

# COMPUTING (COMP)

## Degrees Offered: M.S.

*This program is offered in Manchester.*

The Department of Applied Engineering and Sciences at the Manchester campus offers two master's programs in computing to prepare students for professional careers in IT and Cybersecurity Engineering and for advanced studies in a computing discipline.

Designed for people with a strong interest in computing as well as working professionals in computing fields, the graduate professional computing program focuses on project-based and applied learning. Housed at the Manchester campus, graduate computing students are in the heart of the state's tech, corporate and financial activity, which opens doors to a wealth of internship and job opportunities.

Courses are offered year around in fall, spring, and summer terms. Classes are scheduled during the day and in the evening to meet the needs of both full-time and part-time students. If enrolled part-time and taking, on average, two courses per term, students can complete their graduate program of study in two years.

### Admission Requirements

Applicants must meet the admission standards of the UNH Graduate School and have a bachelor's degree in a computing or computing-related discipline: computer science, information technology, computer information systems, data science, information sciences, computer engineering, or software engineering.

Students with undergraduate degrees in other fields are also welcome to apply. They are required to demonstrate computing competencies in programming, computing systems and tools, and college-level mathematics. Students can satisfy these prerequisites at the Manchester campus by taking undergraduate COMP courses as determined by the program's admissions committee based on the student's academic and professional background. For diligent undergraduate students, this program is also available as an Accelerated Master's Program.

## Programs

- [Cybersecurity Engineering \(M.S.\)](#)
- [Information Technology \(M.S.\)](#)

## Courses

### Computing Technology (COMP)

#### COMP 801 - Integrated Computing Practice

**Credits:** 3

Student learning in this course focuses on the development and application of professional computing competencies. To achieve this goal, students will engage in project management activities, collaborate with peers and participate in teamwork, give presentations and receive feedback, make effective use of appropriate tools and platforms, and gain practice with test-driven iterative development and version control.

**Grade Mode:** Letter Grading

#### COMP 805 - Full Stack Development

**Credits:** 3

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 applications with database and web server applications. Free and open source development and communication tools are used to carry out the course project.

**Grade Mode:** Letter Grading

#### COMP 815 - Information Security

**Credits:** 3

Topics include general security principles and practices, network and system security, access control methodology, and cryptography. Students develop a basic cryptographic system based on sound mathematical principles, elaborate on its features and refine it, and experiment with various ways to attack it. Some programming required.

**Grade Mode:** Letter Grading

#### COMP 820 - Database Systems and Technologies

**Credits:** 3

This is a project course that provides practical experience with database systems and technologies. Topics include data modeling, database design, system development and integration, database administration, and configuration and project management. The course emphasizes communication and collaboration with online tools. Project artifacts and activities are supported by current version control and database development and administration tools.

**Grade Mode:** Letter Grading

#### COMP 821 - Big Data for Data Engineers

**Credits:** 3

In this course students gain practical experience developing data-oriented applications in modern infrastructure frameworks, also known as 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.

**Grade Mode:** Letter Grading

**Special Fee:** Yes

#### COMP 825 - Programming Languages

**Credits:** 3

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.

**Grade Mode:** Letter Grading

**COMP 830 - Software Development**

**Credits:** 3

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.

**Grade Mode:** Letter Grading

**COMP 835 - Secure Networking Technologies**

**Credits:** 3

In this course students study modern computer networking and focus on principles, architectures, protocols, security, and cloud. Modern IT and cloud computing call for expertise in security, which is a theme across all computing subjects, as well as a core area of study. Course requirements include both programming and administrative exercises to explore and gain practice with networking topics.

**Grade Mode:** Letter Grading

**COMP 840 - Machine Learning Applications and Tools**

**Credits:** 3

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, including deep learning techniques. Different application domains are considered, such as computer vision, natural language processing, and cyber security. Students learn to evaluate the effectiveness of machine learning systems as well as their potential prediction problems.

**Grade Mode:** Letter Grading

**COMP 841 - Practical Artificial Intelligence**

**Credits:** 3

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.

**Grade Mode:** Letter Grading

**COMP 842 - Fundamentals of Computer Vision**

**Credits:** 3

This course provides a comprehensive introduction to computer vision, covering both the theoretical and practical skills needed to pursue a career in computer vision, pattern recognition, image processing, and signal processing. Students will learn basic concepts as well as hands-on experience to solve various real-life problems in image processing, feature extraction, object recognition, and image understanding. Not offered for credit if credit is received for COMP 880 Topics Computer Vision.

**Grade Mode:** Letter Grading

**COMP 851 - System Integration and Architecture**

**Credits:** 3

Students work in teams to explore and practice various system integration techniques to address requirements, software and hardware acquisitions, integration issues, and acceptance testing. Specific focus is given to diagnosing and troubleshooting systems interoperability and interface integration issues. Students develop project plans and study the influence of business processes and culture on system architecture decisions. Studied techniques are compared and contrasted to derive lessons learned, best practices, and critical success factors.

**Grade Mode:** Letter Grading

**COMP 855 - Digital Forensics**

**Credits:** 3

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.

**Grade Mode:** Letter Grading

**COMP 860 - Data Visualization & Communication**

**Credits:** 3

Through hand-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.

**Grade Mode:** Letter Grading

**COMP 865 - Secure Software Principles**

**Credits:** 3

This course will explore the fundamentals of software security, covering important software vulnerabilities and attacks that exploit them. This includes, but not limited to, such topics as buffer overflows, SQL injection, session hijacking and considers defenses that prevent or mitigate these attacks, including advanced testing and program analysis techniques. Will look at techniques at each phase of the development cycle that can be used to strengthen the security of software systems.

**Grade Mode:** Letter Grading

**COMP 880 - Topics**

**Credits:** 1-3

This course includes topics and emerging areas in computing. Barring duplication of subject the course may be repeated for credit.

**Repeat Rule:** May be repeated up to unlimited times.

**Grade Mode:** Letter Grading

**COMP 885 - Applied Cryptography**

**Credits:** 3

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.

**Grade Mode:** Letter Grading

## Faculty

[Computing program faculty.](#)

### COMP 890 - Internship and Career Planning

**Credits:** 1

This course is recommended for any student seeking internship and/or employment opportunities. Participants research and evaluate computing-related career opportunities related to their interests. create application portfolio, conduct informational interviews, use networking and job search resources, and participate in employer-based resume reviews and mock interviews. This course cannot be repeated for credit.

**Grade Mode:** Letter Grading

### COMP 891 - Internship Practice

**Credits:** 1-3

The Internship Practice 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 workplace supervisor and a faculty advisor, the student is expected to contribute to the computing products, processes, or services of the organization.

**Repeat Rule:** May be repeated for a maximum of 6 credits.

**Grade Mode:** Letter Grading

### COMP 892 - Applied Research Internship

**Credits:** 1-3

This Applied Research Internship enhances the student's academic achievements with real-world, professional computing applied research projects at a sponsoring organization. The student is expected to apply knowledge and skills acquired through other coursework in the major to address a research question in information technology related fields under the direction of a faculty advisor and a site supervisor at the organization.

**Repeat Rule:** May be repeated for a maximum of 6 credits.

**Grade Mode:** Letter Grading

### COMP 893 - Team Project Internship

**Credits:** 1-3

The internship course provides experiential learning experience through placement in team projects. This hands-on experience allows students to gain practical skills and insights into the field of computing. By working on a collaborative project with external stakeholders, they will contribute to the development of real-world information technology products, processes, or services, and understand the challenges involved in implementing technology solutions in a professional setting.

**Grade Mode:** Letter Grading

### COMP 895 - Independent Study

**Credits:** 1-3

Advanced individual study under the direction of a faculty mentor. Content area to be determined in consultation with faculty mentor. May be repeated.

**Grade Mode:** Letter Grading

### COMP 898 - Master's Project

**Credits:** 3

Guided project on a topic which has been approved as a suitable subject for a master's project. Supervision and advising by faculty in the Computing Technology program. Completion of 24 credits in the major.

**Grade Mode:** Letter Grading

### COMP 899 - Master's Thesis

**Credits:** 1-6

Guided research on a topic which has been approved as a suitable subject for a master's thesis. Supervision and advising by faculty of the Computing Technology program.

**Repeat Rule:** May be repeated for a maximum of 6 credits.

**Grade Mode:** Graduate Credit/Fail grading