Electrical and Computer Engineering, MS

Chairperson: Majeed Hayat, Ph.D.
Electrical and Computer Engineering Graduate Programs website (https://www.marquette.edu/grad/programs-electrical-computer-engineering.php)

Degree Offered

Master of Science

Mission Statement

The Department of Electrical and Computer Engineering embraces the missions of Marquette University and its College of Engineering. The mission of the Department of Electrical and Computer Engineering is to offer its students high quality, up-to-date, nationally-recognized programs in electrical and computer engineering that prepare them for successful careers. This success is marked by a commitment to lifelong learning and a deep concern for the impact of their work on others, research that advances the frontiers of technical and scientific knowledge and service to professional and civic communities.

Program Description

The master of science degree program is designed to provide graduate students with both broad fundamental knowledge and up-to-date information on current and emerging technologies. Students may enroll on either a full-time or part-time basis. Research-oriented master's students engage in research activities under the close supervision of their advisers, gradually learning to become independent researchers. Their projects often are supported by government and industry grants. Courses and research activities make significant use of the department's extensive laboratory and computer facilities. Graduates find employment in industry, research facilities, government and academia.

General Information

All admitted students are required to obtain and read the department's Graduate Student Handbook, which contains complete details about the electrical and computer engineering programs and additional departmental degrees. This handbook is available through the Electrical and Computer Engineering Office, (414) 288-6820 and on the department's graduate programs website (http://www.marquette.edu/engineering/electrical_computer/grad.shtml/).

Electrical and Computer Engineering Master of Science

The EECE department offers two options for earning a master's degree: a thesis option (Plan A) and a non-thesis/course work option (Plan B). By the end of the first term of full-time studies, all master's students are required to meet with their academic adviser and together complete a Master's Program Planning Form. This planning form identifies the chosen option (Plan A or B) as well as the proposed set of courses for their program of study. The program of study must be approved by the adviser and the EECE director of graduate studies.

Students choose one or more from the list of the EECE Department focus areas: Signal Processing, Communications and Controls (Signal Processing, Controls, or Communications); Power and Energy Systems; Electronic Devices and Microsystems; and Computer Engineering (Computer Vision and Image Processing, Embedded Systems and Internet of Things (IoT), or Machine Learning and Algorithms).

Thesis Option (Plan A)

For Plan A, students complete 24 credit hours of course work and 6 credit hours of EECE 6999 Master's Thesis for a total of 30 credit hours. All full-time students are required to participate in EECE 6952 Department Colloquium (0 credits) each term. Course selections are determined in consultation with the adviser and depend on the focus area chosen.

- At least 18 of the 24 credits hours of course work must be taken in EECE.
- At least 12 credit hours (exclusive of thesis) must be taken strictly at the graduate level (6000 or 8000-level).
- Students must successfully complete and defend a research thesis under the guidance of their faculty advisers and thesis committee members.

Non-Thesis/Course Work Option (Plan B)

For Plan B, students complete a total of 30 credit hours of course work. All full-time students are required to participate in EECE 6952 Department Colloquium (0 credits) each term. Course selections are determined in consultation with the adviser and depend on the focus area chosen.

- At least 21 credit hours must be in EECE.
- At least 18 credits of the total program course work and at least 12 credits of the EECE course work must be taken strictly at the graduate level (6000 or 8000-level).

- Students must successfully pass the master of science comprehensive written examination, given in fall and spring term, prior to graduation. The exam covers material from the selected focus area courses.

Signal Processing, Communications and Controls

Code	Title	Hours
Core Courses - choose three of the following:		
EECE 6010	Advanced Engineering Mathematics	3
EECE 6020	Probability and Random Processes in Engineering	3
Choose one of the following area-specific courses:		3
EECE 5510	Digital Signal Processing	
EECE 5560	Introduction to Communication Systems	
EECE 6310	Modern Control Theory	
Elective Core Courses - choose three of the following:		9
EECE 5310	Control Systems	
EECE 5320	Digital Control Systems	
EECE 5390	Developments in Control	
EECE 5550	Developments in Signal Processing	
EECE 5565	Optical Fiber Communications	
EECE 5570	Wireless Communications	
EECE 6320	Optimal Control	
EECE 6330	Nonlinear and Adaptive Control	
EECE 6340	Stochastic Systems Estimation and Control	
EECE 6510	Optimal and Adaptive Digital Signal Processing	
EECE 6520	Digital Processing of Speech Signals	
EECE 6530	Chaos and Nonlinear Signal Processing	
EECE 6540	Advanced Digital Image Processing	
EECE 6560	Information and Coding Theory	
EECE 6931	Topics in Electrical and Computer Engineering (Digital Communications)	
EECE 6931	Topics in Electrical and Computer Engineering (Detection and Estimation)	
EECE 6931	Topics in Electrical and Computer Engineering (Machine Learning for Image Processing)	
Elective Courses - choose two of the following:		6
Selected graduate-level courses in EECE, biomedical engineering, computer science, mathematics as approved by adviser.		
EECE 6952	Department Colloquium (required each term for all full-time students)	0
Plan A or Plan B requirements, as listed above - EECE 6999 or Electives		6
Total Credit Hours:		**30**

Power and Energy Systems

Code	Title	Hours
Core Courses - choose three of the following:		
EECE 5210	Design and Analysis of Electric Motor-Drive Systems	3
EECE 5220	Power Electronics for Renewable Energy Systems	3
Choose one of the following area-specific courses:		3
EECE 5240	Protection and Monitoring of Electric Energy Systems	
EECE 5250	Transients in Electric Energy Systems and Devices	
Elective Core Courses - choose three of the following:		9
EECE 5230	Renewable and Legacy Electric Energy Systems Analysis	
EECE 5290	Developments in Energy and Power	
EECE 6210	Advanced Electric Machines and Drives	
EECE 6220	Advanced Concepts in the Design and Modeling of Electric Machines and Drives	
EECE 6230	Finite Element Analysis	
EECE 6932	Advanced Topics in Electrical and Computer Engineering (Advanced Electrical Machine Design)	
EECE 6932	Advanced Topics in Electrical and Computer Engineering (Advanced Power Electronics)	

EECE 6932	Advanced Topics in Electrical and Computer Engineering (Vector Control)	
Elective Courses - choose two of the following:		6
EECE 5320	Digital Control Systems	
EECE 6010	Advanced Engineering Mathematics	
EECE 6020	Probability and Random Processes in Engineering	
EECE 6310	Modern Control Theory	
EECE 6320	Optimal Control	
EECE 6330	Nonlinear and Adaptive Control	
Selected graduate-level courses in EECE, biomedical engineering, computer science, mathematics as approved by adviser.		
EECE 6952	Department Colloquium (required each term for all full-time students)	0
Plan A or Plan B requirements, as listed above - EECE 6999 or Electives		6
Total Credit Hours:		**30**

Electronic Devices and Microsystems

Code	Title	Hours
Core Courses - choose three of the following:		9
EECE 5110	Microwave Engineering	
or EECE 6110	Advanced Electromagnetic Fields	
or EECE 6120	Electromagnetic Theory	
EECE 5430	Physical Principles of Solid State Devices	
EECE 6010	Advanced Engineering Mathematics	
EECE 6932	Advanced Topics in Electrical and Computer Engineering (Introduction to MEMS)	
Elective Core Courses - choose three of the following:		9
EECE 5130	Antenna Theory and Design	
EECE 5460	Sensor Devices: Theory, Design and Applications	
EECE 6130	Numerical Techniques in Electromagnetics	
EECE 6430	Microelectromechanical Systems and Sensors	
EECE 6931	Topics in Electrical and Computer Engineering (Introduction to Device Fabrication)	
EECE 6931	Topics in Electrical and Computer Engineering (MEMS and Nanotechnology)	
Elective Courses - choose two of the following:		6
Selected graduate-level courses in EECE, thermodynamics, quantum mechanics, materials, finite element methods, mechanical engineering, biomedical engineering, mathematics as approved by adviser.		
EECE 6952	Department Colloquium (required each term for all full-time students)	0
Plan A or Plan B requirements, as listed above - EECE 6999 or Electives		6
Total Credit Hours:		**30**

Computer Engineering

Code	Title	Hours
Core Courses - choose three of the following:		9
EECE 5650	Introduction to Algorithms	
EECE 6810	Algorithm Analysis and Applications	
EECE 6822	Machine Learning	
One 3-credit selected mathematics course		
Elective Core Courses - choose three of the following:		9
Computer Vision and Image Processing:		
EECE 5510	Digital Signal Processing	
EECE 5850	Introduction to Intelligent Systems	
EECE 5860	Introduction to Neural Networks and Fuzzy Systems	
EECE 6540	Advanced Digital Image Processing	
EECE 6840	Neural Networks and Neural Computing	
EECE 6931	Topics in Electrical and Computer Engineering (Machine Learning and Medical Image Analysis)	
EECE 6932	Advanced Topics in Electrical and Computer Engineering (Advanced Signal Processing)	

One 3-credit selected mathematics course		
Embedded Systems and Internet of Things (IoT)		
EECE 5490	Developments in Devices	
EECE 5510	Digital Signal Processing	
EECE 5710	Computer Hardware	
EECE 5730	Computer Architecture	
EECE 5740	Advanced VHDL and FPGA Design	
EECE 5850	Introduction to Intelligent Systems	
EECE 6932	Advanced Topics in Electrical and Computer Engineering (Advanced Signal Processing)	
One 3-credit selected mathematics course		
Machine Learning and Algorithms		
EECE 5690	Developments in Computer Software	
EECE 5850	Introduction to Intelligent Systems	
EECE 5860	Introduction to Neural Networks and Fuzzy Systems	
EECE 5870	Evolutionary Computation	
EECE 6830	Pattern Recognition	
EECE 6840	Neural Networks and Neural Computing	
EECE 6931	Topics in Electrical and Computer Engineering (Machine Learning and Medical Image Analysis)	
One 3-credit selected mathematics course		
Elective Courses - choose two of the following:		6
Selected graduate-level courses in EECE, biomedical engineering, computer science, mathematics as approved by adviser.		
EECE 6952	Department Colloquium (required each term for all full-time students)	0
Plan A or Plan B requirements, as listed above - EECE 6999 or Electives		6
Total Credit Hours:		**30**

Accelerated Bachelor’s–Master’s Degree Program

The EECE Department offers an accelerated degree program where eligible students may obtain both a bachelor's degree and a master of science degree in electrical and computer engineering in five years.

- Students with a GPA of 3.500 or better in their mathematics, science and engineering courses are eligible to apply to this program in their junior year.
- This program is available to undergraduate students in electrical and computer engineering or in physics.
- Students wishing to participate in the five-year program must apply and be admitted to the program before their senior year.

University Policies

- Academic Censure - Graduate School (https://bulletin.marquette.edu/policies/academic-censure/graduate/)
- Academic Integrity (https://bulletin.marquette.edu/policies/academic-integrity/)
- Academic Misconduct (https://bulletin.marquette.edu/policies/academic-misconduct-policy/)
- Academic Program Definitions (https://bulletin.marquette.edu/policies/academic-programs-defined/)
- Accelerated Degree Programs (https://bulletin.marquette.edu/policies/accelerated-degree-programs/)
- Attendance - Graduate School (https://bulletin.marquette.edu/policies/attendance/graduate/)
- Awarding Diplomas and Certificates (https://bulletin.marquette.edu/policies/awarding-diplomas-certificates/)
- Background Checks, Drug Testing (https://bulletin.marquette.edu/policies/background-checks-drug-testing/)
- Class Rank (https://bulletin.marquette.edu/policies/class-rank/)
- Commencement (https://bulletin.marquette.edu/policies/commencement/)
- Conferral of Degrees and Certificates (https://bulletin.marquette.edu/policies/conferral-degrees-certificates/)
- Course Levels (https://bulletin.marquette.edu/policies/course-levels/)
- Credit Hour (https://bulletin.marquette.edu/policies/credit/)
- Credit Load - Graduate School (https://bulletin.marquette.edu/policies/credit-load/graduate/)
- Faculty Grading (https://bulletin.marquette.edu/policies/faculty-grading/)
- Family Education Rights and Privacy Act-FERPA (https://bulletin.marquette.edu/policies/ferpa/)

- Grade Appeals (https://bulletin.marquette.edu/policies/grade-appeals/)
- Grading System - Graduate School and Graduate School of Management (https://bulletin.marquette.edu/policies/grading-system/graduate-management/)
- Graduation - Graduate School (https://bulletin.marquette.edu/policies/graduation/graduate/)
- Immunization and Tuberculosis Screening Requirements (https://bulletin.marquette.edu/policies/immunization-and-tuberculosis-screening/)
- Last Date of Attendance/Activity (https://bulletin.marquette.edu/policies/last-dateof-attendance-activity/)
- Military Call to Active Duty or Training (https://bulletin.marquette.edu/policies/militarycall-active-duty-training/)
- Registration - Graduate School (https://bulletin.marquette.edu/policies/registration/graduate/)
- Repeated Courses - Graduate School (https://bulletin.marquette.edu/policies/repeated-courses/graduate/)
- Student Data Use and Privacy (https://bulletin.marquette.edu/policies/student-data-use-privacy/)
- Transcripts-Official (https://bulletin.marquette.edu/policies/transcripts-official/)
- Transfer Course Credit - Graduate School (https://bulletin.marquette.edu/policies/transfer-course-credit-policy/graduate/)
- Withdrawal - Graduate School (https://bulletin.marquette.edu/policies/withdrawals/graduate/)

Graduate School Policies

- Academic Performance (https://bulletin.marquette.edu/graduate/policies/academic-performance/)
- Academic Programs Overview (https://bulletin.marquette.edu/graduate/policies/academic-programs-overview/)
- Advising (https://bulletin.marquette.edu/graduate/policies/advising/)
- Assistantships and Fellowships (https://bulletin.marquette.edu/graduate/policies/assistantships-andfellowships/)
- Certificate Concurrent Enrollment (https://bulletin.marquette.edu/graduate/policies/certificate-concurrent-enrollment/)
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- Research Involving Humans, Animals, Radioisotopes or Recombinant DNA/Transgenic Organisms (https://bulletin.marquette.edu/graduate/policies/research-involving-humans-animals-radioisotopes-recombinant-dnatransgenic-organisms/)
- Temporary Withdrawal from Graduate Program (https://bulletin.marquette.edu/graduate/policies/temporary-withdrawal-graduate-program/)
- Time Limitations (https://bulletin.marquette.edu/graduate/policies/time-limitations/)
- Working with Minors (https://bulletin.marquette.edu/graduate/policies/working-minors/)

Electrical and Computer Engineering Graduate Programs

- Electrical and Computer Engineering, MS (p. 1)
- Electrical and Computer Engineering, PHD (https://bulletin.marquette.edu/graduate/electrical-computer-engineering-phd/)
- Machine Learning for Engineering Applications, Certificate (https://bulletin.marquette.edu/graduate/machine-learning-engineering-applications-certificate/)
- Renewable Energy Technology and Integration, Certificate (https://bulletin.marquette.edu/graduate/renewable-energy-technology-integration-certificate/)

EECE 5015 Advanced Electrical Engineering Laboratory (3 credits)
Project-based laboratory experience in the design, assembly and testing of advanced electronic and electrical systems. Course content announced prior to each term. Students may enroll in the course more than once as the content of the course changes. Possible topics for the advanced laboratory experience include, but are not limited to: advanced electromagnetic system design, optical and high frequency electronics, nonlinear control systems, motor control circuits and systems, power electronics, communications circuits, integrated microelectronic circuit design and fabrication (VLSI), advanced analog system design, advanced digital system design, microprocessor system-level design. Instruction and use of the appropriate test and measurement tools for design, assembly and testing of systems. Two hrs. lec., 2 hrs. lab.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205015)

EECE 5090 Developments in Electronics (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include laser electronics, optoelectronics and photonics, RF circuit design, SOC design.
Prerequisite: Cons. of instr. or grad. stndg.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205090)

EECE 5100 Transmission Lines and Electromagnetic Waves (3 credits)
Development and use of wave equations as derived from Maxwell's equations to explain the propagation of electromagnetic waves. Includes wave propagation, reflection/diffraction, antennas, and transmission lines including use of the Smith chart. Discusses S parameters and the vector network analyzer. An introduction to the physical principles of radio communication.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205100)

EECE 5110 Microwave Engineering (3 credits)
Studies the fundamentals of microwave engineering. After a review of transmission line theory and the Smith chart, the scattering parameters are developed and used to characterize and design a variety of devices including power dividers/directional couplers, filters, amplifiers, oscillators and mixers. Receiver architectures and system noise are also introduced and developed.
Level of Study: Graduate
Last four terms offered: 2021 Spring Term, 2018 Spring Term, 2016 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205110)

EECE 5130 Antenna Theory and Design (3 credits)
Design and use of antennas of varying types, including wire, broadbands, horn, and reflector antennas in transmitting and receiving applications. The application and design of antenna arrays, and an introduction to diffraction theory.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2017 Spring Term, 2015 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205130)

EECE 5150 Applied Finite Elements in Electromagnetics (3 credits)
Introduction to finite element (FE) analysis as applied to linear and static electromagnetic field problems. Review of basic field formulations using Maxwell's electromagnetic field equations, solution of boundary value problems using the finite difference methods, FE formulations, assembly of elemental and global matrices, pre-processing, post-processing. Application of the FE method using one-dimensional and two-dimensional elements, magnetostatic and electrostatic analysis, and the use of commercially available software packages.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205150)

EECE 5190 Developments in Electromagnetics (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include wireless and microwave components and systems, electromagnetic compatibility, radio wave propagation.
Prerequisite: Cons. of instr. or grad. stndg.
Level of Study: Graduate
Last four terms offered: 2013 Fall Term, 2012 Spring Term, 2011 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205190)

EECE 5210 Design and Analysis of Electric Motor-Drive Systems (3 credits)
Principles of design of AC and DC electric machines, in particular design of electric motors in power electronically controlled adjustable speed drives, torque and power to volume analysis under constant volts per hertz torque-speed control. Covers design of AC induction, synchronous, universal and DC conventional as well as brushless DC motors, and low horsepower motors in adjustable speed drives. Covers effects of space and time harmonics on motor design and performance are covered including harmonic abatement for control of torque pulsation. Use of modern modeling techniques throughout.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2020 Fall Term, 2019 Fall Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205210)

EECE 5220 Power Electronics for Renewable Energy Systems (3 credits)
Fundamental concepts, techniques, and methods for design and analysis of power electronic systems. Modeling of semiconductor switching devices for use in power electronic systems. Practical aspects and power electronic conversion techniques for rectifiers, DC-to-DC converters, DC-to-AC inverters and their applications in wind and solar renewable energy and power electronic systems.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205220)

EECE 5230 Renewable and Legacy Electric Energy Systems Analysis (3 credits)
Elements of renewable and legacy electric power systems; fundamental concepts and techniques for design and analysis; per unit system; load flow; economic dispatch; smart grids and load management; steady state and transient power system stability.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2016 Fall Term, 2014 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205230)

EECE 5240 Protection and Monitoring of Electric Energy Systems (3 credits)
Principles of design of relay and sensor systems for detection of faulty operating conditions in electric generators, transformers, power transmission lines, motors and other loads in power systems. Symmetrical components, balanced and unbalanced faults including single and multiple unbalances. Design and hierarchical coordination of protection systems for interconnected generation, transmission and distribution facilities in power systems, which includes integrated generator-transformer-busbar-transmission line-load protection and analysis of operation under fault conditions.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2019 Fall Term, 2017 Fall Term, 2013 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205240)

EECE 5250 Transients in Electric Energy Systems and Devices (3 credits)
Covers microsecond fast transients in power systems and devices resulting from lightning strokes, switching surges in power systems and devices, as well as impulse surges resulting from pulse width modulation in modern adjustable speed drives, using distributed parameter models and analysis of transmission lines and windings of transformers, generators and motors. Also covers successive reflections, transition points, wavefront flattening techniques and surge arrestor design applications for voltage buildup reduction and control are studied. Includes polyphase multi-velocity multi-conductor system transients.
Level of Study: Graduate
Last four terms offered: 2018 Fall Term, 2016 Fall Term, 2015 Fall Term, 2012 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205250)

EECE 5290 Developments in Energy and Power (1-3 credits)
Course content is announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Topics may include: electronics for machine and drive systems, electrical transients, faults and diagnostics and protection in power devices and systems, renewable energy systems, smart grids and advanced topics in the electric energy engineering area.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205290)

EECE 5310 Control Systems (3 credits)
Review of continuous-time linear systems. Time-domain system analysis. Time-domain design of lead/lag and PID controllers. Root-Locus technique. Frequency-domain system analysis including Nyquist, Bode, and Nichols analysis and relative stability. Frequency-domain design/lag and PID controllers.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205310)

EECE 5320 Digital Control Systems (3 credits)
Review of sampling processes, discrete time linear systems analysis and z-transform. Discrete time and sampled data state-variable analysis. Stability analysis, time domain and frequency-domain analysis and design. Analysis, design and computer implementation of digital algorithms and control systems.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2020 Fall Term, 2019 Spring Term, 2018 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205320)

EECE 5390 Developments in Control (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include optimal, adaptive and robust control methods, digital control and nonlinear systems.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205390)

EECE 5410 Introduction to Device Fabrication (3 credits)
Fundamentals of integrated circuit (IC) and semiconductor device fabrication technology. Also studies specialized microelectromechanical systems (MEMS) processing. Students develop an advanced understanding of all aspects of IC fabrication including: materials (Si, SiO2, GaAs, Al, Au, etc.), processes (deposition, etching, lithography, oxidation/diffusion, etc.), and equipment (reactive ion etching, evaporator, plasma sputtering, chemical vapor deposition, etc.). Includes both theoretical and experimental considerations.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2016 Fall Term, 2015 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205410)

EECE 5430 Physical Principles of Solid State Devices (3 credits)
Fundamental physical principles of solid state devices are presented. The operation of modern semiconductor devices is explained from first principles and these principles are used to extend the students' knowledge of devices used in electronic circuits.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205430)

EECE 5440 MEMS and Nanotechnology (3 credits)
Lecture and laboratory work are combined to provide students with a practical, hands-on introduction to micro-electro-mechanical systems (MEMS) and nano-electro-mechanical systems (NEMS).
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205440)

EECE 5460 Sensor Devices: Theory, Design and Applications (3 credits)
Sensor classification and transduction principles. Fundamental principles and theory of operation of various types of sensors, based on various technologies which include: optical, electrical, acoustical, thermal, magnetic, mechanical and chemical. Analysis of sensor signals. Study of sensor characteristics which include hysteresis, non-linearity, saturation, repeatability, sensitivity, selectivity and resolution. Design and practical implementations of various sensors for scientific, industrial and consumer applications.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2019 Fall Term, 2017 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205460)

EECE 5490 Developments in Devices (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include: optoelectronic devices, nano-scale devices, solid-state devices, integrated electronic devices, power devices, electro-mechanical devices, quantum devices.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2021 Spring Term, 2020 Fall Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205490)

EECE 5510 Digital Signal Processing (3 credits)
Introduction to the theory and practice of discrete-time signals and systems. Concepts covered include Fourier Transforms, Z-transforms, linear time invariant system analysis in the time and frequency domains, sampling theory and Discrete Fourier Transforms. Application of these concepts includes digital filter design techniques and the use of Fast Fourier Transforms for efficient frequency domain analysis. Labs and design projects related to specific signal processing applications are used to illustrate the material, including topics such as audio and image processing.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205510)

EECE 5520 Digital Image Processing (3 credits)
Theory and practice of image digitization, processing, coding and analysis. Representations of images, image models. Techniques of image enhancement and restoration. Image compaction and coding. Segmentation and image understanding. Students have the opportunity to experiment with several image processing techniques using the MATLAB Image Processing Toolbox.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2021 Fall Term, 2020 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205520)

EECE 5530 Probability and Statistics for Engineers (3 credits)
Introduction to probability: probability space, random variables, distribution/density functions, expectation, correlation; transformation of random variables; elements of statistics: sample means, confidence intervals, survival rate, hypothesis testing, model parameter estimation; computational statistical analysis using Matlab; elements of stochastic processes: autocorrelation functions, power spectral density, wide-sense stationary processes, transmission through linear time-invariant systems; applications to engineering problems in circuits, reliability, failure analysis, data communication, computer networks, signal processing, and data-traffic models.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205530)

EECE 5550 Developments in Signal Processing (1-3 credits)
Course content is announced prior to each term. Students may enroll in the course more than once because subject matter changes. Depending upon the subject matter and the instructor, the class may be taught in traditional lecture format or as a seminar which focuses on readings from the current literature. Possible topics include filter design, DSP hardware, Nonlinear signal processing and multi-dimensional signal processing.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205550)

EECE 5560 Introduction to Communication Systems (3 credits)
Survey of digital and analog communication systems including signal representation, modulation techniques, transmit and receive network design considerations.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2020 Spring Term, 2019 Spring Term, 2015 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205560)

EECE 5565 Optical Fiber Communications (3 credits)
Fundamental principles and theories of optical fiber systems are introduced and developed. Review of electromagnetic principles of wave-guides. Step-Index and Graded-Index, single and multimode fibers. Signal analysis in optical fibers: mode interaction, attenuation, dispersion and pulse spreading. Operating characteristics of optical sources and photo-receivers with impact on system performance. Coupling to a fiber and distribution system. Optical fiber communication system design. Design Elective.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2020 Fall Term, 2018 Fall Term, 2017 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205565)

EECE 5570 Wireless Communications (3 credits)
Fundamentals, analysis and design of cell systems, including trunking theory and grade of service. Large scale and small scale path loss analysis and modeling. Overview of modulation techniques, including amplitude and frequency modulating, and digital modulation techniques.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2011 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205570)

EECE 5590 Developments in Communications (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include digital modulation and detection, coding theory, information theory.
Level of Study: Graduate
Last four terms offered: 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205590)

EECE 5610 Object-Oriented Software Engineering (3 credits)
Presents advanced software engineering concepts in the context of object-oriented analysis and design. Topics include: concept of object-orientation, UML modeling techniques, use of CASE tools, use-case requirement analysis, modeling with classes, object-oriented design, design patterns, software quality, testing and correctness, sofware reuse and aspect-oriented software engineering.
Prerequisite: COEN 2610 or equiv.
Level of Study: Graduate
Last four terms offered: 2017 Spring Term, 2016 Spring Term, 2012 Fall Term, 2011 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205610)

EECE 5620 Modern Programming Practices (3 credits)
Explores advanced topics in computer programming. Topics may include: design patterns, advanced graphical components, software component models such as Java Beans, the Java Security model, Java and databases, servlets, Java Server Pages, and Enterprise Java Beans.
Level of Study: Graduate
Last four terms offered: 2012 Spring Term, 2010 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205620)

EECE 5630 Software Testing (3 credits)
Examines the relationship of software testing to quality, emphasizing testing techniques and the role of testing in the validation of system requirements. Topics include: module and unit testing, integration, walkthroughs and inspections, verification and validation, preventing and detecting errors, selecting and implementing project metrics, and defining test plans and strategies traced from system requirements.
Level of Study: Graduate
Last four terms offered: 2011 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205630)

EECE 5650 Introduction to Algorithms (3 credits)
Introduction to the algorithms analysis. Topics to be covered include: the concepts of time and space complexity, advanced data structures, general issues in problem solving methodologies, greedy algorithms, dynamic programming, graph algorithms, AI-related algorithms, and an introduction to NP-completeness theory.
Prerequisite: COSC 2010 or equiv.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2019 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205650)

EECE 5690 Developments in Computer Software (3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205690)

EECE 5710 Computer Hardware (3 credits)
Overview of computer system design. Cost and performance specification. Design of arithmetic and logic units. Fundamentals of central processor architecture and a comparative study of computer instruction set architectures. Detailed study of microprocessors, including instruction execution timing and other timing considerations. Discussions of memory and I/O devices, including the interfaces to the CPU and I/O transfer techniques. Study of common bus standards.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205710)

EECE 5730 Computer Architecture (3 credits)
Review of basic computer architecture. Evaluation of architecture performance. Design and evaluation of instruction sets. Pipeline processors and instruction scheduling. Vector processors. Memory hierarchy and design including cache, main and virtual memories. Memory protection schemes. Input/output and its relation to system performance.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2020 Fall Term, 2019 Fall Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205730)

EECE 5740 Advanced VHDL and FPGA Design (3 credits)
Presents the background, abstractions, and techniques for advanced digital circuits design and optimization. Emphasizes specification and synthesis using VHDL and prototyping using FPGAs of complex systems. Such systems represent examples from various application domains, including processors, image and video processing, filtering and other DSPs, and power electronics.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205740)

EECE 5790 Developments in Computer Hardware (3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2016 Spring Term, 2015 Spring Term, 2014 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205790)

EECE 5800 Networks and Security (3 credits)
A variety of relevant topics are discussed, including communication network architecture, networking protocols, error control, media access control, routing, addressing, congestion/flow control, TCP and UDP, cryptography, authentication and VPNs.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205800)

EECE 5820 Operating Systems and Networking (3 credits)
Introduces the fundamental concepts of operating systems together with the basics of networking and communications including: memory management, scheduling, concurrent processing, device management, file systems, networking, security, and system performance. Examples are drawn from legacy and modern operating systems.
Level of Study: Graduate
Last four terms offered: 2019 Spring Term, 2018 Spring Term, 2017 Spring Term, 2016 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205820)

EECE 5830 Introduction to Computer Graphics (3 credits)
Introduction to computer graphics algorithm design and implementation; includes considerable actual computer graphics experience. Topics include: point-plotting and line-drawing techniques, two-dimensional curve fitting, two- and three-dimensional graphics, clipping, windowing, hidden line removal, modeling, input-output devices, and other topics as future trends dictate.
Prerequisite: Proficiency in at least one high-level computing language.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2019 Fall Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205830)

EECE 5840 Computer Security (3 credits)
Introduction to the important issues in computer security, including cryptography, program security, operating system security, database security, and network security. Also discusses the legal, ethical and privacy issues that arise in computer security. Programming projects enable the student to practice implementing many of the security measures discussed in class.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205840)

EECE 5850 Introduction to Intelligent Systems (3 credits)
Provides a broad exposure to intelligent systems, including related fields such as artificial and computational intelligence. Topics include: intelligent agents, search, game playing, propositional logic and first-order predicate calculus, uncertainty, learning, communication and perception, and philosophical foundations of intelligent systems.
Prerequisite: COSC 2010, MATH 1450, MATH 2105 or equiv.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2020 Fall Term, 2019 Fall Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205850)

EECE 5860 Introduction to Neural Networks and Fuzzy Systems (3 credits)
Concepts of artificial neural network architectures and training algorithms, supervised and unsupervised learning, linear and non-linear neural networks, feedback neural networks, applications in scientific and engineering areas, fundamentals of fuzzy sets and fuzzy logic, fuzzy rules and inference systems, fuzzy pattern classification and clustering analysis and fuzzy control systems.
Prerequisite: COSC 2010 and MATH 1451 or equiv.
Level of Study: Graduate
Last four terms offered: 2016 Fall Term, 2015 Fall Term, 2014 Spring Term, 2012 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205860)

EECE 5870 Evolutionary Computation (3 credits)
Covers a set of search methods based on the Darwinian principle of survival of the fittest. The methods include genetic algorithms, evolutionary strategies and evolutionary and genetic programming, which have been successfully applied to many different problem domains including optimization, learning, control, and scheduling. Provides students with the background and knowledge to implement various evolutionary computation algorithms, discusses trade-offs between different evolutionary algorithms and other search methods, and discusses issues related to the application and performance evaluation of evolutionary algorithms.
Prerequisite: COSC 2010, MATH 1450, MATH 2105 or equiv.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2019 Fall Term, 2017 Fall Term, 2011 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205870)

EECE 5890 Developments in Computing (1-3 credits)
Course content announced prior to each term. Students may enroll in the course more than once as subject matter changes. May be taught in traditional lecture format or as a seminar which focuses on readings from current literature. Possible topics include: advanced hardware (MPP, EPIC, VLIW), advanced software (enterprise systems, embedded software, real-time software) and advanced intelligent systems.
Level of Study: Graduate
Last four terms offered: 2023 Summer Term, 2023 Spring Term, 2022 Fall Term, 2022 Summer Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%205890)

EECE 6010 Advanced Engineering Mathematics (3 credits)
Linear algebra and matrix theory, ordinary differential equations and complex variables emphasizing both theoretical and numerical aspects as well as engineering applications.
Prerequisite: MATH 2451 or equiv.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206010)

EECE 6020 Probability and Random Processes in Engineering (3 credits)
Probability, random variables, statistics, and random processes, emphasizing both theoretical and numerical aspects as well as engineering applications.
Prerequisite: MATH 2451 or equiv.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206020)

EECE 6090 Advanced Engineering 1 (3 credits)
Mathematics, image processing, signal processing, image reconstruction, and imaging systems in medical imaging applications. Offered fall term at the General Electric Medical Systems facility. This course extends beyond the Marquette term; students receive an IC grade initially. The IC will be changed to an A-F grade at the end of the course.; GE employee.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2022 Spring Term, 2021 Fall Term, 2021 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206090)

EECE 6092 Advanced Engineering 2 (3 credits)
Problem solving methodology, software engineering tools and environment (typical topics: UNIX, C, data structures, object oriented paradigm, programming strategies), and hardware engineering tools (typical topics: analog and digital CAD, PALs, VME, applications). EECE 6092 and EECE 6810 may not both be used to meet degree requirements. Offered spring term at the General Electric Medical Systems facility. This course extends beyond the Marquette term; students receive an IC grade initially. The IC will be changed to an A-F grade at the end of the course.; GE employee.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206092)

EECE 6094 Advanced Engineering 3 (3 credits)
Covers advanced concepts in medical imaging and systems. Offered spring term at the General Electric Medical Systems facility. This course extends beyond the Marquette term; students receive an IC grade initially. The IC will be changed to an A-F grade at the end of the course.; GE employee.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206094)

EECE 6110 Advanced Electromagnetic Fields (3 credits)
Solutions of Laplace and Poisson equations arising from electro and magneto static field configurations. Separation of variables, numerical relaxation, and conformal mapping techniques.
Prerequisite: EECE 3110 or equiv.
Level of Study: Graduate
Last four terms offered: 1997 Spring Term, 1994 Fall Term, 1990 Spring Term, 1988 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206110)

EECE 6120 Electromagnetic Theory (3 credits)
Review of Maxwell's equations and waves in dielectric and lossy media; image theory, induction theorem and Green's function. Plane, cylindrical and spherical wave functions; radiation and antennas; rectangular, cylindrical waveguides and cavities; spherical cavities. Perturbation and variation techniques and moment techniques.
Prerequisite: EECE 3120 or equiv.
Level of Study: Graduate
Last four terms offered: 2020 Fall Term, 2012 Spring Term, 2007 Fall Term, 2005 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206120)

EECE 6130 Numerical Techniques in Electromagnetics (3 credits)
Introduction and overview of numerical methods in electromagnetics, focusing on high frequency methods. Topics covered include: a review of analytic methods and the generalized multipole technique, finite difference methods, variational techniques, and the solution to integral equations via the method of moments.
Prerequisite: ELEN 3120 and MATH 2451 or equiv.
Level of Study: Graduate
Last four terms offered: 2010 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206130)

EECE 6210 Advanced Electric Machines and Drives (3 credits)
Machine characterization. Development and application of transformation theory to synchronous and induction machines to predict machine performance under steady state and abnormal conditions. Modeling of permanent magnet and switched reluctance machines, as well as other advanced machine systems. Dynamic performance prediction of electric machines and associated power electronics using equivalent network models and computer simulations.
Prerequisite: ELEN 3210 and MATH 2451 or equiv.
Level of Study: Graduate
Last four terms offered: 2021 Fall Term, 2019 Spring Term, 2017 Spring Term, 2015 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206210)

EECE 6220 Advanced Concepts in the Design and Modeling of Electric Machines and Drives (3 credits)
Presents advanced concepts and methodologies in designing and modeling modern electric machines controlled and operated from electronically switched electric drives. Involves methods of analysis and computation of the adverse synergistic effects which occur between the space harmonics generated in electric machinery due to magnetic circuit topologies, time harmonics generated by electronic switching in the controllers/drives, and the impact of this synergism on losses, efficiency, torque quality and other performance issues. Includes full and rigorous analysis and inclusion of such space harmonics, and time harmonics. Studies, in detail, methods of mitigation or elimination of these effects using advance modeling concepts and tools.
Prerequisite: ELEN 3210 or equiv.
Level of Study: Graduate
Last four terms offered: 2020 Spring Term, 2018 Spring Term, 2016 Spring Term, 2014 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206220)

EECE 6230 Finite Element Analysis (3 credits)
Basic field formulations using Maxwell's electromagnetic field equations. General definitions and formulations of finite element discretization. Consideration of applications and method implementation. Application of the finite element method to engineering and design problems. Post processing, practical aspects and other considerations. Application of method involves the use of commercially available software packages as well as computer code developed during this course.; and proficiency in computer programming.
Prerequisite: MATH 2451 or equiv.
Level of Study: Graduate
Last four terms offered: 2014 Fall Term, 2009 Spring Term, 2003 Fall Term, 1998 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206230)

EECE 6240 Renewable Energy: Policy, Technology and Sustainability (3 credits)
Focuses on the legal policy, technical framework and sustainability for electrical energy project development in Wisconsin. Legal policy topics include corporate structuring, financing, taxation, permitting and strategies to support and oppose such projects. Describes a general overview of technical considerations for emerging renewable technologies in Wisconsin, such as biomass, waste to energy, geothermal, solar and wind projects. Introduces sustainable development aspects of renewable energy projects to identify impacts to the triple bottom line (social, environmental and financial). Fosters a collaborative approach in a multidisciplinary setting to developing renewable energy projects, consistent with legal and technical partnerships that occur in practice.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206240)

EECE 6310 Modern Control Theory (3 credits)
Review of linear algebra and matrices. State variable analysis of continuous-time and discrete-time systems. Controllability and observability of linear systems. Stability of linear and nonlinear systems. Design of feedback control systems. Introduction to optimal control theory.
Prerequisite: EECE 6010 which may be taken concurrently; or MEEN 6101 which may be taken concurrently.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206310)

EECE 6320 Optimal Control (3 credits)
Presents an in-depth understanding of the problems in optimal control theory and their applications. Presents calculus of variations, linear quadratic regulator design, dynamic programming, time-optimal, and output feedback regulating and tracking optimal control techniques for continuous-time systems. Presents discrete-time techniques for calculus of variations, linear quadratic tracking, output feedback optimal control, and time-optimal control. Also presents optimal observers.
Prerequisite: EECE 6010 and EECE 6310 or equiv.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2020 Spring Term, 2019 Spring Term, 2017 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206320)

EECE 6330 Nonlinear and Adaptive Control (3 credits)
Review of state space and modern control theory with emphasis on stability, convergence, and robustness. Lyapunov stability and advanced stability theory. Nonlinear systems analysis, feedback linearization, and sliding mode control. Real-time parameter identification and adaptive observers. Continuous-time and discrete-time self-tuning regulators and model-reference adaptive systems. Introduction to system identification and adaptive control using artificial neural networks.
Prerequisite: EECE 6010 and EECE 6310 or equiv.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2021 Spring Term, 2018 Spring Term, 2015 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206330)

EECE 6340 Stochastic Systems Estimation and Control (3 credits)
Modeling probabilistic dynamical behavior with stochastic systems. Analysis of behavior of linear continuous and discrete time systems via simulation and analytical methods. Filter construction for state and parameter estimation using noisy and incomplete measurements for linear and nonlinear systems and measurements models. Design of optimal controllers based on quadratic criteria for linear stochastic systems.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2020 Fall Term, 2018 Spring Term, 2013 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206340)

EECE 6420 Infrared and Photonics Sensors: Theory and Applications (3 credits)
Fundamentals of infrared (IR) technology. Performance capabilities and operational limitations of IR and photonic devices and sensors. Principles and theory of IR radiation. Analysis of transmission characteristics of optical signals through the atmosphere: effects of scattering, absorption and diffraction as a function of atmospheric parameters. IR sources and detectors. Passive and active IR devices, components and sensors. IR-based and photonic-based sensors; applications to environmental sensing, biotechnology and medical analysis, space and surveillance systems. IR signature analysis. Aspects of advanced IR and photonic technologies with possible performance improvements.
Prerequisite: ELEN 3110 or equiv.
Level of Study: Graduate
Last four terms offered: 2007 Fall Term, 2005 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206420)

EECE 6425 Introduction to Microelectromechanical Systems (MEMS) (3 credits)
Covers the history, design and fabrication of microelectromechanical systems (MEMS) and the basic operating theory of selected MEMS transducers. Typical fabrication methods covered include surface micromachining, bulk micromachining and micro-molding. Surveys a broad range of MEMS transducers (sensors and/or actuators) and applications. Activities include a weekly computer laboratory where students design, layout and simulate classical MEMS devices, to include electrostatic actuators, electro-thermal actuators, multilayer misfit-strain actuators, comb-drive resonators and hinged structures. Students prepare several MEMS designs using a computer-aided drawing program as if to be submitted for fabrication to a commercial micromachining process.
Prerequisite: EECE 4410 or cons. of instr.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206425)

EECE 6430 Microelectromechanical Systems and Sensors (3 credits)
Overview of microelectromechanical-MEMS-transducers and sensors. Basic engineering sciences and fundamental principles relevant to mechanical sensors and micromachined mechanical transducers. Mathematical models and design of microelectromechanical systems. Microfabrication techniques, materials and processes. Mechanical transduction techniques, pressure sensors, force and torque sensors, inertial sensors, flow sensors, micromachined resonant sensors, micromachined chemical sensors.
Prerequisite: ELEN 3110 or equiv.
Level of Study: Graduate
Last four terms offered: 2018 Spring Term, 2010 Fall Term, 2009 Spring Term, 2006 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206430)

EECE 6450 Surface-Acoustic-Wave Devices (3 credits)
Theory of surface and other acoustic modes; design, analysis, and performance of interdigital devices; multistrip couplers; SAW resonators; dispersive delay lines; system applications; current research areas.
Prerequisite: ELEN 3020 and ELEN 3110 or equiv.
Level of Study: Graduate
Last four terms offered: 2012 Spring Term, 2009 Spring Term, 2008 Spring Term, 2007 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206450)

EECE 6510 Optimal and Adaptive Digital Signal Processing (3 credits)
Introduction to optimal and adaptive signal processing theory and applications. Topics include: statistically optimal gradient descent methods, such as least-mean-squares and minimal error methods, least squares and recursive least squares, Wiener filters, linear prediction, Kalman filters and performance and convergence analysis techniques.
Prerequisite: EECE 5510 and EECE 6020 or equiv.
Level of Study: Graduate
Last four terms offered: 2016 Spring Term, 2013 Spring Term, 2011 Spring Term, 2006 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206510)

EECE 6520 Digital Processing of Speech Signals (3 credits)
Introduction to the fundamentals of speech processing, including speech production and perception models and frequency-domain analysis methods such as, linear predictive coding and cepstral analysis. Applications studied include: speech coding, enhancement, recognition and synthesis.
Prerequisite: EECE 5510 or equiv.
Level of Study: Graduate
Last four terms offered: 2015 Fall Term, 2014 Spring Term, 2012 Spring Term, 2010 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206520)

EECE 6530 Chaos and Nonlinear Signal Processing (3 credits)
Introduces the theory and practice for analyzing chaotic and nonlinear signals. Examines methods for finding hidden structures in signals and time series, using techniques such as phase space reconstruction. Discusses topics previously mentioned along with machine learning, time series analysis, adaptive signal processing, wavelets and nonlinear dynamics.
Prerequisite: EECE 5510 or equiv.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2020 Spring Term, 2018 Spring Term, 2016 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206530)

EECE 6540 Advanced Digital Image Processing (3 credits)
Theory and practice of image digitization, processing, coding and analysis. Representations of images, image models. Techniques of image enhancement and restoration. Image compaction and coding. Segmentation and image understanding.
Level of Study: Graduate
Last four terms offered: 2015 Fall Term, 2014 Fall Term, 2009 Fall Term, 2004 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206540)

EECE 6560 Information and Coding Theory (3 credits)
Introduction to information measure, mutual information, self-information, entropy, encoding of information, discrete and continuous channels, channel capacity, error detection, error correcting codes, group codes, cyclic codes, BCH codes, convolution codes, and advanced codes.
Level of Study: Graduate
Last four terms offered: 2007 Spring Term, 2001 Fall Term, 2000 Spring Term, 1998 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206560)

EECE 6570 Detection, Estimation and Learning Theory (3 credits)
Topics include hypothesis testing: Bayes, minimax and Neaman-Pearson detection, asymptotic relative efficiency; Karhunen-Loeve representation; optimal discrete-, continuous-time and sequential detection: structure and performance; maximum likelihood, minimum mean square-error, and maximum a posteriori estimation; sufficient statistics; generalized bounds on estimator performance; linear estimation; Kalman-Bucy and extended Kalman filtering; importance sampling; blind estimation; and elements of compressive sensing.
Prerequisite: EECE 6020 or equiv.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206570)

EECE 6710 Computer Architecture (3 credits)
Review of basic computer architecture. Evaluation of architecture performance. Design and evaluation of instruction sets. Pipeline processors and instruction scheduling. Vector processors. Memory hierarchy and design, including cache, main and virtual memories. Memory protection schemes. Input/output and its relation to system performance.
Prerequisite: COEN 5710 or equiv.
Level of Study: Graduate
Last four terms offered: 2004 Fall Term, 2003 Fall Term, 2002 Fall Term, 2001 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206710)

EECE 6810 Algorithm Analysis and Applications (3 credits)
Introduction to the analysis of algorithms. Topics include: asymptotic complexity notation, recursion analysis, basic and advanced data structures, sorting methodologies, dynamic programming, and graph algorithms, including heuristic search techniques such as best-first and A-star algorithms. Advanced topics include NP-completeness theory and linear programming.
Prerequisite: EECE 2710 and MATH 1451 or equiv.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206810)

EECE 6820 Artificial Intelligence (3 credits)
Provides a comprehensive survey of artificial intelligence. Topics include: search, logic, planning, uncertainty, learning, communication and perception, robotics and philosophical foundations of artificial intelligence.
Prerequisite: COSC 2010, MATH 1450, MATH 2105 or equiv.
Level of Study: Graduate
Last four terms offered: 2009 Fall Term, 2005 Fall Term, 2003 Fall Term, 2001 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206820)

EECE 6822 Machine Learning (3 credits)
An introduction to a range of adaptive computer algorithms that learn models from data. Explores the theoretical foundations of machine learning, including computational learning theory and PAC learnability. Examples of machine learning algorithms studied include: decision trees, artificial neural networks, Bayesian learners, evolutionary algorithms and ensemble techniques.
Prerequisite: EECE 6820 or equiv.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2021 Spring Term, 2019 Spring Term, 2017 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206822)

EECE 6830 Pattern Recognition (3 credits)
Theory and application of statistical pattern recognition, hypothesis testing and parameter estimation. Topics include: probability distribution models, Bayesian decision theory and hypothesis testing, classical and modern approaches to parameter estimation, parametric and non-parametric classifiers. Also, covered are feature selection and transformation techniques such as Principal Components Analysis, a wide range of classifier models and supervised and unsupervised clustering.
Prerequisite: EECE 6020 or equiv.
Level of Study: Graduate
Last four terms offered: 2010 Fall Term, 2006 Fall Term, 2004 Fall Term, 2002 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206830)

EECE 6840 Neural Networks and Neural Computing (3 credits)
Advanced concepts of artificial neural networks and neural computing. Mathematical modeling of neural network architectures including feed-forward and recurrent neural network models. Optimization algorithms in the neural network training. Kohonen Feature Maps (KFM), Learning Vector Quantization (LVQ) and Support Vector Machine (SVM) models. Applications include: optimization, pattern recognition and intelligent controls.
Prerequisite: MATH 1451 or equiv.
Level of Study: Graduate
Last four terms offered: 2013 Spring Term, 2008 Fall Term, 2007 Spring Term, 2004 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206840)

EECE 6931 Topics in Electrical and Computer Engineering (1-5 credits)
Course content announced prior to each offering. Students may enroll more than once as subject matter changes. Possible topics include computer operating systems, multiprogramming and multi-processing systems, computer architecture, optimal and adaptive control, stochastic control, estimation theory, and nonlinear analysis.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206931)

EECE 6932 Advanced Topics in Electrical and Computer Engineering (3 credits)
Course content announced prior to each offering. Students may enroll more than once as subject matter changes. Possible topics include: computer operating systems, multiprogramming and multi-processing systems, computer architecture, optimal and adaptive control, stochastic control, estimation theory, and nonlinear analysis.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2021 Fall Term, 2021 Summer Term, 2021 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206932)

EECE 6952 Department Colloquium (0 credits)
Scholarly presentations on current topics in electrical engineering and computer engineering and related areas by visiting and resident investigators. Required of all full-time graduate students each term. Required of all full-time EECE graduate students. SNC/UNC grade assessment.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206952)

EECE 6953 Seminar in Electrical and Computer Engineering (0-3 credits)
0 credit will be SNC/UNC grade assessment; 1-3 credits will be graded.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206953)

EECE 6964 Practicum for Research and Development in Computing (3 credits)
Provides students, who are enrolled in the M.S. in computing program, an opportunity to participate in the practice of research and/or development in the area of computing. Course Guidelines are available from EECE and MSCS Departments. Available only to full-time students. At most, six credits of EECE 6964 OR MSCS 6964 may be counted toward graduation. S/U grade assessment.
Prerequisite: 3.00 MU GPA; must be enrolled in Plan B option of the M.S. in computing program and have completed at least 21 credit hours of course work, with 15 credit hours earned in graduate (6000-level) courses.
Level of Study: Graduate
Last four terms offered: 2003 Summer Term, 2003 Spring Term, 2002 Fall Term, 2002 Summer Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206964)

EECE 6995 Independent Study in Electrical and Computer Engineering (1-5 credits)
Graduate independent study project of either a theoretical or experimental nature.
Prerequisite: Cons. of instr. and cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206995)

EECE 6999 Master's Thesis (1-6 credits)
S/U grade assessment.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%206999)

EECE 8932 Advanced Topics in Electrical and Computer Engineering (3 credits)
Course content announced prior to each offering. Students may enroll more than once as subject matter changes. Possible topics include: computer operating systems, multiprogramming and multi-processing systems, computer architecture, optimal and adaptive control, stochastic control, estimation theory, and nonlinear analysis.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%208932)

EECE 8986 Cooperative Education in Electrical and Computer Engineering (0-1 credits)
Offers an additional educational experience for graduate students in electrical and computer engineering, intended to increase student professional development and growth as an independent engineer and/or researcher. Provides the opportunity to work on-site with engineers from industry.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Summer Term, 2023 Spring Term, 2022 Fall Term, 2022 Summer Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%208986)

EECE 8995 Independent Study in Electrical and Computer Engineering (1-5 credits)
Graduate independent study project of either a theoretical or experimental nature.
Prerequisite: Cons. of instr. and cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%208995)

EECE 8999 Doctoral Dissertation (1-12 credits)
S/U grade assessment.
Prerequisite: Cons. of instr.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Summer Term, 2022 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%208999)

EECE 9970 Graduate Standing Continuation: Less than Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Designated as less than half-time status only, cannot be used in conjunction with other courses, and does not qualify students for financial aid or loan deferment.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2020 Spring Term, 2018 Spring Term, 2017 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209970)

EECE 9974 Graduate Fellowship: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Designated as full-time status. If a student is already registered in other courses full time, this continuation course is not needed.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2015 Fall Term, 2009 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209974)

EECE 9975 Graduate Assistant Teaching: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Designated as full-time status. If a student is already registered in other courses full time, this continuation course is not needed.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2008 Spring Term, 2007 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209975)

EECE 9976 Graduate Assistant Research: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Designated as full-time status. If a student is already registered in other courses full time, this continuation course is not needed.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2021 Spring Term, 2020 Fall Term, 2020 Spring Term, 2019 Spring Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209976)

EECE 9986 Master's Comprehensive Examination Preparation: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of full-time status. Requires that the student is working 20 hours or more per week toward their master's comprehensive exam. May be taken in conjunction with credit-bearing or other non-credit courses to result in the status indicated, as deemed appropriate by the department.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2019 Spring Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209986)

EECE 9987 Doctoral Qualifying Examination Preparation: Less than Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of less than half-time status. Requires that the student is working less than 12 hours per week toward their doctoral qualifying exam.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2009 Fall Term, 2008 Spring Term, 2007 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209987)

EECE 9988 Doctoral Qualifying Examination Preparation: Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of half-time status. Requires that the student is working more than 12 to less than 20 hours per week toward their doctoral qualifying exam. May be taken in conjunction with credit-bearing or other non-credit courses to result in the status indicated, as deemed appropriate by the department.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2020 Fall Term, 2009 Fall Term, 2008 Spring Term, 2007 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209988)

EECE 9989 Doctoral Qualifying Examination Preparation: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of full-time status. Requires that the student is working 20 hours or more per week toward their doctoral qualifying exam. May be taken in conjunction with credit-bearing or other non-credit courses to result in the status indicated, as deemed appropriate by the department.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209989)

EECE 9994 Master's Thesis Continuation: Less than Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of less than half-time status. Requires that the student is working less than 12 hours per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2022 Fall Term, 2022 Spring Term, 2021 Spring Term, 2020 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209994)

EECE 9995 Master's Thesis Continuation: Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of half-time status. Requires that the student is working more than 12 to less than 20 hours per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2022 Spring Term, 2021 Fall Term, 2021 Summer Term, 2018 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209995)

EECE 9996 Master's Thesis Continuation: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of full-time status. Requires that the student is working 20 hours or more per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Summer Term, 2023 Spring Term, 2022 Fall Term, 2022 Summer Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209996)

EECE 9997 Doctoral Dissertation Continuation: Less than Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of less than half-time status. Requires that the student is working less than 12 hours per week on their doctoral dissertation. All 12 dissertation credits required for the degree should be completed before registering for non-credit Doctoral Dissertation Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209997)

EECE 9998 Doctoral Dissertation Continuation: Half-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of half-time status. Requires that the student is working more than 12 to less than 20 hours per week on their doctoral dissertation. All 12 dissertation credits required for the degree should be completed before registering for non-credit Doctoral Dissertation Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2017 Fall Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209998)

EECE 9999 Doctoral Dissertation Continuation: Full-Time (0 credits)
Fee. SNC/UNC grade assessment. Allows a student to be considered the equivalent of full-time status. Requires that the student is working 20 hours or more per week on their doctoral dissertation. All 12 dissertation credits required for the degree should be completed before registering for non-credit Doctoral Dissertation Continuation.
Prerequisite: Cons. of dept. ch.
Level of Study: Graduate
Last four terms offered: 2023 Summer Term, 2023 Spring Term, 2022 Fall Term, 2022 Summer Term
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=EECE%209999)