	
EE 4xx	Elective II	3	Refer to the elective courses	
EE 4xx	Elective III	3	Refer to the elective courses	
	Total	**73**		

B. Electrical Engineering Technical Elective Courses

The Electrical Engineering Program has two areas of specialization. A student will take at least three courses from one of the following two options:

1. Communications and Electronics

Code	Course Name	Credit Hours.	Prerequisite
EE 421	Communication Electronic Circuits	3	EE 321, EE 350, EE 352
EE 433	Digital Image Processing	3	EE 431
EE 455	Mobile Wireless Communications	3	EE 353
EE 456	Information Theory and Coding	3	EE 353
EE 457	Mobile and Wireless Networks	3	EE 353
EE 458	Fiber optic communications	3	EE 353, EE 223
EE 459	Satellite Communications	3	EE 353
EE 481	Special Topics in Communications	3	To be determined by the Instructor
EE 483	Special Topics in Power	3	To be determined by the Instructor
EE 484	Special Topics in Electronics	3	To be determined by the Instructor
EE 485	Special Topics in Renewable Energy	3	To be determined by the Instructor

2. Instrumentation and Control

Code	Course Name	Credit Hours	Prerequisite
EE 441	Advanced Sensors and Actuators	3	EE 361
EE 442	Advanced Instrumentation	3	EE 361
EE 443	Industrial Electronics	3	EE 321,EE 361
EE 444	Applied Instrumentation	3	EE 361
EE 462	Applied Control Engineering	3	EE 361
EE 464	Programmable Logic Controllers	3	EE 331, EE 361
EE 466	Control Systems Design	3	EE 361
EE 467	Intelligent Controllers	3	EE 361
EE 482	Special Topics in Instrumentation	3	To be determined by the Instructor
EE 486	Special Topics in Control	3	To be determined by the Instructor

Department of Electrical Engineering
College of Engineering
Al Imam Mohammad Ibn Saud Islamic University
Riyadh, Kingdom of Saudi Arabia

ELECTRICAL ENGINEERING PROGRAM [Required Credits = 137]

General Education 17 Credit Hours	Math & Sciences 33 Credit Hours	General Engineering 14 Credit Hours	Core Courses and Electives 73 Credit Hours

FIRST YEAR (FRESHMAN)

FALL	SPRING
CUL 101 [2] Islamic Culture	**IDE 133** [2] Tawheed
ENGL 200 [3] Technical Writing In English	**MATH 116** [3] Calculus II PRE: MATH 115
MATH 115 [3] Calculus I	**PHYS 118** [3] Physics II PRE: PHYS 117, PHYS 119
PHYS 117 [3] Physics I	**PHYS 120** [1] Physics II Lab PRE: PHYS 117, PHYS 119 CO: PHYS 118
PHYS 119 [1] Physics I Lab CO: PHYS 117	**STAT 215** [3] Prob. & Stat. for Engr. PRE: MATH 115
CHEM 104 [3] General Chemistry	**CS 108** [3] Computer Programming PRE: MATH 115
CHEM 105 [1] G. Chemistry Lab CO: CHEM 104	**GE 103** [3] Engineering Graphics and Design
	GE 100 [0] Introduction to Engineering

SECOND YEAR (SOPHOMORE)

FALL	SPRING
QUR 100 [2] Quran Kareem	**QUR 150** [2] Quran Kareem
MATH 207 [3] Calculus III PRE: MATH116	**MATH 236** [3] Mathematical Methods for Engineers PRE: MATH228, MATH207
MATH 228 [3] Linear Algebra & Ord. Diff. Eqns. PRE: MATH 116	**EE 222** [3] Electric Circuit Analysis PRE: EE 221
EE 221 [3] Fund. of Electric Circuits PRE: MATH 116, PHYS 118, PHYS 120, GE 100	**EE 223** [3] Fundamental of Electronic Devices PRE: EE 221
EE 201 [1] Elec. Eng. Basics Lab PRE: CS 108 CO: EE 221	**EE 226** [1] Electric Circuits Lab PRE: EE 221, ENGL 200 CO: EE 222
EE 231 [3] Digital logic Circuits PRE: MATH 116, GE 100	**EE 232** [3] Signals and Systems PRE: EE 221, EE 201
EE 233 [1] Digi. logic Cir. lab PRE: ENGL 200 CO: EE 231	**EE 271** [3] Electromagnetics I PRE: MATH 207, MATH 228, PHYS 118

THIRD YEAR (JUNIOR)

FALL	SPRING
FIQ 150 [2] Fiqh	**NAHU 105** [2] Nahu
MATH 346 [3] Numerical Analysis PRE: MATH 236, CS 108	**GE 303** [3] Eng. Economy PRE: MATH 236
EE 373 [3] Electromagnetics II PRE: EE 271	**EE 331** [3] Digital Systems PRE: CS 108, EE 231, EE 233, EE 223
EE 321 [3] Electronic Devices and Applications PRE: EE 223	**EE 362** [1] Introduction to Instrumentation and Control Lab. CO: EE 361
EE 324 [1] Elec. Devices & App. Lab CO: EE 321	**EE 353** [3] Communication Engineering II PRE: EE 350
EE 342 [2] Sensors and Transducers PRE: EE 222	**EE 361** [3] Introduction to Control Systems PRE: EE 232, EE 341
EE 350 [3] Communication Engineering I PRE: EE 232, EE 223, STAT 215, MATH 236	**EE 352** [1] Communication Engineering I Lab CO: EE 353

GE 399: Engineering Training [0]
Summer Semester, (Pre-requisite: 90 credit Hours)

FOURTH YEAR (SENIOR)

FALL	SPRING
GE 401 [3] Project Management PRE: STAT 215	**HIST 101** [2] Asseerah Annabawia
EE 431 [3] Digital signal Processing PRE: EE 232, MATH 246	**GE 302** [2] Professional Ethics for Engineers PRE: GE 399
EE 463 [3] Digital Control Systems PRE: EE 341, EE 361	**EE 453** [3] Telecommunication Networks PRE: EE 353
EE 470 [3] Electromechanical Energy Conversion PRE: EE 373, EE 222	**EE 454** [1] Communication Engineering II Lab PRE: EE 352
EE 493 [2] **Graduation Project I** PRE: GE 103, Completion of 100 Credit Hours	**EE 471** [3] Power Systems PRE: EE 470
EE 4** [3] Elective I	**EE 4**** [3] Elective II
	EE 4** [3] Elective III
	EE 494 [2] Graduation Project II PRE: EE 493

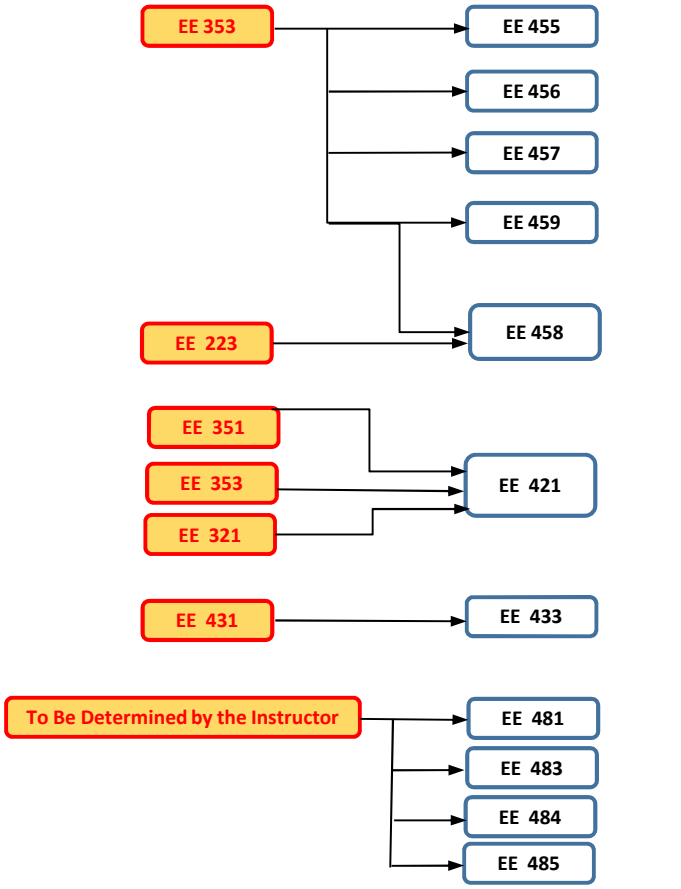
No. of Courses / Credits per Semester:							
[7 / 16]	[8 / 18]	[7/ 16]	[7 / 18]	[7 / 17]	[7 / 16]	[6 / 17]	[8 / 19]

Department of Electrical Engineering, College of Engineering,
Al Imam Mohammad Ibn Saud Islamic University, Riyadh, Kingdom of Saudi Arabia

Electrical Engineering Program - Elective Courses

FINAL YEAR
Fall Spring

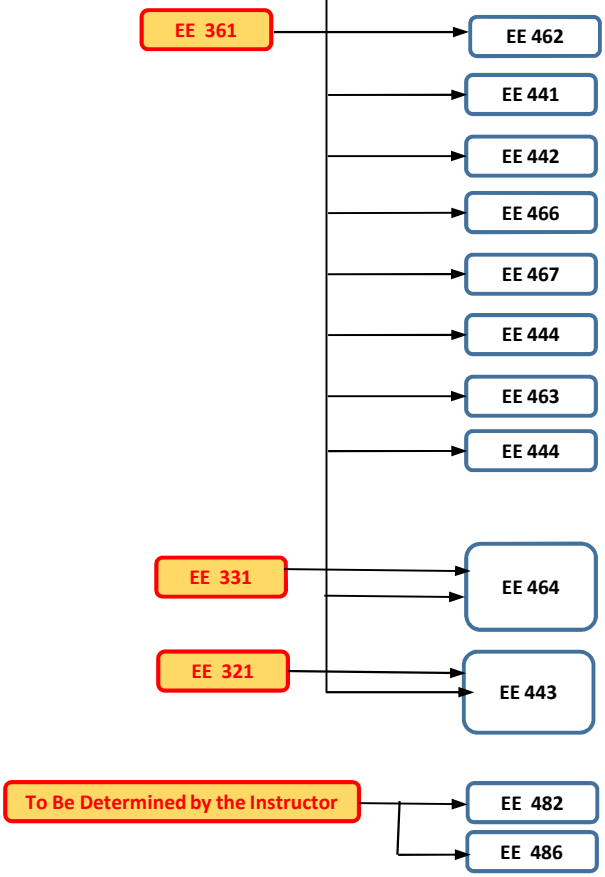
Communication and Electronics Engineering



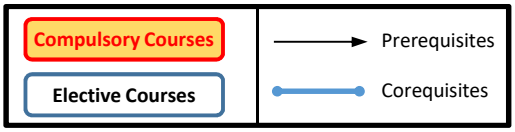
EE 455: Mobile Wireless Communications
EE 456: Information Theory and Coding
EE 457: Mobile and Wireless Networks
EE 433: Digital Image Processing
EE 421: Communication Electronics
EE 458: Fiber Optic Communications
EE 459: Satellite Communication
EE 481: Special Topics in Communication
EE 483: Special Topics in Electronics
EE 484: Special Topics in Power
EE 485: Special Topics in Renewable Energy
EE 353: Communication Engineering II
EE 223: Fundamental of Electronic Devices
EE 321: Electronic Devices and Applications.
EE 350: Communication Engineering I
EE 431: Digital Signal Processing

FINAL YEAR
Fall Spring

Instrumentation and Control Engineering



EE 462: Applied Control Engineering
EE 441: Advanced Sensors and Actuators
EE 442: Advanced Instrumentation
EE 466: Control Systems Design
EE 467: Intelligent Controllers
EE 444: Applied Instrumentation
EE 464: Programmable Logic Controllers
EE 443: Industrial Electronics
EE 482: Special Topics in Instrumentation
EE 486: Special Topics in Control
EE 361: Introduction to Control Systems.
EE 342: Sensors and Transducers
EE 331: Digital Systems
EE 321: Electronic Devices and Applications



Electrical Engineering Undergraduate Curriculum

First Year (Freshman)

First Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	CUL 101	Islamic Culture	2	2		
2	CHEM 104	General Chemistry	3	3		1
3	CHEM 105	General Chemistry Lab	1		2	
4	MATH 115	Calculus I	3	3		2
5	PHYS 117	Physics I	3	3		1
6	PHYS 119	Physics I Lab	1		2	
7	ENGL 200	Technical Writing in English	3	3		1
Semester Total Credit Hours			**16**	**14**	**4**	**5**
Cumulated Total Credit Hours			**16**	**14**	**4**	**5**

Second Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	IDE 133	Tawheed	2	2		
2	PHYS 118	Physics II	3	3		1
3	PHYS 120	Physics II lab	1		2	
4	MATH 116	Calculus II	3	3		2
5	CS 108	Computer programming	3	2	2	
6	GE 103	Engineering Graphics and Design	3	2	2	
7	STAT 215	Probability and Statistics for Engineers	3	3		1
8	GE 100	Introduction to Engineering	0	0		2
Semester Total Credit Hours			**18**	**15**	**6**	**6**
Cumulated Total Credit Hours			**34**	**29**	**10**	**11**

Second Year (Sophomore)

Third Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	QUR 100	Quran Kareem	2	2		
2	EE 201	Basics of Electrical Engineering Applications Lab	1		2	
3	MATH 228	Linear Algebra and Ordinary Differential Equations	3	3		2
4	MATH 207	Calculus III	3	3		2
5	EE 221	Fundamentals of Electric Circuits	3	3		1
6	EE 231	Digital Logic Circuits	3	3		1
7	EE 233	Digital Logic Circuits Lab	1		2	
Semester Total Credit Hours			**16**	**14**	**4**	**6**
Cumulated Total Credit Hours			**50**	**43**	**14**	**17**

Fourth Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	MATH 236	Mathematical Methods for Engineers	3	3		2
2	QUR 150	Quran Kareem	2	2		
3	EE 222	Electrical Circuits Analysis	3	3		1
4	EE 223	Fundamentals of Electronic Devices	3	3		1
5	EE 226	Electric Circuits Lab	1		2	
6	EE 232	Signals and Systems	3	3		1
7	EE 271	Electromagnetics I	3	3		1
Semester Total Credit Hours			**18**	**17**	**2**	**6**
Cumulated Total Credit Hours			**68**	**60**	**16**	**23**

Third Year (Junior)

Fifth Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	FIQ 150	FIQH	2	2		
2	EE 373	Electromagnetics II	3	3		1
3	MATH 346	Numerical Analysis	3	3		2
4	EE 321	Electronic Devices & Applications	3	3		1
5	EE 324	Electronic Devices & Applications Lab	1		2	
6	EE 350	Communication Engineering I	3	3		1
7	EE 342	Sensors and Transducers	2	2		1
Semester Total Credit Hours			**17**	**16**	**2**	**6**
Cumulated Total Credit Hours			**85**	**76**	**18**	**29**

Sixth Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	NAHU 105	NAHU	2	2		
2	GE 303	Engineering Economy	3	3		1
3	EE 331	Digital Systems	3	3		1
4	EE 353	Communication Engineering II	3	3		1
5	EE 352	Communication Engineering I Lab	1		2	
7	EE 361	Introduction to Control Systems	3	3		1
8	EE 362	Introduction to Instrumentation & Control Lab	1		2	
9	GE 399	Engineering Training	0	0	0	0
Semester Total Credit Hours			**16**	**14**	**4**	**4**
Cumulated Total Credit Hours			**101**	**90**	**22**	**33**

Fourth Year (Senior)

Seventh Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	GE 401	Project Management	3	3		
2	EE 431	Digital Signal Processing	3	3		1
3	EE 463	Digital Control Systems	3	3		1
4	EE 470	Electromechanical Energy Conversion	3	3		1
5	EE 4**	Elective I	3	3		1
6	EE 493	Graduation Project I	2		4	
Semester Total Credit Hours			**17**	**15**	**4**	**4**
Cumulated Total Credit Hours			**118**	**105**	**26**	**37**

Eighth Level

No.	Course Code	Course Name	Credit Hours	Theory	Lab	Tut
1	EE 453	Telecommunication Networks	3	3		1
2	EE 454	Communication Engineering II Lab	1		2	
3	EE 471	Power Systems	3	3		1
4	EE 4**	Elective II	3	3		1
5	EE 4**	Elective III	3	3		1
6	EE 494	Graduation Project II	2		4	
7	GE 302	Professional Ethics for Engineers	2	2		
8	HST 101	Asseerah Annabawia	2	2		
Semester Total Credit Hours			**19**	**16**	**6**	**4**
Cumulated Total Credit Hours			**137**	**121**	**32**	**41**

Course Description

1. GENERAL ENGINEERING

GE 103	Engineering Graphics and Design	3 Credit Hours

This course introduces the students to the computer drafting software (AutoCAD) in order to be able to model parts and assemblies. It uses parametric and non-parametric solids, surface and wire frame models. It explains part editing, two-dimensional documentation of models along with the planar projection theory. It includes sketching of perspective, isometric, multi-view, and section views as a main tool to conceptualize ideas. It also explains dimensioning guidelines and tolerance techniques. A Team or an individual design project will be assigned as a final illustration to increase students understanding of drawing techniques and solving problem through design learned in the course.

GE 100	Introduction to Engineering	0 Credit Hours

Introduction to the engineering profession, roles and responsibilities of engineers, professional and ethical aspects of the profession, major engineering disciplines, academic background and requirements of each discipline, sub-specialties within each discipline, jobs availability and financial benefits, role of professional engineering bodies and societies, teamwork.

CS 108	Computer Programming	3 Credit Hours

The course introduces students to structured programming techniques. Topics include different control statements (sequence, selection, and repetition), functions, fundamental data types, and data structures (arrays and pointers). Upon successful completion of the course, students will solve computer problems by using structured programming techniques and adequate tools (text editor, compiler, and debugger).

GE 302	Professional Ethics for Engineers	2 Credit Hours

Introduction to engineering ethics; definition of a profession, personal and professional ethics, explore many of the ethical issues, discussion of ethical theories, code of ethics, problem solving techniques. Introduce engineer's rights and responsibilities. Asses Safety, risk and accidents. Explain the Rights and Responsibilities of Engineers.

GE 303	Engineering Economy	3 Credit Hours

This course investigates methods of economic analysis for decision making among alternative courses of action in engineering, business and government applications. Topics include: Time value of money, Money management, and Equivalence calculations under inflation, Present worth analysis, Annual Equivalence Analysis, Rate of return analysis. Benefit-Cost ratio & profitability index analyses.

GE 399 Engineering Training 0 Credit Hours

Eight weeks training in a relevant industry under the supervision of an external supervisor from industry. Each student must submit a technical report about his learning experience during training in addition to fulfilling any other requirements as determined by the department.

GE 401 Project Management 3 Credit Hours

This course concentrates on the general methodology for managing a technical project from concept to operational use, with emphasis on the functions, roles, and responsibilities of the project manager. The course emphasizes on planning, scheduling, using arrow networks, execution and communications, project lifecycle, risk analysis, interface management, design review, design control assessment, reporting and reaction to critical problems. It also includes the characteristics of projects, design and process, labour, material and equipment utilization. Cost estimation, pricing and contracting, planning, cost control, monitoring and management systems are also covered.

2. CORE COURSES AND TECHNICAL ELECTIVES

EE 201 Basics of Electrical Engineering Applications Lab 1 Credit Hours

Introduction to verification of circuit laws and theorems using PSpice. Measuring and controlling physical phenomena through laboratory exercises and projects using LabVIEW. Introduction to programming in MATLAB: Variables, Basic operations in linear algebra and statistics, Operations on matrices, built-in functions, adding functions, M-files, Loops, Controlling operations, Types of error, Plots.

EE 221 Fundamentals of Electric Circuits 3 Credit Hours

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, Transient analysis of first-order circuits, AC Power Analysis.

EE 222 Electrical Circuits Analysis 3 Credit Hours

The content in the course specification is: Three phase analysis, RLC circuits, Mutual inductance, Two port networks, Laplace transform, Circuit analysis in the S-domain, Frequency selective circuits.

EE 223 Fundamentals of Electronic Devices 3 Credit Hours

Semiconductor: Different semiconductor materials. Impurity doping, Intrinsic and extrinsic semiconductors. Conductivity, Carrier concentration, Charge densities. 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.

EE 226 Electric Circuits Lab 1 Credit Hour

In this lab course the student will get hands-on experience to design, construct and analyze different Electrical circuits. Student will learn Ohm's law, Kirchhoff current & voltage laws, Resistors in Series & Parallel, Star to Delta circuit analysis, Thevenin's & Norton's theorem, Superposition theorem & Maximum power transfer theorem verification RC circuit transient analysis & AC sinusoidal analysis. During this course the student will learn hand on experience on simulation software "Pspice", Bread board, oscilloscope & Functional generators.

EE 231 Digital Logic Circuits 3 Credit Hours

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

EE 232 Signals and Systems 3 Credit Hours

Classification of continuous- and discrete-time signals, Continuous and discrete-Linear time-invariant systems, Fourier series, Fourier transform, Laplace transform, Discrete time Fourier Transform, Linear circuits and systems concepts, Impulse response, Convolution, Transfer function, Frequency response, Introduction to Ideal Filters, Introduction to sampling of analog signals, Introduction to difference equations and discrete Fourier Transform.

EE 233 Digital Logic Circuit Lab 1 Credit Hour

Hands-on experience to design, construct and analyze different logic circuits. Student will construct logic circuits using integrated circuit (IC), logic breadboard, LEDs, power supply and other basic components. Both combinational and sequential logic circuits will be given in experiments. Design and analyze various digital circuits involving logic gates, multiplexers, decoders, flip-flops, counters and registers is included. Simulation using hardware descriptive language (HDL) such as Verilog will be covered.

EE 271 Electromagnetics I 3 Credit Hours

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. Introduction to time varying fields.

EE 321 Electronic Devices and Applications 3 Credit Hours

MOS and BJT Amplifier's frequency response. Multistage amplifiers. Differential Amplifiers. Digital logic families (ECL, and CMOS circuits). Operational Amplifiers. Linear and nonlinear op amp applications. Non-ideal characteristics of Op Amps. Oscillators. Active filters.

EE 324 Electronics Devices and Applications Lab 1 Credit Hour

This course is intended to introduce the Bipolar Junction Transistor (BJT) and Operational Amplifier characteristics, Frequency Response of Single and Double stage BJT amplifier, Different Configurations of op-amps, Applications of Op-amps such as inverting & non-inverting Comparators, Characteristics and Frequency response of inverting & non-inverting amplifiers, integrators , differentiators, Active Low Pass Filters and their Frequency Responses, Active High Pass Filters and their Frequency Responses, Schmitt Triggers, Oscillators.

EE 331 Digital Systems 3 Credit Hours

Microprocessor hardware and software Models; Addressing modes and techniques, Instruction sets, Assembly language programming and debugging, Memory and input/output mapping, Input and output instructions, Input/output Interfacing.

EE 342 Sensors and Transducers 2 Credit Hours

Principles and operation of sensor devices; Mathematical modeling of sensor: physical variable Measurement; Transducer classification and type, general input-output configuration, Static and Dynamic characteristics of Sensors, Variable resistance transducers: Potentiometers, Thermistors, RTDs, metal and semiconductor strain gauges and their signal conditioning circuits, Bridge Measurements, strain gauge applications, Accelerometer, Mercury Thermometer, Inductive Transducers; Linear Variable Differential Transducers; Capacitive Transducers, Thermoelectric Transducers; Thermocouples.

EE 350 Communication Engineering I 3 Credit Hours

Elements of a communication system, Transmission of signals through linear systems, Representation of baseband and band-pass signals and systems, Signal spectrum, Analog Amplitude Modulation and Demodulation (AM, DSBSC, SSB, VSB). Analog Angle Modulation and Demodulation (PM, FM), Noise representation and analysis: SNR analysis of AM and FM systems. Sampling theorem, QAM multiplexing, Pulse modulation techniques: PAM, PPM, and PWM.

EE 352 Communications Engineering I Lab 1 Credit Hour

Introduction to Laboratory equipment such as oscilloscope and spectrum analyzer; Analog modulations AM, PM generation and detection; Digital modulation.

EE 353 Communication Engineering II 3 Credit Hours

Quantization and PCM Encoding. Noise analysis in PCM systems. Baseband pulse transmission (matched filters, intersymbol interference); Eye pattern, Nyquist criteria; Equalization. Digital passband transmission: Coherent PSK/FSK/QPSK/MSK and non-coherent orthogonal modulation; power spectra and bandwidth efficiency of binary and quaternary modulation schemes; Information theory: Mutual information and channel capacity; Error control coding.

EE 361 Introduction to Control Systems 3 Credit Hours

Description of introduction to control systems course: Basic components of a control system, Mathematical foundation : Complex-variable concept, Laplace transform, Transfer function, Block Diagrams, Signal-flow graphs, State-variable analysis of linear dynamic systems, stability of linear control systems, Introduction to Modelling of Mechanical systems , Modeling of Electrical Systems, DC Motors in control systems, PID Controllers, Steady State Errors, Root Locus, Time-domain analysis of control systems, frequency-domain analysis of control systems.

EE 362 Introduction to Instrumentation and Control Lab 1 Credit Hours

An introduction to Lab View, Tutorials and Programing aspect from control systems view point. Linear Time-invariant Systems and Representation, Block Diagram Reduction, performance characteristics of first and second order systems, Effect of Feedback on disturbance and Control System Design, building a VI and modifying signals in Lab View, Exercises in Lab View, Use the NI USB-6009 for data acquisition and Digital Input / Output.

EE 373 Electromagnetics II 3 Credit Hours

Time varying fields, Maxwell's equations. Plane wave propagation. Reflection and refraction. Poynting vector. Introduction to transmission line theory. Introduction to radiation and antennas.

EE 431 Digital Signal Processing 3 Credit Hours

System functions, Discrete time Fourier transform, Discrete Fourier transform, Linear and circular convolution, Z-transform, Sampling and aliasing, Digital filter structures, Signal flow graphs, Elementary FIR/IIR filter design techniques, Windows, Bilinear and band transformations.

EE 453 Telecommunication Networks 3 Credit Hours

ISO/OSI & Internet protocol stack TCP/IP and the relevant protocols used in computer networks. Concept of application layer protocols, HTTP, SMTP, POP3, FTP, DNS. Transport layer protocols, TCP and UDP. Network layer Internet Protocol (IP), subnet, IP fragmentation and packet routing protocols RIP, OSPF. link layer protocols error detection, correction EDC, CRC, ALOHA, CSMA/CD, ARP, Ethernet. Physical Layer include Data and Signals.