Electrical Engineering

Program
College of Engineering
Major

Bachelor of Electrical Engineering Study Plan

Fall (Year 1)

Item #	Title	Credits
SE 100	Programming for Engineers	3
SE 100 L	Programming for Engineers Lab	1
CHM 102	Introduction to Chemistry	3
CHM 102 L	Introduction to Chemistry lab	1
MAT 101	Calculus I	3
PHU 103	Mechanics and Waves for Engineers	3
PHU 103 L	Mechanics and Waves for Engineers Labs	1
ENG 101	Freshman English 1	3

Spring (Year 1)

Item #	Title	Credits
ME 201	Materials Science and Engineering	3
ME 201 L	Materials Science and Engineering Lab	1
MAT 112	Calculus II	3
PHU 124	Electromagnetism and Waves for Engineers	3
PHU 124 L	Electromagnetism and Waves for Engineers Labs	1
ARB 101	Arabic Language I	2
ENG 112	Freshman English II	3

Fall (Year 2)

Item #	Title	Credits
EE 207	Foundation of Electrical Engineering	3
EE 207 L	Foundation of Electrical Engineering Lab	1
MAT 211	Calculus III	3
MAT 212	Linear Algebra	3
MAT 213	Differential Equations	3
ISL 101	Islamic Studies I	2
ENG 222	Technical Writing	3

Spring (Year 2)

Item #	Title	Credits
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 for Engineers	3
ARB 112	Arabic Language II	2

Fall (Year 3)

Item #	Title	Credits
EE 301	Signals and Systems	3
EE 303	Introduction to Electronics	3
EE 303 L	Introduction 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
ISL 112	Islamic Studies II	2

Spring (Year 3)

Item #	Title	Credits
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

Summer Internship

Item #	Title	Credits
EE 390	Electrical Engineering Summer Internship	0

Fall (Year 4)

Item #	Title	Credits
EE 405	Electric Power Systems	3
EE 413	Digital Communications	3
EE 413 L	Digital Communications Lab	1
EE 495	Electrical Engineering Capstone Project I	3
	EE 4** - Technical Elective	3
	EE 4** - Technical Elective	3
	EE 4** L - Technical Elective Lab	1

Spring (Year 4)

Item #	Title	Credits
EE 496	Electrical Engineering Capstone Project II	3
	EE 4** - Technical Elective	3
	EE 4** - Technical Elective	3
	EE 4** L - Technical Elective Lab	1
	EE 4** - Technical Elective	3
	EE 4** L - Technical Elective Lab	1

Technical Electives

Item #	Title	Credits
EE 401	Special Topics in Electrical Engineering	3
EE 401 L	Special Topics in Electrical Engineering Lab	1
EE 402	Introduction to Wireless Networks	3
EE 403	Wireless Communications	3
EE 403 L	Wireless Communications Lab	1
EE 404	Data Engineering in Electrical Systems	3
EE 404 L	Data Engineering in Electrical Systems Lab	1
EE 406	Digital Electronics	3
EE 406 L	Digital Electronics Lab	1
EE 408	Communication Electronics	3
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 411	Internet of Things	3
EE 412	Nanoelectronics	3
EE 412 L	Nanoelectronics Lab	1
EE 417	Digital Signal Processing	3
EE 417 L	Digital Signal Processing Lab	1
EE 418	Digital Image Processing	3
EE 418 L	Digital Image Processing Lab	1
EE 420	Power Electronics	3
EE 420 L	Power Electronics Lab	1
EE 422	Antennas and Wave Propagation	3
EE 423	Optical Fiber Communication Systems	3
EE 424	Optoelectronics	3
EE 424 L	Optoelectronics Lab	1
EE 425	Microwave Engineering	3
EE 426	Renewable Energy	3
EE 427	Digital Control	3
EE 428	Modern Control Theory	3
EE 435	Undergraduate Research in Electrical Engineering	3
EE 440	Machine Learning	3
EE 440 L	Machine Learning Lab	1
EE 444	Artificial Intelligence	3
EE 481	Innovations and Entrepreneurship in Engineering	3

Electrical Engineering Tracks:

All EE students have the opportunity of selecting their electives in the fourth year according to their desired academic objective in consultation with their academic advisor. Regular, non-track students select any of the offered EE electives in the fourth year, specifically, three electives with a lab and two electives without a lab. Students also have the option to follow one of the three tracks in the program, namely, Robotics & AI, Renewable Energy, or Innovation & Entrepreneurial tracks.

Whether selecting the regular program or one of the three tracks, the total credits of these electives is 18 CRHs. All offered technical electives are available for regular non-track students, whether or not they are associated with a given track. In summary, all EE students follow the same curriculum and take the same required courses, with the difference being the designation of the electives in the fourth year. A regular non-track student would have the electives distribution in the fourth year as shown in the above listed study plan. Per standing policy, and with the approval of the department chair, a student may opt to take one of the 3 CRH technical electives from another engineering program.

Robotics & AI Track

Robots are automated machines that can assist humans in a variety of settings, from manufacturing processes, to working in critical conditions, unsuitable for human life. Robotics specialists aim to achieve diverse tasks by designing mechanical devices, able to complete them intelligently. Studying robotics, students will acquire information related to computer gadgetry, mobile robot programming, robotic motion methods, mathematical algorithms, social implications of technology, and more. Apart from learning specific scientific methods, graduates will gain skills that involve mathematical thinking but also artistic vision. Robotics will prepare specialists in competencies such as technology design, programming, repairing and installing equipment for machines, etc. Career paths in robotics cover a large subject palette, from medicine to engineering and IT. Robotics graduates usually engage in jobs as laboratory assistants, testing technicians, quality assurance staff, programmers, systems controllers, or researchers.

Track Course Requirements

In addition to completing the core course: **EE 306 + L – Control and Feedback System Design**, students should complete the following four courses.

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 411	Internet of Things	3
EE 440	Machine Learning	3
EE 440 L	Machine Learning Lab	1
EE 444	Artificial Intelligence	3

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

Track Plan

Fall (Year 4)

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
	EE 444 or SE 444	3

Spring (Year 4)

Item #	Title	Credits
EE 440	Machine Learning	3
EE 440 L	Machine Learning Lab	1
EE 411	Internet of Things	3
	EE 4** - Technical Elective	3
	EE 4** L - Technical Elective Lab	1

Renewable Energy Track

The Renewable Energy track offered at Alfaisal University is a specialization within electrical engineering concerning the generation of electrical power from a wide range of renewables. The track addresses the major topics related to power plant planning, theory and practical design of renewable and non-renewable sources, integration with the power grid, and engineering economy factors of design and deployment. Renewable energy resources covered include a wide array of established and experimental phase plants including solar, wind, hydro, tidal, wave, biomass and geothermal. This is in addition to energy storage technologies such as fuel cells and pumped hydro. The integration of these energy sources into the power grid with the power electronics theory and practice is also emphasized.

As well as having multiple technical and transferable skill competencies, graduates will gain strong analytical skills, and have the ability to lead complex design projects. Electrical renewable energy engineers have a wide range of employment opportunities across the power generation, conversion, distribution, and management sectors, including power utilities, factories, consultancy firms as well as the domestic markets where renewable energy systems are now commonly sought and deployed.

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:

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 420	Power Electronics	3
EE 420 L	Power Electronics Lab	1
EE 426	Renewable Energy	3
EE 426 L	Renewable Energy Lab	1
IE 450	Management for Engineers	3

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

Track Plan

Fall (Year 4)

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 420	Power Electronics	3
EE 420 L	Power Electronics Lab	1

Spring (Year 4)

Item #	Title	Credits
EE 426	Renewable Energy	3
EE 426 L	Renewable Energy Lab	1
IE 450	Management for Engineers	3
	EE 4** - Technical Elective	3

Innovation & Entrepreneurial Track

When it comes to pursuing a career in engineering, whether it is resources engineering, sustainable materials or even innovative recycling, specialist skills and knowledge are vital if you want to stand out compared to other job candidates. Much like every other industry in the world, the electrical engineering landscape is evolving at a rapid rate, and so the demand for engineers with an innovative and entrepreneurial mindset has never been greater. Innovation and entrepreneurship are key drivers in today's engineering world, and the push for sustainable products, services and technologies is needed now more than ever.

Electrical Engineers work to improve society, and not just for the benefit of the local community, but the planet as a whole. Over the last few years, there has been a rise in developing sustainable innovative solutions, from e-mobility and new battery technologies for greener, more sustainable cities, to communications and robotics for a digital industry 4.0. Without innovation in these areas, modern life would not be possible. With this track, you will develop your expertise in Innovation and entrepreneurship; adding to this your in-depth engineering know-how and you will be well on your way to a career in research, industrial innovation, or even starting up your own business.

Track Course Requirements

In addition to completing the core course: **IE 315 – Engineering Economy and Cost Analysis**, students should complete the following four courses as technical electives:

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 440	Machine Learning	3
EE 440 L	Machine Learning Lab	1
EE 481	Innovations and Entrepreneurship in Engineering	3
IE 450	Management for Engineers	3

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

Track Plan

Fall (Year 4)

Item #	Title	Credits
EE 410	Cyber Physical Systems	3
EE 410 L	Cyber Physical Systems Lab	1
EE 481	Innovations and Entrepreneurship in Engineering	3

Spring (Year 4)

Item #	Title	Credits
IE 450	Management for Engineers	3
EE 440	Machine Learning	3
EE 440 L	Machine Learning Lab	1
	EE 4** - Technical Elective	3
	EE 4** L - Technical Elective Lab	1