Computer Engineering (COEN)

COEN 2020 Electric Circuits 2 (3 credits)
Sinusoidal steady-state analysis. Power in AC circuits. Linear and ideal transformers. Laplace transform methods and circuit analysis applications.
Passive and active frequency-selective circuits. Fourier methods. Overview of discrete-time analysis.
Prerequisite: EECE 2010.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%202020)

COEN 2610 Software Methodologies (3 credits)
The first course in software engineering covering the software life cycle with an emphasis on Agile and Scrum. Steps in the software life cycle include
requirements engineering, software design and testing, and software evolution. This includes a semester long project using the Scrum process.
Prerequisite: EECE 1610 or COSC 1010.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%202610)

COEN 2710 Microprocessors (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.
Prerequisite: EECE 2030, which must be taken concurrently.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%202710)

COEN 4610 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.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204610)

COEN 4620 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.
Prerequisite: COSC 2100.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204620)

COEN 4630 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.
Prerequisite: COSC 2100 or equivalent experience.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204630)

COEN 4650 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 2100.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204650)

COEN 4690 Developments in Computer Software (3 credits)
Course content is announced prior to each semester. Students may enroll in the course more than once because subject matter changes. COEN design
elective.
Prerequisite: Cons. of instr. Consent required.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204690)

COEN 4710 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.
Prerequisite: EECE 2030.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204710)

COEN 4720 Embedded Systems Design (3 credits)
This course introduces students to embedded systems, the types of hardware that can support such systems, and the interfacing used in embedded systems. The course is a combined laboratory and lecture course, which directly applies the embedded systems techniques using hardware description and assembly languages to field programmable gate array technology.
Prerequisite: COEN 2710 and EECE 3015.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204720)

COEN 4730 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: Sr. stndg. and COEN 2710; or cons. of instr.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204730)

COEN 4790 Developments in Computer Hardware (3 credits)
Course content is announced prior to each semester. Students may enroll in the course more than once because subject matter changes. COEN design elective.
Prerequisite: Cons. of instr. Consent required.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204790)

COEN 4800 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.
Prerequisite: COEN 2610.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204800)

COEN 4820 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.
Prerequisite: COSC 2100.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204820)

COEN 4830 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, lighting and shading, 3D viewing, texturing, shadowing, introduction to ray tracing, input-output devices, and other topics as future trends dictate.
Prerequisite: Proficiency in at least one high level computing language.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204830)

COEN 4840 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.
Prerequisite: COSC 2100 or equiv.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204840)

COEN 4850 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 2100, MATH 1450 and MATH 2100.
Level of Study: Undergraduate
Marquette Core Curriculum: NSM Cgntn, Lang, Mmry/Intlgnc
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204850)

COEN 4860 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 2100 and MATH 1451.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204860)

COEN 4870 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 2100, MATH 1450 and MATH 2100.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204870)

COEN 4890 Developments in Intelligent Systems (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.
Prerequisite: Cons. of instr. or Sr. stndg.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204890)

COEN 4920 Principles of Design (3 credits)
Course content focuses on a structured product design and development process that includes project definition, customer needs identification, product specification, concept generation and concept selection. Also focuses on issues related to teamwork, project management and effective communication. Student team design projects culminate in the development of a technically and economically viable concept and a proposal for future development of this concept (done in the second semester of this two-course sequence). 2 hr. lec., 1 hr. disc.
Prerequisite: Sr. stndg.; Co-op students, Jr. stndg. Cross-listed with BIEN 4920, ELEN 4920 and MEEN 4920.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204920)

COEN 4995 Independent Study in Computer Engineering (1-4 credits)
Undergraduate independent study project of either a theoretical or experimental nature.
Prerequisite: Jr. stndg. or Sr. stndg., 3.000 GPA, cons. of instr., and cons. of dept. ch. Consent required.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204995)

COEN 4998 Senior Design Project (3 credits)
Focus on detailed design, prototyping and testing design concepts. Includes topics directly relevant to student design projects and careers in the engineering profession. Student team design projects culminate in a final report that documents the performance and details (engineering drawings and/or documentation) of their final design. 2 hrs. lec., 1 hr. disc.
Prerequisite: COEN 4920; Cross-listed with BIEN 4998, ELEN 4998 and MEEN 4998.
Level of Study: Undergraduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=COEN%204998)