ELECTRICAL AND COMPUTER ENGINEERING
COLORADO STATE UNIVERSITY

Recommended Courses by ECE Topic Area

Undergraduate Students

IMPORTANT: Verify that a course is an approved Technical Elective for your major:
https://www.engr.colostate.edu/ece/undergraduates/degree-programs/

ECE course descriptions and additional course information can be found on the ECE Courses page:
https://www.engr.colostate.edu/ece/courses/

ECE Topic Areas

Click on the topic of interest to jump to the recommended courses within that topic area.

AEROSPACE

Aerospace – Electrical Engineering

Course Number	Course Name	Semester Offered*	Credits	Online
ATS 550	Atmospheric Radiation and Remote Sensing	F	3	X
ECE 404	Experiments in Optical Electronics	F	2	
ECE 411	Control Systems	F	3	X
ECE 412	Digital Control and Digital Filters	S	3	X
ECE 415	Semiconductor Physics and Junctions	S	2	
ECE 421	Telecommunications I	F	3	X
ECE 441	Optical Electronics	F	3	
ECE 444	Antennas & Radiation	F	3	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 456	Computer Networks	S	4	X
ECE 461	Power Systems	F	4	
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 516	Information Theory	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 521	Satellite Communication	S	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 536	RF Integrated Circuit Design	F, Even years	3	
ECE 540	Computational Electromagnetics	F, Odd years	3	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 548	Microwave Theory & Component Design	S, Odd years	3	
ECE 549	Radar Systems and Design	S, Odd years	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 562	Power Electronics	S, Even years	3	X
ECE/ENGR 565	Electrical Power Engineering	F, Odd years	3	X
ECE 572	Semiconductor Transistors	S	1	
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
ENGR 570	Coupled Electromechanical Systems	F, Even years	3	X
MECH 518	Orbital Mechanics	F	3	X
MECH 519	Aerospace Vehicles Trajectory and Performance	S	3	X
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X

Avionics and Power Systems

Course Number	Course Name
ECE 404	Experiments in Optical Electronics
ECE 441	Optical Electronics
ECE 461	Power Systems
ECE 562	Power Electronics
ECE/ENGR 565	Electrical Power Engineering
ENGR 570	Coupled Electromechanical Systems

Central Aerospace Principles

Course Number	Course Name
ECE 411	Control Systems
ECE 444	Antennas & Radiation
ECE 521	Satellite Communication
ECE 549	Radar Systems and Design
ECE 578	Satellite Data Analysis
ECE 579	Global Navigation Satellite Systems
MECH 518	Orbital Mechanics
MECH 519	Aerospace Vehicles Trajectory and Performance

Communications and Sensing

Course Number	Course Name
ATS 550	Atmospheric Radiation and Remote Sensing
ECE 421	Telecommunications I
ECE 444	Antennas & Radiation
ECE 512	Digital Signal Processing
ECE 514	Applications of Random Processes
ECE 516	Information Theory
ECE 521	Satellite Communication
ECE 536	RF Integrated Circuit Design
ECE 540	Computational Electromagnetics
ECE 541	Applied Electromagnetics
ECE 545	FPGA Signal Processing/Software-Defined Radio
ECE 548	Microwave Theory & Component Design
ECE 549	Radar Systems and Design
ECE 556	AI for Radar and Remote Sensing
ECE 578	Satellite Data Analysis
ECE 579	Global Navigation Satellite Systems
ECE 580C9	Signal Processing and Artificial Intelligence

Robotics and Controls

Course Number	Course Name
ECE 411	Control Systems
ECE 412	Digital Control and Digital Filters
ECE 452	Computer Organization and Architecture
ECE 455	Intro to Robot Programming/Simulation
ECE 456	Computer Networks
ECE 520	Optimization Methods for Control & Communications
ECE/CS 528	Embedded Systems and Machine Learning
ECE/CS 561	Hardware/Software Design of Embedded Systems
ECE 580C8	Adaptive Systems and Machine Learning
ECE 580C9	Signal Processing and Artificial Intelligence
MECH 580B6	Aerospace Guidance, Navigation, and Control

Aerospace - Computer Engineering

Course Number	Course Name	Semester Offered*	Credits	Online
ATS 550	Atmospheric Radiation and Remote Sensing	F	3	X
CS 314	Software Engineering	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 415	Software Testing	S	4	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 430	Database Systems	S	4	X
CS 435	Introduction to Big Data	F	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 465	Multimodal Interaction for 3D User Interfaces	S	4	X
CS 475	Parallel Programming	F	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 545	Machine Learning	F	4	X
CS 553	Algorithmic Language Compilers	As needed	4	
CS 559	Quantitative Security	F	4	X
CS 575	Parallel Processing	As needed	4	X
CT 307[a]	High Performance Programming in Rust	S	2	
ECE 340[a]	Electromagnetics for Computer Engineering	F	3	X
ECE 404	Experiments in Optical Electronics	F	2	
ECE 411	Control Systems	F	3	X
ECE 412	Digital Control and Digital Filters	S	3	X
ECE 415	Semiconductor Physics and Junctions	S	2	
ECE 421	Telecommunications I	F	3	X
ECE 441	Optical Electronics	F	3	
ECE 444	Antennas & Radiation	F	3	
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 456	Computer Networks	S	4	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 516	Information Theory	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 521	Satellite Communication	S	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 540	Computational Electromagnetics	F, Odd years	3	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 549	Radar Systems and Design	S, Odd years	3	X
ECE 554	Computer Architecture	S, Even years	3	X

Aerospace – Computer Engineering, continued

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 571	VLSI System Design/Lab	S	4	
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
ENGR 570	Coupled Electromechanical Systems	F, Even years	3	X
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 451	Introduction to Numerical Analysis II	S	3	
MECH 518	Orbital Mechanics	F	3	X
MECH 519	Aerospace Vehicles Trajectory and Performance	S	3	X
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X
STAT 421	Introduction to Stochastic Processes	S	3	
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X

[a] Counts as technical elective for Computer Engineering major students only.

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Number	Course Name	Semester Offered*	Credits	Online
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 540	Artificial Intelligence	S	4	X
CS 545	Machine Learning	F	4	X
ECE 513	Digital Image Processing	S	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 516	Information Theory	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 578	Satellite Data Analysis	S	3	X
ECE/BIOM 580C7	Machine Learning in Imaging and Spectroscopy	F, Even years	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X

BIOMEDICAL ENGINEERING

Biomedical Devices

Course Number	Course Name	Semester Offered*	Credits	Online
CS 464	Principles of Human-Computer Interaction	S	4	X
ECE/BIOM 403	Intro to Optical Techniques in Biomedical Engineering	F, Even years	3	X
ECE 404	Experiments in Optical Electronics	F	2	
ECE 415	Semiconductor Physics and Junctions	S	2	
ECE/BIOM 431	Biomedical Signal and Image Processing	S	3	X
ECE 441	Optical Electronics	F	3	
ECE 480A8	Waves in Photonic Integrated Circuit Elements	F	3	
ECE 504	Physical Optics	F, Odd years	3	X
ECE 505	Nanostructures: Fundamentals and Applications	As needed	3	X
ECE/MATH 522	Random Walks	F, Even years	3	X
ECE/BIOM 526	Biological Physics	F, Odd years	3	X
ECE/BIOM 527A	Biosensors: Cells as Circuits	F, Odd years	1	
ECE/BIOM 527B	Biosensors: Signal and Noise in Biosensors	S, Even years	1	
ECE/BIOM 527C	Biosensors: Sensor Circuit Fundamentals	F, Odd years	1	
ECE/BIOM 527D	Biosensors: Electrochemical Sensors	F, Odd years	1	
ECE/BIOM 527E	Biosensors: Affinity Sensors	S, Even years	1	
ECE/BIOM 527F	Biosensors: Biophotonic Sensors Using Refractive Index	S, Even years	1	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 546	Laser Fundamentals and Devices	S, Odd years	3	
ECE 572	Semiconductor Transistors	S	1	
ECE 574	Optical Materials and Devices	S, Even years	3	X
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 469	Linear Algebra II	S	3	

Biomedical Signals and Systems

Course Number	Course Name	Semester Offered*	Credits	Online
CS 425	Introduction to Bioinformatics Algorithms	F	4	X
CS 525	Bioinformatics Algorithms	As needed	4	X
ECE/BIOM 403	Intro to Optical Techniques in Biomedical Engineering	F, Even years	3	X
ECE/BIOM 431	Biomedical Signal and Image Processing	S	3	X
ECE 457[b]	Fourier Optics	S	3	X
ECE 480A8	Waves in Photonic Integrated Circuit Elements	F	3	
ECE 502[b]	Advanced Fourier Optics	S	4	X
ECE 503	Ultrafast Optics	S, Even years	3	
ECE 504	Physical Optics	F, Odd years	3	X
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE/MATH 522	Random Walks	F, Even years	3	X

Biomedical Signals and Systems, continued

Course Number	Course Name	Semester Offered*	Credits	Online
ECE/BIOM 526	Biological Physics	F, Odd years	3	X
ECE/BIOM 527A	Biosensors: Cells as Circuits	F, Odd years	1	
ECE/BIOM 527B	Biosensors: Signal and Noise in Biosensors	S, Even years	1	
ECE/BIOM 527C	Biosensors: Sensor Circuit Fundamentals	F, Odd years	1	
ECE/BIOM 527D	Biosensors: Electrochemical Sensors	F, Odd years	1	
ECE/BIOM 527E	Biosensors: Affinity Sensors	S, Even years	1	
ECE/BIOM 527F	Biosensors: Biophotonic Sensors Using Refractive Index	S, Even years	1	
ECE/BIOM 537	Biomedical Signal Processing	As needed	3	X
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 580C7	Machine Learning in Imaging and Spectroscopy	F, Even years	3	X
MATH 419	Introduction to Complex Variables	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 469	Linear Algebra II	S	3	

[b] Students cannot receive credit for both ECE457 and ECE502.

COMMUNICATIONS

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 421	Telecommunications I	F	3	X
ECE/MATH 430	Fourier and Wavelet Analysis with Apps.	S	3	
ECE 444	Antennas & Radiation	F	3	
ECE 456	Computer Networks	S	4	X
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 516	Information Theory	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 521	Satellite Communication	S	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 549	Radar Systems and Design	S, Odd years	3	X
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
MATH 417	Advanced Calculus I	F	3	
MATH 466	Abstract Algebra I	F	3	
MATH 469	Linear Algebra II	S	3	
MATH 474	Introduction to Differential Geometry	F, Odd years	3	
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X

COMPUTER ENGINEERING

Computer Architecture

Course Number	Course Name	Semester Offered*	Credits	Online
CS 314	Software Engineering	F,S	3	X
CS 320	Algorithms: Theory and Practice	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 356	System Security	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 414	Object Oriented Design	F	4	X
CS 415	Software Testing	S	4	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 422	Automata, Logic, and Computation	F	4	X
CS 425	Intro to Bioinformatics Algorithms	F	4	
CS 435	Introduction to Big Data	F	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 453	Introduction to Compiler Construction	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 458	Blockchain Principles and Applications	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 475	Parallel Programming	F	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 530	Fault-Tolerant Computing	S	4	X
CS 545	Machine Learning	F	4	X
CS 553	Algorithmic Language Compilers	As needed	4	
CS 559	Quantitative Security	F	4	X
CS 575	Parallel Processing	As needed	4	X
CT 307[a]	High Performance Programming in Rust	S	2	
ECE 340[a]	Electromagnetics for Computer Engineering	F	3	X
ECE 445	Digital Logic Synthesis	S, Even years	3	X
ECE 450/451	Digital System Design Lab/Digital System Design	F	4	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 480A6	Optical Computing	S	3	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 571	VLSI System Design	S	4	
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X

Computer Architecture, continued

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
MATH 360[a]	Mathematics of Information Security	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 460	Information and Coding Theory	S	3	
MATH 463	Post-Quantum Cryptography	S, Odd years	3	
STAT 421	Introduction to Stochastic Processes	S	3	

[a] Counts as technical elective for Computer Engineering major students only.

Computer Engineering

Course Number	Course Name	Semester Offered*	Credits	Online
CS 314	Software Engineering	F,S	3	X
CS 320	Algorithms: Theory and Practice	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 356	System Security	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 414	Object Oriented Design	F	4	X
CS 415	Software Testing	S	4	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 422	Automata, Logic, and Computation	F	4	X
CS 425	Intro to Bioinformatics Algorithms	F	4	
CS 435	Introduction to Big Data	F	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 453	Introduction to Compiler Construction	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 458	Blockchain Principles and Applications	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 475	Parallel Programming	F	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 530	Fault-Tolerant Computing	S	4	X
CS 545	Machine Learning	F	4	X
CS 553	Algorithmic Language Compilers	As needed	4	
CS 559	Quantitative Security	F	4	X
CS 575	Parallel Processing	As needed	4	X
CT 307[a]	High Performance Programming in Rust	S	2	
ECE 340[a]	Electromagnetics for Computer Engineering	S	3	X
ECE 445	Digital Logic Synthesis	S, Even years	3	X
ECE 450/451	Digital System Design Lab/Digital System Design	F	4	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 456	Computer Networks	S	4	X
ECE 480A6	Optical Computing	S	3	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 571	VLSI System Design	S	4	
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X

Computer Engineering, continued

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
IDEA 310H[a]	Design Thinking Toolbox: Mixed Reality Design	F, Even years	3	
MATH 360[a]	Mathematics of Information Security	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 460	Information and Coding Theory	S	3	
MATH 463	Post-Quantum Cryptography	S, Odd years	3	
MECH 564	Fundamentals of Robot Mechanics and Controls	S	3	X
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X
STAT 421	Introduction to Stochastic Processes	S	3	
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X

[a] Counts as technical elective for Computer Engineering major students only.

Computer Networking

Course Number	Course Name	Semester Offered*	Credits	Online
CS 314	Software Engineering	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 425	Intro to Bioinformatics Algorithms	F	4	
CS 435	Introduction to Big Data	F	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 458	Blockchain Principles and Applications	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 545	Machine Learning	F	4	X
CS 559	Quantitative Security	F	4	X
ECE 340[a]	Electromagnetics for Computer Engineering	S	3	X
ECE 445	Digital Logic Synthesis	S, Even years	3	X
ECE 456	Computer Networks	S	4	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 516	Information Theory	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
MATH 360[a]	Mathematics of Information Security	F	3	
MATH 460	Information and Coding Theory	S	3	
MATH 463	Post-Quantum Cryptography	S, Odd years	3	
STAT 421	Introduction to Stochastic Processes	S	3	

[a] Counts as technical elective for Computer Engineering major students only.

Embedded Systems

Course Number	Course Name	Semester Offered*	Credits	Online
CS 314	Software Engineering	F,S	3	X
CS 320	Algorithms: Theory and Practice	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 356	System Security	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 414	Object Oriented Design	F	4	X
CS 415	Software Testing	S	4	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 422	Automata, Logic, and Computation	F	4	X
CS 425	Intro to Bioinformatics Algorithms	F	4	
CS 435	Introduction to Big Data	S	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 453	Introduction to Compiler Construction	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 458	Blockchain Principles and Applications	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 465	Multimodal Interaction for 3D User Interfaces	S	4	X
CS 475	Parallel Programming	F	4	X
CS 481A5	Data Mining at Scale	As needed	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 530	Fault-Tolerant Computing	S	4	X
CS 545	Machine Learning	F	4	X
CS 553	Algorithmic Language Compilers	As needed	4	
CS 559	Quantitative Security	F	4	X
CS 575	Parallel Processing	As needed	4	X
CT 307[a]	High Performance Programming in Rust	S	2	
ECE 340[a]	Electromagnetics for Computer Engineering	S	3	X
ECE 445	Digital Logic Synthesis	S, Even years	3	X
ECE 450/451	Digital System Design Lab/Digital System Design	F	4	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 456	Computer Networks	S	4	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 571	VLSI System Design	S	4	

Embedded Systems, continued

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ENGR 480A1	Engineering with Drones	S	3	
MATH 360[a]	Mathematics of Information Security	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 451	Introduction to Numerical Analysis II	S	3	
MATH 460	Information and Coding Theory	S	3	
MATH 463	Post-Quantum Cryptography	S, Odd years	3	
MECH 564	Fundamentals of Robot Mechanics and Controls	S	3	X
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X
STAT 421	Introduction to Stochastic Processes	S	3	
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X

[a] Counts as technical elective for Computer Engineering major students only.

High Performance Computing

Course Number	Course Name	Semester Offered*	Credits	Online
CS 314	Software Engineering	F,S	3	X
CS 320	Algorithms: Theory and Practice	F,S	3	X
CS 345	Machine Learning Foundations and Practice	F,S	3	X
CS 356	System Security	F,S	3	X
CS 370	Operating Systems	F,S	3	X
CS 414	Object Oriented Design	F	4	X
CS 415	Software Testing	S	4	X
CS 420	Introduction to Analysis of Algorithms	F	4	X
CS 422	Automata, Logic, and Computation	F	4	X
CS 425	Intro to Bioinformatics Algorithms	F	4	
CS 435	Introduction to Big Data	S	4	X
CS 440	Introduction to Artificial Intelligence	F	4	X
CS 445	Introduction to Machine Learning	S	4	X
CS 453	Introduction to Compiler Construction	S	4	X
CS 455	Introduction to Distributed Systems	S	4	X
CS 456	Modern Cybersecurity	F	4	X
CS 458	Blockchain Principles and Applications	S	4	X
CS 462	Engaging in Virtual Worlds	F	4	X
CS 464	Principles of Human-Computer Interaction	S	4	X
CS 475	Parallel Programming	F	4	X
CS 482A	Study Abroad – Japan: Engaging in Virtual Worlds	SU	4	
CS 530	Fault-Tolerant Computing	S	4	X
CS 545	Machine Learning	F	4	X
CS 559	Quantitative Security	F	4	X
CS 575	Parallel Processing	As needed	4	X
CT 307[a]	High Performance Programming in Rust	S	2	
ECE 340[a]	Electromagnetics for Computer Engineering	S	3	X
ECE 445	Digital Logic Synthesis	S, Even years	3	X
ECE 450/451	Digital System Design Lab/Digital System Design	F	4	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 456	Computer Networks	S	4	X
ECE 480A7	Intro to Quantum Computing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 519	Network Centric Systems	S, Even years	3	X
ECE/CS 528	Embedded Systems and Machine Learning	F	4	X
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 578	Satellite Data Analysis	S	3	X
ECE 580C6	Storage System--Device to System Perspective	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	

High Performance Computing, continued

Course Number	Course Name	Semester Offered*	Credits	Online
MATH 360[a]	Mathematics of Information Security	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 451	Introduction to Numerical Analysis II	S	3	
MATH 460	Information and Coding Theory	S	3	
MATH 463	Post-Quantum Cryptography	S, Odd years	3	
MATH 469	Linear Algebra I	S	3	
SYSE 580A6	AI – Augmented Systems Engineering	S, Even years	3	X
STAT 421	Introduction to Stochastic Processes	S	3	

[a] Counts as technical elective for Computer Engineering major students only.

CONTROLS

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 411	Control Systems	F	3	X
ECE 412	Digital Control and Digital Filters	S	3	X
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
MATH 417	Advanced Calculus I	F	3	
MATH 418	Advanced Calculus II	S, Even years	3	
MATH 466	Abstract Algebra I	F	3	
MATH 469	Linear Algebra II	S	3	
MATH 474	Introduction to Differential Geometry	F, Odd years	3	
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X

DIGITAL SIGNAL AND IMAGE PROCESSING

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 512	Digital Signal Processing	F	3	X
ECE 513	Digital Image Processing	S	3	X
ECE 514	Applications of Random Processes	F	4	X
ECE 516	Information Theory	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 521	Satellite Communication	S	3	X
ECE/MATH 522	Random Walks	F, Even years	3	X
ECE/BIOM 537	Biomedical Signal Processing	As needed	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X
ECE/BIOM 580C7	Machine Learning in Imaging and Spectroscopy	F, Even years	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
MATH 417	Advanced Calculus I	F	3	
MATH 418	Advanced Calculus II	S, Even years	3	
MATH 466	Abstract Algebra I	F	3	
MATH 469	Linear Algebra II	S	3	
MATH 474	Introduction to Differential Geometry	F, Odd years	3	
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X

ELECTRICAL POWER AND ENERGY

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 411	Control Systems	F	3	X
ECE 461	Power Systems	F	4	
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 562	Power Electronics	S, Even years	3	X
ECE/ENGR 565	Electrical Power Engineering	F, Odd years	3	X
ECE/ENGR 566	Grid Integration of Wind Energy Systems	S, Odd years	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
MECH 403	Energy Engineering	F	3	X
MATH 417	Advanced Calculus I	F	3	
MATH 418	Advanced Calculus II	S	3	
MATH 419	Introduction to Complex Variables	F	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 451	Introduction to Numerical Analysis II	S	3	

ELECTROMAGNETICS AND REMOTE SENSING

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 444	Antennas & Radiation	F	3	
ECE 512	Digital Signal Processing	F	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 521	Satellite Communication	S	3	X
ECE 536	RF Integrated Circuit Design	F, Even years	3	
ECE 540	Computational Electromagnetics	F, Odd years	3	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 548	Microwave Theory & Component Design	S, Odd years	3	
ECE 549	Radar Systems and Design	S, Odd years	3	X
ECE 556	AI for Radar and Remote Sensing	S	3	X
ECE 578	Satellite Data Analysis	S	3	X
ECE 579	Global Navigation Satellite Systems	F	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
ENGR 480A1	Engineering with Drones	S	3	
MECH 580B6	Aerospace Guidance, Navigation, and Control	S	3	X

LASERS & OPTICS

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 312[b]	Linear Systems Analysis II	S	3	
ECE/BIOM 403	Intro to Optical Techniques in Biomedical Engineering	F, Even years	3	X
ECE 404	Experiments in Optical Electronics	F	2	
ECE 415	Semiconductor Physics and Junctions	S	2	
ECE/MATH 430	Fourier & Wavelet Analysis with Applications	S	3	
ECE 441	Optical Electronics	F	3	
ECE 457[c]	Fourier Optics	S	3	X
ECE 480A8	Waves in Photonic Integrated Circuit Elements	F	3	
ECE 502[b]	Advanced Fourier Optics	S	4	X
ECE 503	Ultrafast Optics	S, Even years	3	
ECE 504	Physical Optics	F, Odd years	3	X
ECE 505	Nanostructures: Fundamentals and Applications	As needed	3	X
ECE 506	Optical Interferometry and Laser Metrology	F, Odd years	3	X
ECE 507	Plasma Physics and Applications	S, Even years	3	
ECE/BIOM 526	Biological Physics	F, Odd years	3	X
ECE/BIOM 527B	Biosensors: Signal and Noise in Biosensors	S, Even years	1	
ECE/BIOM 527F	Biosensors: Biophotonic Sensors Using Refractive Index	S, Even years	1	
ECE 544	Silicon Photonics for Computing Systems	F	3	X
ECE 546	Laser Fundamentals and Devices	S, Odd years	3	
ECE 572	Semiconductor Transistors	S	1	
ECE 573	Semiconductor Optoelectronics Laboratory	As needed	3	
ECE 574	Optical Materials and Devices	S, Even years	3	X
ECE/BIOM 580C7	Machine Learning in Imaging and Spectroscopy	F, Even years	3	X
MATH 419	Introduction to Complex Variables	F	3	
PH 315	Modern Physics Lab	S	2	
PH 425	Advanced Physics Laboratory	S	2	
PH 451	Introductory Quantum Mechanics I	F	3	
PH 452	Intro to Quantum Mechanics II	S	3	
PH 462	Statistical Physics	F	3	

[b] Counts as technical elective for Lasers and Optical Engineering Concentration students only.

[c] Credit not allowed for both ECE457 and ECE502.

ROBOTICS

Robotic Control

Course Number	Course Name	Semester Offered*	Credits	Online
CS 345	Machine Learning Foundations and Practice	F, S	3	X
CS 445	Introduction to Machine Learning	S	4	X
ECE 411	Control Systems	F	3	X
ECE 412	Digital Control and Digital Filters	S	3	X
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 514	Applications of Random Processes	F	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 469	Linear Algebra II	S	3	
MECH 564	Fundamentals of Robot Mechanics and Controls	S	3	X

Robotics Vision

Course Number	Course Name	Semester Offered*	Credits	Online
CS 345	Machine Learning Foundations and Practice	F, S	3	X
CS 410	Introduction to Computer Graphics	F	3	X
CS 445	Introduction to Machine Learning	S	4	X
DSCI 475	Topological Data Analysis	S	2	
ECE 455	Intro to Robot Programming/Simulation	F, 2025	3	X
ECE 512	Digital Signal Processing	F	3	X
ECE 513	Digital Image Processing	S	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 580C8	Adaptive Systems and Machine Learning	S	3	X
ECE 580C9	Signal Processing and Artificial Intelligence	S, Odd	3	
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 469	Linear Algebra II	S	3	
MATH 474	Introduction to Differential Geometry	F, Odd years	3	
MECH 564	Fundamentals of Robot Mechanics and Controls	S	3	X

SEMI-CONDUCTOR DEVICES AND PROCESSING

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 404	Experiments in Optical Electronics	F	2	
ECE 441	Optical Electronics	F	3	
ECE 415	Semiconductor Physics and Junctions	S	2	
ECE 504	Physical Optics	F, Odd years	3	X
ECE 505	Nanostructures	As needed	3	X
ECE 536	RF Integrated Circuit Design	F, Even years	3	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 546	Laser Fundamentals and Device	S, Odd years	3	
ECE 571	VLSI System Design	S	4	
ECE 572	Semiconductor Transistors	S	1	
ECE 573	Semiconductor Optoelectronics Laboratory	As needed	3	
ECE 574	Optical Materials and Devices	S, Even years	3	X

VLSI (VERY LARGE SCALE INTEGRATION)

Course Number	Course Name	Semester Offered*	Credits	Online
ECE 340[a]	Electromagnetics for Computer Engineering	S	3	X
ECE 450/451	Digital System Design and Laboratory	F	4	
ECE 452	Computer Organization and Architecture	S	3	X
ECE 520	Optimization Methods for Control & Communications	S	3	X
ECE 534	Analog Integrated Circuit Design	As needed	4	
ECE 536	RF Integrated Circuit Design	F, Even years	3	
ECE 538	Design Analysis of Analog Digital Interface	As needed	4	
ECE 541	Applied Electromagnetics	F, Even years	3	
ECE 544	Silicon Photonics in Computing Systems	F	3	X
ECE 545	FPGA Signal Processing/Software-Defined Radio	As needed	3	X
ECE 554	Computer Architecture	S, Even years	3	X
ECE/CS 561	Hardware/Software Design of Embedded Systems	S, Odd years	4	X
ECE 571	VLSI System Design	S	4	
ECE 580C6	Storage System--Device to System Perspective	S	3	X
MATH 450	Introduction to Numerical Analysis I	F	3	
MATH 451	Introduction to Numerical Analysis II	S	3	
STAT 421	Introduction to Stochastic Processes	S	3	

[a] Counts as technical elective for Computer Engineering major students only.