



# Electrical & Computer Engineering Department

*School of Engineering & Applied Science*

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## ENGINEERING MANAGEMENT ELECTRONICS and COMPUTING TECHNICAL SPECIALITY

**CATALOG YEAR 201210 (2011-2012)**

**MIAMI UNIVERSITY**

**BACCALUREATE PROGRAM**

**Degree Awarded: Bachelor of Science in Engineering with a  
Major in Engineering Management**

Many of today's global businesses require graduates with interdisciplinary skills in engineering and business. This program provides you with an interdisciplinary education in engineering, business and management, science, mathematics, and liberal education. You choose an engineering specialty and a Thematic Sequence of courses in another discipline, as well as a variety of choices within the foundation courses of the Miami Plan. This broad educational experience will help you address technological problems in their large organizational and societal contexts. You can gain valuable work experience by participating in a co-op or internship program. As a graduate, you will be qualified to fill technical positions that require interaction with business aspects of operations, purchasing, personnel, accounting, and marketing. Examples of such positions include technical sales, line supervision, purchasing, environmental protection, and quality control.

The Electronics and Computing Technical Specialty provides a solid foundation in electrical and computer engineering while developing the skills necessary to manage the development of products, including computers and other electronics. This technical specialty complements Miami's institutional objectives to support Ohio's emphasis on increasing STEM-related programs. Graduates can have an impact on the needs of a global society whose reliance on electronics and computing is ever-increasing.

For more information, contact the Electrical and Computer Engineering office, 260 EGB Bldg. (513-529-0740) and visit our web site: <http://www.eas.muohio.edu/ece>.

**ENGINEERING MANAGEMENT CURRICULUM**  
**ELECTRONICS AND COMPUTING TECHNICAL SPECIALTY**  
**Catalog Year 201110 (2010-2011)**  
**129 Credit Hours**

**English Composition (9 hours)**

Miami Plan English Composition MPF I (6)  
ENG 313 Technical Writing (3)

**Fine Arts, Humanities, and Social Science (9 hours)**

Miami Plan Foundation II A Fine Arts Elective (3)  
Miami Plan Foundation II B Humanities Elective (3)  
ECO 201 Principles of Microeconomics (3)

**Global Perspectives (6-9 hours)**

- 6 hours of foundation credit from any Miami-approved study abroad program or
- 9 hours of “G” courses specifically designed to have a global perspective or
- 9 hours of “G-cluster”, 3 courses that focus on a global issue or theme.

**Natural Science (18 hours)**

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 IVA Biological Science (3)

**Mathematics (15 hours)**

MTH 151, 251 Calculus I, II (5, 4)  
MTH 222 Linear Algebra or MTH 231 Discrete Math (3)  
MTH 347 or MTH 245 Differential Equations (3)

**Business Core (21 hours)**

ACC 221 Intro. to Financial Accounting (3)  
ECO 202 Principles of Macroeconomics (3)  
MGT 291 Organizational Behavior & Theory (3)  
MGT 302 Operations Management (3)  
MKT 291 Principles of Marketing (3)  
MGT Tracks (6) (select one track)  
Supply Chain Management Track  
MKT 431 Logistics Management  
MGT 432 Purchasing and Mat. Mgmt  
Operations Management Track  
MGT 451 Operations Planning & Sch  
MGT 453 Productivity Improvement  
Human Resources Track  
MGT 303 Human Resources Mgmt  
MGT 405 Labor Relationship & Conflict Mgmt  
Entrepreneurship Track  
ESP 467 Entrepreneurship: New Vent  
ESP 481 Technology, Products, Vent

**Engineering Core (10 hours)**

EAS 101 Computing, Engineering and Society (1)

EAS 102 Problem Solving and Design (3)  
EGM/MGT 311 Project Management (3)  
MME/PCE 341 Engineering Economics (3)

**Electronics and Computing Core (36 hours)**

CSE 153 Intro. to C/C++  
or CSE 174 Fund. of Prog. (3)  
ECE 205 Electric Circuit Analysis I (4)  
ECE 287 Digital Systems Design (4)  
ECE 304 Electronics (3)  
ECE 303 Computer-Aided Experimentation (3)  
ECE 306 Signals and Systems (3)  
ECE 345 Random Signal Processing (3)  
ECE 387 Embedded Systems Design (4)

Electives (9-10): Choose from

Any ECE course (at least 200 level)  
CSE 271 Object-Oriented Programming (3)  
CSE 274 Data Abstraction & Data Structure (3)  
MTH 252 Calculus III (4)

**Senior Capstone (4 hours)**

ECE 448 Senior Design Project I (2)  
ECE 449 Senior Design Project II (2)

**Thematic Sequence**

The MTH 3 thematic sequence (MTH 222, MTH 252, MTH 347) is built-in to the attached sample plans. Consult your academic advisor before deviating from the sample plans. You must declare your thematic sequence before graduation.

**Total Credit Hours**

A minimum of 128 hours is required. More hours may be necessary depending on course selections and the method used to satisfy MPF III (Global Perspectives).

**Note about Credit/No-Credit Courses**

You must take the following courses for a grade (credit/no-credit not allowed): All business core, engineering, chemistry, physics, mathematics, statistics, computer science, and English courses that are used to satisfy degree requirements.

**Sample Plans**

The attached sample plans satisfy all requirements. Sample plan option 2 is designed for students with a stronger interest in computing (in particular, programming). Other plans are possible, but consult your academic advisor before deviating from the sample plans.

**SAMPLE PLAN OPTION 1**  
**ENGINEERING MANAGEMENT**  
**ELECTRONICS AND COMPUTING SPECIALTY**  
**CATALOG YEAR 201210 (2011-2012)**

**Consult your advisor before scheduling classes! Actual course offerings may vary.**

**Freshman Year**

First Semester

EAS 101	Computing, Engineering and Society	1
MPF I	English Composition	3
MPF III	Global Perspectives	3
MTH 151	Calculus I	5
PHY 181	Physics I	4
PHY 183	Physics I Lab	<u>1</u>
		17

Second Semester

CSE 153	Introduction to C/C++ Programming	3
EAS 102	Problem Solving and Design	3
MPF I	English Composition	3
MTH 251	Calculus II	4
PHY 182	Physics II	4
PHY 184	Physics II Lab	<u>1</u>
		18

**Sophomore Year**

First Semester

ECE 205	Electric Circuit Analysis I	4
ECE 287	Digital Systems Design	4
ECO 201	Microeconomics (MPF IIC)	3
MTH 222	Linear Algebra	3
MTH 252	Calculus III	<u>4</u>
		18

Second Semester

ACC 221	Intro. to Financial Accounting	3
CHM 141	College Chemistry	3
CHM 144	Chemistry Lab	2
ECE 303	Computer-Aided Experimentation	3
ECO 202	Macroeconomics	3
MTH 347	Differential Equations	<u>3</u>
		17

**Junior Year**

First Semester

ECE 304	Electronics	3
ECE 306	Signals and Systems	3
ECE 345	Random Signal Processing	3
MGT 302	Operations Management	3
MKT 291	Principles of Marketing	<u>3</u>
		15

Second Semester

ECE 387	Embedded Systems Design	4
ENG 313	Technical Writing	3
MGT 291	Organizational Behavior & Theory	3
MME/PCE 341	Engineering Economics	3
MPF III	Global Perspectives	<u>3</u>
		16

**Senior Year**

First Semester

COM 135	Public Expression & Critical Inquiry	3
ECE 448	Senior Design Project I	2
ECE	200-level or higher ECE course	3
EGM/MGT 311	Project Management	3
Management Track		3
MPF IIA	Fine Arts	<u>3</u>
		17

Second Semester

ECE 449	Senior Design Project II	2
ECE	200-level or higher ECE course	3
Management Track		3
MPF III	Global Perspectives	3
MPF IV A	Biological Science	<u>3</u>
		14

**129 Credit Hours**

The [Global Miami Plan](#) requirement includes 6 hours of English Composition (typically ENG 111-112); 9 hours in Fine Arts, Humanities, and Social Science (ECO 201 fulfills 3 hours of Social Science) with a minimum of 3 hours in each; 6-9 hours in Global Perspectives; 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 foundation course must provide a cultural perspective (Cul), and at least one of foundation course must provide a historical perspective (H). You must take an approved Thematic Sequence (MPT) and a 4 hour Senior Capstone Experience (MPC) (ECE/MME 448 and 449 fulfill the capstone requirement). The outline above is one example of how the courses might be arranged. To ensure that you stay on track toward completion of all degree requirements, meet with your academic advisor before registration each semester.

**SAMPLE PLAN OPTION 2**  
**ENGINEERING MANAGEMENT**  
**ELECTRONICS AND COMPUTING SPECIALTY**  
**CATALOG YEAR 201210 (2011-2012)**

**Consult your advisor before scheduling classes! Actual course offerings may vary.**

**Freshman Year**

First Semester

CSE 174	Fund. of Prog. & Problem Solving	3
EAS 101	Computing, Engineering and Society	1
MPF I	English Composition	3
MTH 151	Calculus I	5
PHY 181	Physics I	4
PHY 183	Physics I Lab	<u>1</u>
		17

Second Semester

CSE 271	Object-Oriented Programming	3
EAS 102	Problem Solving and Design	3
MPF I	English Composition	3
MTH 251	Calculus II	4
PHY 182	Physics II	4
PHY 184	Physics II Lab	<u>1</u>
		18

**Sophomore Year**

First Semester

ECE 205	Electric Circuit Analysis I	4
ECE 287	Digital Systems Design	4
ECO 201	Microeconomics (MPF IIC)	3
MTH 222	Linear Algebra	3
MTH 252	Calculus III	<u>4</u>
		18

Second Semester

CHM 141	College Chemistry	3
CHM 144	Chemistry Lab	2
CSE 274	Data Abstraction & Data Structures	3
ECE 303	Computer-Aided Experimentation	3
ECO 202	Macroeconomics	3
MTH 347	Differential Equations	<u>3</u>
		17

**Junior Year**

First Semester

ECE 304	Electronics	3
ECE 306	Signals and Systems	3
ECE 345	Random Signal Processing	3
MGT 302	Operations Management	3
MKT 291	Principles of Marketing	<u>3</u>
		15

Second Semester

ACC 221	Intro. to Financial Accounting	3
ECE 387	Embedded Systems Design	4
ENG 313	Technical Writing	3
MGT 291	Organizational Behavior & Theory	3
MME/PCE 341	Engineering Economics	<u>3</u>
		16

**Senior Year**

First Semester

COM 135	Public Exp. & Critical Inq. (MPF IIB)	3
ECE 448	Senior Design Project I	2
EGM/MGT 311	Project Management	3
	Management Track	3
MPF IIA	Fine Arts	3
MPF III	Global Perspectives	<u>3</u>
		17

Second Semester

ECE 449	Senior Design Project II	2
	Management Track	3
MPF III	Global Perspectives	3
MPF III	Global Perspectives	3
MPF IV A	Biological Science	<u>3</u>
		14

**129 Credit Hours**

The [Global Miami Plan](#) requirement includes 6 hours of English Composition (typically ENG 111-112); 9 hours in Fine Arts, Humanities, and Social Science (ECO 201 fulfills 3 hours of Social Science) with a minimum of 3 hours in each; 6-9 hours in Global Perspectives; 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 foundation course must provide a cultural perspective (Cul), and at least one of foundation course must provide a historical perspective (H). You must take an approved Thematic Sequence (MPT) and a 4 hour Senior Capstone Experience (MPC) (ECE/MME 448 and 449 fulfill the capstone requirement). The outline above is one example of how the courses might be arranged. To ensure that you stay on track toward completion of all degree requirements, meet with your academic advisor before registration each semester.

## ELECTRICAL & COMPUTER ENGINEERING - COURSE DESCRIPTIONS 201210 (2011-2012)

**ECE 205 Electric Circuit Analysis I (4)** Study of electric circuits and networks. Includes resistive circuits, first-order transients, sinusoidal steady-state analysis, and frequency response. Emphasis on basic principles and their application to circuit analysis using linear algebra and calculus. Laboratory component included. (*Prerequisite: PHY 182/184; Co-requisite: MTH 249 or MTH 251 or MTH 257H*)

**ECE/CSE 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: CSE 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 devices, register-level design, and microcomputer system organization. Students must show competency in computer-aided design (CAD) and laboratory implementation of digital systems. (*Prerequisite: none*)

**ECE 291 Renewable Energy Systems (3)** Analysis of various renewable energy sources, including hydroelectric, solar, wind, biomass, geothermal, nuclear and hydrogen. Sustainability of energy sources and environmental impact of energy consumption are addressed. (*Prerequisite: PHY 172*)

**ECE/MME 303 Computer-Aided Experimentation (3)** Study of theory and application of instrumentation and experimentation including: components and concepts of computer-machine interface systems; design of computer-controlled experimentation for real-time industrial measurement, monitoring, and control; AC power analysis; applications of the Laplace Transform. Laboratory component included. (*Prerequisite: ECE 205; Co-requisite: MTH 347 or MTH 245 for MME majors only*)

**ECE 304 Electronics (3)** Analysis and design of electronic circuits and subsystems. Frequency response and circuit models for amplifiers; non-ideal operational amplifier circuits; transistors; transistor amplifiers; small signal operation and models. Laboratory component included. (*Prerequisite: ECE 305 or ECE/MME 303*)

**ECE 306 Signals and Systems (3)** Study of the basic principles of signals and systems. 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. Lectures,

simulation exercises, and design projects. (*Prerequisite: ECE 205 or PHY 292/294 and Concurrent: ECE 305 or ECE/MME 303 and MTH 245 or MTH 347*) **It is recommended that students enroll in MTH 245 or MTH 347 PRIOR to enrolling in ECE 306.**

**ECE 320 Professional Practice (0)** Students participating in the ECE co-op program register for this course during semesters when they are away from Oxford on work assignment. This enables students to remain in good standing with the University Registrar.

**ECE 325 Applied Electromagnetics (3)** Study of theories and applications of electromagnetic fields and waves; including electrostatics, magnetostatics, Maxwell equations, plane wave propagation and reflection, transmission lines, and antennas. Laboratory component included. (*Prerequisites: ECE 305 or ECE/MME 303 and MTH 245 or MTH 347*)

**ECE 345 Random Signal Processing (3)** Introduction to 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*)

**ECE 387 Embedded Systems Design (4)** Fundamentals of computer systems design, interfacing and basics of embedded computers (microprocessors). Laboratory projects require students to successfully design, implement, debug, and document computer solutions requiring a mix of hardware and software. Intro of models and methodologies for designing systems containing both hardware and software components, or co-design. Substantial design projects required of each student. (*Prerequisites: ECE 287 and CSE 153 or CSE 274*)

**ECE 414/514 Introduction to VLSI Circuit and System Design (3)** Study of fundamentals of modern VLSI IC design. Introduction of three main aspects of CMOS IC engineering: device operation, circuit design, and circuit layout. Also, introduction of three main aspects of VLSI system engineering: system-level simulation, interconnect analysis, and basics of high-volume manufacturability. Hands-on experience with modern IC design software. (*Prerequisites: ECE 287 and ECE 304*)

**ECE 425/525 Digital Signal Processing (3)** Study of the relation between continuous-time and discrete-time signals. Time-sampling, signal representation, transformation and manipulation of digital signal, digital filter structure and design. (*Prerequisite: ECE 306; Co-requisites: ECE 345 or STA 301 or STA 368*)

**ECE 426/526 Biomedical Signal Analysis (3)** Physiological origin, characterization, modeling, and analysis of biomedical signals, including EEG, MEG and ECG signals. Noise and artifact reduction; nonparametric and model-based spectral estimation; joint time-frequency analysis. *(Prerequisites: ECE 306, and STA 301 or STA 368, or ECE 345, or permission of instructor.)*

**ECE 427/527 Radar Signal Processing (3)** Principles, theories and techniques of radar signal processing. Including: elements of radar systems; radar equation; sampling and quantization of pulse radar signals; radar waveforms; Doppler processing; target detection; and concepts of synthetic aperture imaging and beamforming. *(Prerequisites: ECE 306, and STA 301 or STA 368, or ECE 345, or permission of instructor.)*

**ECE 428/528 Real-Time Digital Signal Processing (3)** Study of real-time digital signal processing techniques. Design and implementation of 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. *(Prerequisites: ECE 425)*

**ECE 429/529 Digital Image Processing (3)** Study of digital image processing techniques. Included: digital image fundamentals, digital image spatial filtering, digital image frequency filtering, image restoration, inverse filtering, Wiener filtering, and color image processing fundamentals. *(Prerequisite: ECE 425)*

**ECE 430/530 Electromagnetics in Wireless Sensing and Communications (3)** Electromagnetic aspects of modern wireless sensing and communications. Fundamentals of EM wave propagation in various media, antenna design and wireless system analysis. Hands-on experience with computational modeling and contemporary EM software. *(Prerequisite: ECE 325; Co-requisites: ECE 345 or STA 301 or STA 368)*

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

**ECE 448 Senior Design Project I (2) and ECE 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)** Introduction to basic communication systems and their principles and practices including modulation and demodulation, multiplexing techniques, system design, and performance analysis. *(Prerequisites: ECE 306 and ECE 345 or STA 301 or STA 368 and Co-requisite: ECE 304)*

**ECE 461/561 Network Modeling and Performance Analysis (3)** Modeling and performance analysis of computer and communication networks including delay and occupancy models, architectures, transmission media, multiple access, switching, and protocols. Emphasis on lower layer network performance. *(Prerequisites: ECE 345 or STA 301 or STA 368)*

**ECE 465/565 Introduction to GPS (3)** Study of basic Global Positioning Systems (GPS), including GPS satellite constellation, satellite orbits, ground monitoring stations' functions, GPS receiver working principles, GPS measurement errors and correction techniques, recent advancements in GPS, and applications of GPS. Students will learn to use a variety of GPS receivers and analyze GPS data. *(Prerequisites: PHY 182 and MTH 251; Co-requisites: MTH 222, STA 301 or STA 368 or ECE 345)*

**ECE 475/575 Software Receiver Technologies (3)** Study of important aspects of software-based Global Positioning System (GPS) receivers, including GPS signal structure, radio frequency front end design, GPS signal acquisition and tracking methods and algorithms, and navigation data extraction using software digital signal processing implementations. *(Prerequisites: ECE 306, STA 301 or STA 368 or ECE 345; Recommended: ECE 325)*

**ECE 470/570 Special Topics (3)** Advanced special topics in electrical and computer engineering. *(Prerequisite: Permission of instructor.)* **470.N Introduction to Navigation:** Study of basic theories, techniques (including animal navigation), components, and systems required in determining a user's position, velocity, and attitude for navigation purposes. Discussion of recent developments in navigation techniques and methods. Hands-on experience with navigation models.

**ECE 491 Power Systems Engineering (3)** Study of electric power generation, utility load flow, fault analysis, system stability, surge protection, and the interconnection of the electrical grid system. *(Prerequisite: ECE 303 or ECE 305)*

**ECE 610 Graduate Seminars (1)** Weekly presentations on current research topics in multi-disciplinary areas of electrical and computer engineering, computational science and engineering, and their applications in other disciplines by graduate students, faculty, and visiting scientists and researchers. Research methods, processes, and presentation skills are emphasized. Approved for credit/no-credit grading only. May be repeated. *(Prerequisite: Graduate standing or consent of instructor.)*

**ECE 700 Independent Studies**