

MASTER OF SCIENCE IN COMPUTER ENGINEERING

The purpose of this degree is to prepare students for advanced study and/or research or industrial practice in the field of computer engineering. The Master of Science in Computer Engineering (M.S.C.P.E.) program builds a strong foundation in all aspects of the design and development of computer systems, with a specialization in a major area. Students have the option to pursue thesis research under the guidance of a faculty adviser. Areas of study include computer hardware design, computer networking and telecommunications, and computer system and application software. The program is normally completed in three semesters of full-time study.

The admission requirements for this degree follow the existing admission requirements for master's degrees in the ECE department. Students whose accredited B.S. degree is not in computer engineering may pursue the M.S.C.P.E., provided that they have an adequate background and can 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 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.

The program of study includes a minimum of 32 credit hours of acceptable graduate coursework, with a minimum of 21 credit hours of ECE coursework. A minimum of 20 credit hours must be taken at the 500-level or higher. Up to six credit hours of ECE short courses may be applied to the degree. Students, with adviser approval, select courses appropriate to their needs and interests. The program of study must include two core and two elective courses within one of the computer engineering (CPE) areas of concentration (computer hardware design, computer systems software, and networks and telecommunications), and at least one core course from each of the two remaining areas. An M.S.C.P.E. candidate may, with permission of a thesis adviser, include in their program a thesis of six to eight credit hours. The master's thesis is strongly recommended for pre-doctoral students. The thesis option requires a written thesis and an oral defense of the thesis. Thesis format and deadlines are set by the Graduate College.

Master of Science in Computer Engineering (Coursework Only Option)

Requirement	Credits
Minimum Credits Required	32
Minimum ECE Course Credit	21
Maximum 400-Level Credit	12
Minimum 500-Level Credit	20
Maximum 700-Level Credit	6
Maximum Transfer Credit	9

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 core course from each of the two remaining CPE areas of concentration from the lists below (p. 2)		6-8
General Electives		(14)
Select 14 credit hours of general ECE electives		14

Master of Science in Computer Engineering (Thesis Option)

Requirement	Credits
Minimum Credits Required	32
Minimum ECE Course Credit	21
Maximum 400-Level Credit	12
Minimum 500-Level Credit	20
Maximum 700-Level Credit	6
Maximum Transfer Credit	9

Code	Title	Credit Hours
Computer Engineer 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 core course from each of the two remaining CPE areas of concentration from the lists below (p. 2)		6-8
General Electives		(8)
Select eight credit hours of general ECE electives		8
Thesis Research		(6-8)
ECE 591	Research and Thesis for Masters Degree ¹	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 or ECE 429	Advanced VLSI Systems Design Introduction to VLSI Design	3-4
ECE 585 or ECE 586	Computer Organization and Design Hardware Security and Advanced Computer Architectures	3
Elective Courses		(0)
ECE 425	Analysis and Design of Integrated Circuits	3
ECE 429	Introduction to VLSI Design	4
ECE 430 or ECE 523	Fundamentals of Semiconductor Devices Fundamentals of Semiconductor Devices	3
ECE 441	Smart and Connected Embedded System Design	4
ECE 442 or ECE 510	Internet of Things and Cyber Physical Systems Internet of Things and Cyber Physical Systems	3
ECE 446	Advanced Logic Design	4
ECE 447 or ECE 501	Artificial Intelligence and Edge Computing Artificial Intelligence and Edge Computing	3
ECE 485 or ECE 585	Computer Organization and Design Computer Organization and Design	3
ECE 523	Fundamentals of Semiconductor Devices	3
ECE 529	Advanced VLSI Systems Design	3
ECE 530	High Performance VLSI IC Systems	3
ECE 583	High Speed Computer Arithmetic	3
ECE 584	VLSI Architecture for Signal Processing and Communication Systems	3
ECE 586	Hardware Security and Advanced Computer Architectures	3
ECE 587	Hardware/Software Codesign	3

ECE 588	Hardware Acceleration for Machine Learning	3
ECE 589	Computer-Aided Design of Analog IC	3

Computer Systems Software

Code	Title	Credit Hours
Core Courses		(6)
CS 550	Advanced Operating Systems	3
ECE 528 or ECE 590	Application Software Design Object-Oriented Programming and Machine Learning	3
Elective Courses		(0)
ECE 442 or ECE 510	Internet of Things and Cyber Physical Systems Internet of Things and Cyber Physical Systems	3
ECE 443 or ECE 518	Introduction to Computer Cyber Security Computer Cyber Security	3
ECE 447 or ECE 501	Artificial Intelligence and Edge Computing Artificial Intelligence and Edge Computing	3
ECE 448 or ECE 528	Application Software Design Application Software Design	3
ECE 449 or ECE 590	Object-Oriented Programming and Machine Learning Object-Oriented Programming and Machine Learning	3
ECE 587	Hardware/Software Codesign	3
CS 487	Software Engineering I	3
CS 545	Distributed Computing Landscape	3
CS 546	Parallel and Distributed Processing	3
CS 550	Advanced Operating Systems	3
CS 551	Operating System Design and Implementation	3
CS 555	Analytic Models and Simulation of Computer Systems	3
CS 586	Software Systems Architectures	3
CS 587	Software Project Management	3
CS 588	Advanced Software Engineering Development	3
CS 589	Software Testing and Analysis	3

Networks and Telecommunications

Code	Title	Credit Hours
Core Courses		(6)
ECE 408 or ECE 545	Introduction to Computer Networks Modern Internet Technologies	3
ECE 541 or ECE 543	Communications Networks Performance Analysis Computer Network Security	3
Elective Courses		(0)
ECE 406 or ECE 504	Wireless Communications Systems Wireless Communication System Design	3
ECE 408 or ECE 545	Introduction to Computer Networks Modern Internet Technologies	3
ECE 442 or ECE 510	Internet of Things and Cyber Physical Systems Internet of Things and Cyber Physical Systems	3
ECE 443 or ECE 518	Introduction to Computer Cyber Security Computer Cyber Security	3
ECE 444 or ECE 543	Computer Network Security Computer Network Security	3
ECE 503	5G Wireless Network: Architecture, New Radio, and Security	3
ECE 504	Wireless Communication System Design	3
ECE 508	Video Communications	3

ECE 511	Analysis of Random Signals	3
ECE 513	Communication Engineering Fundamentals	3
ECE 514	Digital Communication Principles	3
ECE 515	Modern Digital Communications	3
ECE 516	Coding for Distributed Storage Systems	3
ECE 517	Modern Wireless Network Protocols and Standards	3
ECE 519	Coding for Reliable Communications	3
ECE 520	Information Theory and Applications	3
ECE 541	Communications Networks Performance Analysis	3
ECE 542	Design and Optimization of Computer Networks	3
ECE 544	Wireless and Mobile Networks	3
ECE 546	Wireless Network Security	3
ECE 547		3
ECE 570	Fiber-Optic Communication Systems	3
ECE 584	VLSI Architecture for Signal Processing and Communication Systems	3