ELECTRICAL ENGINEERING
BACCALAUREATE PROGRAM
Degree Awarded: Bachelor of Science in Applied Science, with a major in Electrical Engineering

MIAMI UNIVERSITY
SCHOOL OF ENGINEERING & APPLIED SCIENCE
2003-2004 (200410)

For information, contact the Department of Manufacturing & Mechanical Engineering, 144 Kreger (513-529-2650); and visit our web site: http://www.eas.muohio.edu/egr/.

Electrical engineering encompasses analysis, design, synthesis, and maintenance of products, services, and systems in a wide range of areas. Such areas include electrical, electrical mechanical, and electronics systems, computers and information related systems. 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 and society to hire academically qualified electrical engineers who can apply modern techniques and methods of engineering to solve problems, create new ideas, and produce high-quality products and services.

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 production to service. Technology is in every aspect of our society and daily lives. Equipped with the problem solving skills and current knowledge of engineering and science, an electrical engineer may choose to couple the technical aspects of their education with other responsibilities to work in many other diversified fields such as management, business, law, medicine, and politics. Graduates will also be prepared to continue their education at the graduate level in electrical engineering, and allied fields, such as biomedical engineering, computer science, and aerospace engineering.

Program Requirements: Electrical Engineering
128 Total Hours Required for the Degree
2003-2004 (200410)

English (9 hours) 6.6%

ENG 111 College Composition (3)
ENG 112 Composition & Literature (3)
ENG 313 Technical Writing (3)

Mathematics & Statistics (19) 13.9%
MTH 151 Calculus I (5)
MTH 231 Discrete Math (3)
MTH 251 Calculus II (4)
MTH 245 Differential Equations for Engineering (3)
STA 368 Intro to Statistics (4)

Fine Arts, Humanities & Social Science (12) 8.8%
U.S. & World Culture (6) 4.4%
ECO 201 Principles of Microeconomics (3)
Miami Plan Fine Arts Elective (3)
Miami Plan Fine Arts, Humanities or Social Science (3)
Miami Plan Humanities Elective (3)
Miami Plan U.S. Cultures Elective (3)
Miami Plan World Cultures Elective (3)

Natural Science (18) 13.1%
PHY 181,2,3,4 The Physical World with Lab (10)
CHM 141, 144 College Chemistry with Lab (5)
Miami Plan Biological Science Elective (3)

Thematic Sequence (9 built-in) 6.6%
Liberal Education sequence outside your major focused around a theme.

Capstone Experience (4) 2.9%
EGR 448/449 Senior Design Projects (2,2)

EE Required Courses (60) 43.8%

Required Engineering Courses (36)
EGR 101 Introduction to Engineering I (2)
EGR 102 Introduction to Engineering II (2)
EGR 203 Electric Circuit Analysis (4)
EGR 211 Stat Mod. of Mechanical Systems (3)
EGR/CSA 287 Digital Systems Design (4)
EGR 303 Computer-aided Experimentation (3)
EGR 304 Electronics (3)
EGR 306 Signals and Systems (3)
EGR 314 Engineering Thermodynamics (3)
EGR 425 Digital Signal Processing (3)
EGR 453 Communication Systems
EGR 436 Control of Dynamic Systems

Required Computer Science & Systems Analysis Courses (12)
CSA 174 Fundamentals of Programming & Problem Solving (3)
CSA 271 Object-Oriented Programming (3)
CSA 274 Data Abstraction & Data Structure (3)
CSA 278 Computer Architecture (3)

Technical Electives (9)
The technical electives, with advisor approval, may include courses from CSA, EGR, MTH, and Natural Sciences. Sample courses are:
EGR 311 Dynamic Modeling of Mechanical Systems (3)
CSA 381 Operating Systems (3)
CSA 283 Data Communication and Networks (3)
CSA 285 Client Server Systems (3)
CSA 386 Introduction to Computer Graphics (3)
CSA 486 Introduction to Artificial Intelligence (3)
PHY 291 Contemporary Physics (4)
PHY 293 Contemporary Physics Lab (2)
PHY 423 Materials Physics (3)
PHY 441 Optics and Laser Physics (4)
PHY 461 Electromagnetic Theory (4)
PHY 471 Advanced Electronics (3)
MTH 252 Calculus III (4)
MTH 422 Matrices & Linear Algebra (3)
MTH 453 Numerical Analysis (3)
MTH 454 Numerical Analysis (3)

Free Elective (3) – course must be approved by advisor

SAMPLE CURRICULUM
ELECTRICAL ENGINEERING
SCHOOL OF ENGINEERING AND APPLIED SCIENCE – MIAMI UNIVERSITY
2003-2004 (200410)

Freshman Year

First Semester		Second Semester	
EGR 101 Introduction to Engineering I	2	CHM 141 College Chemistry (MPF IVB)	3
ENG 111 College Composition (MPF I)	3	CHM 144 College Chemistry Lab (MPF IVB)	2
MTH 151 Calculus I	5	CSA 174 Fundamentals of Prog. & Prob. Solving	3
Miami Plan US Cultures Course (MPF IIIA)	3	EGR 102 Introduction to Engineering II	2
Miami Plan Humanities Course (MPF IIB)	3	ENG 112 Composition & Literature (MPF I)	3
		MTH 251 Calculus II	4
	16		17

Sophomore Year

First Semester		Second Semester	
CSA 271 Object-Oriented Programming	3	CSA 274 Data Abstraction & Data Structure	3
ECO 201 Principles of Microeconomics (MPF IIC)	3	EGR 203 Electric Circuit Analysis	4
MTH 231 Discrete Math	3	PHY 182 The Physical World (MPF IVB)	4
MTH 245 Differential Equations	3	PHY 184 The Physical World Lab (MPF IVB)	1
PHY 181 The Physical World (MPF IVB)	4	STA 368 Introduction to Statistics	4
PHY 183 The Physical World Lab (MPF IVB)	1		
	17		16

Junior Year

First Semester		Second Semester	
CSA 278 Computer Architecture	3	EGR 303 Computer-aided Experimentation	3
EGR/CSA 287 Digital Systems Design	4	EGR 306 Signals and Systems	3
EGR 2xx Engineering Mechanics	3	EGR/PSE 314 Engineering Thermodynamics	3
EGR 304 Electronics	3	Technical Elective	3
ENG 313 Technical Writing	3	Miami Plan Biological Sci. Course (MPF IVA)	3
		Miami Plan Fine Arts Course (MPF IIA)	3
	16		18

Senior Year

First Semester		Second Semester	
EGR 436 Control of Dynamic Systems	3	EGR 449 Senior Design Project (MPC)	2
EGR 448 Senior Design Project (MPC)	2	EGR 4yy Communication Systems	3
EGR 4xx Digital Signal Processing	3	Free Elective	3
Technical Elective	3	Technical Elective	3
Miami Plan Fine Arts, Humanities or Soc Sci Course	3	Miami Plan World Cultures Course (MPF IIIB)+	3
Miami Plan Thematic Sequence (MPT)	3	Miami Plan Thematic Sequence (MPT)	3
	17		17

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 3 hour Senior Capstone Experience (MPC) (EGR 448/449 fulfills the capstone requirement).

*This sample curriculum lists 6 hours of the 9-hour thematic sequence requirement. It is assumed that the first 3 hours are utilized as a Miami Plan foundation requirement.

Technical Electives – 9 hours

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

EGR 311 Dynamic Modeling of Mech. Systems	PHY 291 Contemporary Physics	MTH 252 Calculus III
CSA 381 Operating Systems	PHY 293 Contemporary Physics Lab	MTH 422 Matrices & Linear Algebra
CSA 283 Data Communication & Networks	PHY 423 Materials Physics	MTH 453 Numerical Analysis
CSA 285 Client Server Systems	PHY 441 Optics and Laser Physics	MTH 454 Numerical Analysis
CSA 386 Introduction to Computer Graphics	PHY 461 Electromagnetic Theory	
CSA 486 Intro to Artificial Intelligence	PHY 471 Advanced Electronics	

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Manufacturing & Mechanical Engineering Course Descriptions

101 INTRODUCTION TO ENGINEERING I

102 INTRODUCTION TO ENGINEERING II

203 ELECTRIC CIRCUIT ANALYSIS Study of electric circuits and networks with emphasis on industrial applications. Includes resistive circuits, first-order transients and sinusoidal steady state. Study of the principles and analysis of polyphase distribution circuits. Corequisites: MTH 245, PHY 182.

2xx ENGINEERING MECHANICS

287 DIGITAL SYSTEMS DESIGN 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.

303 COMPUTER-AIDED EXPERIMENTATION In-depth 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 measurement, monitoring and control of automated industrial processes. Prerequisites: EGR 203,EGR 211, STA 368.

304 ELECTRONICS Analysis and design of electronic circuits and subsystems. Frequency response and feedback in small signal amplifiers. Study of field effect transistors, unijunction transistors, silicon-controlled rectifiers, DIACs TRIACs, and optoelectronic devices. Operational amplifier applications. Prerequisite: EGR 203.

306 SIGNALS AND SYSTEMS

311 DYNAMIC MODELING OF MECHANICAL SYSTEMS Displacement, velocity, and acceleration of a particle; relations between forces acting on a rigid body and changes in motion produced; translation; rotation, plane motion. Solutions using principles of force, mass, and acceleration; work and energy; and impulse and momentum. Prerequisites: EGR 211; MTH 251.

314 ENGINEERING THERMODYNAMICS Study of the fundamental principles of thermodynamics. Emphasis placed on engineering applications such as power cycles, refrigeration and heat transfer systems. Prerequisites: MTH 251, PHY 182. Cross-listed with PPS 314.

4XX DIGITAL SIGNAL PROCESSING

4YY COMMUNICATION SYSTEMS

436 CONTROL OF DYNAMIC SYSTEMS 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: EGR 303.

437 COMPUTER-INTEGRATED MANUFACTURING SYSTEMS In-depth study of theory, design, and application of computer-controlled manufacturing systems. Applications of advanced technologies including adaptive-control, automated materials handling and flexible manufacturing systems. Prerequisite: EGR 303, 434.

448-449 SENIOR DESIGN PROJECT 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. EGR 448: feasibility studies performed; EGR 449: implementation, testing, and production of design. Prerequisite: senior standing in student's major.

Computer Science & System Analysis Course Descriptions

174 FUNDAMENTALS OF PROGRAMMING & PROBLEM SOLVING Algorithm development and refinement in problem solving. Modular programming using sequence, selection, and repetition control structures. Program debugging and testing. Formatted input/output. Data files. Fundamental data types. User-defined data types: structured and enumerated. Arrays and arrays of structures. Simple sorting and searching algorithms. Character data and string processing. Algorithm efficiency considerations. Classes, objects, and introduction to object-oriented programming. Prerequisite: CSA 163 or strong programming ability in a compiler language.

271 OBJECT-ORIENTED PROGRAMMING Design and implementation of software using object-oriented programming techniques including inheritance, polymorphism, generic programming, object persistence, and operator overloading. Students analyze program specifications and identify appropriate objects and classes. Additional programming topics include dynamic memory, recursion, existing object libraries, and binary/ASCII file processing. Credit not awarded for both CSA 271 and 279. Prerequisite: CSA 174 with a grade of C- or better or equivalent.

274 DATA ABSTRACTION & DATA STRUCTURE Abstract data types and their implementation as data structures using object-oriented programming. Use of object-oriented principles in the selection and analysis of various ADT implementations. Sequential and linked storage representations: lists, stacks, queues, and tables. Nonlinear data structures: trees and graphs. Recursion, sorting, searching, and algorithm complexity. Prerequisite: CSA 271 with a grade of C- or better, MTH 231 or concurrent registration.

278 COMPUTER ARCHITECTURE 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 174 or equivalent.

381 OPERATING SYSTEMS Introduction to operating systems concepts. The operating system as a resource manager. Principles for the design and implementation of operating systems. User interface programming in current operating systems. Process scheduling and deadlock prevention. Memory management, virtual memory, paging, and segmentation. Interrupt processing. Device management, I/O systems and I/O processing. Security and protection. Examples of operating systems including distributed and open systems. Prerequisite: CSA 278.

283 DATA COMMUNICATION AND NETWORKS Introduction to data communications, computer networks, protocols, and distributed processing as well as relevant standards and underlying theory. Topics include communication codes, transmission methods (analog and digital), interfacing (such as RS-232), error detection, communication protocols (such as TCP/IP), communications architectures (such as the OSI model), switching methods, and network types. Local area network and internetwork technologies are studied. The client/server model of distributed processing addressed. Students design and implement data communications and network-based software. Prerequisite: CSA 174 or permission of instructor.

285 CLIENT SERVER SYSTEMS Introduction to the basic hardware, software, and concepts necessary to design and implement enterprise-wide client server systems. The costs and benefits of client server applications are examined. Different client server architectures are presented with emphasis on the way in which Web technology and the Intranet can be used to implement client-server systems. Students design and construct client-server systems using remote servers on multiple platforms and several different client platforms. Testing of GUI and performance tuning is presented. A project enables students to apply the principles and techniques presented in class. Prerequisite: CSA 283 or permission of instructor.

386 INTRODUCTION TO COMPUTER GRAPHICS Introduction to techniques to create images on the computer. Covers graphics hardware and software, animation, mathematic theory behind 2- and 3-dimensional translation, rotation, and scaling, and areas of graphics application such as computer-aided design. Programming required. Prerequisite: CSA 274 and MTH 231.

486 INTRODUCTION TO ARTIFICIAL INTELLIGENCE Basic concepts of artificial intelligence (AI) including problem solving, search knowledge representation, and rule-based systems covered with symbolic AI language such as PROLOG or LISP. Application areas (natural language understanding, pattern recognition, learning and expert systems) are explored. Prerequisite: CSA 274 or 606.