

MASTER OF SCIENCE IN COMPUTER ENGINEERING AND ELECTRICAL ENGINEERING

The purpose of the Master of Science in Computer Engineering and Electrical Engineering dual degree (M.S.CPE/E.E.) is to prepare students for advanced study and/or research, or for industry in the fields of both computer and electrical engineering. The M.S.CPE./E.E. program provides for a strong foundation in all aspects of the design and development of computer systems, and also offers several areas of study within electrical engineering. There is also an option to pursue thesis research under the guidance of a faculty adviser.

There is a growing need for engineers with a strong educational background in both computer engineering and electrical engineering. In the M.S.CPE./E.E. program, students will be introduced to topics important to the computer engineering field, such as computer hardware design, computer networks, and software engineering, as well as topics in electrical engineering, such as communications and signal processing, electronics and electromagnetics, and power and control systems. The program of study includes a minimum of 45 credit hours of acceptable graduate coursework in both computer engineering and electrical engineering. M.S.CPE./E.E. degree requirements are described in the section below. Requirements for the M.S.CPE./E.E. fully satisfy the existing requirements for an M.S. in Computer Engineering and an M.S. in Electrical Engineering. The program is usually completed in four semesters of full-time study.

Admission requirements for the M.S.CPE./E.E. are the same as those for admission to the Master of Science in Computer Engineering or Electrical Engineering. Students whose accredited B.S. degree is not in computer and/or electrical engineering may pursue the CPE./E.E. degree provided that they demonstrate proficiency in the material contained in the following undergraduate courses:

ECE 211	Circuit Analysis I	3
ECE 213	Circuit Analysis II	4
ECE 218	Digital Systems	4
ECE 242 or CS 350	Digital Computers and Computing Computer Organization and Assembly Language Programming	3
ECE 307	Electrodynamics	4
ECE 308	Signals and Systems	3
ECE 311	Engineering Electronics	4
CS 201	Accelerated Introduction to Computer Science ¹	4
CS 401	Introduction to Advanced Studies I	3
MATH 251	Multivariate and Vector Calculus	4
MATH 252	Introduction to Differential Equations	4

¹ i.e. CS 115 and CS 116 combined

A student may demonstrate proficiency by successfully completing the courses or by demonstrating satisfactory performance in one or more special examinations administered by the department.

In addition to all university requirements for a master of science degree, the M.S.CPE./E.E. degree has the following requirements:

1. A minimum of 45 credit hours of graduate-level coursework including the following:
 - a. Two core courses and two elective courses in a CPE major area, chosen from among the CPE areas of concentration
 - b. One core course from each of the two remaining areas of CPE concentration
 - c. Four (or more) courses within an EE major area, chosen from among the EE areas of concentration
 - d. A minimum of two courses chosen from either or both of the remaining EE areas of concentration
 - e. Additional coursework approved by the academic adviser
2. A GPA of at least 3.0/4.0 (excluding prerequisites and proficiencies)

The CPE/EE program is subject to the following restrictions: a minimum of 30 credit hours coursework at the 500-level or higher; at least 30 credit hours of ECE courses, excluding short courses; no more than six credit hours of ECE short courses; six to eight credit hours of research work (ECE 591) leading to an M.S. dissertation may be included with the approval of a thesis adviser.

Each regular (matriculated) graduate student is assigned an academic adviser, indicated in their formal letter of admission to the master's program.

Master of Science in Computer Engineering and Electrical Engineering (Coursework Only Option)

Requirement	Credits
Minimum Credits Required	45
Minimum 500-Level Credit	30
Minimum ECE Credit	30
Maximum 700-Level Credit	6

Code	Title	Credit Hours
Computer Engineering Major Courses		(12-15)
Select two core courses from the chosen CPE area of concentration from the lists below (p. 2)		6-7
Select two elective courses from the chosen CPE area of concentration from the lists below (p. 2)		6-8
Computer Engineering Elective Courses		(6-8)
Select one course from each of the two remaining CPE areas of concentration from the lists below (p. 2)		6-8
Electrical Engineering Major Courses		(12-16)
Select four courses from the chosen EE area of concentration from the lists below (p. 4)		12-16
Electrical Engineering Minor Electives		(6-8)
Select two courses from either or both of the remaining EE areas of concentration (p. 4)		6-8
General Electives		(0-9)
Select zero to nine credit hours of general ECE electives		0-9

Master of Science in Computer Engineering and Electrical Engineering (Thesis Option)

Requirement	Credits
Minimum Credits Required	45
Minimum 500-Level Credit	30
Minimum ECE Credit	30
Maximum 700-Level Credit	6

Code	Title	Credit Hours
Computer Engineering Major Courses		(12-15)
Select two core courses from the chosen CPE area of concentration from the lists below (p. 2)		6-7
Select two elective courses from the chosen CPE area of concentration from the lists below (p. 2)		6-8
Computer Engineering Elective Courses		(6-8)
Select one course from each of the two remaining CPE areas of concentration from the lists below (p. 2)		6-8
Electrical Engineering Major Courses		(12-16)
Select four courses from the chosen EE area of concentration from the lists below (p. 4)		12-16
Electrical Engineering Minor Electives		(6-8)
Select two courses from either or both of the remaining EE areas of concentration (p. 4)		6-8
General Electives		(0-3)
Select zero to three credit hours of general ECE electives		0-3
Thesis Research		(6-8)
ECE 591	Research and Thesis M.S.	6-8

¹ Students pursuing the thesis option must complete six to eight credit hours of research work (ECE 591) leading to an M.S. dissertation with the approval of a thesis adviser.

CPE Areas of Concentration

Computer Hardware Design

Code	Title	Credit Hours
Core Courses		(6-7)
ECE 529	Advncd VLSI Systems Dsgn	3-4

or ECE 429	Intro to VLSI Design	
ECE 585	Advanced Compt Arch	3
Elective Courses		(48)
ECE 425	Anlys Dsgn Intgrtd Circuits	3
ECE 429	Intro to VLSI Design	4
ECE 430	Fund of Semiconductor Devices	3
ECE 441	Microcomputers/Embedded Comp	4
ECE 446	Advanced Logic Design	4
ECE 485	Computer Organization & Design	3
ECE 529	Advncd VLSI Systems Dsgn	3
ECE 530	High Performnc VLSI/IC Systems	3
ECE 583	High Speed Compt Arithmetic	3
ECE 584	VLSI Archs Sgnl Prcs Commnctns	3
ECE 585	Advanced Compt Arch	3
ECE 586	Fault Detcntn Digital Circuits	3
ECE 587	Hardware Software Codesign	3
ECE 588	CAD Techniques VLSI Dsgn	3
ECE 589	CAD of Analog IC	3

Computer Systems Software

Code	Title	Credit Hours
Core Courses		(6)
CS 550	Advanced Operating Systems	3
CS 551	Operating Syst Design&Implemtn	3
Elective Courses		(36)
ECE 449	Obj-Orrtd Cmptr Sim	3
ECE 587	Hardware Software Codesign	3
CS 487	Software Engineering	3
CS 545	Distributed Computing Lndscp	3
CS 546	Parallel and Distributed Proc	3
CS 550	Advanced Operating Systems	3
CS 551	Operating Syst Design&Implemtn	3
CS 555	Anlytc Mdls Simul Comp Syst	3
CS 586	Software Systems Arch	3
CS 587	Software Project Management	3
CS 588	Advnd Software Engrg Dev	3
CS 589	Software Testing and Anlys	3

Networks and Telecommunications

Code	Title	Credit Hours
Core Courses		(7)
ECE 407	Intro Comp Ntwks with Lab	4
or ECE 408	Intro to Computer Ntwks	
ECE 541	Perform Eval Compt Ntwrk	3
or ECE 545	Advanced Computer Networks	
Elective Courses		(74)
ECE 407	Intro Comp Ntwks with Lab	4
ECE 408	Intro to Computer Ntwks	3
ECE 443	Intro Computer Cyber Security	4
ECE 504	Wireless Comm System Design	3
ECE 508	Video Processing & Comm	3
ECE 511	Analysis Random Signals	3
ECE 513	Commctn Engrg Fundamentals	3

ECE 514	Digital Commctn Principles	3
ECE 515	Modern Digital Communications	3
ECE 516	Coding Distributed Storage Sys	3
ECE 517	Wireless Ntwrk Protocols/Stand	3
ECE 519	Coding Reliable Communications	3
ECE 520	Info Theory and Applications	3
ECE 541	Perform Eval Compt Ntwrk	3
ECE 542	Dsgn Optmztn Compt Ntwrks	3
ECE 543	Computer Network Security	3
ECE 544	Wireless and Mobile Networks	3
ECE 545	Advanced Computer Networks	3
ECE 546	Wireless Network Security	3
ECE 547	Wireless Ntwrks Perf Analysis	3
ECE 570	Fiber Optic Communication Syst	3
ECE 584	VLSI Archs Sgnl Prcs Commctns	3
CS 455	Data Communication	3
CS 544	Computer Ntwrks II: Ntwrk Svc	3

EE Areas of Concentration

Communications and Signal Processing

Code	Title	Credit Hours
ECE 401	Communication Electronics	3
ECE 403	Digital & Data Comm Systems	3
ECE 405	Digital & Data Comm Syst w/Lab	4
ECE 406	Intro to Wireless Comm Systems	3
ECE 421	Microwave Circuits and Systems	3
ECE 423	Microwave Crct&Systs w/Lab	4
ECE 436	Digital Signal Pcsgi w/Lab	4
ECE 437	Digital Signal Processing I	3
ECE 481	Image Processing	3
ECE 504	Wireless Comm Systm Design	3
ECE 507	Imaging Theory & Applications	3
ECE 508	Video Processing & Comm	3
ECE 509	Electromagnetic Field Theory	3
ECE 511	Analysis Random Signals	3
ECE 513	Commctn Engrg Fundamentals	3
ECE 514	Digital Commctn Principles	3
ECE 515	Modern Digital Communications	3
ECE 516	Coding Distributed Storage Sys	3
ECE 519	Coding Reliable Communications	3
ECE 520	Info Theory and Applications	3
ECE 522	Electromagnetic Compatibility	3
ECE 565	Compt Vision Image Processing	3
ECE 566	Statistical Pattern Rcgntn	3
ECE 567	Statistical Signal Processing	3
ECE 568	Digital Speech Processing	3
ECE 569	Digital Signal Processing II	3
ECE 570	Fiber Optic Communication Syst	3
ECE 576	Antenna Theory	3
ECE 578	Microwave Theory	3

Computers and Microelectronics

Code	Title	Credit Hours
ECE 407	Intro Comp Ntwks with Lab	4
ECE 408	Intro to Computer Ntwks	3
ECE 425	Anlys Dsgn Intgrtd Circuits	3
ECE 429	Intro to VLSI Design	4
ECE 430	Fund of Semiconductor Devices	3
ECE 441	Microcomputers/Embedded Comp	4
ECE 443	Intro Computer Cyber Security	4
ECE 446	Advanced Logic Design	4
ECE 449	Obj-Orntd Cmptr Sim	3
ECE 485	Computer Organization & Design	3
ECE 502	Basic Network Theory	3
ECE 517	Wireless Ntwrk Protocols/Stand	3
ECE 521	Quantum Electronics	3
ECE 524	Adv Electronic Circuit Design	3
ECE 525	RF Integrated Circuit Design	3
ECE 526	Active Filter Design	3
ECE 527	Perform Anlys RF Intgrtd Crcts	3
ECE 529	Advncd VLSI Systems Dsgn	3
ECE 530	High Performnc VLSI/IC Systems	3
ECE 541	Perform Eval Compt Ntwrk	3
ECE 542	Dsgn Optmztn Compt Ntwrks	3
ECE 543	Computer Network Security	3
ECE 544	Wireless and Mobile Networks	3
ECE 545	Advanced Computer Networks	3
ECE 546	Wireless Network Security	3
ECE 547	Wireless Ntwrks Perf Analysis	3
ECE 571	Nanodevices Technology	3
ECE 575	Electron Devices	3
ECE 583	High Speed Compt Arithmetic	3
ECE 584	VLSI Archs Sgnl Prcs Commnctns	3
ECE 585	Advanced Compt Arch	3
ECE 586	Fault Detcntn Digital Circuits	3
ECE 587	Hardware Software Codesign	3
ECE 588	CAD Techniques VLSI Dsgn	3
ECE 589	CAD of Analog IC	3

Power and Control

Code	Title	Credit Hours
ECE 411	Power Electronics	4
ECE 412	Hybrid Electric Vehicle Drives	4
ECE 417	Power Dist Engring	3
ECE 418	Power Systems Analysis	3
ECE 419	Power Systems Analysis w/Lab	4
ECE 420	Analyt. Methods for Power Syst	3
ECE 438	Control Systems	3
ECE 505	Applied Optimization Engrgs	3
ECE 506	Anlys Nonlinear Systems	3
ECE 531	Linear System Theory	3
ECE 533	Robust Control	3
ECE 535	Discrete Time Systems	3

ECE 538	Renewable Energies	3
ECE 539	Cmpt Aided Dsgn Elec Machines	3
ECE 540	Relibly Theory Syst Implntn	3
ECE 548	Energy Harvesting	3
ECE 549	Motion Control Syst Dynamics	3
ECE 550	Power Elect Dymcs Control	3
ECE 551	Advanced Power Electronics	3
ECE 552	Adjustable Speed Drives	3
ECE 553	Power System Planning	3
ECE 554	Power Systems Relaying	3
ECE 555	Power Market Operations	3
ECE 556	Power Mkt Ecnmcs Security	3
ECE 557	Fault Tolerant Power Systems	3
ECE 558	Power System Reliability	3
ECE 559	High Voltage Power Trans	3
ECE 560	Power Syst Dynamics Stability	3
ECE 561	Deregulated Power Systems	3
ECE 562	Power Syst Tran Management	3
ECE 563	Comptl Intlgn Engineering	3
ECE 564	Cntrl Oprtn Elect Power Systs	3
ECE 579	Oper/Plan/Dist Power Grid	3
ECE 580	Elements of Sustainable Energy	3
ECE 581	Elements of Smart Grid	3
ECE 582	Microgrid Design and Operation	3