جامعة الفيصل
Alfaisal University

Bachelor of Electrical Engineering

College of Engineering & Advanced Computing,
Alfaisal University

Effective: Fall 2026 with tracks

About the Program

The Bachelor of Electrical Engineering at Alfaisal University provides a broad and rigorous education across the core areas of the discipline, including electronics, power systems, communications, and control. The curriculum also integrates essential computing principles to prepare students for the digital and interconnected nature of contemporary engineering practice. Breadth is supported through university electives drawn from the humanities, social sciences, and general sciences. The program is accredited by the Engineering Accreditation Commission of ABET, reflecting alignment with international standards.

Students gain depth through technical electives and may pursue a track in Renewable Energy or a general pathway. Additional opportunities exist to complement the major with minors or double majors across the university. Real-world preparation is emphasized through a required summer internship and a year-long capstone design project.

Graduates gain strong analytical grounding, practical engineering competence, and professional readiness. They pursue careers across sectors such as power and energy, electronics, communications, automation and control, robotics, and emerging technology domains, or pursue advanced study.

Curriculum Structure and Study Plan

The Bachelor of Electrical Engineering curriculum is composed of **133** Credit Hours (CRHs) divided as follows:

I. University General Education Requirements (18 CRHs)
- a. Arts & Humanities (9 CRHs)
- b. Social Sciences (6 CRHs)
- c. Sciences (3 CRHs)

II. College Requirements (41 CRHs)
- a. Mathematics and Statistics (21 CRHs)
- b. Basic Sciences (12 CRHs)
- c. Engineering requirements (8 CRHs)

III. Major Requirements (74 CRHs)
- a. Core Major Requirements (59 CRHs)
- b. Technical Electives (15 CRHs)
- c. Summer Internship (0 CRHs)

I. University General Education Requirements (18 CRHs)

a) Arts & Humanities (9 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
ENG 101	University Writing	3	3	0	0		
ENG 222	Technical Writing	3	3	0	0	ENG 101	
____	Arts & Humanities Elective I*	3	3	0	0		

* Select any 3-CRHs course from the University-approved list of Arts & Humanities courses.

b) Social Sciences (6 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
____	Social Sciences Elective I*	3	3	0	0		
____	Social Sciences Elective II *	3	3	0	0		

* Select any two 3-CRHs courses (i.e., 6 CRHs in total) from the University-approved list of Social Sciences courses.

c) Sciences (3 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
AI 102	AI for Everyone: Foundations and Applications	3	3	0	0		

II. College Requirements (41 CRHs)

a) Mathematics and Statistics (21 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
MAT 101	Calculus I	3	3	0	0		
MAT 112	Calculus II	3	3	0	0	MAT 101	
MAT 211	Calculus III	3	3	0	0	MAT 112	
MAT 212	Linear Algebra	3	3	0	0	MAT 112	
MAT 213	Differential Equations	3	3	0	0	MAT 112	MAT 212
MAT 224	Numerical Methods	3	3	0	0	MAT 212	
STA 212	Probability and Statistics	3	3	0	0	MAT 112	

b) Basic Sciences (12 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
CHM 101	General Chemistry I	3	3	0	1		
CHM 101 L	General Chemistry I Lab	1	0	2	0		CHM 101
PHU 103	Physics I	3	3	0	1		MAT 101
PHU 103 L	Physics I Lab	1	0	2	0		PHU 103
PHU 124	Physics II	3	3	0	1	PHU 103, MAT 101	
PHU 124 L	Physics II Lab	1	0	2	0	PHU 103, MAT 101	PHU 124

c) Engineering Requirements (8 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
COE 100	Student Orientation and Academic Success	1	1	0	0		
SE 100	Programming for Engineers	3	3	0	0		
SE 100 L	Programming for Engineers Lab	1	0	2	0		SE 100
IE 315	Engineering Economy and Cost Analysis	3	3	0	0	STA 212	

III. Major Requirements (74 CRHs)

a) Core Major Requirements (59 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
EE 207	Foundations of Electrical Engineering	3	3	0	1	PHU 124	MAT 213
EE 207 L	Foundations of Electrical Engineering Lab	1	0	2	0		EE 207
EE 208	Electric Circuits	3	3	0	0	EE 207	
EE 209	Applied Electromagnetics	3	3	0	0	EE 207, MAT 211	
EE 210	Digital Logic Systems	3	3	0	0		
EE 210 L	Digital Logic Systems Lab	1	0	2	0		EE 210
EE 301	Signals and Systems	3	3	0	0	EE 208, MAT 224	
EE 302	Communications Theory	3	3	0	0	EE 301, STA 212	
EE 302 L	Communications Theory Lab	1	0	2	0		EE 302
EE 303	Introduction to Electronics	3	3	0	0	EE 208	
EE 303 L	Introduction to Electronics Lab	1	0	2	0		EE 303
EE 304	Microelectronics	3	3	0	0	EE 303	
EE 304 L	Microelectronics Lab	1	0	2	0		EE 304
EE 305	Computer Networks	3	3	0	0	SE 100, STA 212, EE 210 or SE 223	
EE 305 L	Computer Networks Lab	1	0	2	0		EE 305
EE 306	Control and Feedback System Design	3	3	0	0	EE 301	
EE 306 L	Control and Feedback System Design Lab	1	0	2	0		EE 306

EE 307	Computer Architecture	3	3	0	0	SE 100, EE 210 or SE 223	
EE 307 L	Computer Architecture Lab	1	0	2	0		EE 307
EE 308	Electrical Energy Conversion	3	3	0	0	EE 209	
EE 308 L	Electrical Energy Conversion Lab	1	0	2	0		EE 308
EE 405	Electric Power Systems	3	3	0	0	EE 308, MAT 224	
EE 413	Digital Communications	3	3	0	0	EE 302	
EE 413 L	Digital Communications Lab	1	0	2	0		EE 413
EE 495	Electrical Engineering Capstone Project I	3	0	6	0	EE 306	
EE 496	Electrical Engineering Capstone Project II	3	0	6	0	EE 495	
EE 499	Ethics and Professional Development	1	1	0	0		

b) Technical Electives (15 CRHs)

Select five courses from the following list:

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut.		
EE 401	Special Topics in Electrical Engineering	3	3	0	0	EE 306	
EE 402	Introduction to Wireless Networks	3	3	0	0	EE 305	
EE 403	Wireless Communications	3	3	0	0	EE 413	
EE 404	Data Engineering in Electrical Systems	3	3	0	0	EE 301	
EE 406	Digital Electronics	3	3	0	0	EE 304	
EE 408	Communication Electronics	3	3	0	0	EE 304	
EE 410	Cyber Physical Systems	3	3	0	0	EE 306	

EE 411	Internet of Things	3	3	0	0	EE 305	
EE 412	Nanoelectronics	3	3	0	0	EE 304	
EE 412 L	Nanoelectronics Lab	1	0	2	0		EE 412
EE 414	Fundamentals of Robotics	3	3	0	0	EE306	
EE 415	Industrial Robotics	3	3	0	0	EE306	
EE 416	Unmanned Aerial Vehicles and Drones	3	3	0	0	EE306	
EE 417	Digital Signal Processing	3	3	0	0	EE 301	
EE 418	Digital Image Processing	3	3	0	0	EE 301	
EE 420	Power Electronics	3	3	0	0	EE 304	
EE 422	Antennas and Wave Propagation	3	3	0	0	EE 209	
EE 423	Optical Fiber Communication Systems	3	3	0	0	EE 422	
EE 424	Optoelectronics	3	3	0	0	EE 304	
EE 425	Microwave Engineering	3	0	0	0	EE 422	
EE 426	Renewable Energy	3	3	0	0	EE 405	
EE 427	Digital Control	3	3	0	0	EE 306	
EE 428	Modern Control Theory	3	3	0	0	EE 306	
EE 435	Undergraduate Research in Electrical Engineering	3	0	6	0	See req.*	
EE 440	Machine Learning	3	3	0	0	EE 301	
EE 442	Intelligent Electrical Systems	3	3	0	0	EE 306	
EE 444	Artificial Intelligence	3	3	0	0	EE 306	
EE 481	Innovations and Entrepreneurship in Engineering	3	3	0	0	EE 306	

*** EE 435 requires department chair approval, a minimum 3.0 GPA, and a signed research contract.**

c) Summer Internship (0 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Prerequisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
EE 390	Electrical Engineering Summer Internship	0	0	0	0	EE 302, EE 304, EE 306, EE 308	

Typical Study Plan-Electrical Engineering Program

4-Year Curriculum: ***133 Credit Hours Total***

Each course below follows the following format:
Course Code, Course Title, and Course Credit Hours (Lecture contact hours – Lab contact hours – Tutorial contact hours)

1st Year			
Fall	**Course Code**	**Course-Title**	**CRHs**
	CoE 100	**Student Orientation & Academic Success**	**1 (1-0-0)**
	SE 100	**Programming for Engineers**	**3 (3-0-0)**
	SE 100 L	**Programming for Engineers Lab**	**1 (0-2-0)**
	MAT 101	**Calculus I**	**3 (3-0-0)**
	PHU 103	**Physics I**	**3 (3-0-1)**
	PHU 103 L	**Physics I Lab**	**1 (0-2-0)**
	ENG 101	**University Writing**	**3 (3-0-0)**
		Total	**15**
Spring	**Course Code**	**Course-Title**	**CRHs**
	CHM 101	**General Chemistry I**	**3 (3-0-1)**
	CHM 101 L	**General Chemistry I Lab**	**1 (0-2-0)**
	MAT 112	**Calculus II**	**3 (3-0-0)**
	PHU 124	**Physics II**	**3 (3-0-1)**
	PHU 124 L	**Physics II Lab**	**1 (0-2-0)**
	AI 102	**AI for Everyone: Foundation and Applications**	**3 (3-0-0)**
	___	**Arts & Humanities Elective I ***	**3 (3-0-0)**
		Total	**17**

* Refer to the EE department guidelines on University Requirements in this Study Plan.

2nd Year			
Fall	Course Code	Course-Title	CRHs
	EE 207	Foundations of Electrical Engineering	3 (3-0-1)
	EE 207 L	Foundations of Electrical Engineering Lab	1 (0-2-0)
	MAT 211	Calculus III	3 (3-0-0)
	MAT 212	Linear Algebra	3 (3-0-0)
	MAT 213	Differential Equations	3 (3-0-0)
	ENG 222	Technical Writing	3 (3-0-0)
		Total	16
Spring	Course Code	Course-Title	CRHs
	EE 208	Electric Circuits	3 (3-0-0)
	EE 209	Applied Electromagnetics	3 (3-0-0)
	EE 210	Digital Logic Systems	3 (3-0-0)
	EE 210 L	Digital Logic Systems Lab	1 (0-2-0)
	MAT 224	Numerical Methods	3 (3-0-0)
	STA 212	Probability and Statistics	3 (3-0-0)
	___	Social Sciences Elective I *	3 (3-0-0)
		Total	19

* Refer to the EE department guidelines on University Requirements in this Study Plan.

3rd Year			
Fall	Course Code	Course-Title	CRHs
	EE 301	Signals and Systems	3 (3-0-0)
	EE 303	Introduction to Electronics	3 (3-0-0)
	EE 303 L	Introduction to Electronics Lab	1 (0-2-0)
	EE 305	Computer Networks	3 (3-0-0)
	EE 305 L	Computer Networks Lab	1 (0-2-0)
	EE 307	Computer Architecture	3 (3-0-0)
	EE 307 L	Computer Architecture Lab	1 (0-2-0)
	___	Social Sciences Elective II *	3 (3-0-0)
		Total	**18**
Spring	**Course Code**	**Course-Title**	**CRHs**
	EE 302	Communications Theory	3 (3-0-0)
	EE 302 L	Communications Theory Lab	1 (0-2-0)
	EE 304	Microelectronics	3 (3-0-0)
	EE 304 L	Microelectronics Lab	1 (0-2-0)
	EE 306	Control and Feedback System Design	3 (3-0-0)
	EE 306 L	Control and Feedback System Design Lab	1 (0-2-0)
	EE 308	Electrical Energy Conversion	3 (3-0-0)
	EE 308 L	Electrical Energy Conversion Lab	1 (0-2-0)
	IE 315	Engineering Economy and Cost Analysis	3 (3-0-0)
		Total	**19**

Summer	Course Code	Course-Title	CRHs
	EE 390	Electrical Engineering Summer Internship	0 (0-0-0)
		Total	**0**

* Refer to the EE department guidelines on University Requirements in this Study Plan.

4th Year			
Fall	**Course Code**	**Course-Title**	**CRHs**
	EE 405	**Electric Power Systems**	**3 (3-0-0)**
	EE 413	**Digital Communications**	**3 (3-0-0)**
	EE 413 L	**Digital Communications Lab**	**1 (0-2-0)**
	EE 495	**Electrical Engineering Capstone Project I**	**3 (0-6-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
		Total	**16**
Spring	**Course Code**	**Course-Title**	**CRHs**
	EE 496	**Electrical Engineering Capstone Project II**	**3 (0-6-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
	EE 499	**Ethics and Professional Development**	**1 (1-0-0)**
		Total	**13**

Electrical Engineering Tracks:

All EE students can select their electives in the fourth year according to their desired academic objective in consultation with their academic advisor and available offerings within the department.

Students can select the non-track option or the Renewable Energy Track. Both options have the same required courses, and the track will only determine the choice of electives in the fourth (senior) year. The total of credit hours for the electives is 15 CRHs for all four tracks.

- **Bachelor of Electrical Engineering – Renewable Energy Track**

The Renewable Energy track at Alfaisal University is a specialization within electrical engineering focused on generating electrical power from various renewable sources. The track covers key topics such as power plant planning, the theory and practical design of renewable and non-renewable energy sources, grid integration, and engineering economy factors involved in design and deployment. Renewable energy resources include a wide range of established and experimental plants, such as solar, wind, hydro, tidal, wave, biomass, and geothermal energy. It also covers energy storage technologies like fuel cells and pumped hydro. Emphasis is placed on integrating these energy sources into the power grid using power electronics theory and practice.

Graduates will develop multiple technical and transferable skills, including strong analytical abilities and leadership in complex design projects. Electrical renewable energy engineers have diverse employment opportunities across power generation, conversion, distribution, and management sectors—including power utilities, factories, consultancy firms, and domestic markets—where renewable energy systems are increasingly in demand.

Track Course Requirements:

In addition to completing the core course: **EE 308 + L – Electrical Energy Conversion and EE 405 Electric Power Systems,** students should complete the following four courses as technical electives:

- EE 410 Cyber-Physical Systems
- EE 420 Power Electronics
- EE 426 Renewable Energy

Equivalents to EE 410 may be sought in technical elective courses in control and robotics. Advisor's and Chair's prior approval are required.

The student will need to further complete the program's elective requirements, and have a capstone project themed according to the track.

Track Plan:

4th Year Electives			
Fall	**Course Code**	**Course-Title**	**CRHs**
	EE 420	**Power Electronics**	**3 (3-0-0)**
	EE 4**	**Technical Elective**	**3 (3-0-0)**
		Total	**6**

	Course Code	Course-Title	CRHs
Spring	EE 410	Cyber Physical Systems	3 (3-0-0)
	EE 426	Renewable Energy	3 (3-0-0)
	EE 4**	Technical Elective	3 (3-0-0)
		Total	**9**

• Course Descriptions

In this section we give the course descriptions of Electrical Engineering courses of the program. All specifications for all courses of the program are listed in Appendix C.

Each course below follows the following format:
Course Code: Course Title Course Credit Hours (Lecture contact hours-Lab contact hours-Tutorial Course Code Course Title Course Credit Hours (Lecture contact hours – Lab contact hours – Tutorial contact hours)
Course Description
Prerequisites
Co-requisites

Core Courses

EE 207: Foundation of Electrical Engineering **3 (3-0-1)**
The course teaches fundamental concepts of electrical circuits, students will be familiarized with the essential principles of electrical circuit analysis composition of components into systems and networks, and understanding the trade-offs and limits imposed by energy and noise. Students learn to apply the concepts during laboratory design.
Prerequisites: PHU 124
Co-requisites: MAT 213

EE 207 L: Foundation of Electrical Engineering Lab **1 (0-2-0)**
Laboratory experiments dealing with Foundation of Electrical Engineering.
Prerequisites: None
Co-requisites: EE 207

EE 208: Electric Circuits **3 (3-0-0)**
The course teaches the design and analysis of interconnected networks of lumped circuit elements.
Prerequisites: EE 207
Co-requisites: None

EE 209: Applied Electromagnetics **3 (3-0-0)**
The course teaches the application of electromagnetic principles to classical and modern devices. The concepts of work and energy and electromagnetic fields are addressed.
Prerequisites: EE 207, MAT 211
Co-requisites: None

EE 210: Digital Logic Systems **3 (3-0-0)**
The course teaches theoretical foundations and concepts of digital systems and applies these concepts with design problems and projects. Students are exposed to the design and engineering of digital computers and subsystems.
Prerequisites: None
Co-requisites: None

EE 210 L: Digital Logic Systems Lab **1 (0-2-0)**
Laboratory experiments dealing with Digital Logic Systems.
Prerequisites: None
Co-requisites: EE 210

EE 301: Signals and Systems **3 (3-0-0)**
The course teaches fundamental concepts of signals and systems analysis, with applications drawn from filtering, audio and image processing, communications, and automatic control. The objective of the course is to allow students to develop a thorough understanding of time-domain and frequency domain approaches to the analysis of continuous and discrete systems. To provide students with necessary tools and techniques to analyze electrical networks and systems.
Prerequisites: EE 208, MAT 224
Co-requisites: None

EE 302: Communications Theory **3 (3-0-0)**
The course teaches communication systems and information theory. Topics covered include the classification of signals and systems, Fourier series and transform applications, power spectra and spectral density, band-limited signals and noise, sampling theory and digital transmission, modulation techniques and pulse code modulation.
Prerequisites: EE 301, STA 212
Co-requisites: None

EE 302 L: Communications Theory Lab **1 (0-2-0)**
Laboratory experiments dealing with Communications Theory.
Prerequisites: None
Co-requisites: EE 302

EE 303: Introduction to Electronics **3 (3-0-0)**
The course teaches the fundamentals of electronic circuits, including diode characteristics and diode circuits, transistors and applications, switches and MOS transistors, amplifiers, energy storage elements, digital circuits and applications. Design and laboratory exercises are also significant components of the course.
Prerequisites: EE 208
Co-requisites: None

EE 303 L: Introduction to Electronics Lab **1 (0-2-0)**
Laboratory experiments dealing with Introduction to Electronics.
Prerequisites: None
Co-requisites: EE 303

EE 304: Microelectronics **3 (3-0-0)**
This course teaches analog circuit analysis and design, including an introduction to the tools and methods necessary for the creative design of practical circuits using active devices.
Prerequisites: EE 303
Co-requisites: None

EE 304 L: Microelectronics Lab **1 (0-2-0)**
Laboratory experiments dealing with Microelectronics.
Prerequisites: None
Co-requisites: EE 304

EE 305: Computer Networks **3 (3-0-0)**
The course teaches the fundamental concepts of communication networks, and is concerned specifically with network architectures and protocols. The objective of the course is to allow students to develop a thorough understanding of the architectures of networks and the basic principles that allow the transmission of data over networks.
Prerequisites: SE 100, STA 212, EE 210 (or SE 223)
Co-requisites: None

EE 305 L: Computer Networks Lab **1 (0-2-0)**
Laboratory experiments dealing with Computer Networks.
Prerequisites: None
Co-requisites: EE 305

EE 306: Control and Feedback System Design **3 (3-0-0)**
The course teaches the analysis and synthesis of continuous and sampled-data linear feedback control systems, and its application to a variety of physical systems
Prerequisites: EE 301
Co-requisites: None

EE 306 L: Control and Feedback System Design Lab **1 (0-2-0)**
Laboratory experiments dealing with Control and Feedback System Design.
Prerequisites: None
Co-requisites: EE 306

EE 307: Computer Architecture **3 (3-0-0)**
The course introduces the architecture of digital systems, with an emphasis on the structural principles common to a wide range of computer technologies. Multilevel implementation strategies, the definition of new primitives (e.g., gates, instructions, procedures, and processes) and their mechanization using lower-level elements, the organization and operation of digital computers and the hardware/software interface are addressed.
Prerequisites: SE 100, EE 210 (or SE 223)
Co-requisites: None

EE 307 L: Computer Architecture Lab **1 (0-2-0)**
Laboratory experiments dealing with Computer Architecture.
Prerequisites: None
Co-requisites: EE 307

EE 308: Electrical Energy Conversion **4 (3-2-0)**
The course teaches the basic concepts of electrical machines and power semiconductor converters and their application within modern power systems.
Prerequisites: EE 209
Co-requisites: None

EE 308 L: Electrical Energy Conversion Lab **1 (0-2-0)**
Laboratory experiments dealing with Electrical Energy Conversion.
Prerequisites: None
Co-requisites: EE 308

EE405: Electric Power Systems **3 (3-0-0)**

The course teaches the components, analysis, and modeling of large scale electric power systems. This includes the review of single and three phase circuit variables and parameters and the per unit system. The components of the system are studied including the transformers and the transmission line parameters. In addition, the operation in terms of modeling and analysis of electric power systems is studied in steady state and transient state, with a particular focus on power flow solution methods. Case studies are introduced to prepare for more advanced topics. A project accompanies the course to introduce practical aspects of measurements and operation, with simulations addressing large scale problems.

Prerequisites: EE 308, MAT 224

Co-requisites: None

EE 413: Digital Communications **3 (3-0-0)**

The course teaches the principles of digital communication systems. Topics include sampling, quantization and encoding of analog signals, pulse code modulation (PCM), delta modulation (DM), noise analysis in PCM and DM systems, base-band digital systems (matched filter, probability of error, inter-symbol interference, equalization, distortionless transmission, and M-ary transmission), line codes and their power spectra, pass-band digital systems (ASK, FSK PSK, DPSK, and M-ary), bandwidth and power requirements of modulation schemes, coherent and non-coherent detection, error rate analysis, and introduction to information theory.

Prerequisites: EE 302

Co-requisites: None

EE 413 L: Digital Communications Lab **1 (0-2-0)**

Laboratory experiments dealing with Digital Communications.

Prerequisites: None

Co-requisites: EE 413

EE 495: Electrical Engineering Capstone Project I **3 (0-6-0)**

Students work in teams as professional engineering consultants on an independent engineering project under the supervision of a project advisor. The design process is emphasized, encompassing project definition, feasibility analysis, evaluation of alternative designs, and design computations. For each project, the scope of work is developed and negotiated between client and student consultants. The scope of work may also include fabrication, device testing, and field-testing. Projects are arranged by the students with approval of the instructor. The design and methodology are emphasized in part 1. Progress reports and an end of term report are submitted to the project advisor with an oral presentation of the design and methodology of the project.

Prerequisites: EE 306

Co-requisites: None

EE 496: Electrical Engineering Capstone Project II **3 (0-6-0)**

The students work on the implementation and validation of the designs developed in part 1. A demonstration is presented, and a final written report is submitted to the project advisor. Oral presentations of reports are made before the faculty and students. A student who selects a project suggested by the industry has the opportunity of working with an industry sponsor.

Prerequisites: EE 495

Co-requisites: None

EE 499: Ethics and Professional Development **1 (1-0-0)**
The course integrates modules covering ethics, career and professional development, along with preparations for the Jahiziyah / Saudi Engineering Council Exams. The course also introduces professional ethics and compares them with personal ethics and common morality. Professional ethics will be studied within the engineering context where differentiation between Ethics, Morals and the Laws will be discussed. Typical Ethical issues that engineers face such as safety, health, confidentiality and conflict of interest will be covered. The course will also cover professional development lecture series for the students to introduce them to topics and applications related to Electrical Engineering and the job market, as well as trends in the local and international economies.
Prerequisites: None
Co-requisites: None

Elective Courses

EE 401 Special Topics in Electrical Engineering **3 (3-0-0)**
This course provides instruction and experience in timely topics related to Electrical Engineering major.
Prerequisites: EE 306
Co-requisites: None

EE 402: Introduction to Wireless Networks **3 (3-0-0)**
The course surveys the various types of wireless communications, the protocols involved and the design issues that nature and engineering impose upon the telecommunications engineer. Specifically, the course covers wireless network architectures including cellular networks, local area networks, multi-hop wireless networks such as ad hoc networks, mesh networks, and sensor networks; capacity of wireless networks; medium access control, routing protocols, and transport protocols for wireless networks; mechanisms to improve performance and security in wireless networks; energy-efficient protocols for sensor networks.
Prerequisites: EE 305
Co-requisites: None

EE 403: Wireless Communications **3 (3-0-0)**
The course teaches wireless communications for voice, data, and multimedia. Topics include wireless systems and standards, characteristics of the wireless channel, including path loss for different environments, random log-normal shadowing due to signal attenuation, and the flat and frequency-selective properties of multipath fading.
Prerequisites: EE 413
Co-requisites: None

EE 404: Data Engineering in Electrical Systems **3 (3-0-0)**
The course introduces students to data engineering and science (DES) techniques, with a focus on application to substantive (i.e. "applied") engineering problems. Students will gain experience in identifying which problems can be tackled by DES methods, and learn to identify which specific DES methods are applicable to a problem at hand.
Prerequisites: EE 301
Co-requisites: None

EE 406: Digital Electronics **3 (3-0-0)**
This course aims to familiarize students with the basic concepts and mechanisms of operation and design of digital electronic circuits, both discrete and integrated. Topics covered include an overview of MOS and BJT types, structures and operation, digital logic inverters (voltage transfer characteristic, digital integrated circuit technologies and logic-circuit families), CMOS inverters (dynamic operation of the CMOS inverter, inverter sizing, power dissipation), logic-gate circuits (NOR, NAND, XOR), propagation delay analysis, pseudo-NMOS logic circuits, gate circuits, pass-transistor logic circuits (NMOS transistors as switches, CMOS transmission gates as switches), dynamic MOS logic circuits (Emitter-coupled logic (ECL) and families), BiCMOS inverters and logic gates, latches, flip-flop circuits, multivibrators, and an overview of memory circuits types and architectures, and A/D and D/A converters.
Prerequisites: EE 304
Co-requisites: None

EE 408: Communication Electronics **3 (3-0-0)**
This course is designed for senior-level undergraduate students in Electrical Engineering. It builds upon perquisite courses on signal and systems, communications, control systems, and electronics to further enhance the understanding of communication circuits operation and physical implementation. The course focuses on the field of communication electronics at levels from block diagram to circuit analysis for physical implementation. It aims to cover topics as radio frequency amplifiers, oscillators, signal spectra, noise, modulation and AM systems, transmitter and receiver circuits, sideband systems, frequency and phase modulation, phase-locked loops, and pulse and digital modulation.
Prerequisites: EE 304
Co-requisites: None

EE 410: Cyber Physical Systems **3 (3-0-0)**
This course takes on an updated view of electrical engineering systems, especially in light of the their increasing predominant cyber-physical nature. It offers a review of modeling physical systems, including electrical, mechanical, thermal and fluid. It also covers notions such as hybrid (continuous-discrete) and applied control theory. Modeling computational (cyber) aspects of modern systems is then discussed, along with relevant considerations including communications, aggregate control, and connected sensing and actuation.
Prerequisites: EE 306
Co-requisites: None

EE 411: Internet of Things **3 (3-0-0)**
This course introduces the principles, technologies, challenges, and required expertise needed for building the Internet of Things (IoT) solutions. It provides a big picture of what is involved in IoT. Topics covered in this course include analog and digital sensing, interfacing sensors with microcontrollers, digital communication protocols, microcontroller choices and capabilities, gateways, fog computing, networking, cloud computing, need and challenges for cryptography and compression, security issues, and low power/energy challenges. The course involves a hands-on-experience that culminates in an implementation project.
Prerequisites: EE 305
Co-requisites: None

EE 412: Nanoelectronics **3 (3-0-0)**
The course teaches an introduction to the electronic properties of molecules, carbon nanotubes, crystals and other nanodevices.
Prerequisites: EE 304
Co-requisites: None

EE 414 Foundations of Robotics 3 (3-0-0)
This course provides an introduction to robotics, focusing on foundational concepts such as modeling, control, perception, and planning. Emphasis is placed on the integration of sensors, actuators, and control algorithms to design and analyze robotic systems, with applications in automation, manufacturing, and autonomous navigation.
Pre-requisites: EE 306
Co-requisites: none

EE 415 Industrial Robotics 3 (3-0-0)
This course covers the principles and applications of industrial robotic manipulators used in automation and manufacturing. Topics include dynamics, forward and inverse kinematics, trajectory generation, and programming with ROS-Industrial and other simulation software. Students study industrial safety, precision actuation, and end-effector integration. Practical labs focus on motion control, sensor feedback, and real-world automation tasks, preparing students to design and deploy robotic arms for manufacturing, assembly, and collaborative robotic systems.
Pre-requisites: EE 306
Co-requisites: none

EE 416 Unmanned Aerial Vehicles and Drones 3 (3-0-0)
This course provides an overview of unmanned aerial vehicle design, flight dynamics, control systems, and autonomous mission planning. Students implement stabilization, navigation, and obstacle avoidance using modern UAV flight-control and robotics middleware frameworks. The course examines aerial mapping, inspection, and delivery applications, and introduces intelligent mission reasoning alongside regulatory and safety frameworks governing civilian and research UAV operations. Emphasis is placed on the safe, intelligent, and ethical deployment of aerial robotic systems.
Pre-requisites: EE 306
Co-requisites: none

EE 417: Digital Signal Processing 3 (3-0-0)
This course presents an introduction to the techniques and algorithms of digital processing for signals and information data. It is designed for senior-level undergraduate students in electrical and computer engineering. The theory and practice covered in this course can be applied in wide range of science fields, such as image processing, communications, satellite systems, biomedical, power and electronic devices, and programmable units. The proposed content covers a review of discrete-time sequences and systems, sampling of continuous-time signals and aliasing effect, discrete Fourier transform: properties and applications; fast Fourier transform (FFT): implementation and computations, finite impulse response (FIR) filters design and analysis: low-pass, band pass, high pass, phase response etc., and infinite impulse response (IIR) filters design methods and cascaded structures. The course involves extensive software and programming experience to enrich the understanding of the covered material.
Prerequisites: EE 301
Co-requisites: None

EE 418: Digital Image Processing 3 (3-0-0)
The course teaches an introduction to image processing and its applications, including the fundamental concepts of visual perception and image acquisition, the basic techniques of image manipulation, segmentation and coding, and a preliminary understanding of pattern recognition and computer vision.
Prerequisites: EE 301
Co-requisites: None

EE 420: Power Electronics **3 (3-0-0)**
The course teaches the principles of designing power electronic circuits. Power electronics design has applications in several fields from motor drives to consumer electronics to electric power transmission over HVDC lines. Therefore, the course reviews the fundamentals before covering generic power electronic circuit topologies. This entails a review of the switching devices, e.g., diodes, thyristors, BJTs, and the review of the fundamentals of electric circuit design and magnetism. Building on the fundamentals, the course covers AC to DC, DC to DC, DC to AC, and AC to AC electric power conversion topologies. The lab component is simultaneously administered to offer a practical perspective including the selection of components vis-à-vis the application, the instrumentation. In addition, the lab goes over the prototyping and testing aspects of power electronic circuit design.
Prerequisites: EE 304
Co-requisites: None

EE 422: Antennas and Wave Propagation **3 (3-0-0)**
This course introduces the characteristics of electromagnetic waves and their behavior during the propagation through different media. The wave equation is derived using the Maxwell's equations for time varying fields. The electromagnetic wave propagation in different media as well as their reflection at normal and oblique angle of incidence is discussed. The concept of transmission line theory and its parameters, smith chart and its application are introduced. Waveguide and TM & TE modes are discussed. In addition the course includes Antenna characteristics, antenna types such as dipole, loop and antenna array.
Prerequisites: EE 209
Co-requisites: None

EE 423: Optical Fiber Communication Systems **3 (3-0-0)**
The course teaches the introduction to the optical fiber communications. Topics discusses dielectric slab waveguide, step-index and graded-index optical fibers, single mode and multimode fiber, attenuation and dispersion, light sources (LED and Laser diode), optical modulation and detection, noise modeling in optical receivers, and error rate analysis.
Prerequisites: EE 422
Co-requisites: None

EE 424: Optoelectronics **3 (3-0-0)**
The course teaches semiconductor light sources, such as different types of LEDs, Lasers (both gas and solid states), modulation techniques, photodetectors, PIN diode, avalanche Photo Diode (APD), the basics of optical waveguides and the principles of fiber optics
Prerequisites: EE 304
Co-requisites: None

EE 425: Microwave Engineering **3 (3-0-0)**
The course teaches the fundamentals of Microwave Engineering. Topics include a review of electromagnetics theory, and discuss transmission lines and waveguides, microwave network analysis, impedance matching, passive microwave devices (power dividers and directional couplers), strip-line and micro-strip line circuits, microwave filters, and introduction to ferrimagnetic materials and components.
Prerequisites: EE 422
Co-requisites: None

EE 426: Renewable Energy **3 (3-0-0)**

This course covers fundamentals of renewable energy systems, Solar energy, Bio-energy, Wind energy, Hydro-power, Tidal power, Wave energy and Geothermal energy. Also integration of renewable energy systems will be covered in the course. The students will be exposed to technical aspects of mentioned topics; How to utilize renewable energy for domestic and industrial applications; requirements and obstacles of applications; how to integrate renewable energy systems.

Prerequisites: EE 405

Co-requisites: None

EE 427: Digital Control **3 (3-0-0)**

The course discusses digital control designs and methodologies for dynamic systems. It describes classical and state-space control methods, and applies them to selected applications. The course explores the advantages and limitations of each method, offers an overview of feedback control systems, and proposes to cover selected topics on multivariable and optimal control methods. The course involves Matlab experience to improve the understanding of the covered design methods. The topics include a review of continuous control (feedback, root locus, frequency response design, compensation, state-space design), basic digital control (digitization, sampling, PID), discrete systems (linear difference equations, z-transform, spectrum, block diagrams), discrete equivalents (design via numerical integration, zero-pole matching), transform techniques (root locus in z-plane, frequency response), state-space approaches (regulator design, integral control and disturbance estimation, controllability and observability), and an introduction to multivariable and optimal control (time-varying and LQR steady-state optimal control, multivariable design)

Prerequisites: EE 306

Co-requisites: None

EE 428: Modern Control Theory **3 (3-0-0)**

The course covers the fundamentals of Matrix Theory including eigenvalues and eigenvectors, and the matrix representations of the Diagonal, Jordan, Controllable, and Observable forms. The student learns to represent systems in terms of their state variables and state diagrams, and then solve for their response in the time domain. The focus of the course is on linear time invariant or LTI systems. Furthermore, the controllability and observability of the LTI system is studied, before covering the design of state feedback and output feedback control techniques. In addition, observer design is covered, with the separation principle, to construct observer-based control systems.

Prerequisites: EE 306

Co-requisites: None

EE 435: Undergraduate Research in Electrical Engineering **3 (0-6-0)**

Students participate in supervised research with a faculty member. Supervised research can be: 1) independent research undertaken by the student (thesis, independent study), or 2) assistance on a faculty member's research project. Students must find a faculty member who is willing to supervise him/her as an assistant on an existing project or as the author of an individual project. The student and the faculty supervisor will complete and sign a research contract which will be turned in to the chair of the Electrical Engineering Department. Drafting the contract will allow the student to develop ideas about what should be accomplished and what the faculty supervisor's expectations are. All academic requirements are at the discretion of the supervising faculty member. Students should agree on a plan for the semester with the faculty mentor before the research begins. The plan should include academic requirements, the basis for grading the experience, and a plan for student/professor meetings for the semester. It is the student's responsibility to report progress and seek guidance when needed. Students are expected to be active and reliable participants in the research experience.

Prerequisites: Department Chair approval, a GPA of at least 3.0/4.0, and a signed research contract.

EE 440: Machine Learning **3 (3-0-0)**
This course introduces machine learning and its applications in electrical engineering systems. It offers a review of relevant background in probability and background, and introduces general machine learning methods including supervised learning, unsupervised learning, and reinforcement learning. Applications instances in electrical engineering systems are discussed.
Prerequisites: EE 301
Co-requisites: None

EE 442: Intelligent Electrical Systems **3 (3-0-0)**
This course introduces the principles of intelligent systems with applications in electrical and cyber-physical domains. Topics include system modeling and dynamics, decision-making under uncertainty, adaptive and model-based approaches, multi-agent systems, robustness and safety, and ethics of intelligent systems. Emphasis is placed on mathematical foundations, electrical engineering applications, and integration of sensing, decision, and actuation.
Pre-requisites: EE 306
Co-requisites: none

EE 444: Artificial Intelligence **3 (3-0-0)**
The course teaches the theory and implementation of Artificial Intelligence through several state-of-the-art methods.
It is also cross listed with SE 444 Artificial Intelligence
Prerequisites: EE 306
Co-requisites: None

EE 481: Innovations and Entrepreneurship in Engineering **3 (3-0-0)**
This course guides engineers and scientists who want to create new products that that could become income-producing businesses for themselves and for investors. Students will learn to sharpen an idea and turn it into a product, conduct patent searches, complete a provisional patent application, and prepare a business plan from a business model.
Prerequisites: EE 306
Co-requisites: None

جامعة الفيصل
Alfaisal University

Alfaisal University
B.S. in Electrical Engineering
Study Plan Summary
Effective: Fall 2026

كلّية الهندسة
College of Engineering

Name:		ID#:	Email:
Advisor:		Starting Semester:	Expected Graduation:

4-Year Curriculum: 133 Credit Hours Total.

Freshman Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
CoE 100	Student Orientation & Academic Success	1		
SE 100	Programming for Engineers	3		
SE 100 L	Programming for Engineers Lab	1		
MAT 101	Calculus I	3		
PHU 103	Physics I	3		
PHU 103 L	Physics I Lab	1		
ENG 101	University Writing	3		
	Total	15		

Freshman Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
CHM 101	General Chemistry I	3		
CHM 101 L	General Chemistry I Lab	1		
MAT 112	Calculus II	3		
PHU 124	Physics II	3		
PHU 124 L	Physics II Lab	1		
AI 102	AI for Everyone: Foundation and Applications	3		
____	Arts & Humanities Elective I	3		
	Total	17		

Sophomore Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 207	Foundations of Electrical Engineering	3		
EE 207 L	Foundations of Electrical Engineering Lab	1		
MAT 211	Calculus III	3		
MAT 212	Linear Algebra	3		
MAT 213	Differential Equations	3		
ENG 222	Technical Writing	3		
	Total	16		

Sophomore Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 208	Electric Circuits	3		
EE 209	Applied Electromagnetics	3		
EE 210	Digital Logic Systems	3		
EE 210 L	Digital Logic Systems Lab	1		
MAT 224	Numerical Methods	3		
STA 212	Probability and Statistics	3		
____	Social Sciences Elective I	3		
	Total	19		

Junior Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 301	Signals and Systems	3		
EE 303	Intro to Electronics	3		
EE 303 L	Intro to Electronics Lab	1		
EE 305	Computer Networks	3		
EE 305 L	Computer Networks Lab	1		
EE 307	Computer Architecture	3		
EE 307 L	Computer Architecture Lab	1		
____	Social Sciences Elective II	3		
	Total	18		

Junior Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 302	Communications Theory	3		
EE 302 L	Communications Theory Lab	1		
EE 304	Microelectronics	3		
EE 304 L	Microelectronics Lab	1		
EE 306	Control and Feedback System Design	3		
EE 306 L	Control and Feedback System Design Lab	1		
EE 308	Electrical Energy Conversion	3		
EE 308 L	Electrical Energy Conversion Lab	1		
IE 315	Engineering Economy and Cost Analysis	3		
	Total	19		

Junior Year - Summer Semester

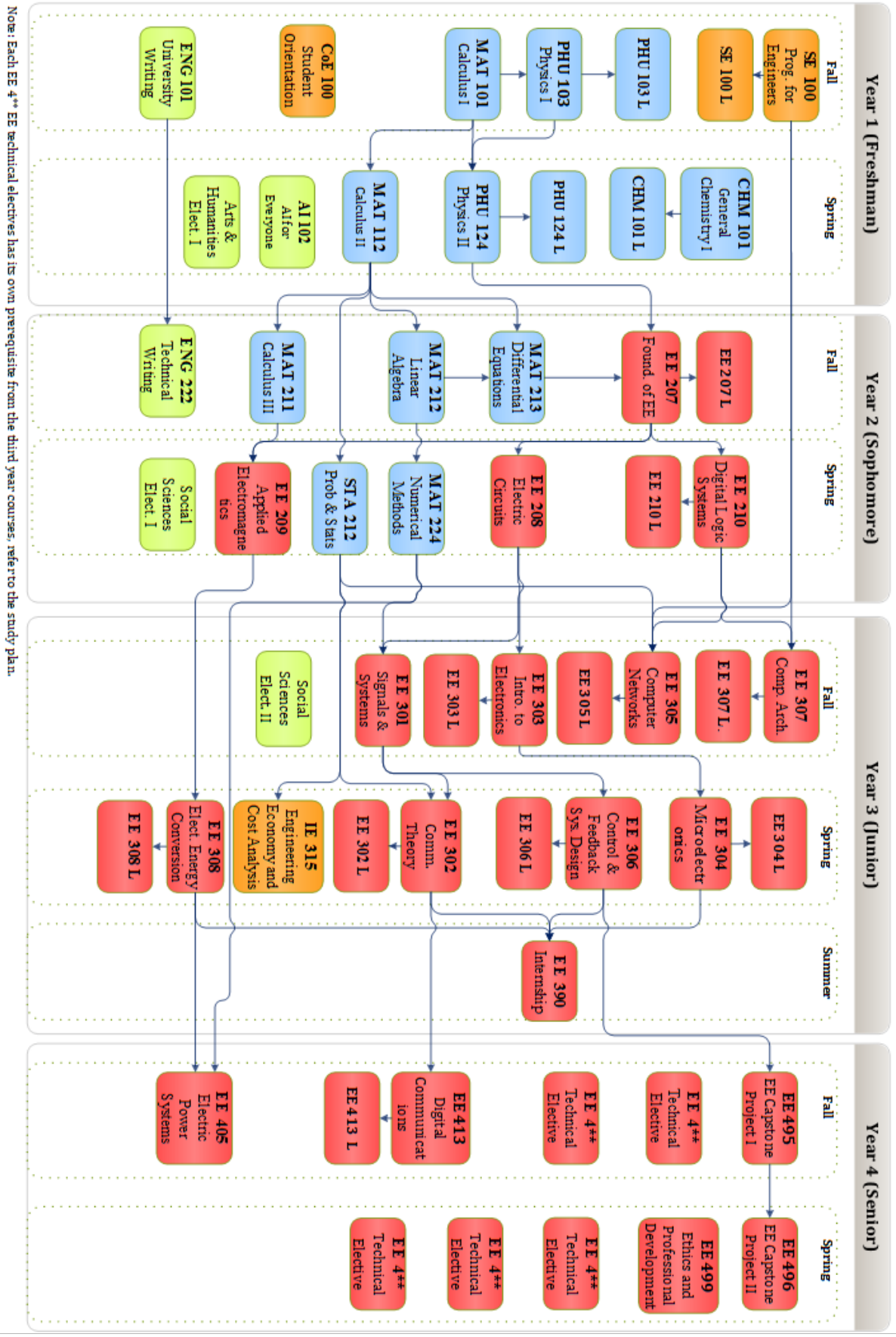
Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 390	Electrical Engineering Summer Internship	0		
	Total	0		

Senior Year - Fall Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 495	Electrical Engineering Capstone Project I	3		
EE 405	Electric Power Systems	3		
EE 413	Digital Communications	3		
EE 413 L	Digital Communications Lab	1		
4**TE	EE Elective	3		
4**TE	EE Elective	3		
	Total	16		

Senior Year - Spring Semester

Course Code	Course-Title	CRHs	Semester Taken	Retake/ Transfer
EE 496	Electrical Engineering Capstone Project II	3		
4**TE	EE Elective	3		
4**TE	EE Elective	3		
4**TE	EE Elective	3		
EE 499	Ethics and Professional Development	1		
	Total	13		



Note: Each EE 4** EE technical electives has its own prerequisite from the third year courses, refer to the study plan.