CATALOG YEAR 200710

Electrical & Computer Engineering Department
School of Engineering & Applied Science

ELECTRICAL ENGINEERING
MIAMI UNIVERSITY

BACCALAUREATE PROGRAM
Degree Awarded: Bachelor of Science in Engineering
with a major in Electrical Engineering

Electrical Engineering encompasses analysis, design, and synthesis of products and processes in a variety of areas. Such areas include electrical, electromechanical, and electronic systems, computers, and their associated components, as well as development of processes needed in such areas as audio, video, and image enhancement and recognition. The field of electrical engineering requires the ability to understand and apply math, science, and engineering science; to research concepts and apply modeling methods, to simulate and test working conditions and their impact on the designed systems, and to synthesize different elements in order to obtain the optimum design of a specific product.

The increasing sophistication in products and systems requires industry to hire academically qualified electrical engineers who can apply modern techniques and methods of engineering. Examples include computer-aided design, computer-assisted engineering, robotics, and computer-vision.

The electrical engineer of the 21st century must be able to think critically in broader contexts because problems in contemporary society are not only technical but also social and economic in nature. This program provides the student with a broad electrical engineering education enhanced by courses in manufacturing engineering, mechanical engineering, computer science, computer engineering, economics, humanities, social science, world and American cultures, and liberal arts.

Graduates have the opportunity to work in a diverse spectrum of professional fields. These vary from research to design, from development to manufacturing, from technical sales to production. Many electrical engineers work in manufacturing-related areas such as in the analysis and design of varied products and computer-related fields such as computer hardware and chip design, as well as in non-technical sectors of the economy such as business, law, and management. Graduates will also be prepared to continue their education at the graduate level.

Double majors must have 18 elective credit hours and you cannot use a required course in one major as an elective in the other major. Technical elective must be approved by advisor unless advisor deems that the Undergraduate Curriculum Committee (UCC) should make the decision. A petition would then need to be submitted to the UCC committee.

For information, contact the Electrical and Computer Engineering office, 109 Kreger (513-529-8342) and visit our web site: http://www.eas.muohio.edu/ece.

ELECTRICAL ENGINEERING MAJOR REQUIREMENTS

Total Degree Requirements is 128 Hours
Catalog Year 2006-2007 (200710)

General Education (27 hrs)

English (9 hrs) 7%
- ENG 111 College Composition (3)
- ENG 112 Composition and Literature (3)
- ENG 313 Technical Writing (3)

Fine Arts, Humanities, and Social Science (12 hrs) 9%
- ECO 201 Principles of Microeconomics (3)
- Miami Plan Foundation II A Fine Arts Elective (3)
- Miami Plan Foundation II B Humanities Elective (3)
- Miami Plan Foundation II Elective (3)

US and World Cultures (6 hrs) 5%
- Miami Plan Foundation III A US Cultures Elective (3)
- Miami Plan Foundation III B World Cultures Elective (3)

Thematic Sequence (MTH2 **built-in**)

Liberal Education 9 hour sequence outside your major focused around a theme.

The thematic sequence MTH2-Basic Mathematical Tools for Science may be fulfilled by ECE requirements (MTH 151 or 153, MTH 231, & STA 301 or 368).

Mathematics & Science (36- 37 hrs) 29%

- MTH 151 Calculus I (5)
- MTH 231 Discrete Mathematics (3)
- MTH 245 Differential Equation for Engineers (3)
- MTH 251 Calculus II (4)
- STA 368 Intro to Statistics (4) or STA 301 Applied Statistics (3)
- PHY 181, 183 Physics I and Lab (4,1)
- PHY 182, 184 Physics II and Lab (4,1)
- CHM 141, 144 College Chemistry and Lab (3,2)
- Miami Plan Foundation IV A Biological Science (3)

Computer Science & System Analysis (12 hrs) 9%

- CSA 174 Fundamentals of Programming (3)
- CSA 271 Object-Oriented Programming (3)
- CSA 274 Data Abstraction and Data Structure (3)
- ECE 278 Computer Architecture (3)

General Engineering (11 hrs) 9%

- EAS 101 Computing, Engineering and Society (1)
- EAS 102 Problem Solving and Design (3)
- ECE/MME 448 Senior Design Project I (2)
- ECE/MME 449 Senior Design Project II (2)
- MME 211 Static Modeling of Mechanical Systems (3)

Required Electrical Engineering (32 hrs) 25%

- ECE 205 Electric Circuit Analysis I (3)
- ECE 287 Digital Systems Design (4)
- ECE 304 Electronics (3)
- ECE 305 Electric Circuit Analysis II (3)
- ECE 306 Signals and Systems (3)
- ECE 325 Applied Electromagnetics (3)
- ECE 387 Embedded Systems Design (4)
- ECE 425 Digital Signal Processing (3)
- ECE/MME 436 Control of Dynamic Systems (3)
- ECE 453 Communication Systems (3)

Electrical Engineering Electives (9 - 10 hrs) 7%

Computer Engineering Elective
- CSA 283 Data Communication and Networks (3)
- CSA 381 Operating System (3)
- CSA 386 Computer Graphics (3)
- CSA 486 Introduction to Artificial Intelligence (3)
- ECE 414/514 Introduction to VLSI Circuit and System Design (3)
- ECE 461/561 Network Modeling and Performance Analysis (3)

Control and Instrumentation Elective
- ECE 470 Special Topics (3)
- MME 311 Dynamics Modeling (3)

ELECTRICAL ENGINEERING MAJOR (*SAMPLE*) FOUR-YEAR PLAN
Catalog Year 2006-2007 (200710)

Freshman Year

First Semester			*Second Semester*		
EAS 101	Computing, Engineering and Society	1	EAS 102	Problem Solving and Design	3
ENG 111	College Composition	3	ENG 112	Composition and Literature (MPF I)	3
MTH 151	Calculus I	5	MTH 251	Calculus II	4
PHY 181	Physics I	4	PHY 182	Physics II	4
PHY 183	Physics I Lab	1	PHY 184	Physics II Lab	1
CSA 174	Fund. of Programming and Problem Solving	3	CSA 271	Object-Oriented Programming	3
		17			18

Sophomore Year

First Semester			*Second Semester*		
ECE 205	Electric Circuit Analysis I	3	CHM 141	College Chemistry	3
ECE 287	Digital Systems Design	4	CHM 144	Chemistry Lab	2
MTH 231	Discrete Mathematics	3	CSA 274	Data Abstraction & Data Structures	3
MTH 245	Differential Equations	3	ECE 305	Electric Circuit Analysis II	3
MPF III A	US Cultures	3	ECE 278	Computer Architecture	3
		16			14

Junior Year

First Semester			*Second Semester*		
STA 368	Introduction to Statistics or STA 301	4	ENG 313	Technical Writing	3
ECE 304	Electronics	3	ECE 425	Digital Signal Processing	3
ECE 306	Signals and Systems	3	MME 211	Static Modeling of Mechanical Systems	3
MPF IV A	Biological Science	3	ECE 325	Applied Electromagnetics	3
ECO 201	Microeconomics	3	ECE 387	Embedded Systems Design	4
		16			16

Senior Year

First Semester			*Second Semester*		
ECE/MME 448	Senior Design Project I	2	ECE/MME 449	Senior Design Project II	2
ECE/MME 436	Control of Dynamics Systems	3	ECE	Elective	6
ECE 453	Communication Systems	3	MPF II	Miami Plan Foundation	3
ECE	Elective	3	MPF II B	Humanities Elective	3
MPF II A	Fine Arts Elective	3			14
+MPF III B	World Cultures	3			
		17			

128 Hours required for degree

+The School of Engineering & Applied Science and its Advisory Council suggest you consider taking IDS 159, Strength Through Cultural Diversity, to meet the World Cultures (MPF IIIB) requirement and the non-dominant (ND) perspective.

The Miami Plan for Liberal Education Foundation (MPF) requirement includes 6 hours of English Composition (ENG 111-112 fulfills this requirement); 9 hours in Fine Arts and Humanities with a minimum of 3 hours in Fine Arts and 6 hours in Humanities (COM 135 fulfills 3 hrs of humanities); 9 hours in Social Science and World Cultures with a minimum of 3 hours in Social Science and 3 hours in World Cultures (ECO 201 fulfills 3 hours of Social Science); 9 hours of Natural Science, including one laboratory course with a minimum of 3 hours in Biological Science and 3 hours in Physical Science; 3 hours of Mathematics, Formal Reasoning or Technology (MTH 151 fulfills this requirement). At least one of these foundation courses must provide a historical perspective (H) and at least one must provide a perspective different from that of the dominant cultural heritage (ND) of the United States (typically fulfilled with selected Fine Arts, Humanities, Social Science, or World Cultures courses). Foundation courses ordinarily are taken in your first two years. The actual order in which you take these courses is up to you. The outline above is just one sample of how the courses might be arranged. You also must complete 12 hours of Focus: Advanced Liberal Learning courses, including 9 hours of an approved Thematic Sequence (MPT)* and a 4 hour Senior Capstone Experience (MPC) (ECE/MME 448 and 449 fulfill the capstone requirement).

* The thematic sequence MTH2-Basic Mathematical Tools for Science is fulfilled by ECE requirements (MTH 151 or 153, MTH 231, and STA 301 or 368); the form to "declare" a thematic sequence must be submitted through the department offering the sequence.

Technical Electives – 9 hours

The technical electives, with advisor approval, may include courses from CSA, MME, MTH, and Natural Sciences. Sample courses are:

CSA 283 Data Communication and Networks (3)
CSA 381 Operating System (3)
CSA 386 Introduction to Computer Graphics (3)
CSA 486 Introduction to Artificial Intelligence (3)
MME 311 Dynamics Modeling (3)
ECE 414/514 Introduction to VLSI Circuit and System Design (3)
ECE 461/561 Network Modeling and Performance Analysis (3)
ECE 470 Special Topics (3)

ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT - COURSE DESCRIPTIONS 2006-2007

ECE 205 Electric Circuit Analysis I (3) Study of electric circuits and networks. Includes resistive circuits, first-order transients and sinusoidal steady state. Emphasizes on the basic principles and their application to circuit analysis using linear algebra and complex numbers. *(Prerequisite – PHY 182 and Co-requisite MTH 245)*

ECE/ 278 Computer Architecture (3) Principles of Von Neumann computer architecture. Data representation and computer arithmetic. Memory hierarchy. CPU structure and instruction sets. Assembly language programming to better understand and illustrate computer architecture concepts. Performance considerations and alternative computer architectures. *(Prerequisite: CSA 271 or equivalent)*

ECE 287 Digital Systems Design (4) Design of digital systems. Topics include switching algebra and switching functions, logic design of combinational and sequential circuits using TTL, combinational logic design with MSI and LSI, busing, flip-flops, registers counters, programmable logic devices, memory device, register-level design, and microcomputer system organization. Students must show competency in the computer-aided design (CAD) and laboratory implementation of digital systems. *(Prerequisite: CSA 174 or equivalent.)*

ECE/MME 303 Computer-Aided Experimentation (4) Study of theory and application of instrumentation and experimentation; components and concepts of computer-machine interface systems; design of computer-controlled experimentation for real-time industrial measurement, monitoring, and control; electric power analysis and polycircuits. *(Prerequisite: ECE 205, MME 211, STA 368)*

ECE 304 Electronics (3) analysis and design of electronic circuits and subsystems. Frequency response and feedback in small signal amplifiers. Study of field effect transistors, uninjunction transistors, silicon-controlled rectifiers, DIACs TRIACs, and optoelectronic devices. Operational amplifier applications. *(Prerequisite: ECE 305)*

ECE 305 Electric Circuit Analysis II (3) In-depth study of electric circuits and networks with an emphasis on practical applications. Includes AC power analysis, poly-phase and magnetically coupled circuits, electric machines, frequency response and filters, Laplace transform, and two-port networks. *(Prerequisites: PHY 182, MTH 245, and ECE 205)*

ECE 306 Signals and Systems (3) An introductory course covering the principles of signals and systems. The course combines lectures, Matlab simulation exercises, and design projects to expose students to the theories and concepts of both continuous-time and discrete time forms of signals and systems, as well as applications of the theories and concepts in communication systems, control systems, and signal processing. *(Prerequisite: ECE 305, MTH 245, and PHY 182/184)*

ECE 325 Applied Electromagnetics (3) Theories and applications of electromagnetic fields and waves; including electrostatics, magnetostatics, Maxwell equations, plane wave propagation and reflection, transmission lines, waveguides, and antennas. *(Prerequisites: ECE 205 and MTH 245)*

ECE 387 Embedded Systems Design (4) Fundamentals of computer systems design, interfacing and basics of embedded computers (microprocessors). Laboratory projects will require students to successfully design, implement, debug, and document computer solutions requiring a mix of hardware and software. Models and methodologies for designing systems containing both hardware and software components, or co-design, will be introduced. Substantial design projects will be required of each student. (*Prerequisite: ECE 287)*

ECE 414/514 (3) Introduction to VLSI Circuit and System Design
This course covers fundamentals of modern VLSI IC design. It introduces three main aspects of CMOS IC engineering: device operation, circuit design and circuit layout, as well as three main aspects of VLSI system engineering: system-level simulation, interconnect analysis and basics of high-volume manufacturability. It provides hands-on experience with modern IC design software. *(Prerequisites: ECE 287 and ECE 304)*

ECE 425/525 Digital Signal Processing (3) Investigates the relation between continuous-time and discrete-time signals. Topics include time-sampling, signal representation, transformation and manipulation of digital signal, digital filter structure and design. *(Prerequisite: ECE 306)*

ECE/MME 436 Control of Dynamic Systems (3) an in-depth study of the theory, design, and analysis of feedback control of dynamic systems. Integrate the problem-solving techniques and concepts of electric circuits and computer-aided experimentation into the design and construction of programmable-logic based control systems and its application in modern manufacturing systems. Design methodologies applied in lab exercises and short-term design projects. (*Prerequisites: ECE/MME 303 or ECE 305)*

ECE/MME 448 Senior Design Project I (2) and ECE/MME 449 Senior Design Project II (2) Student teams, with varied academic backgrounds, conduct major open-ended research/design projects. Elements of the design process are considered as well as real-world constraints, such as economic and societal factors, marketability, ergonomics, safety, aesthetics, and ethics. 448: feasibility studies performed; 449: implementation, testing, and production of design. Nonmajors can register fore 3-4 credits. *(Prerequisite: senior standing in student's major.)*

ECE 453/553 Communication Systems (3) Introduces students to basic communication systems principle and practice. Topics include modulation, demodulation and multiplexing techniques. System design and performance analysis will also be covered. *(Prerequisites: ECE 304 and ECE 306)*

ECE 461/561 Network Modeling and Performance Analysis (3) Modeling and performance analysis of computer and communication networks including delay and occupancy models in networks, architectures, transmission media, multiple accessed, switching, and protocols. Emphasis is on lower layer network performance. *(Prerequisites: STA 368 or 301; CSA 283, or permission of instructor.)*

ECE 470 Special Topics (3) Advanced special topics in electrical and computer engineering. *(Prerequisite: Permission of instructor.)*

- 470.G. Introduction to Global Positioning Systems: Study of the Global Positioning System (GPS). Covers basic principles of satellite navigation systems, measurement coordinate systems, satellite signal structure, basic GPS receiver principles, GPS data processing, measurement errors, differential receivers, GPS augmentation systems, and GPS applications

- 470.N Introduction to Navigation: The course introduces basic theories, techniques (including how animals navigate), components, and systems required to determine a user's position, velocity, and attitude for navigation purposes. The course will also discuss recent development in navigation techniques and methods. The course will combine lectures, exercises, and some hands-on experience for students.

- 470.S Software GPS Receivers: Covers all aspects of software-based Global Positioning System (GPS) receivers, including GPS signal structure, radio frequency front end design, GPS signal acquisition, tracking methods and navigation data extraction, and software algorithms to implement traditional hardware-based functionalities.