

B.S. IN ELECTRICAL ENGINEERING

Overview

Electrical Engineering is concerned with the design, analysis and implementation of a variety of systems, components and devices, primarily of an electrical or electronic nature, which form the cornerstone of our complex and technologically oriented society. For example, this ranges from small-scale integrated electronics and photonics systems and devices, the technological drivers of the information technology revolution, to large-scale electrical power systems and power generators, which supply the nation's energy needs and form the basis for sustained economic growth. Furthermore, Electrical engineering also involves the design of micro and nano devices, integrated circuits, hardware, and large-scale systems for telecommunications and networking that engender our increasingly networked life. Therefore, electrical engineering is a vast and rich discipline involved in the design of systems, components, and devices for a variety of applications and areas such as portable electronics (e.g., cell phones), communications and networks, biomedical sensing and medical systems, energy harvesting, next generation displays, lasers, optical and wireless transmission, audio/video compression and recognition, radar and tracking/guidance systems, and remote sensing systems.

The University of Miami's electrical engineering curriculum is focused on the fundamentals of the discipline, in the first two years building a firm foundation in mathematics, basic science, and basic engineering principles such as basic circuits, electronics, software and programming, computer hardware, and signal and system analysis. The students build upon this foundation through more advanced courses and focused specialization, culminating in a capstone major design experience. We continually update our curriculum and laboratories to incorporate new scientific and technological developments, and industry practices. Our graduates have gone on to successful careers in industry, or to graduate school in science and engineering, as well as law school, business school, and medical school.

Audio Engineering Option

Audio Engineering at the University of Miami was established 1992. The program brings together faculty expertise from Electrical and Computer Engineering and from the Frost School of Music. It uniquely meets the needs of industry, training professionals with solid foundations in technical areas where sound and acoustics play a key role. Students gain theoretical knowledge from engineering and music, along with analytical, technical and design skills that can only be acquired with an engineering degree.

The Audio Engineering option curriculum combines traditional electrical engineering areas such as electronics, digital systems, microprocessors and digital signal processing with audio studies in acoustics, digital speech and audio, and acoustic transducers. Students work in modern laboratory facilities where they can experiment with electronics, digital design, microprocessors, audio recording, audio synthesis and acoustics. UM Audio Engineering graduates are audio-specialized electrical engineers who are highly sought-after by the industry.

During its 27 successful years, Audio Engineering at UM has produced an impressive group of alumni successful careers in music, gaming and entertainment, telecommunications, the analog and digital electronics, computer and software industries, and in the biomedical systems and instrumentation industry. Many have pursued graduate degrees at other top universities. The program implements continuous improvements, including innovative teaching and hands-on audio engineering design projects, as well as ever-deeper links with industry.

Pre-Med Option

Our Department offers a pre-medical option that allows motivated students to obtain the rigorous education of a bachelors degree in electrical engineering while simultaneously completing the basic science requirements necessary for applying to medical or dental school. Much of the excitement in engineering involves applications of electrical and computer engineering to problems in health, such as the development of nano-scale biosensors, or the signal processing analysis of DNA sequences. The pre-med option allows students to learn the fundamentals of Electrical and Computer Engineering while preparing them for entry into either medical school, advanced graduate study, or industry.

Curriculum Requirements: B.S. in Electrical Engineering

Code	Title	Credit Hours
Common Engineering Requirements		
EGN 110 or EGN 114 or EGN 123	Innovation and Entrepreneurship in Engineering Global Challenges Addressed by Engineering and Technology Computing and Digital Solutions for the future	3
ECE 112	Introduction to Engineering II	2
ECE 118	Introduction to Programming	3
ECE 201	Electrical Circuit Theory	3
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
ECE 211	Logic Design	3
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 218	Data Structures	3

ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 315	Digital Design Laboratory	1
ECE 316	Structured Digital Design	1
ECE 336	Discrete-Time Signals and Systems	3
ECE 481	Senior Project I	1
ECE 482	Senior Project II	2
EE Core Electives		6
ECE Design Elective		3
Engineering and Technical Electives		
ECE 301	Electromagnetic Field Theory	3
ECE Electives		9
Technical Electives		9
Other Courses		
Math & Basic Science Credit Hours		
ECE 310	Introduction to Engineering Probability	3
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 311	Introduction to Ordinary Differential Equations	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
PHY 221	University Physics I	3
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Total Credit Hours		126

Curriculum Requirements: B.S. in Electrical Engineering - Audio Engineering Option

Code	Title	Credit Hours
Common Engineering Requirements		
EGN 110	Innovation and Entrepreneurship in Engineering	3
or EGN 114	Global Challenges Addressed by Engineering and Technology	
or EGN 123	Computing and Digital Solutions for the future	
ECE 112	Introduction to Engineering II	2
ECE 118	Introduction to Programming	3
ECE 201	Electrical Circuit Theory	3
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
ECE 211	Logic Design	3

ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 218	Data Structures	3
ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 315	Digital Design Laboratory	1
ECE 316	Structured Digital Design	1
ECE 336	Discrete-Time Signals and Systems	3
ECE 481	Senior Project I	1
ECE 482	Senior Project II	2
EE Core Electives		6
ECE Design Elective		3
Engineering and Technical Electives		
ECE 502	Engineering Acoustics ¹	3
ECE 540	Digital Speech and Audio Processing ²	3
Audio Engineering or Technical Electives		9
Other Courses		
MMI (Music Media) Credit Hours		9
MTC (Music Theory) Credit Hours		3
Math & Basic Science Credit Hours		
ECE 310	Introduction to Engineering Probability	3
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 311	Introduction to Ordinary Differential Equations	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
PHY 221	University Physics I	3
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Total Credit Hours		132

¹ If ECE 502 is not available, students can take MMI or ECE courses (300 level or above) as a substitute with the approval of their advisor

² If ECE 540 is not available, students can take MMI or ECE courses (300 level or above) as a substitute with the approval of their advisor

Curriculum Requirements: B.S. in Electrical Engineering - Pre-Med Option

Code	Title	Credit Hours
EGN 110	Innovation and Entrepreneurship in Engineering	3
or EGN 114	Global Challenges Addressed by Engineering and Technology	
or EGN 123	Computing and Digital Solutions for the future	
ECE 112	Introduction to Engineering II	2

ECE 118	Introduction to Programming	3
ECE 201	Electrical Circuit Theory	3
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
ECE 211	Logic Design	3
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 218	Data Structures	3
ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 315	Digital Design Laboratory	1
ECE 316	Structured Digital Design	1
ECE 336	Discrete-Time Signals and Systems	3
ECE 481	Senior Project I	1
ECE 482	Senior Project II	2
EE Core Electives		6
ECE Design Elective		3
Engineering and Technical Electives		
ECE Elective		3
Technical Elective		3
Other Courses		
Math & Basic Science Credit Hours		
ECE 310	Introduction to Engineering Probability	3
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 221	University Physics I	3
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
Biology and Chemistry Credit Hours		
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	1-2
Advanced BioScience Elective		3
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9

People and Society Cognate	9
STEM Cognate (9 credits) (fulfilled through the major)	
Total Credit Hours	135-136

Suggested Plan of Study: B.S. in Electrical Engineering

Freshman Year		Credit Hours
Fall		
EGN 110, 114, or 123	Innovation and Entrepreneurship in Engineering or Global Challenges Addressed by Engineering and Technology or Computing and Digital Solutions for the future	3
WRS 105	First-Year Writing I	3
MTH 151	Calculus I for Engineers	5
PHY 221 - University Physics I		3
	Credit Hours	14
Spring		
ECE 112	Introduction to Engineering II	2
ECE 118	Introduction to Programming	3
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
PHY 222 - University Physics II		3
PHY 224 - University Physics II Lab		1
	Credit Hours	16
Sophomore Year		
Fall		
ECE 201	Electrical Circuit Theory	3
ECE 218	Data Structures	3
MTH 311	Introduction to Ordinary Differential Equations	3
Arts and Humanities Cognate ¹		3
PHY 223 - University Physics III		3
PHY 225 - University Physics III Lab		1
	Credit Hours	16
Spring		
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
ECE 211	Logic Design	3
MTH 210	Introduction to Linear Algebra	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
	Credit Hours	17
Junior Year		
Fall		
ECE 301	Electromagnetic Field Theory	3
ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 315	Digital Design Laboratory	1
ECE 336	Discrete-Time Signals and Systems	3
ECE 310	Introduction to Engineering Probability	3
People and Society Cognate ¹		3
	Credit Hours	17
Spring		
ECE 212	Processors: Hardware, Software, and Interfacing	3

ECE 316	Structured Digital Design	1
EE Core Elective ¹		3
EE Core Elective ¹		3
ECE Elective ¹		3
People and Society Cognate ¹		3
Credit Hours		16
Senior Year		
Fall		
ECE 481	Senior Project I	1
ECE Elective ¹		3
ECE Elective ¹		3
ECE Design Elective ¹		3
Technical Elective ¹		3
People and Society Cognate ¹		3
Credit Hours		16
Spring		
ECE 482	Senior Project II	2
Technical Elective ¹		3
Technical Elective ¹		3
Arts and Humanities Cognate ¹		3
Arts and Humanities Cognate ¹		3
Credit Hours		14
Total Credit Hours		126

¹ See description of electives under the Departmental Electives Section.

² Offered only in the Fall semester.

Suggested Plan of Study: B.S. in Electrical Engineering - Audio Engineering Option

Freshman Year		
		Credit Hours
Fall		
EGN 110, 114, or 123	Innovation and Entrepreneurship in Engineering or Global Challenges Addressed by Engineering and Technology or Computing and Digital Solutions for the future	3
WRS 105	First-Year Writing I	3
MTH 151	Calculus I for Engineers	5
MMI 220	Introduction to Music Recording	3
PHY 221	University Physics I	3
Credit Hours		17
Spring		
ECE 112	Introduction to Engineering II	2
ECE 118	Introduction to Programming	3
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
PHY 222	University Physics II (Substitutes PHY 206)	3
PHY 224	University Physics II Lab	1
Credit Hours		16
Sophomore Year		
Fall		
ECE 201	Electrical Circuit Theory	3
ECE 218	Data Structures	3
MTH 311	Introduction to Ordinary Differential Equations	3
Arts and Humanities Cognate ²		3

PHY 223	University Physics III (Substitutes PHY 207)	3
PHY 225	University Physics III Lab	1
Credit Hours		16
Spring		
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
ECE 211	Logic Design	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
MTH 210	Introduction to Linear Algebra	3
Credit Hours		17
Junior Year		
Fall		
ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 315	Digital Design Laboratory	1
ECE 336	Discrete-Time Signals and Systems	3
ECE 310	Introduction to Engineering Probability	3
Audio Engineering Elective ¹		3
Arts and Humanities Cognate ²		3
Credit Hours		17
Spring		
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 316	Structured Digital Design	1
ECE 436	Digital Signal Processing	3
EE Core Elective ¹		3
MMI 503	Audio Software Development I	3
Arts and Humanities Cognate ²		3
Credit Hours		16
Senior Year		
Fall		
ECE 481	Senior Project I	1
ECE 502	Engineering Acoustics ⁵	3
ECE Design Elective ¹		3
Audio Engineering or Tech. Elective ¹		3
Audio Engineering Elective ¹		3
People and Society Cognate ¹		3
Credit Hours		16
Spring		
ECE 482	Senior Project II	2
ECE 540	Digital Speech and Audio Processing ⁵	3
MMI 436	Audio for Visual and Interactive Media ⁴	3
MMI 501	Transducer Theory	3
People and Society Cognate ¹		3
People and Society Cognate ¹		3
Credit Hours		17
Total Credit Hours		132

¹ See description of electives under the Electrical and Computer Engineering Section.

² Recommended a cognate that includes a Musicology Elective.

³ Offered only in the Fall semester.

⁴ Note that MMI 504 could be substituted for MMI 436.

⁵ If ECE 502 or ECE 540 is not available, student can take MMI or ECE courses (300 level or above) as a substitute with the approval of their advisor

Suggested Plan of Study: B.S. in Electrical Engineering - Pre-Med Option

Freshman Year		Credit Hours
Fall		
EGN 110, 114, or 123	Innovation and Entrepreneurship in Engineering or Global Challenges Addressed by Engineering and Technology or Computing and Digital Solutions for the future	3
WRS 105	First-Year Writing I	3
MTH 151	Calculus I for Engineers	5
PHY 221	University Physics I	3
Arts and Humanities Cognate ¹		3
Credit Hours		17
Spring		
ECE 112	Introduction to Engineering II	2
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
PHY 222	University Physics II (Substitutes PHY 206)	3
PHY 224	University Physics II Lab	1
CHM 121	Principles of Chemistry	4
Credit Hours		17
Sophomore Year		
Fall		
ECE 118	Introduction to Programming	3
ECE 201	Electrical Circuit Theory	3
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 223	University Physics III (Substitutes PHY 207)	3
CHM 113	Chemistry Laboratory I	1
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
Credit Hours		18
Spring		
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 206	Circuits, Signals, and Systems	3
PHY 225	University Physics III Lab	1
CHM 221	Introduction to Structure and Dynamics	4
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
Credit Hours		17
Junior Year		
Fall		
ECE 211	Logic Design	3
ECE 218	Data Structures	3
ECE 302	Electronics II	3
ECE 303	Electronics Laboratory	1
ECE 336	Discrete-Time Signals and Systems	3
CHM 222	Organic Reactions and Synthesis	4
CHM 205	Chemical Dynamics Laboratory	1
Credit Hours		18
Spring		
ECE 212	Processors: Hardware, Software, and Interfacing	3

ECE 310	Introduction to Engineering Probability	3
ECE 315	Digital Design Laboratory	1
MTH 210	Introduction to Linear Algebra	3
CHM 206	Organic Reactions and Synthesis Laboratory	2
Advanced Bioscience Elective ²		3
People and Society Cognate ¹		3
Credit Hours		18
Senior Year		
Fall		
ECE 316	Structured Digital Design	1
ECE 481	Senior Project I	1
EE Design Elective ¹		3
EE Core Elective ¹		3
EE Core Elective ¹		3
People and Society Cognate ¹		3
Arts and Humanities Cognate ¹		3
Credit Hours		17
Spring		
ECE 482	Senior Project II	2
ECE Elective		3
Technical Elective ¹		3
Arts and Humanities Cognate ¹		3
People and Society Cognate ¹		3
Credit Hours		14
Total Credit Hours		136

¹ See description of electives under the Departmental Electives Section.

² Offered only in the Fall semester.

Mission

The mission of the Department of Electrical and Computer Engineering is to achieve and maintain, through a continuous improvement process, excellence in undergraduate and graduate education, research, and service to the community and the nation. We endeavor to accomplish this by providing high-quality education and research programs which will impart the requisite knowledge and skills to our students enabling them to assume leadership roles in contributing to the advancement of the underlying electrical and computer engineering technologies which sustain the current world economy, to promote a strong commitment to life-long learning, to prepare them for a variety of alternative career paths and to participate as responsible citizens in a rapidly changing and shrinking global community.

Program Educational Objectives

We expect that the alumni of the Electrical Engineering Program will exhibit the following:

1. Successful careers in dynamic and multidisciplinary fields with the ability to apply electrical engineering practices within societal, global, and environmental contexts in an ethical manner.
2. Demonstrating life-long learning through activities such as completion of graduate studies and/or professional development.

Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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. An ability to communicate effectively with a range of audiences.
4. 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. 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. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.