



جامعة الأمير محمد بن فهد
PRINCE MOHAMMAD BIN FAHD UNIVERSITY

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Electrical Engineering Catalog

Students CATALOG 2009-2011



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Prince Mohammad Bin Fahd University

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COLLEGE OVERVIEW

The College of Engineering accepts successful male students from PMU's Preparatory Program or other qualified male students into electrical engineering degree.

While students completing electrical engineering degrees at PMU could certainly continue on to graduate studies, the main emphasis in the engineering programs is on the preparation of graduates for employment.

Vision and Mission

Vision

The College of Engineering at PMU offers a unique and distinguished education that prepares future leaders and innovators in the electrical engineering. The education process will explore innovative methodologies and technologies to achieve its objectives.

Mission

PMU's Electrical engineering will educate tomorrow's engineering leaders and innovators, will create new knowledge, will provide a nurturing environment of team work and lifelong learning, and will positively impact the economic prosperity of the Kingdom of Saudi Arabia.

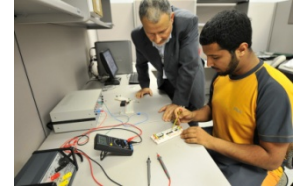
ADMISSIONS PROCESS AND REQUIREMENTS

Admission to studies in the departments of Electrical Engineering is open to male students who have completed the PMU Preparatory Program or who have met the university criteria for bypassing the program. Please visit our admission website to obtain more information or

<http://www.pmu.edu.sa/downloads/Student/Web%20Admission%20Guide%20v2.1.pdf>

Required Courses in the Preparatory Program

The PMU Preparatory Program concentrates on English language, mathematics, and study skills. Within this program, the first semester math course, PRPM 0011: Introductory Algebra, is required of all students. However, during the second semester of mathematics, students have a choice of two tracks, either Power Systems or Telecommunications Systems.



Students required to take PRPM 0022: Pre-Calculus, during the second semester of the Preparatory Program.



PERFORMANCE EXPECTATIONS

Required Grade Average

The Electrical Engineering Department provides for minimum standards of academic performance from its students. Using a 4.0 scale for course grades, the Electrical Engineering Department will require that students maintain minimum grades of:

- 2.0 in courses from the PMU Core Curriculum
- 2.0 in all degree-specific courses (courses from the Core Curriculum that engineering students must take beyond the minimum requirement)
- 2.25 in all courses required in the College of Engineering that are common to all engineering majors
- 2.5 in all courses within the major academic discipline

All PMU students are required to pass an internationally-normed subject content exam.

A student who receives a D (1.0) or F (0.0) in any course will be required to repeat the course and to achieve the required grade point score. In the case of an elective, another elective may be selected. These students will be required to participate in tutoring and remediation programs offered by the college faculty and the PMU Learning Resources Center.

COMPONENTS OF DEGREE PROGRAMS

Electrical engineering degree program in PMU's College of Engineering consists of a 139 semester credit hours. The electrical engineering program is divided into five major components:

General Education Requirements:

These requirements for the University Core Curriculum and College Core Curriculum include 60 credit hours of courses in the PMU core competencies, communication, Arabic Language and Islamic Studies, physical education, mathematics, laboratory science, and social and behavioral sciences.

Additional Core Curriculum Requirements: These requirements include courses in mathematics and laboratory science in addition to the Core Curriculum requirements. These requirements add 6 credit hours beyond the 60 hour minimum for a total of 66 hours from the Core Curriculum.

Specifically, engineering degree programs extend PMU's College Core requirement of six semester credit hours of mathematics to 14 hours, and specify that the courses will be:

MATH 1422: Calculus I
 MATH 1423: Calculus II
 MATH 1324: Calculus III
 MATH 2332: Differential Equations

University Core Curriculum requires eight semester hours of Natural and Physical Science. Engineering degree programs extend PMU's College Core requirements in Natural and Physical Sciences from eight semester credit hours to 12 hours and specify that the courses will be:

CHEM 1421: Chemistry for Engineers I
 PHYS 1421: Physics for Engineers I
 PHYS 1422: Physics for Engineers II

College of Engineering Requirements:

These requirements consist of seven courses totaling 19 credit hours that are common to all engineering degree programs in the College of Engineering. They represent a base of knowledge that is presumed for all engineers. The courses within the College of Engineering that meet these requirements are designated with the prefix GEEN. These courses include the following:

GEEN 1211: Introduction to Engineering
 GEEN 2311: Statics and Dynamics of Rigid Bodies I
 GEEN 2312: Introduction to Computing
 GEEN 2313: Thermodynamics I
 GEEN 2314: Circuits I
 GEEN 3211: Engineering Economy
 GEEN 3311: Introduction to Fluid Mechanics

Degree Program Requirements: Each degree program has unique course requirements that apply to the degree major and that also differentiate the program from other majors within the college.

Electives:

Each degree program identifies the available electives and any constraints that will apply to the selection and scheduling of electives.

Capstone Series – Electrical Engineering

PMU's Core Curriculum includes a series of three required assessment courses. The series begins in the sophomore year with ASSE 2111: Learning Outcome Assessment I and continues in the junior year with ASSE 3211: Learning Outcome Assessment II. The series culminates in the senior year with a final capstone design course, ASSE 4311: Learning Outcome Assessment III.

The electrical engineering programs in the College of Engineering treat the final capstone course as a group of three engineering courses that will integrate conceptual material and practical experience in an environment of professional-grade engineering design. The electrical engineering capstone course group is structured as follows:

GEEN 3211: Engineering Economy
 EEEN 4311: Design Methodology and Project Management
 ASSE 4311: Learning Outcome Assessment III

Courses Required For Electrical Engineering

The Bachelor of Science in Electrical Engineering consists of four components totaling 139 credit hours:

Expanded PMU Core Curriculum:

This expanded core curriculum consists of 66 hours of coursework.

The College of Engineering Requirements:

These requirements consist of 19 hours of coursework contained in the seven courses designated with the GEEN prefix.

Degree Program Requirements:

These requirements consist of 45 hours of course work in electrical engineering as follows:

EEEN 2111: Circuits I Lab

EEEN 3301 internship
EEEN 3312: Circuits II
EEEN 3331: Digital Systems
EEEN 3341: Signals and Systems
EEEN 3361: Electromagnetic Fields and Waves
EEEN 3391: Probability and Random Signal Analysis
EEEN 3421: Electronics I
EEEN 3422: Electronics II
EEEN 4311: Design Methodology and Project Management
EEEN 4321 Sensors and Instrumentation
EEEN 4331: Microprocessors
EEEN 4351: Automatic Control Systems
EEEN 4361: Electric Machinery
EEEN 4391: Advanced Applied Mathematics

Degree Electives:

The Electrical Engineering Degree Program requires 9 semester credit hours of electives to be taken from six 4000 level courses composed of two options, in Electrical Power Systems and in Telecommunications Systems.

The Electrical Power Systems Option consists of three courses:

EEEN 4371: Electric Power Systems
EEEN 4372: Electric Power Transmission and Distribution
MEEN 3333: Heat Transfer

The Telecommunications Systems Option consists of three courses:

EEEN 4341: Communication Systems
EEEN 4342: Digital Communication Systems
EEEN 4343: Wireless Communication Systems

Electrical Engineering Study Plan

Total Semester Credit Hours: 139

Freshman Program

First Semester

		<i>Hours</i>
COMM 1311	Written Communication	3
ALIS 1211	Arabic / Islamic Studies	2
PHED 1111	Physical Education	1
UNIV 1211	Prof. Development and Competencies	2
MATH 1422	Calculus I	4
CHEM 1421	Chemistry for Engineers I	4
GEEN 1211	Introduction to Engineering	2
	Total	18

Second Semester

		<i>Hours</i>
COMM 1312	Writing and Research	3
ALIS 1212	Arabic / Islamic Studies	2
PHED 1112	Physical Education	1
UNIV 1212	Critical Thinking and Problem Solving	2
MATH 1423	Calculus II	4
PHYS 1421	Physics for Engineers I	4
XXXX ****	Social Science Elective*	3
	Total	19

*Select any Social Science course from the College Core Curriculum

Sophomore Program

First Semester

		<i>Hours</i>
COMM 2311	Oral Communication	3
ALIS 2211	Arabic / Islamic Studies	2
UNIV 1213	Leadership and Teamwork	2
ASSE 2111	Learning Outcome Assessment I	1
MATH 1324	Calculus III	3
PHYS 1422	Physics for Engineers II	4
GEEN 2311	Statics and Dynamics I	3
	Total	18

Second Semester

		<i>Hours</i>
COMM 2312	Tech and Professional Communications	3
ALIS 2212	Arabic / Islamic Studies	2
GEEN 2313	Thermodynamics I	3
GEEN 2312	Introduction to Computing	3
MATH 2332	Differential Equations	3
GEEN 2314	Circuits I	3
EEEN 2111	Circuits I Lab	1
	Total	18

Junior Program***First Semester***

		<i>Hours</i>
ASSE 3211	Learning Outcome Assessment II	2
EEEN 3312	Circuits II	3
EEEN 3421	Electronics I	4
EEEN 3331	Digital Systems	3
GEEN 3311	Introduction to Fluid Mechanics	3
	<i>Total</i>	<i>15</i>

Second Semester

		<i>Hours</i>
GEEN 3211	Engineering Economy	2
EEEN 3391	Probability and Random Signal Analysis	3
EEEN 3341	Signals and Systems	3
EEEN 3361	Electromagnetic Fields and Waves	3
EEEN 3422	Electronics II	4
	<i>Total</i>	<i>15</i>

SUMMER (Junior Year): EEEN 3301 Internship 3 Credits

Senior Program***First Semester***

		<i>Hours</i>
EEEN 4391	Advanced Applied Mathematics	3
EEEN 4311	Design Methodology & Project Management	3
EEEN 4331	Microprocessors	3
EEEN 4361	Electric Machinery	3
EEEN 4321	Sensors and Instrumentation	3
EEE ****	EEEN Elective1**	3
	<i>Total</i>	<i>18</i>

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Second Semester

		<i>Hours</i>
ASSE 4311	Learning Assessment III	3
EEEN 4351	Automatic Control Systems	3
EEE ****	EEEN Elective2	3
EEE ****	EEEN Elective3	3
XXXX ****	Social Science Elective	3
	<i>Total</i>	<i>15</i>

****Select all electives from one group:

Group I - Electrical Power Systems: MEEN 3333: Heat Transfer, EEEN 4371: Electric Power Systems, and EEEN 4372: Electric Power Transmission and Distribution

Group II - Telecommunications Systems: EEEN 4341: Communication Systems, EEEN 4342: Digital Communication Systems, or EEEN 4343: Wireless Communication Systems

Electrical Engineering Annual Course Offerings

Core Courses*	Fall Courses	Spring Courses
<ul style="list-style-type: none"> • Circuits I and Lab • Digital Systems • Signals and Systems • Probability and random Signal Analysis 	<ul style="list-style-type: none"> • Circuits II • Electronics I • Advanced Applied Mathematics • Design Methodology and Project Management • Digital Communication (Elective) • Sensor and Instrumentations (Elective) • Wireless Communications (Elective) 	<ul style="list-style-type: none"> • Electronics II • Electromagnetic Fields and Waves. • Microprocessors • Control Systems • Assessments III • Electric Machinery • Communications (Elective) • Digital Signal Processing (Elective)

*: These courses will be offered every term.

Course Descriptions

Electrical Engineering – EEEN

EEEN 2111: Circuits I Lab - Also listed as COEN 2111: Circuits I Lab (0, 1) **This course covers experimental aspects of the topics covered in GEEN 2314: Circuits I. Topics include basic breadboarding techniques and circuit construction; use of multi-meters, oscilloscopes, power supplies, and function generators; DC and AC voltage and current measurement techniques; troubleshooting techniques; and comparison of experimental and simulated circuits.** Prerequisites: **MATH 1324: Calculus III, PHYS 1422: Physics for Engineers II. Completion of or concurrent registration for: MATH 2332: Differential Equations, GEEN 2314: Circuits I**

EEEN 3301 – Internship (3,0)

This is a senior year course aimed at developing field experience for electrical Engineering students. The completion of this course is achieved through internship in industry and other field experience organizations approved by the electrical Engineering Department. Students are expected to gain hands-on field experience in applied electrical engineering, engineering project management/execution and other engineering and business skills.

Prerequisites: completion of junior year.

EEEN 3312: Circuits II - Also listed as COEN 3312: Circuits II (2, 1) **This course is a continuation of GEEN 2314: Circuits I. Topics include a review of DC and AC circuit analysis techniques; complex numbers and phasors; use of phasors in the analysis of AC circuits; AC power concepts; polyphase circuits; magnetically coupled circuits; applications of Laplace and Fourier transforms in circuit analysis; s-domain circuit analysis; Bode plots; and filters.** Prerequisites: **MATH 2332: Differential Equations, GEEN 2314: Circuits I, EEEN 2111: Circuits I Lab**

EEEN 3331: Digital Systems - Also listed as COEN 3323: Digital Systems (2,1) **This course addresses the understanding and design of digital systems. Topics progress through Boolean algebra and logic gates; combinational logic; sequential logic and synchronous sequential logic systems; and design of logic circuits.** Prerequisites: **GEEN 2314: Circuits I, EEEN 2111: Circuits I Lab**

EEEN 3341: Signals and Systems - Also listed as COEN 3322: Signals and Systems (3, 0) **This course presents instruction in electrical signals and systems. Subject matter includes types of signals and systems, signal and system modeling, Fourier Series, Fourier Transform and applications, Laplace Transform and applications, state variable techniques, discrete time signals and systems.** Prerequisite: **EEEN 3312: Circuits II**

EEEN 3361: Electromagnetic Fields and Waves (3, 0) **This course presents a study of electromagnetic fields and their relationship to problem solving in engineering. The course of study begins with the development of an understanding of the basics, moves to integration of the basic knowledge, and proceeds to the ability to use that knowledge to solve electromagnetic field problems using analysis, modeling, and simulation.** Prerequisites: **PHYS 1422: Physics for Engineers II, MATH 1324: Calculus III**

EEEN 3391: Probability and Random Signal Analysis (3, 0) **This course covers probability, statistics, random variables, random signals, introduction to random processes, correlation functions and analysis of linear system response to random inputs and disturbances. Engineering applications to signal processing and linear system analysis also are included.** Prerequisite: **Concurrent registration in EEEN 3341: Signals and Systems**

EEEN 3421: Electronics I - Also listed as COEN 3421: Electronics I (3, 1) **This course is the first of two courses in the use of electronic devices in analog and digital circuits. The lecture component covers device physics and modeling of op-amps, diodes, FETs, and BJTs; single and multi-stage amplifiers; differential amplifiers; feedback; frequency response; and Bode plots. The laboratory component covers generation and acquisition of signals; current, voltage, and impedance measurements; transfer function measurement; and spectrum measurements and analysis. Prerequisites: GEEN 2314: Circuits I, EEEN 2111: Circuits I Lab. Completion or concurrent registration for: EEEN 3312: Circuits II**

EEEN 3422: Electronics II (3, 1) **This course is the second of two courses in the use of electronic devices in analog and digital circuits. Its lecture component covers analysis and design of operational amplifier circuits, D/A and A/D conversion, CMOS logic circuits, filters, oscillators and multi-vibrator circuits, power amplifiers, and pulse and switching circuits. The laboratory component covers the design and analysis of electronic circuits for digital and analog applications to a set of prescribed criteria. Prerequisite: EEEN 3421: Electronics I**

EEEN 4311: Design Methodology and Project Management (3, 0) **This course presents an overview of engineering design designed to prepare students for ASSE 4311: Learning Outcome Assessment III, the final capstone course for engineering majors. Its subject matter is the entire product design process including project planning, quality function deployment, design specification, concept generation and selection, system and subsystem design, the role of engineering economics, the profession's codes and standards, and project management. Prerequisites: EEEN 3391: Probability and Random Signal Analysis, GEEN 3211: Engineering Economy**

EEEN 4321: Sensors and Instrumentation (2,3)

The course provides senior students in Electrical Engineering a hands-on introduction to the fundamental technology and practical application of sensors. Capacitive, inductive, optical, ultrasonic, and other sensing methods are examined. Instrumentation techniques incorporating computer control, sampling, and data collection and analysis are reviewed in the context of real-world scenarios. Open-ended laboratory activities and required written documentation help to develop students' analytical and communication skills
Prerequisites: EEEN 3422: Electronics II

EEEN 4331: Microprocessors (2, 1) **This course presents the development of microprocessor systems with an introduction to assembly language programming. Instruction includes hardware-software interactions, programming techniques, and control of real-time hardware. Through the classes and labs, students are led to integrate knowledge into hands-on design and control applications. Prerequisite: EEEN 3331: Digital Systems**

EEEN 4341: Communication Systems (2, 1) **This course presents a study of telecommunications theory and practice. Students develop competency in information theory; signals; systems; and analog modulation; digital data transmission; and error correcting codes. Methods of instruction include lecture, class discussion, and out-of-class assignments. Prerequisites: EEEN 3341: Signals and Systems, EEEN 3391: Probability and Ransom Signal Analysis**

EEEN 4342: Digital Communication Systems (3,0) **This course presents an overview of the field of digital communications. The learning experiences provide students with grounding in the underlying basic theory of digital modulation and coding. Instruction in the course makes use of computer simulation and problem solving to encourage students' ability in practical applications. Prerequisite: EEEN 4341: Communication Systems**

EEEN 4343: Wireless Communication Systems (3, 0) **This course constitutes an introduction to wireless communications and networks. Students acquire an understanding of this technology's development and study transmission fundamentals, principles of operation, design, and issues current to the field.** Prerequisites: **EEEN 3361: Electromagnetic Fields and Waves, EEEN 4341: Communication Systems**

EEEN 4351: Automatic Control Systems (2, 1) **This course introduces automatic control systems. The elements of control systems are presented. Students progress through class activities and labs to apply knowledge through analysis and design of systems. The course includes mathematical modeling of systems.** Prerequisite: **EEEN 3312: Electric Circuits II**

EEEN 4361: Electric Machinery (2, 1) **This course addresses the principles of electrical transformers and machinery, their analysis and design. Instruction begins with the basics of magnetic circuits and transformers and progresses through the study of electrical machinery, with an introduction to electrical power systems analysis.** Prerequisites: **EEEN 3312: Electric Circuits II, EEEN 3361: Electromagnetic Fields and Waves**

EEEN 4371: Electric Power Systems (3, 0) **This course presents a study of electrical power systems, their analysis, operation, and design. Students are introduced to the fundamental concepts of the field. The class progresses through consideration of models to modern operations. Students consider issues and real-world problem analysis and solutions.** Prerequisites: **EEEN 4361: Electric Machinery, EEEN 4391: Advanced Applied Mathematics.** Concurrent registration in **EEEN 4372: Electric Power Transmission and Distribution**

EEEN 4372: Electric Power Transmission and Distribution (3, 0) **This course addresses the principles of electrical power transmission and distribution. It covers analysis and design of overhead and underground transmission lines; electric and magnetic field profiles; medium and low voltage distribution systems; transformer connections; faults and selection of protective equipment.** Prerequisites: **EEEN 3361: Electromagnetic Fields and Waves, EEEN 4391: Advanced Applied Mathematics.** Concurrent registration in **EEEN 4371: Electric Power Systems**

EEEN 4391: Advanced Applied Mathematics (3, 0) **This course covers engineering applications of ordinary and partial differential equations, Fourier and Laplace transforms, linear algebra; introduction to numerical analysis and complex variables. Mathematical modeling with applications to analysis and design of deterministic engineering systems also are included.** Prerequisites: **MATH 1324: Algebra III, MATH 2332: Differential Equations**

GEEN 3211: Engineering Economy (2, 0) This course teaches the basic principles and techniques of economic analysis and cost engineering. Applications are made to real engineering problems and processes. The use of economics in evaluating engineering designs is emphasized. **Prerequisite:** **GEEN 3311: Introduction to Fluid Mechanics**

GEEN 3311: Introduction to Fluid Mechanics (3, 0) This course introduces students to the concepts of fluid statics and fluid dynamics. Fluid statics refers to a fluid at rest and the forces which act on the fluid in that state. Fluid dynamics refers to a fluid in motion and the forces that act on the fluid in that state. **Prerequisite:** **GEEN 2313: Thermodynamics I**

Electrical Engineering General Courses

Course No.	Course Name	Credit Hours	Classroom Hours		Others
			Class	Lab	
GEEN 1211	Introduction to Engineering	2 (2,0)	2	0	
GEEN 2311	Statics and Dynamics of Rigid Bodies I	3 (3,0)	3	0	
GEEN 2312	Introduction to Computing	3 (3,0)	3	0	
GEEN 2313	Thermodynamics I	3 (3,0)	3	0	
GEEN 2314	Circuits I (also listed as COEN 2311: Circuits I)	3 (2,1)	2	0	Recitation session 1
GEEN 3211	Engineering Economy	2 (2,0)	2	0	
GEEN 3311	Introduction to Fluid Mechanics	3 (3,0)	3	0	
ASSE 4311	Learning Outcome Assessment III	3 (3,0)	3	0	

ELECTRICAL ENGINEERING COURSES

Course No.	Course Name	Credit Hours	Classroom Hours		Others
			Class	Lab	
EEEN 2111	Circuits I Lab (also listed as COEN 2111: Circuits I Lab)	1 (0,1)	0	3	
EEEN 3312	Circuits II (also listed as COEN 3312: Circuits II)	3 (2,1)	2	0	Recitation Session 2 hrs / week
EEEN 3331	Digital Systems (also listed as COEN 3323: Digital Systems)	3 (2,1)	2	3	
EEEN 3341	Signal and Systems (also listed as COEN 3322: Signals and Systems)	3 (3,0)	3		Project development Time each week as needed outside of class
EEEN 3361	Electromagnetic Fields and Waves	3 (3,0)	3	0	
EEEN 3391	Probability and Random Signal Analysis	3 (3,0)	3	0	
EEEN 3421	Electronics I (also listed as COEN 3421: Electronics I)	4 (3,1)	3	3	
EEEN 3422	Electronics II	4 (3,1)	3	3	
EEEN 4311	Design Methodology and Project Management	3 (3,0)	3	0	Team project development (outside of class)
EEEN 4321	Sensors and Instrumentations	3(2,3)	2	3	
EEEN 4331	Microprocessors	3 (2,1)	2	3	
EEEN 4341	Communication Systems	3 (2,1)	2	3	
EEEN 4342	Digital Communication Systems	3 (3,0)	3	0	
EEEN 4343	Wireless Communication Systems	3 (3,0)	3	0	

Course No.	Course Name	Credit Hours	Classroom Hours		Others
			Class	Lab	
EEEN 4351	Automatic Control Systems	3 (2,1)	2	3	
EEEN 4361	Electric Machinery	3 (2,1)	2	3	
EEEN 4371	Electric Power Systems	3 (3,0)	3	0	
EEEN 4372	Electric Power Transmission and Distribution	3 (3,0)	3	0	
EEEN 4391	Advanced Applied Mathematics	3 (3,0)	3	0	