

CATALOG YEAR 200910

2008-2009



**Electrical & Computer
Engineering Department**
School of Engineering & Applied Science

**COMPUTER ENGINEERING
MIAMI UNIVERSITY**

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

Computer engineering is an exciting discipline that integrates topics from computer science (such as software development) and electrical engineering (such as digital hardware). Computer engineers design and develop computer-based solutions to engineering problems. The resulting systems are used in products that range from home appliances to industrial robots and from automobiles to aircraft. Computer engineers have influence in fields such as computers, computer systems, control systems, energy, information technology, manufacturing, micro-electro-mechanical systems, nanotechnology, power generation, aerospace, defense, and transportation. They also hold influential positions in a variety of research laboratories.

The program has a solid foundation of mathematics and science, computer programming, digital system design, engineering design, communication skills, and Miami's traditional liberal-arts education. In addition, you can take electives from other areas of engineering, computer science, physics, and mathematics to pursue your personal interests.

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, 260 EGR Bldg. (513-529-0740) and visit our web site: <http://www.eas.muohio.edu/ece>.

COMPUTER ENGINEERING MAJOR REQUIREMENTS

**Total Degree Requirements is 128 Hours
Catalog Year (200910) 2008-2009**

General Education (27 hours)

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

Fine Arts, Humanities, and Social

Science (12 hours) 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 (3)

US and World Cultures (6 hours) 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 STA 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 (18 hours)

14%

CSA 174 Fundamentals of Programming (3)
CSA 271 Object-Oriented Programming (3)
CSA 274 Data Abstraction & Data Structures (3)
ECE 278 Computer Architecture (3)
CSA 283 Data Communication and Networks (3)
CSA 381 Operating Systems (3)

General Engineering (11 hours)

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)
PCE 219 Statics and Mechanics of Materials or
MME 211 (3)

Required Electrical Engineering (23 hours) 18%

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 387 Embedded Systems Design (4)
ECE 425 Digital Signal Processing (3)

Computer Engineering Electives (12-13 hrs) 9%

Software Engineering Elective

CSA 348 Applied Software Engineering (3)
CSA 383 Client Server Systems (3)
CSA 385 Data Base Systems (3)
CSA 386 Computer Graphics (3)
CSA 486 Introduction to Artificial Intelligence (3)
CSA 464 Algorithm (3)

Control and Instrumentation Elective

MME 311 Dynamics Modeling (3)
ECE 428/528 Real-Time Digital Signal Processing (3)
ECE/MME 436 Control of Dynamics Systems (3)
ECE 470 Special Topics (3)

Communication Elective

ECE 325 Applied Electromagnetics (3)
ECE 414/514 Introduction to VLSI Circuit and
System Design (3)
ECE 453 Communication Systems (3)
ECE 461/561 Network Modeling and Performance
Analysis (3)

COMPUTER ENGINEERING MAJOR (SAMPLE) FOUR-YEAR PLAN

Catalog Year (200910) 2008-2009

Freshman Year

First Semester

EAS 101	Computing, Engineering and Society	1
ENG 111	College Composition	3
MTH 151	Calculus I	5
PHY 181	Physics I	4
PHY 183	Physics I Lab	1
CSA 174	Fund. of Programming and Problem Solving	<u>3</u>
		17

Second Semester

EAS 102	Problem Solving and Design	3
ENG 112	Composition and Literature (MPF I)	3
MTH 251	Calculus II	4
PHY 182	Physics II	4
PHY 184	Physics II Lab	1
CSA 271	Object-Oriented Programming	<u>3</u>
		18

Sophomore Year

First Semester

ECE 205	Electric Circuit Analysis I	3
ECE 287	Digital Systems Design	4
MTH 231	Discrete Mathematics	3
MTH 245	Differential Equations	3
MPF III A	US Cultures	<u>3</u>
		16

Second Semester

CHM 141	College Chemistry	3
CHM 144	Chemistry Lab	2
CSA 274	Data Abstraction & Data Structures	3
ECE 305	Electric Circuit Analysis II	3
ECE 278	Computer Architecture	<u>3</u>
		14

Junior Year

First Semester

CSA 283	Data Communication and Networks	3
ECE 304	Electronics	3
ECE 306	Signals and Systems	3
MPF IV A	Biological Science	3
ECO 201	Microeconomics	<u>3</u>
		15

Second Semester

CSA 381	Operating Systems	3
ECE 425	Digital Signal Processing	3
PCE 219	Statics and Mechanics of Materials <u>or</u>	
MME 211	Static Modeling of Mechanical Systems	3
STA 368	Introduction to Statistics or STA 301	4/3
ECE 387	Embedded Systems Design	<u>4</u>
		16/17

Senior Year

First Semester

ECE/MME 448	Senior Design Project I	2
ECE	Elective	6
ENG 313	Technical Writing	3
MPF II A	Fine Arts Elective	3
+MPF III B	World Cultures	<u>3</u>
		17

Second Semester

ECE/MME 449	Senior Design Project II	2
ECE	Elective	6
MPF II	Miami Plan Foundation	3
MPF II B	Humanities Elective	<u>3</u>
		14

128 Total Hours required for the degree

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

The Miami Plan for Liberal Education Foundation (MPF) requirement includes 6 hours of English Composition (ENG 111-112 fulfills this requirement); 12 hours in Fine Arts, Humanities, and Social Science (ECO 201 fulfills 3 hours of Social Science) with a minimum of 3 hours in each; 6 hours in U.S. and World Cultures; 9 hours of Natural Science, including one laboratory course with a minimum of 3 hours in Biological Science and 3 hours in Physical Science (PHY 181-182, 183-184 and CHM 141-144 more than fulfills the Physical Science requirement; however, a biological science course is still required); 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). 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 must also complete 12 hours of Focus: Advanced Liberal Learning courses, including 9 hours in 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 – 12 hours

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

CSA 348	Applied Software Engineering (3)	ECE 325	Applied Electromagnetics (3)
CSA 383	Client Server Systems (3)	ECE 414/514	Introduction to VLSI Circuit and System Design (3)
CSA 385	Database Systems (3)	ECE 428/528	Real-Time Digital Signal Processing (3)
CSA 386	Introduction to Computer Graphics (3)	ECE/MME 436	Control of Dynamics Systems (3)
CSA 486	Introduction to Artificial Intelligence (3)	ECE 453	Communication Systems (3)
CSA 464	Algorithm (3)	ECE 461/561	Network Modeling and Performance Analysis (3)
MME 311	Dynamics Modeling (3)	ECE 470/570	Special Topics (3)

ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT - COURSE DESCRIPTIONS 2008-2009

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 Concurrent: MTH 249 or MTH 251 or MTH 257H)*

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: none)*

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. *(Prerequisites: ECE 205, MME 211, and STA 301 or 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 or ECE/MME 303)*

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: ECE 205 or PHY 292/294 and Concurrent: MTH 245 or MTH 347)*

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: 205 or PHY 292/294 and Concurrent: ECE 305 and MTH 245 or MTH 347)*

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 305 or ECE/MME 303 and MTH 245 or MTH 347)* **Technical Elective for CE**

ECE 345 Random Signal Processing (3) Introduces probability and statistics, including applications relevant to electrical and computer engineering. Includes extensive coverage of random variables. Introduces random processes and illustrates their importance in communications, signal processing and networking. *(Prerequisites: MTH 249 or MTH 251 and MTH 222 or MTH 231 and Concurrent: ECE 306)*

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. *(Prerequisites: ECE 287 and CSA 153 or CSA 274)*

ECE 414/514 Introduction to VLSI Circuit and System Design (3) 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)* **Technical Elective for CE and EE**

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 428/528 Real-Time Digital Signal Processing (3) Study of real-time digital signal processing techniques. Students will learn how to design and implement real time digital signal processing algorithms with an industry-standard DSP microprocessor. Several structured laboratory exercises, such as spectrum analysis and digital filtering, followed by an extensive final project will be given. *(Prerequisites: ECE 306 and ECE 425)* **Technical Elective for CE and EE**

ECE 430/530 Electromagnetics in Wireless Sensing and Communications (3) Introduces electromagnetic aspects of modern wireless sensing and communications. Covers fundamentals of EM wave propagation in various media, antenna design and wireless system analysis. Hands-on experience with computational modeling and contemporary EM software is provided. (*Prerequisite: ECE 325*)

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. (*Prerequisite: ECE/MME 303 or ECE 305*)

Technical Elective for CE

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 for 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 306 and ECE 345 or STA 301 or STA 368 and Concurrent: ECE 304*) Technical Elective for CE

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: ECE 345 or STA 301 or STA 368*) Technical Elective for CE and EE

ECE 470/570 Special Topics (3) Advanced special topics in electrical and computer engineering. (*Prerequisite: Permission of instructor.*) Technical Elective for CE and EE

- **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.