COMPUTER SCIENCE (COMPSCI)

COMPSCI 101 Introduction to PC Application Software
3 cr. Undergraduate.
Introduction to software applications of the personal computer, including word processing, desktop publishing, spreadsheets, and databases.
Prerequisites: none.
Course Rules: Not open to CompSci students for cr.
Last Taught: Fall 2017, Fall 2016, Fall 2015, Fall 2014.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 111 Introduction to Unix
1 cr. Undergraduate.
Introduction to basic user skills for Unix operating systems. File system structure and access control. Basic user commands. Text editing. Internet utilities.
Prerequisites: none.
Last Taught: Fall 2010, Fall 2009, Spring 2009, Fall 2008.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 112 Introduction to the Internet and the World Wide Web
3 cr. Undergraduate.
Survey of the technologies that enable common Internet applications and their security/privacy issues. Topics include HTTP, TCP/IP, DNS, email protocols, search engines, encryption, digital signatures and malware.
Prerequisites: none.
Last Taught: Fall 2012, Fall 2011, Fall 2009, Spring 2009.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 113 Introduction to Web Document Production
3 cr. Undergraduate.
An introduction to the computer languages used in World Wide Web documents. Design principles; techniques for form processing and inclusion of multimedia content.
Prerequisites: none.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 132 Introduction to Computers and Programming
3 cr. Undergraduate.
How computers work; communicating with computers; introductory programming in a high-level language; elementary problem solving.
Prerequisites: Level 30 on Math Placement Test or Math 105(C).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 140 Introduction to the Computer Science Laboratories
1 cr. Undergraduate.
Survey of the programming tools available in the Computer Science laboratory environment.
Prerequisites: CompSci 201(C)
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 140 Introduction to the Computer Science Laboratories
1 cr. Undergraduate.
Survey of the programming tools available in the Computer Science laboratory environment.
Prerequisites: none.
Course Rules: Not open to CompSci students for cr.
Last Taught: Fall 2017, Fall 2016, Fall 2015, Fall 2014.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 150 Survey of Computer Science
3 cr. Undergraduate.
A survey of computer science. Topics include data storage and manipulation, operating systems and networks, algorithms and data structures, programming languages, artificial intelligence, and computability.
Prerequisites: none.
Course Rules: Counts as repeat of CompSci 299 with similar topic.
General Education Requirements: NS
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 151 Introduction to Scientific Programming in Fortran
3 cr. Undergraduate.
Design and implementation of computer programs in fortran; stress will be placed on applications to different fields of science and engineering.
Prerequisites: Math 231(C) or 226(C).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 160 Introduction to Computer Game Design and Programming
3 cr. Undergraduate.
An overview of computer game history; design concepts and considerations; implementation using a modern software development platform, such as GameMaker.
Prerequisites: none.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 201 Introduction to Engineering Programming
3 cr. Undergraduate.
Problem solving with structured programming techniques using an engineering oriented programming language, such as MATLAB, including control structures, functions, arrays and matrices.
Prerequisites: Math Placement Level 40 or Math 116(P).
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 240 Introduction to Engineering Programming
3 cr. Undergraduate.
Problem solving with structured programming techniques using an engineering oriented programming language, such as MATLAB, including control structures, functions, arrays and matrices.
Prerequisites: Math Placement Level 40 or Math 116(P).
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 241 C Programming for Embedded Systems
3 cr. Undergraduate.
Problem solving with structured programming techniques, using the C programming language. Topics include using arrays and pointers, memory management, unions, structures, files and low level I/O, and process’s and inter-process communication.
Prerequisites: a grade of C or better in COMPSCI 202(P), COMPSCI 240(P), or COMPSCI 250(P).
Last Taught: Spring 2022, Spring 2021, Fall 2020, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 250 Introductory Computer Programming
3 cr. Undergraduate.
Problem solving with structured programming techniques using an object-oriented programming language, including control structures, functions, arrays, vectors, and pre-defined objects.
Prerequisites: Math Placement level 30.
Last Taught: Spring 2022, Fall 2021, Summer 2021, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 290 Introductory Topics in Computer Science:
1-3 cr. Undergraduate.
Lectures on new introductory material in computer science. Variable-content course.
Prerequisites: specific courses dependent on topic.
Course Rules: May be retaken to max of 6 cr w/chg in topic.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 315 Introduction to Computer Organization and Assembly Language Programming
3 cr. Undergraduate.
Introduction to number systems, arithmetic and Boolean operations. Digital computer organization. A specific computer system, assembly and machine language programming.
Prerequisites: Math Placement Level 40 or Math 116(P) or Math 211(P); CompSci 250(201)(P).
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 337 System Programming
3 cr. Undergraduate.
Introduction to the application programmer interface for a modern operating system. Overview of mechanisms for object oriented programming and memory management
Prerequisites: C or better in CompSci 251(P)
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 351 Data Structures and Algorithms
3 cr. Undergraduate.
Programming in a structured, high-level, object-oriented language. Implementation of data structures and algorithms and their application.
Prerequisites: Math Placement Level 40 or Math 116(P) or 211(P); C or better in CompSci 251(P).
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 395 Social, Professional, and Ethical Issues
3 cr. Undergraduate.
The social, professional and ethical issues that arise in the context of professional computing.
Prerequisites: soph st or cons instr.
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 411 Machine Learning and Applications
3 cr. Undergraduate/Graduate.
Important topics and application in machine learning, including deep learning. Provides hands-on experience with machine learning software and libraries.
Prerequisites: completion of one of the following: COMPSCI 202(P), COMPSCI 241(P), or COMPSCI 250(P); or consent of instructor.
Course Rules: COMPSCI 411 and ELECENG 411 are jointly offered and count as repeats of one another.
Last Taught: Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 411G Machine Learning and Applications
3 cr. Undergraduate/Graduate.
Important topics and application in machine learning, including deep learning. Provides hands-on experience with machine learning software and libraries.
Prerequisites: completion of one of the following: COMPSCI 202(P), COMPSCI 241(P), or COMPSCI 250(P); or consent of instructor.
Course Rules: COMPSCI 411 and ELECENG 411 are jointly offered and count as repeats of one another.
Last Taught: Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 417 Introduction to the Theory of Computation
3 cr. Undergraduate/Graduate.
Introduction to formal languages, grammars and automata. Finite state automata, pushdown automata, turing machines. Regular, context-free recursive and recursively enumerable languages. Decidability.
Prerequisites: jr st; grade of C or better in CompSci 317(P) or grade of C or better in Math 341(P).
Last Taught: Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 417G Introduction to the Theory of Computation
3 cr. Undergraduate/Graduate.
Introduction to formal languages, grammars and automata. Finite state automata, pushdown automata, turing machines. Regular, context-free recursive and recursively enumerable languages. Decidability.
Prerequisites: jr st; grade of C or better in CompSci 317(P) or grade of C or better in Math 341(P).
Last Taught: Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 422 Introduction to Artificial Intelligence
3 cr. Undergraduate/Graduate.
Introduction to core techniques and broad survey of AI. Topics include: Lisp, heuristic search, knowledge representation, planning, vision, learning.
Prerequisites: jr st; C or better in CompSci 317(217)(P); & CompSci351(252)(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 422G Introduction to Artificial Intelligence
3 cr. Undergraduate/Graduate.
Introduction to core techniques and broad survey of AI. Topics include: Lisp, heuristic search, knowledge representation, planning, vision, learning.
Prerequisites: jr st; C or better in CompSci 317(217)(P); & CompSci351(252)(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 423 Introduction to Natural Language Processing
3 cr. Undergraduate/Graduate.
Introduction to natural language processing programs and an overview of the field. Topics include syntactic frameworks, parsing, semantics, interpretation, and applications.
Prerequisites: jr st; C or better in CompSci 351(P).
Last Taught: Fall 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 423G Introduction to Natural Language Processing
3 cr. Undergraduate/Graduate.
Introduction to natural language processing programs and an overview of the field. Topics include syntactic frameworks, parsing, semantics, interpretation, and applications.
Prerequisites: jr st; C or better in CompSci 351(P).
Last Taught: Fall 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 425 Introduction to Data Mining
3 cr. Undergraduate/Graduate.
Algorithms for uncovering useful information from data. Topics include data exploration, association rules, clustering, supervised learning, and mining structured data (e.g., sequences or graphs)
Prerequisites: jr st; CompSci 251(P), Math 221(P) or Math 232(P)
Course Rules: Counts as repeat of CompSci 657 with same topic.
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 425G Introduction to Data Mining
3 cr. Undergraduate/Graduate.
Algorithms for uncovering useful information from data. Topics include data exploration, association rules, clustering, supervised learning, and mining structured data (e.g., sequences or graphs)
Prerequisites: jr st; CompSci 251(P), Math 221(P) or Math 232(P)
Course Rules: Counts as repeat of CompSci 657 with same topic.
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 431 Programming Languages Concepts
3 cr. Undergraduate/Graduate.
Examination of abstract features of languages. Study of syntactic and semantic models; design and programming in procedural, object-oriented, functional and logical languages. Implementation methods.
Prerequisites: jr st; grade of C or better in CompSci 351(252)(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 431G Programming Languages Concepts
3 cr. Undergraduate/Graduate.
Examination of abstract features of languages. Study of syntactic and semantic models; design and programming in procedural, object-oriented, functional and logical languages. Implementation methods.
Prerequisites: jr st; grade of C or better in CompSci 351(252)(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 443 Intelligent User Interfaces and Usability Assessment
3 cr. Undergraduate.
Critical reading and discussion of scientific literature on the principles, methods, and current research in intelligent user interfaces including applications, architectures, and evaluation.
Prerequisites: jr st.
Last Taught: Spring 2022, Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 444 Introduction to Text Retrieval and Its Applications in Biomedicine
3 cr. Undergraduate/Graduate.
Introduction to text retrieval, text classification and their biomedical applications; topics include: indexing, query processing, and document retrieval methods.
Prerequisites: jr st; CompSci 351(P) or HCA 442(P).
Course Rules: Jointly offered with & counts as repeat of HCA 444, CompSci 744, & HCA 744.
Last Taught: Fall 2021, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 444G Introduction to Text Retrieval and Its Applications in Biomedicine
3 cr. Undergraduate/Graduate.
Introduction to text retrieval, text classification and their biomedical applications; topics include: indexing, query processing, and document retrieval methods.
Prerequisites: jr st; CompSci 351(P) or HCA 442(P).
Course Rules: Jointly offered with & counts as repeat of HCA 444, CompSci 744, & HCA 744.
Last Taught: Fall 2021, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 458 Computer Architecture
3 cr. Undergraduate/Graduate.
Processor organization, memory hierarchy, pipelining, computer architectures exploiting instruction/data/thread level parallelism, warehouse scale computers.
Prerequisites: sophomore standing and a grade of C or better in COMPSCI 241(P) or COMPSCI 251(P).
Course Rules: COMPSCI 458 and ELECENG 458 are jointly offered and count as repeats of one another.
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 458G Computer Architecture
3 cr. Undergraduate/Graduate.
Processor organization, memory hierarchy, pipelining, computer architectures exploiting instruction/data/thread level parallelism, warehouse scale computers.
Prerequisites: sophomore standing and a grade of C or better in COMPSCI 241(P) or COMPSCI 251(P).
Course Rules: COMPSCI 458 and ELECENG 458 are jointly offered and count as repeats of one another.
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 459 Fundamentals of Computer Graphics
3 cr. Undergraduate/Graduate.
Scan-line algorithms, object representation, homogeneous coordinates, geometric transformations, viewing curves, illumination models, interactive input methods, texture mapping.
Prerequisites: jr st; Math 232(P); CompSci 251(P).
Last Taught: Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 459G Fundamentals of Computer Graphics
3 cr. Undergraduate/Graduate.
Scan-line algorithms, object representation, homogeneous coordinates, geometric transformations, viewing curves, illumination models, interactive input methods, texture mapping.
Prerequisites: jr st; Math 232(P); CompSci 251(P).
Last Taught: Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 469 Introduction to Computer Security
3 cr. Undergraduate/Graduate.
Privacy and authenticity of data and programs, communication, operating systems, network and database security, computer viruses, cryptography, private and public key cryptosystems, protocols.
Prerequisites: jr st; C or better in both CompSci 317(217)(P) & 251(P).
Last Taught: Summer 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 469G Introduction to Computer Security
3 cr. Undergraduate/Graduate.
Privacy and authenticity of data and programs, communication, operating systems, network and database security, computer viruses, cryptography, private and public key cryptosystems, protocols.
Prerequisites: jr st; C or better in both CompSci 317(217)(P) & 251(P).
Last Taught: Summer 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 481 Server-side Internet Programming
3 cr. Undergraduate/Graduate.
Introduces students to the concept of server-side programming and web applications development. Topics include dynamic web site development, session management, security, and relational databases.
Prerequisites: jr st; one of COMPSCI 113 (P), INFOST 320 (P), or ART 324 (P); C or better in COMPSCI 202(P), COMPSCI 361(P) or COMPST 702(P).
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 481G Server-side Internet Programming
3 cr. Undergraduate/Graduate.
Introduces students to the concept of server-side programming and web applications development. Topics include dynamic web site development, session management, security, and relational databases.
Prerequisites: jr st; one of COMPSCI 113 (P), INFOST 320 (P), or ART 324 (P); C or better in COMPSCI 202(P), COMPSCI 361(P) or COMPST 702(P).
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 482 Rich Internet Applications
3 cr. Undergraduate/Graduate.
Prerequisites: jr st; CompSci 361(P) or 481(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 482G Rich Internet Applications
3 cr. Undergraduate/Graduate.
Prerequisites: jr st; CompSci 361(P) or 481(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 511 Symbolic Logic
3 cr. Undergraduate/Graduate.
First-order predicate calculus; formal properties of theoretical systems; chief results of modern mathematical logic; advanced topics such as completeness and computability.
Prerequisites: jr st & either Philos 212(P) or 6 cr Math at the 300-level or above; or grad st.
Course Rules: COMPSCI 511, Math 511, & Philos 511 are jointly offered & count as repeat of each other.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 511G Symbolic Logic
3 cr. Undergraduate/Graduate.
First-order predicate calculus; formal properties of theoretical systems; chief results of modern mathematical logic; advanced topics such as completeness and computability.
Prerequisites: jr st & either Philos 212(P) or 6 cr Math at the 300-level or above; or grad st.
Course Rules: CompSci 511, Math 511, & Philos 511 are jointly offered & count as repeat of each other.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 520 Computer Networks
3 cr. Undergraduate/Graduate.
Layered network architecture, protocols, data transmission, local area networks, multiplexing and switching, routing flow and congestion control, internetworking, wireless networking, network reliability and security.
Prerequisites: jr st; CompSci 315(215)(P) or CompSci 458(P) or ElecEng 367(P).
Last Taught: Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 520G Computer Networks
3 cr. Undergraduate/Graduate.
Layered network architecture, protocols, data transmission, local area networks, multiplexing and switching, routing flow and congestion control, internetworking, wireless networking, network reliability and security.
Prerequisites: jr st; CompSci 315(215)(P) or CompSci 458(P) or ElecEng 367(P).
Last Taught: Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 522 Computer Game Design
3 cr. Undergraduate/Graduate.
Design of rules, environments, rewards, and punishments, Game metrics, Including artificial intelligence in games, Puzzle generation, Automatic design, Humanness test, Influence maps, Diversity, Unpredictability.
Prerequisites: jr st; grade of C or better in CompSci 317(P).
Course Rules: Counts as repeat of CompSci 657 with similar topic.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 522G Computer Game Design
3 cr. Undergraduate/Graduate.
Design of rules, environments, rewards, and punishments, Game metrics, Including artificial intelligence in games, Puzzle generation, Automatic design, Humanness test, Influence maps, Diversity, Unpredictability.
Prerequisites: jr st; grade of C or better in CompSci 317(P).
Course Rules: Counts as repeat of CompSci 657 with similar topic.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 530 Computer Networks Laboratory
3 cr. Undergraduate/Graduate.
Prerequisites: jr st; CompSci 520(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 530G Computer Networks Laboratory
3 cr. Undergraduate/Graduate.
Prerequisites: jr st; CompSci 520(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 535 Algorithm Design and Analysis
3 cr. Undergraduate/Graduate.
Introduction to abstract data structures, analysis of time and space requirements of numerical and non-numerical algorithms methods for data manipulation.
Prerequisites: junior standing, MATH 211(P), MATH 213(P), MATH 221(P) or MATH 231(P); a grade of C or better in COMPSCI 351(P) and either COMPSCI 317(P) or both MATH 341(P) and MTHSTAT 361(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 535G Algorithm Design and Analysis
3 cr. Undergraduate/Graduate.
Introduction to abstract data structures, analysis of time and space requirements of numerical and non-numerical algorithms methods for data manipulation.
Prerequisites: junior standing, MATH 211(P), MATH 213(P), MATH 221(P) or MATH 231(P); a grade of C or better in COMPSCI 351(P) and either COMPSCI 317(P) or both MATH 341(P) and MTHSTAT 361(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 536 Software Engineering
3 cr. Undergraduate/Graduate.
Software engineering, the software life cycle, qualities of software; design, specification and verification of software, programming environments and tools, object oriented programming.
Prerequisites: jr st; grade of C or better in CompSci 251(P).
Last Taught: Spring 2012, Fall 2011.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 536G Software Engineering
3 cr. Undergraduate/Graduate.
Software engineering, the software life cycle, qualities of software; design, specification and verification of software, programming environments and tools, object oriented programming.
Prerequisites: jr st; grade of C or better in CompSci 251(P).
Last Taught: Spring 2012, Fall 2011.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 537 Introduction to Operating Systems
3 cr. Undergraduate/Graduate.
Process management including process creation, switching, multithreading, scheduling, communication and concurrency control; memory management including paging, segmentation and virtual memory; systems programming.
Prerequisites: jr st; CompSci 458(C) or ElecEng 458(C); CompSci 337(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 537G Introduction to Operating Systems
3 cr. Undergraduate/Graduate.
Process management including process creation, switching, multithreading, scheduling, communication and concurrency control; memory management including paging, segmentation and virtual memory; systems programming.
Prerequisites: jr st; CompSci 458(C) or ElecEng 458(C); CompSci 337(P).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 545G FPGA Embedded CPUs & Firmware Development
3 cr. Undergraduate/Graduate.
Use of modern embedded system central processor units (CPUs) with integrated field-programmable gate arrays (FPGAs). Design and implementation of firmware for these devices.
Prerequisites: jr st; ElecEng 367(P) & 457(P).
Course Rules: Jointly offered with & counts as repeat of ElecEng 545.
Last Taught: Fall 2014.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 547G User-Centered Interaction Design
3 cr. Undergraduate/Graduate.
Introduction of human-computer interaction theories and design processes. Emphasis is on applied user experience (UX) design.
Prerequisites: sr st.
Course Rules: Jointly offered with & counts as repeat of InfoSt 547.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 547G User-Centered Interaction Design
3 cr. Undergraduate/Graduate.
Introduction of human-computer interaction theories and design processes. Emphasis is on applied user experience (UX) design.
Prerequisites: sr st.
Course Rules: Jointly offered with & counts as repeat of InfoSt 547.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 552G Advanced Object-Oriented Programming
3 cr. Undergraduate/Graduate.
An advanced course in object-oriented programming. Abstraction; single and multiple inheritance; dynamic binding of functions; polymorphic types and operators; survey of object-oriented techniques.
Prerequisites: jr st; C or better in both CompSci 351(P) & 361(P).
Last Taught: Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 557G Advanced Object-Oriented Programming
3 cr. Undergraduate/Graduate.
An advanced course in object-oriented programming. Abstraction; single and multiple inheritance; dynamic binding of functions; polymorphic types and operators; survey of object-oriented techniques.
Prerequisites: jr st; C or better in both CompSci 351(P) & 361(P).
Last Taught: Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 620 Undergraduate Seminar in Algorithms
1 cr. Undergraduate.
Variable topics seminar in algorithms.
Prerequisites: COMPSCI 535(P).
Course Rules: Retakable to 6 cr max with change in topic.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 654 Introduction to Compilers
3 cr. Undergraduate.
Fundamentals of compiler construction for modern programming languages. Syntax analysis, table organization, storage administration, semantic routines and code generation
Prerequisites: Prereq. jr st, CompSci 431(P), 654(C).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 655 Compiler Implementation Laboratory
3 cr. Undergraduate/Graduate.
Implementation of compiler phases: scanner, parser, semantic analysis; code generation and optimization.
Prerequisites: Prereq. jr st, CompSci 431(P); 654(C) or 754(C).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 655G Compiler Implementation Laboratory
3 cr. Undergraduate/Graduate.
Implementation of compiler phases: scanner, parser, semantic analysis; code generation and optimization.
Prerequisites: Prereq. jr st, CompSci 431(P); 654(C) or 754(C).
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 657 Topics in Computer Science
1-4 cr. Undergraduate/Graduate.
Lectures on recent advances in computer science. Specific credits and any additional prerequisites will be announced in Schedule of Classes whenever course is offered.
Prerequisites: jr st.
Course Rules: May be retaken w/chg in topic to 9 cr max.
Last Taught: Spring 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 657G Topics in Computer Science
1-4 cr. Undergraduate/Graduate.
Lectures on recent advances in computer science. Specific credits and any additional prerequisites will be announced in Schedule of Classes whenever course is offered.
Prerequisites: jr st.
Course Rules: May be retaken w/chg in topic to 9 cr max.
Last Taught: Spring 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 658 Topics in Applied Computing
1-4 cr. Undergraduate.
Lectures on recent advances in applied computing. Specific credits and any additional prerequisites will be announced in Schedule of Classes whenever course is offered.
Prerequisites: jr st.
Course Rules: May be retaken w/chg in topic.
Last Taught: Fall 2021, Spring 2021, Fall 2020, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 699 Independent Study
1-3 cr. Undergraduate/Graduate.
Prerequisites: jr st; cons instr.
Course Rules: May be retaken to max of 6 cr by undergraduates.
Last Taught: Spring 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 699G Independent Study
1-3 cr. Undergraduate/Graduate.
Prerequisites: jr st; cons instr.
Course Rules: May be retaken to max of 6 cr by undergraduates.
Last Taught: Spring 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 700 CEAS Graduate Seminar
1-3 cr. Graduate.
Seminar in professional ethics, oral and written communication, contemporary social issues, career development, time management, and laboratory safety.
Prerequisites: grad st
Course Rules: Civ Eng 700, CompSci 700, ElecEng 700, Ind Eng 700, MatlEng 700 & MechEng 700 are jointly offered and count as repeats of one another
Last Taught: Fall 2020, Spring 2020, Fall 2019, Spring 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 704 Analysis of Algorithms
3 cr. Graduate.
Introduction to concrete complexity theory and efficient algorithms. Fast data structure and graph algorithms, matrix multiplication, algebraic and numeric algorithms, reductions and NP-completeness. Exponential and non-elementary lower bounds.
Prerequisites: grad st
Course Rules: CivEng 710, CompSci 710, ElecEng 710, IndEng 710, MatEng 710 & MechEng 710 are jointly offered and count as repeats of one another
Last Taught: Fall 2021, Fall 2020, Fall 2019, Spring 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 708 Scientific Computing
3 cr. Graduate.
Fundamental algorithms and practical issues of scientific computing, including Monte Carlo simulations, data fitting, fast Fourier transform, optimization, numerical integration & differentiation, parallel computing, selected biomedical applications.
Prerequisites: grad st
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 710 Artificial Intelligence
3 cr. Graduate.
AI programming, search techniques game playing, knowledge representation, knowledge acquisition, expert systems, selected topics from learning. Natural language understanding, vision and robotics.
Prerequisites: grad st
Course Rules: Not open to students who have cr in ElecEng 710, which is identical to CompSci 710.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 711 Introduction to Machine Learning
3 cr. Graduate.
Introduction to machine learning techniques and applications, including optimal classification, regression, support vector machines, boosting, deep learning, and clustering.
Prerequisites: grad st
Course Rules:
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 712 Image Processing
3 cr. Graduate.
This course covers the materials required to process and enhance photographic images, remote sensor multispatial scanner data and others. Topics include transform techniques, recorders, discriminate function, and associated hardware.
Prerequisites: grad st
Last Taught: Fall 2021, Fall 2020, Fall 2019, Fall 2018.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 714 Computational Geometry
3 cr. Graduate.
Special data structures and algorithmic techniques for representing and manipulating geometric objects, such as points, lines and polygons. Applications to vlsi design and robotics.
Prerequisites: grad st, CompSci 535(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 718 Advanced Computer Graphics: Modeling and Animation
3 cr. Graduate.
Advanced graphics topics on mesh processing, illumination models, ray-tracing, and volumetric data visualization; popular animation approaches such as keyframes, particles, fluids and rigid bodies.
Prerequisites: grad st.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 720 Computational Models of Decision Making
3 cr. Graduate.
Theoretical foundations and practical problems of formulating and constructing computational models of decision making.
Prerequisites: basic course in Probability or Statistics.
Last Taught: Fall 2021, Fall 2020, Fall 2019, Fall 2018.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 722 Artificial Intelligence Planning Techniques
3 cr. Graduate.
Algorithms and representations for classical and more expressive planning, search control techniques, study and comparison of a variety of planners, applications of planning.
Prerequisites: grad st; Comp Sci 535(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 723 Natural Language Processing
3 cr. Graduate.
Principles and problems of natural language processing with emphasis on recent advances and open problems. Topics: lexicons, parsing, interpretation, discourse structure, generation, and collaborative interfaces.
Prerequisites: grad st; CompSci 422(P) or 710(P).
Course Rules: Not open to students with cr in CompSci 423.
Last Taught: Fall 2021, Fall 2020, Spring 2019, Fall 2017.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 724 Distributed Algorithms
3 cr. Graduate.
Identification of canonical problems in distributed computing, design and analysis of algorithms to solve these problems. Formal proof techniques and impossibility results.
Prerequisites: grad st; CompSci 517(P), 535(P), or 523(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 725 Robot Motion Planning
3 cr. Graduate.
Configuration space, C-obstacles, sampling-based algorithms, potential fields, coverage, hierarchical motion planning, human control, relaxation, moving or deformable obstacles, multirobot motion planning, metrics, outdoor planning.
Prerequisites: grad st
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 729 Real-Time Operating Systems
3 cr. Graduate.
Fundamentals of real-time operating systems with emphasis on scheduling and resource management.
Prerequisites: grad st
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 730 Advanced Computer Networks
3 cr. Graduate.
Network architecture, protocols, routing, congestion control, traffic management, ATM, optical networks, TCP/IP LANs, WANs, QOS, wireless and mobile networks, mobility management, security, multimedia, network management.
Prerequisites: CompSci 520 (P).
Last Taught: Fall 2019, Fall 2014, Fall 2010, Fall 2009.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 732 Type Systems for Programming Languages
3 cr. Graduate.
Lambda calculus, simple types, record types, subtypes, polymorphic types, type reconstruction, universal types, bounded quantification, higher-order types.
Prerequisites: graduate standing and COMPSCI 431(P).
Last Taught: Fall 2021, Fall 2019, Fall 2016, Spring 2015.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 737 Software Project Management
3 cr. Graduate.
Concepts and techniques for management of large software projects. Life cycle models; team organization; cost estimation and budgeting; schedule and risk management; software metrics.
**Prerequisites:** grad st; CompSci 361(P) or equivalent
**Last Taught:** Spring 2015, Spring 2013.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 738 Program Analysis for Software Engineering
3 cr. Graduate.
Static techniques for determining run-time properties of a program: dataflow analysis, abstract interpretation.
**Prerequisites:** grad st.
**Last Taught:** Spring 2021, Spring 2018, Spring 2017, Spring 2009.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 743 Intelligent User Interfaces
3 cr. Graduate.
Principles, methods, and current research in intelligent user interfaces including applications, architectures, knowledge representation, and evaluation.
**Prerequisites:** grad st.
**Last Taught:** Spring 2022, Fall 2019, Fall 2018, Fall 2017.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 744 Text Retrieval and Its Applications in Biomedicine
3 cr. Graduate.
Fundamental issues and current research in text retrieval, text classification and their biomedical applications; Programming and use of indexing, query processing, and document retrieval methods.
**Prerequisites:** grad st; COMPSCI 351(P) or HCA 442 (P)
**Course Rules:** Not open to students who have cr in HCA 744, COMPSCI 444, or HCA 444.
**Last Taught:** Fall 2021, Spring 2020, Fall 2018, Spring 2015.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 747 Principles & Practices of User Interface Design
3 cr. Graduate.
Principles and practices of user interface design for desktop, web, and mobile applications: interaction principles; UI design elements; user-centered design process and practices.
**Prerequisites:** grad st.
**Last Taught:** Spring 2016, Spring 2014, Spring 2012, Fall 2009.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 754 Compiler Construction and Theory
3 cr. Graduate.
Fundamentals of compiler construction for modern programming languages. Syntax analysis, table organization, storage administration, semantic routines and code generation.
**Prerequisites:** grad st.
**Course Rules:** Not open to those who have cr in CompSci 654.
**Last Taught:** Spring 2022, Spring 2020, Spring 2018, Spring 2016.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 755 Information and Coding Theory
3 cr. Graduate.
Information measures, entropy, source coding, Shannon’s theorems, channel capacity, error correcting codes, linear codes, convolutional codes, arithmetic codes, encoding and decoding algorithms.
**Prerequisites:** grad st.
**Last Taught:** Fall 2019, Fall 2018, Fall 2017, Fall 2016.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 757 Data Base Organization and File Structure
3 cr. Graduate.
Introduction to automatic information organization and retrieval. Dictionary construction and operation, statistical and syntactic operations, performance evaluation of retrieval systems, design of query languages, models of database systems, database security.
**Prerequisites:** grad st; CompSci 217(P) & 535(P).
**Last Taught:** Spring 2014, Fall 2011, Spring 2010, Spring 2009.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 758 Advanced Computer Architecture
3 cr. Graduate.
Advanced topics in computer architecture including pipeline processing, multiple and parallel processing systems, performance enhancement issues and VLSI computing structures.
**Prerequisites:** grad st; CompSci 458(NP) or ElecEng 458(NP).
**Course Rules:** Not open to students who have cr in ElecEng 758, which is identical to CompSci 758.
**Last Taught:** Fall 2013, Fall 1997, Fall 1995, Spring 1994.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 759 Data Security
3 cr. Graduate.
Protection of data in computer and communication systems, cryptography, classical one key and public key cryptosystems, database protection, operating system security.
**Prerequisites:** graduate standing and COMPSCI 317(P).
**Last Taught:** Spring 2019, Spring 2018, Spring 2017, Spring 2016.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 760 Computer Systems Performance Evaluation
3 cr. Graduate.
Performance measurement and tools, workload characterization, Markov models, queueing theory, simulation, benchmarks, data analysis, parallel systems performance analysis.
**Prerequisites:** grad st; CompSci 458(P) or ElecEng 458(P).
**Course Rules:** Not open to students who have cr in ElecEng 760, which is the same as CompSci 760.
**Last Taught:** Fall 2017, Fall 2016, Fall 2014, Spring 2013.
**Current Offerings:** https://catalog.uwm.edu/course-search/

COMPSCI 761 Software Testing and Verification
3 cr. Graduate.
Software testing techniques: test case generation, test oracles, regression testing, structural testing, test coverage, mutation testing, and model-based testing. Testing for object-oriented and distributed software. Security testing.
**Prerequisites:** grad st; CompSci 361(P) or equivalent
**Current Offerings:** https://catalog.uwm.edu/course-search/
COMPSCI 762 Fault-Tolerant Computing
3 cr. Graduate.
Faults in digital circuits, fault detection, fault location, system reconfiguration or repair, system recovery, design for testability, self-checking circuits, fault-tolerant interconnection networks, systems level fault-diagnosis, fault-tolerant software.
Prerequisites: grad st; ElecEng 354(P).
Course Rules: Not open to students with cr for ElecEng 762.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 780 Multimedia Systems
3 cr. Graduate.
Survey of principles and applications of multimedia computer systems. Media fundamentals. Networking, architecture, software engineering, and user interface issues.
Prerequisites: CompSci 537(P).
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 790 Advanced Topics in Computer Science:
3 cr. Graduate.
Discussion of special advanced topics in theoretical as well as applied areas in computer science.
Prerequisites: grad; add’t prereqs depending on topic.
Course Rules: Retakable w/chg in topic to 9 cr max. Specific topics may be jointly-offered w/Philos.
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 805 Randomized Algorithms; Pseudorandom Numbers
3 cr. Graduate.
Prerequisites: CompSci 704(P) CompSci 523(R).
Last Taught: Fall 2013, Fall 2010, Spring 2007, Fall 2005.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 810 Knowledge Representation
3 cr. Graduate.
Study of the design and properties of formalisms for representing knowledge in computational systems. Topics include: first-order logic, nonmonotonic logic, uncertainty, time, space, beliefs, plans.
Prerequisites: grad st; CompSci 710(P).
Last Taught: Fall 2014, Spring 2011.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 811 Advanced Machine Learning
3 cr. Graduate.
Advanced topics and applications in machine learning, including deep learning, recurrent neural networks, EM algorithm and clustering, reinforcement learning, Markov models and MCMC, and variational inference.
Prerequisites: ELECENG 711(P) or ELECENG 420(P) and COMPSCI 411(P); or consent of instructor.
Course Rules: COMPSCI 811 and ELECENG 811 are jointly offered and count as repeats of one another; they also count as a repeat of COMPSCI 890 or ELECENG 890 with similar topic 'Advanced Machine Learning'.
Last Taught: Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 854 Advanced Compiler Techniques
3 cr. Graduate.
Details of compiler construction: syntax theory, attribute grammars, implementing advanced language features, optimization
Prerequisites: grad st; CompSci 654(P) or 754(P)
Last Taught: Fall 2018, Fall 2015, Fall 2010.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 859 Advanced Cryptography and Security Protocols
3 cr. Graduate.
Elliptic curve cryptography, AES, cryptanalysis, secret sharing, zero knowledge proofs, provable security.
Prerequisites: grad st; CompSci 469(P) & CompSci 535(P), or CompSci 759(P)
Last Taught: Spring 2012, Fall 2008.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 870 Medical Informatics Seminar
1 cr. Graduate.
Presentations by medical informatics affiliated faculty and invited speakers. Graduate students may present their work or published research from recent medical informatics journals or conferences.
Prerequisites: grad st.
Course Rules: Meets once every two weeks for 100 minutes.
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 880 Bioengineering Seminar
1 cr. Graduate.
Presentations by bioengineering affiliated faculty, invited speakers, and graduate students.
Prerequisites: grad st
Course Rules: MechEng 880, ElecEng 880, CompSci 880, MatlEng 880, IndEng 880 & Civ Eng 880 are jointly offered and count as repeats of one another. May be repeated to 3 cr. max.
Last Taught: Spring 2015, Fall 2012.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 888 Candidate for Degree
0 cr. Graduate.
Available for graduate students who must meet minimum credit load requirement.
Prerequisites: graduate standing.
Course Rules: Fee for 1 cr assessed; unit does not count towards credit load for Fin Aid. Repeatable. Satisfactory/Unsatisfactory only.
Last Taught: Spring 2022, Fall 2021, Summer 2020, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 990 Masters Thesis
1-9 cr. Graduate.
Prerequisites: grad st; cons instr.
Last Taught: Spring 2022, Fall 2021, Summer 2021, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 995 Master's Capstone Project
1-3 cr. Graduate.
Independent project supervised by student's adviser
Prerequisites: grad st; cons instr & grad prog comm.
Last Taught: Spring 2022, Fall 2021, Spring 2021, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/
COMPSCI 998 Doctoral Thesis
1-12 cr. Graduate.
Prerequisites: grad st; cons instr & grad prog committee.
Last Taught: Spring 2022, Fall 2021, Summer 2021, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

COMPSCI 999 Advanced Independent Study
1-3 cr. Graduate.
Prerequisites: grad st; cons instr & grad prog comm.
Last Taught: Spring 2022, Fall 2021, Summer 2021, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/