

Electrical Engineering, B.S.E.E.

Degree Offered

- Bachelor of Science in Electrical Engineering (B.S.E.E.)

Nature of the Program

Electrical engineering is one of the most dynamic fields of engineering today. New technologies are under constant development and new industries are emerging as a result of the efforts of electrical engineers.

The Electrical Engineering curriculum provides a well-rounded education to meet the needs and challenges of our modern society. The student will receive a solid background in mathematics and science, as well as, a strong foundation in the major areas of electrical engineering (circuits and systems, computers, electronics, electromagnetic fields, controls, communications, electric machinery and power) supported by practical-oriented laboratory assignments. The student can pursue special areas of interest through several elective courses. The student will be well prepared to be successful in the workforce and be productive.

One of the key features of engineering that sets it apart from other disciplines is design. Design is the creative process of putting ideas, components, and systems together to develop solutions to problems and needs. The curriculum encourages design-oriented thinking at a fundamental level and culminates in the capstone senior design course sequence in which many factors such as technical, economic, environmental, ethical and legal, health and safety, manufacturability, political, social, sustainability, and realistic standards are considered.

The ability of the engineer to communicate in writing and speech is very important as the modern engineer is expected to express technical concepts and defend technical decisions in front of non-technical people. Therefore, courses in English, social science, and the humanities are vital in the Electrical Engineering curriculum.

Educational Objectives

After graduation, students will accomplish one or more of the following objectives:

- **Professional Practice:** Electrical engineering graduates will be successful in professional practice in engineering.
- **Post-graduate Education:** Electrical engineering graduates will be successful in pursuing advanced education.
- **Advancement:** Electrical engineering graduates will successfully advance in their careers.

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef/>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
General Education Foundations		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Curriculum Requirements

Code	Title	Hours
	University Requirements	16
	Program Requirements	6
	Math and Science Requirements	34
	Electrical Engineering Major Requirements	68
Total Hours		124

University Requirements

Code	Title	Hours
	General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)	
	Outstanding GEF Requirements 1, 5, 6, and 7	15
WVUE 191	First Year Seminar	1
Total Hours		16

An overall 2.0 Professional GPA is required. Professional GPA includes ENGL 305 and all Math, Science and Engineering Major courses.

Program Requirements

Code	Title	Hours
ECON 401	Managerial Economics (GEF 4)	3
WRIT 305	Technical Writing	3
Total Hours		6

Math and Science Requirements

Code	Title	Hours
MATH 155	Calculus 1 (GEF 3)	4
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4
MATH 441	Applied Linear Algebra	3
MATH 448	Probability and Statistics	3
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 8)	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 2)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
Total Hours		34

Electrical Engineering Major Requirements

Code	Title	Hours
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory	4
CPE 320 & CPE 321	Microprocessor Systems and Microprocessor Systems Laboratory	4
CS 112	Computer Science - Engineers 1	3
EE 101	Introduction to Electrical and Computer Engineering	1
EE 200	Software Tools	2
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
EE 223 & 223L	Electrical Circuits and Electrical Circuits Laboratory	4

EE 311	Junior Instrumentation Lab	1
EE 327	Signals and Systems 1	3
EE 329	Signals and Systems 2	3
EE 335 & 335L	Electromechanical Energy Conversion and Systems and Electromechanical Energy Conversion and Systems Laboratory	4
EE 345	Engineering Electromagnetics	3
EE 365 & EE 366	Analog Electronics and Analog Electronics Laboratory	4
EE 411	Fundamentals of Control Systems	3
EE 412	Automatic Control Lab	1
EE 436	Power Systems Analysis	3
EE 461	Introduction to Communications Systems	3
EE 480	Capstone Project - Design	3
EE 481	Capstone Project - Implementation	3
EE 400	Community Service	0
EE/CPE Electives (Select two of the following):		6
CPE 421	Embedded Systems	
CPE 442	Introduction to Digital Computer Architecture	
CPE 450	Introduction to Microelectronics Circuits	
CPE 455	VLSI Design	
CPE 462	Wireless Networking	
CPE 493	Special Topics	
EE 405	Protective Relaying	
EE 413	Introduction to Digital Control	
EE 427	Introduction to Robotics	
EE 431	Electrical Power Distribution Systems	
EE 434	Alternative Energy Resources	
EE 435	Introduction to Power Electronics	
EE 437	Fiber Optics Communications	
EE 445	Introduction to Antennas	
EE 452	Network Synthesis	
EE 456	RF Design	
EE 463	Digital Signal Processing Fundamentals	
EE 493	Special Topics	
Technical Electives (See approved list)		6
Total Hours		68

Technical Electives

Code	Title	Hours
BIOL 230	Human Anatomy and Physiology 1	4
BIOL 231	Human Anatomy and Physiology 2	4
BIOL 233	Anatomy and Physiology	4
BIOL 240	Microbiology	4
BIOL 303	Genetics	4
CHEM 215	Introductory Analytical Chemistry	3
CHEM 233	Organic Chemistry 1	3
CHEM 233L	Organic Chemistry 1 Laboratory	1
CS 201	Data Structures	3
CS 222	Intro Software Engineering	3
CS 264	Data Base Management	3
CS 310	Principles of Programming Languages	3
CS 320	Analysis of Algorithms	3

CS 321	Introduction to Networking	3
CS 324	Database Management	3
CS 355	Computer Systems	3
CS 410	Compiler Construction	3
CS 450	Operating Systems Structure	4
CS 454	Cryptology	3
CS 456	Digital Image Processing	3
CS 470	Introduction to Computer Graphics	3
CS 472	Artificial Intelligence	3
CS 475	Game Development	3
CYBE 465	Cybersecurity Principles and Practice	3
MATH 341	Introduction to Algebraic Structures	3
MATH 378	Discrete Mathematics	3
MATH 381	Introduction to Analysis and Topology	3
MATH 420	Numerical Analysis 1	3
MATH 441	Applied Linear Algebra	3
MATH 448	Probability and Statistics	3
MATH 451	Introduction to Real Analysis 1	3
MATH 452	Introduction to Real Analysis 2	3
MATH 456	Complex Variables	3
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 320	Thermodynamics	3
MAE 321	Applied Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 407	Power Plant Engineering	3
PHYS 314	Introductory Modern Physics	4
Any CPE (Computer Engineering) Course		
Any EE (Electrical Engineering) Course		

Business Technical Electives

Code	Title	Hours
No more than one course (3 credits) can be used from this list.		
ACCT 201	Principles of Accounting 1	3
ACCT 202	Principles of Accounting 2	3
BCOR 350	Principles of Marketing	3
BCOR 360	Supply Chain Management	3
BCOR 370	Principles of Management	3
ENTR 201	Business Planning	3
FIN 310	Investments	3
FIN 321	Personal Finance	3
FIN 325	Financial Management 1	3
FIN 326	Financial Management 2	3
FIN 480	International Finance	3
MANG 310	Management of Small Business	3
MANG 350	Leadership In Business	3
MANG 422	Organizational Behavior	3
MKTG 315	Buyer Behavior	3
MKTG 325	Marketing Research	3
MKTG 485	Global Marketing	3

Suggested Plan of Study

First Year

Fall	Hours	Spring	Hours
ENGL 101 (GEF 1)		3 ENGL 102 (GEF 1)	3
MATH 155 (GEF 3)		4 MATH 156 (GEF 8)	4
CHEM 115 & 115L (GEF 8)		4 EE 101	1
CS 112		3 GEF 5	3
WVUE 191		1 GEF 6	3
		15	14

Second Year

Fall	Hours	Spring	Hours
MATH 251		4 MATH 261	4
PHYS 111 & 111L (GEF 2)		4 PHYS 112 & 112L (GEF 8)	4
EE 200		2 EE 223 & 223L	4
EE 221 & 221L		4 CPE 271 & 271L	4
GEF 7		3	
		17	16

Third Year

Fall	Hours	Spring	Hours
MATH 448		3 MATH 441	3
CPE 320 & CPE 321		4 WRIT 305	3
EE 327		3 EE 311	1
EE 345		3 EE 329	3
EE 365 & EE 366		4 EE 335 & 335L	4
		17	14

Fourth Year

Fall	Hours	Spring	Hours
EE 411 & EE 412		4 ECON 401	3
EE 436		3 EE 400	0
EE 461		3 EE 481	3
EE 480		3 EE/CPE Elective	3
EE/CPE Elective		3 Technical Elective	3
		Technical Elective	3
		16	15

Total credit hours: 124

Major Learning Outcomes

ELECTRICAL ENGINEERING

1. Problem Solving

Students will attain an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. Engineering Design

Students will attain an ability to 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. Effective Communication

Students will attain an ability to communicate effectively with a range of audiences.

4. Engineering Responsibilities

Students will attain an ability to 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. Teamwork

Students will attain an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. Engineering Experimentation

Students will attain an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. Learning

Students will attain an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.