COMP 405 - Introduction to Web Design and Development  
**Credits:** 4  
Students learn the fundamentals of how the Internet works, gain practice with foundational technologies that power websites and learn how to solve problems like a programmer. A significant portion of the course covers web front-end design and development; students create a website using HTML/CSS, and are introduced to JavaScript and responsive web design techniques. Topics include Internet history and structure, legal and ethical issues. No prior programming experience is required.  
**Attributes:** Environment, TechSociety (Disc)  
**Equivalent(s):** IT 403

COMP 415 - Mobile Computing First and For Most  
**Credits:** 4  
This course examines how mobile computing is transforming our everyday lives and the society and environment in which we live. In this course the students will engage the mobile ecosystem by inventing apps and solving problems of personal, social, and environmental relevance. Students will learn computational thinking skills and create mobile apps using AppInventor, a free and open source visual blocks-based programming environment. Students will share their creative apps with peers and communities. They will also exercise inclusion, civic engagement, and peer learning in the context of innovating with free and open source software that empower individuals and communities.  
**Attributes:** Environment, TechSociety (Disc)  
**Equivalent(s):** IT 403

COMP 424 - Applied Computing 1: Foundations of Programming  
**Credits:** 4  
Integrates three essential computing competencies: Problem solving, data analysis, and programming. Problems are chosen from data-driven real-world examples such as astronomy, cryptography, environmental simulation, image processing, and video games. Emphasis is on formulating problems, thinking creatively about how computations can solve problems, and expressing solutions clearly and accurately. Using Python, students learn design, implementation, testing, and analysis of algorithms and programs.  
**Equivalent(s):** CS 410, CS 414, CS 415

COMP 425 - Introduction to Programming  
**Credits:** 4  
An introduction to problem solving and object-oriented programming. Emphasis is on programming concepts and techniques and their application to software development. Students learn to write, review, document, share, and demonstrate interactive applications and participate in pair programming, peer-led tutoring, and collaborative learning throughout the course.  
**Equivalent(s):** CS 410, CS 414
COMP 560 - Ethics and the Law in the Digital Age  
Credits: 4  
Examines classical and ethical and legal constructs as they pertain to current and topical issues. Students develop and articulate a personal point of view on a broad range of issues based on sound ethical principles and consider the impact of such views on co-workers, employers, and society in general. Topics also include: major social issues involving intellectual property, privacy, current U.S. and international relations relevant to ethical theories. The interplay between ethics and law is explored through current case studies and students formulate and support conclusions based on ethical constructs presented in class. Case study analysis is a major component in course delivery. Writing intensive.  
Attributes: Humanities(Disc); Writing Intensive Course  

COMP 570 - Statistics in Computing and Engineering  
Credits: 4  
An introduction to tools from probability and statistics that are needed by computing and engineering professionals. Exploratory data analysis including graphic data analysis, discrete and continuous probability distributions, inference, linear regression, and analysis of variance, with applications from artificial intelligence, machine learning, data mining, and related topics. Project work and use of statistical software are an integral part of the course. Prereq: MATH 425.  

COMP 574 - Applied Computing 2: Foundations of Machine Learning  
Credits: 4  
Introduction to making informed, data-based decisions with machine learning, data representation and analysis tools, and programming. Emphasis is on the importance of gathering, cleaning, normalizing, visualizing and analyzing data to drive informed decision-making in any field of study. Students learn to use tools and techniques to work on real-world datasets using procedural and basic machine learning algorithms. Students also learn to ask good, exploratory questions and develop metrics to come up with a well-thought-out analysis. Prereq: COMP 424.  

COMP 625 - Data Structures and Algorithms  
Credits: 4  
An introduction to object-oriented design, analysis, and implementation of data structures and algorithms. Students apply concepts and techniques to develop information processing applications. Best programming practices of editing, debugging, documentation, testing, and code review are stressed. Familiarity with an object-oriented programming language and experience with application development are required. Prereq: COMP 525.  

Equivalent(s): CS 515  

COMP 630 - Systems Software  
Credits: 4  
Today's organizations need to deliver applications and services by automating processes that develop and deploy software and manage scalable computing infrastructures. Students will learn how to integrate development, operations, and cloud computing and gain experience with design approaches, version control, continuous integration, cloud-based APIs, and monitoring metrics. Key to systems software tools and automation processes are increased communication and collaboration practiced in the course team projects. Students who took COMP 698 Sp/Topic Systems Software cannot repeat for credit. Prereq: COMP 530.  

COMP 650 - Network Administration and Maintenance  
Credits: 4  
Advances the understanding of networks through practical application of administering and maintaining an intranet and its servers. Students use a modern server operating system and network management tools. Routine tasks include: install and configure servers, setup directory services and access privileges, tune network services, understand and implement network security, perform routine maintenance, and practice troubleshooting techniques. Prereq: COMP 550.  

COMP 690 - Internship Experience  
Credits: 4  
The internship provides field-based learning experience through placement in a computing field. Students gain practical computing experience in a business, non-profit, or government organization. Under the direction of a faculty advisor, the student is expected to contribute to the information technology products, processes, or services of the organization. Majors only. May be repeated but no more than 4 credits may fill major requirements. Prereq: UMST 582.  
Repeat Rule: May be repeated for a maximum of 8 credits.  

COMP 698 - Special Topics  
Credits: 1-4  
Course topics not offered in other courses. Topics covered vary depending on contemporary computing topics, programmatic need, and availability and expertise of faculty. Barring duplication of subject, may be repeated for credit.  
Repeat Rule: May be repeated for a maximum of 8 credits.  

COMP 705 - Full Stack Development  
Credits: 4  
Students work in teams and implement, test, document, demonstrate, and deploy web systems that solve organizational needs expressed by real clients. Emphasis is on advanced server-side and client-side programming and integration of web application with database and web server applications. Free and open source development and communication tools are used to carry out the course project. Prereq: Senior status.  

COMP 715 - Information Security  
Credits: 4  
Topics include general security principles and practices, network and system security, access control methodology, and cryptography. Students develop a simple cryptographic system based on sound mathematical principals, work to improve it, and find ways to attack it. Some programming required. Prereq: Senior status.  

COMP 720 - Database Systems and Technologies  
Credits: 4  
This is a project course that provides practical experience with developing a storage subsystem of a computer information system. Topics include data modeling, database design, system implementation, and integration with a target application. Emphasis is on implementation activities, database application development artifacts, project communication, and supporting system development and project management tools. Prereq: Senior status.
COMP 721 - Big Data for Data Engineers  
Credits: 4  
In this course students gain practical experience developing data-oriented applications in modern infrastructure frameworks, also known as the cloud data solutions. Guided by what a data scientist profile is, students become familiar with the use cases of data oriented applications. They will apply key data modeling and data design concepts to meet business requirements. Students will also apply modern software development to iteratively construct solutions using established reference architectures. Project work will be based in Google Cloud Platform and Amazon Web Services. Prereq: Senior Status. Special fee.

COMP 725 - Programming Languages  
Credits: 4  
Explores the main features of modern, high-level, general purpose programming languages from the user point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and visual, and to learn how specific features of such languages can be used efficiently in solving problems. The purpose is to gain knowledge regarding the languages studied as well as providing the basis to conduct analysis related to comparisons and divergence in capabilities. Prereq: Senior status. 
Equivalent(s): CIS 698, COMP 698, ET 647

COMP 730 - Software Development  
Credits: 4  
Presents an iterative methodology for developing software systems. Development activities include requirements elicitation and analysis, system and object design, implementation and testing, project and configuration management, infrastructure maintenance, and system deployment to end user. Students work in teams, assume developer roles, build models of a real-world system, and deliver a proof-of-concept or prototype. Prereq: COMP 525. 
Attributes: Writing Intensive Course

COMP 740 - Machine Learning Applications and Tools  
Credits: 4  
Introduces students to practical approaches of machine learning. The course is an exploration of creative applications of artificial intelligence using modern machine learning components and tools. Different application domains are considered, such as computer vision, natural language processing, and cyber security. Students learn to evaluate machine learning systems as well as their potential prediction problems. Cannot receive credit if credit earned for COMP 780 AdvTop/ML Tools & Appl. Prereq: COMP 525.

COMP 741 - Practical Artificial Intelligence  
Credits: 4  
Balancing the science of AI with its engineering applications, the course focuses on AI foundations and principles for building intelligent computational systems. Reasoning, planning, learning, explaining, and acting with certainty and uncertainty are AI areas in which students will practice how to build AI systems that solve real-world problems. Particular attention is given to the impact of AI applications on our society and related ethical, privacy, security, and safety implications. Prereq: COMP 525.

COMP 750 - Neural Networks  
Credits: 4  
Artificial neural networks power the recent advances in computer vision, speech recognition, and machine translation. This is a first course on neural networks with a focus on applications in computer vision and natural language processing. Topics will include generic feedforward neural networks, convolutional neural networks for computer vision tasks and recurrent neural networks with application to natural language processing, with other topics to be selected based on the interests of the instructor and the class. Prereq: Senior status. 
Equivalent(s): DATA 750

COMP 755 - Digital Forensics  
Credits: 4  
This course studies cyber-attack prevention, planning, detection, response, and investigation with the goals of counteracting cybercrimes. The topics covered in this course include fundamentals of digital forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anti-forensics techniques, anonymity and pseudonymity, computer security policies and guidelines, and methods and standards for extraction and preservation of digital evidence. Prereq: COMP 525.

COMP 760 - Data Visualization & Communication  
Credits: 4  
Through hands-on experience with a leading data visualization tool, the course introduces the concepts of data visualization to allow students to communicate and analyze data effectively using visual techniques.

COMP 780 - Advanced Topics in Computing  
Credits: 1-4  
The course includes advanced topics and emerging areas in computing. Barring duplication of subject, the course may be repeated for credit. Prereq: Senior status or permission.

COMP 785 - Applied Cryptography  
Credits: 4  
This course aims to give students an overview of cryptographic concepts and methods, a good knowledge of some commonly used cryptographic primitives and protocols, a sound understanding of theory and implementation, as well as limitations and vulnerabilities, and an appreciation of the engineering difficulties involved in employing cryptographic tools to build secure systems. Some programming required. Prereq: COMP 525.

COMP 790 - Capstone Project  
Credits: 4  
This course requires the development of a real world project that responds to an IT organizational need. The project is undertaken by a team of students. An iterative approach is used to incrementally address the project requirements while constructing a prototype of the IT solution to the original problem. Prereq: COMP 690 and CIS 610. Writing intensive. Attributes: Writing Intensive Course

COMP 795 - Independent Study  
Credits: 1-4  
Advanced individual study under the direction of a faculty mentor. Content area to be determined in consultation with faculty mentor. Prereq: permission. May be repeated.