COMPUTER INFORMATION SYSTEMS

The Computer Information Systems Department at Mount Wachusett Community College provides students with the opportunity to earn the following Associate of Science degrees:

COMPUTER SCIENCE (CSS)	COMPUTER INFORMATION SYSTEMS TRANSFER (CIT)	COMPUTER INFORMATION SYSTEMS (CIS)
Courses in computer science and mathematics form the foundation of this degree.	Courses in computer science and business form the foundation of this degree.	Courses in information technology form the foundation of this degree.
The purpose is to prepare students for transfer into a baccalaureate degree program in Computer Science.	The purpose is to prepare students for transfer into a baccalaureate degree program in Computer Information Systems.	The purpose is to prepare students for employment.

The following certificates lead to the CIS degree and thus serve as an excellent starting point.

IT SUPPORT SPECIALIST CERTIFICATE (ITC)	CYBER SECURITY CERTIFICATE (CSC)	SOFTWARE SUPPORT CERTIFICATE (SWC)	DATA ANALYSIS CERTIFICATE (DAT)
Information systems, hardware and networks form the foundation of this certificate.	Networking, hardware, and security courses form the foundation of this certificate.	Spreadsheets, databases and programming form the foundation of this certificate.	Data literacy, management, visualization, analytics, and ethics form the foundation of this certificate.
This certificate is designed to overlap the first year of the CIS degree and to help prepare students to work in IT Helpdesk positions.	This certificate is designed to assist students who want to start learning about IT and security.	This certificate is designed to introduce students to software systems and to help prepare students for software technical support positions.	This certificate is designed to introduce students to essential data skills and to provide additional career options, especially for students already working in the IT environment.

Please select one of the tabs above to learn more about a specific degree or certificate program.

COMPUTER SCIENCE (CSS)

The purpose of the Associate of Science Degree in Computer Science program is to graduate students who are prepared for transfer into a baccalaureate degree program in Computer Science.

Courses in computer science and mathematics form the foundation of this degree. Students are required to complete 62 total credits of which 33 are Computer Science and Mathematics credits and 29 credits are liberal arts and science credits. Additionally, this program meets the STEM transfer degree program General Education Core.

Using current and emerging technologies, students will develop skills in object-oriented programming, procedural programming, systems programming, data structures and databases with secure software development best practices embedded throughout the program.

Computer Science is a rigorous program. Therefore, students should plan to dedicate more independent study time than is required for a non-Computer Science Degree. It is expected that a student majoring in Computer Science full time will spend 40 hours per week in independent study.

Year 1		
Fall		**Credits**
CIS 150	Computer Science I	3
ENG 101	College Writing I	3
MAT 211	Calculus I	4
MAT 143	Statistics	3
Lab Science I Elective [1]		4
Spring		
CIS 152	Computer Science II	3
ENG 102	College Writing II	3
MAT 212	Calculus II	4

MAT 180	Discrete Mathematics	3
Lab Science II Elective [1]		4
Year 2		
Fall		
CIS 250	Systems Programming	3
MAT 220	Linear Algebra	4
Humanities Elective [2]		3
Social Science Elective [3]		3
Spring		
CIS 252	Algorithms and Data Structures	3
CIS 224	Database Design and Implementation	3
SPC 113	Speech (formerly THE113)	3
History Elective [4]		3
Literature Elective [5]		3
	Total Credits:	**62**

1. Lab Science Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
2. Humanities Elective: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
3. Social Science Elective: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
4. Any HIS course.
5. Literature Elective: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).

See Computer Science program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library (as available) and access to software though cloud based services.

Transfer Options

For transfer options, please click here (http://catalog.mwcc.edu/academicresources/#transferinformationtext). It is recommended that you also consult with your academic advisor.

Special Requirements

Students are required to complete the CSS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

COMPUTER INFORMATION SYSTEMS TRANSFER TRACK (CIT)

Start your computer information systems degree and training at Mount Wachusett Community College. The Computer Information Systems Transfer degree qualifies a student for direct transfer to Massachusetts State Universities under the MassTransfer agreement. Students will be introduced to business software systems and object oriented programming.

Year 1		
Fall		**Credits**
CIS 128	Introduction to Information Systems	3
ENG 101	College Writing I	3
Lab Science Elective [1]		4
MAT 162	College Algebra	4
CIS 150	Computer Science I	3
Spring		
ENG 102	College Writing II	3
Science Elective [2]		3-4
ECO 101	Macroeconomics	3
MAT 180	Discrete Mathematics	3
CIS 152	Computer Science II	3
Year 2		

Fall		
ECO 102	Microeconomics	3
ACC 101	Principles Of Accounting I	3
Humanities Elective [3]		3
MAT 143	Statistics	3
CIS 250	Systems Programming	3
Spring		
ACC 102	Principles Of Accounting II	3
SPC 113	Speech (formerly THE113)	3
Literature Elective [4]		3
History Elective [5]		3
CIS 224	Database Design and Implementation	3
	Total Credits:	**62-63**

1 Lab Science Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
2 Science Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
3 Humanities Electives: ART, ASL, DAN, ENG, FRE, HUM, MUS, PHL, SPA, THE. MWCC graduates who wish to transfer to Fitchburg State University are strongly advised to complete HUM 260 The Art Of Being Human I.
4 Literature Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
5 Any HIS course.

See Computer Information Systems program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Transfer Options

For transfer options, please click here (http://catalog.mwcc.edu/academicresources/#transferinformationtext). It is recommended that you also consult with your academic advisor.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

COMPUTER INFORMATION SYSTEMS DEGREE (CIS)

This degree will prepare students for the information technology (IT) field especially related to IT support specialist and help desk entry positions. Students will utilize software applications, networks, and web servers; query database applications to locate, evaluate, and use data; create web pages and web graphics; create written documentation and oral presentations; configure, monitor, secure, and administer network resources; as well as demonstrate technical skills and ability in analyzing, assessing, diagnosing, and trouble-shooting hardware, software, network, and other desktop issues. Additionally, students will gain knowledge related to a broad overview of information security.

Year 1		
Fall		**Credits**
CIS 128	Introduction to Information Systems	3
CIS 140	Microcomputer Networking Applications	3
ENG 101	College Writing I	3
MAT 143	Statistics	3
Social Science Elective [1]		3
Spring		
CIS 133	Data Visualization	3
CIS 143	Introduction to Helpdesk Support	3
CIS 144 or 131	Network Security(or Linux Programming)	3
Professional Elective (see list below)		3
ENG 102	College Writing II	3
Year 2		
Fall		
CIS 150	Computer Science I	3
CIS 113	CIS Internship (or CIS Elective)	3
Science Elective [2]		3-4
ACC/BUS/MGT/MKT Elective [3]		3
CIS 136	Data Ethics	3
Spring		
CIS 219	Principles Of Information Security	3
CIS 141	Supporting Private Clouds	3
CIS 224	Database Design and Implementation	3
Humanities Elective [4]		3
CIS Elective (see list below)		3
	Total Credits:	**60-61**

1 Social Science Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
2 Science Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).
3 ACC/BUS/MGT/MKT Electives: ACC, BUS, MGT or MKT (BUS 112 Introduction To Customer Relations Recommended)
4 Humanities Electives: See Elective Courses by Abbreviation (http://catalog.mwcc.edu/electivecoursesbyabbreviation/).

Professional Electives

		Credits
ENG 106	Technical Writing	3
SPC 113	Speech (formerly THE113)	3
BUS 112	Introduction To Customer Relations	3
EAS 130	Fundamentals of Geospatial Technologies	4

CIS Electives

		Credits
CIS 109	Introduction to Programming	3
CIS 118	Introduction to Full Stack Development	3

CIS 121	Spreadsheet Applications	3
CIS 123	Microcomputer Database Management	3
CIS 129	Data Literacy and Management	3
CIS 131	Linux Programming	3
CIS 136	Data Ethics	3
CIS 144	Network Security	3
CIS 152	Computer Science II	3
CIS 225	Introduction to Data Analytics	3
CIS 250	Systems Programming	3
CIS 252	Algorithms and Data Structures	3

See Computer Information Systems program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Transfer Options

For transfer options, please click here (http://catalog.mwcc.edu/academicresources/#transferinformationtext). It is recommended that you also consult with your academic advisor.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The CIS 219 Principles Of Information Security course serves as the program's capstone, course. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

Career Options/Earning Potential

For career options, please click here. (https://mwcc.lightcastcc.com/programs/computer-information-systems-associate-degree/166957/?region=North%20Central%20MA/Southwest%20NH&radius=)

CYBER SECURITY CERTIFICATE (CSC)

This certificate is designed as an introduction for students who want to start a career in IT security. Students will learn how to install operating systems and applications and study networking topics. Students will learn how to secure these technologies and protect against possible exploits and attacks. Students may use this certificate as preparation for the CompTIA Security+ SYO-201 exam or as a foundation for ongoing security studies.

Year 1		
Fall		**Credits**
CIS 128	Introduction to Information Systems	3
CIS 140	Microcomputer Networking Applications	3
CIS 143	Computer Service and Repair	3
CIS Elective [1]		3
Spring		
CIS 144	Network Security	3
CIS 141	Supporting Private Clouds	3
CIS 131	Linux Programming	3
CIS Elective [1]		3
	Total Credits:	**24**

1 Any CIS course

See Computer Information Systems program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

Transfer Options

This program is intended for immediate career entry. Courses completed as part of this certificate program can be applied to the Computer Information Systems Degree.

Career Options/Earning Potential

For career options, please click here. (https://mwcc.lightcastcc.com/programs/cyber-security-certificate/166957/?region=North%20Central%20MA/Southwest%20NH&radius=)

DATA ANALYSIS CERTIFICATE (DAT)

This certificate is designed to introduce students to essential data skills and to provide additional career options, especially for students already working in the IT environment. Students will work with spreadsheets, databases, data visualization tools, and programming languages while learning about data literacy, management, visualization, analytics, and ethics.

Year 1		
Fall		**Credits**
CIS 121	Spreadsheet Applications	3
MAT 143	Statistics	3
CIS 129	Data Literacy and Management	3
CIS 133	Data Visualization	3
ENG 101	College Writing I	3
Spring		
CIS 150 or 109	Computer Science I (or Introduction to Programming)	3
CIS 224	Database Design and Implementation	3
CIS 225	Introduction to Data Analytics	3
CIS 136	Data Ethics	3
	Total Credits:	**27**

See Computer Information Systems program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

Transfer Options

This program is intended to provide additional career options, especially for students already working in the IT environment. Courses completed as part of this certificate program can be applied to the Computer Information Systems Degree.

Career Options/Earning Potential

For career options, please click here. (https://mwcc.lightcastcc.com/programs/data-analysis-certificate-certificate/166957/?region=North%20Central%20MA/Southwest%20NH&radius=)

IT SUPPORT SPECIALIST CERTIFICATE (ITC)

This certificate will prepare students for the information technology (IT) field, especially related to IT support specialist and helpdesk entry positions. Students will utilize software applications, networks, and web servers; query database applications to locate, evaluate, and use data; configure, monitor, secure, and administer network resources; as well as demonstrate technical skills and ability in analyzing, assessing, diagnosing, and troubleshooting hardware, software, network, and other desktop issues. Additionally, students may apply this certificate as a step toward the Computer Information Systems (CIS) Degree.

Year 1		
Fall		**Credits**
CIS 140	Microcomputer Networking Applications	3
CIS 128	Introduction to Information Systems	3
CIS 143	Introduction to Helpdesk Support	3
ENG 101	College Writing I	3
Spring		
CIS 131	Linux Programming	3
Professional Elective (see list below)		3
CIS 136	Data Ethics	3

CIS Elective [1]	3
Total Credits:	**24**

[1] CIS 109 Introduction to Programming or higher.

Professional Electives

		Credits
BUS 112	Introduction To Customer Relations	3
ENG 106	Technical Writing	3
SPC 113	Speech (formerly THE113)	3
EAS 130	Fundamentals of Geospatial Technologies	4

See Computer Information Systems program student learning outcomes and technical standards.

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college's adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

Transfer Options

This program is intended for immediate career entry. Courses completed as part of this certificate program can be applied to the Computer Information Systems Degree.

Career Options/Earning Potential

For career options, please click here. (https://mwcc.lightcastcc.com/programs/it-support-specialist-certificate/166957/?region=North%20Central%20MA/Southwest%20NH&radius=)

SOFTWARE SUPPORT CERTIFICATE (SWC)

The Software Support Certificate is a grouping of courses that will prepare students for jobs in software systems support, end user training, software quality assurance and software documentation. It serves as a foundation to the IT Support Specialist Certificate (ITC) and the Computer Information Systems (CIS) degree.

Year 1		
Fall		**Credits**
CIS 121	Spreadsheet Applications	3
CIS 128	Introduction to Information Systems	3
CIS 133	Data Visualization	3
MAT 143	Statistics	3
Spring		
CIS 140	Microcomputer Networking Applications	3
CIS 150	Computer Science I	3
CIS 224	Database Design and Implementation	3
BUS 112	Introduction To Customer Relations	3
	Total Credits:	**24**

Student Success Tips

To be successful, students must spend additional time outside of class completing assignments. Access to a computer with the appropriate software is essential. MWCC provides computer access in various labs and in the library, as available.

Special Requirements

Students are required to complete the CIS courses as listed. Prior to enrolling in each course, students must ensure they meet the course prerequisites. The college’s adaptive computer lab, which provides assistive technology for students with disabilities, is available. Technical standards must be met with or without accommodations.

Transfer Options

This program is intended for immediate career entry. Courses completed as part of this certificate program can be applied to the Computer Information Systems Degree.

Career Options/Earning Potential

For career options, please click here. (https://mwcc.lightcastcc.com/programs/software-support-certificate/166957/?region=North%20Central%20MA/Southwest%20NH&radius=)

PROGRAM STUDENT LEARNING OUTCOMES FOR COMPUTER SCIENCE (CSS)

Upon graduation from this program, students shall have demonstrated the ability to:

1. Analyze a problem and identify and define the computing requirements appropriate to its solution.
2. Given a specification, design, implement and evaluate a software system that correctly satisfies the specification.
3. Deploy appropriate computer science, mathematical and security principles for the design and development of software solutions.
4. Function effectively on teams to accomplish a common goal.
5. Communicate effectively to explain and document computing solutions to both a technical and non-technical audience.

PROGRAM STUDENT LEARNING OUTCOMES FOR COMPUTER INFORMATION SYSTEMS (CIS)

Upon graduation from this program, students shall have demonstrated the ability to:

1. Describe how data is organized to serve businesses needs and develop data management skills to organize, query, analyze, and report data.
2. Configure, test, verify, and troubleshoot computer systems and networks (at an introductory level).
3. Describe business's use of software systems and develop fundamental programming and application skills to support business needs.
4. Describe how to secure data, networks, and systems and implement security measures.
5. Communicate effectively to explain and document computing solutions to both a technical and non-technical audience.

PROGRAM STUDENT LEARNING OUTCOMES FOR COMPUTER INFORMATION SYSTEMS TRANSFER (CIT)

CIS Objectives 1, 3, and 5 above

PROGRAM STUDENT LEARNING OUTCOMES FOR CYBER SECURITY CERTIFICATE (CSC)

CIS Objectives 1 and 2 above

PROGRAM STUDENT LEARNING OUTCOMES FOR IT SUPPORT SPECIALIST (ITC)

CIS Objectives 1 and 2 above

PROGRAM STUDENT LEARNING OUTCOMES FOR SOFTWARE SUPPORT CERTIFICATE (SWC)

CIS Objectives 1, 2, 3, and 5 above

PROGRAM STUDENT LEARNING OUTCOMES FOR DATA ANALYSIS CERTIFICATE (DAT)

CIS Objectives 1, 3, and 5 above

TECHNICAL STANDARDS [1] FOR CSS, CIT, CIS, CSC, ITC AND SWC

[1] For general information about technical standards and accommodation, see Technical Standards. (http://catalog.mwcc.edu/academicresources/academicandgradingpolicies/technicalstandards/)

Students entering these programs must be able to demonstrate the ability to:

- Comprehend textbook material at the 11th grade level;
- Communicate and assimilate information either in spoken, printed, signed, or computer voice format;
- Gather, analyze, and draw conclusions from data;
- Read from a computer screen;
- Learn to operate a computer;
- Possess manual dexterity to operate computer devices such as a keyboard and mouse;
- Work at a computer for a minimum of two hours.

CIS 109. Introduction to Programming. 3 Credits.
This course introduces students to fundamental problem-solving and programming concepts using the high-level language Python. Topics covered include data types, variables, constants, decision statements, repetition, functions, strings and lists. Prerequisites: MAT 092 (corequisite) or placement.

CIS 113. CIS Internship. 3 Credits.
This internship experience will allow students to apply computer information skills, perform information technology tasks and develop professional habits while interacting with professionals in the field. Students must pass a CORI check prior to beginning the internship. Placements may be made at a profit or not-for-profit business. The placement must be a site approved by the professor. The basis for the grade will be a combination of a reflective journal log, student participation, log of hours, and internship supervisor evaluations. Student participation will include sharing their experiences at the internship site, the preparation of a resume, participation in interviewing techniques and mock interviews. The field experience will equal 120 hours. This is a three-credit course. Prerequisite: The completion of 15 credits (9 of which are CIS credits) in one of the CIS degree or certificate programs and a GPA of 3.0 are required.

CIS 118. Introduction to Full Stack Development. 3 Credits.
Students should be comfortable with basic computer skills prior to enrolling in this course. Essential computer skills include utilizing word processing, web browsers and email as well as managing files and folders (save, locate, open, create, copy, paste, delete). Additionally, students should be curious and problem-solving oriented. Learn and practice the foundational concepts of full stack development to create both front end (client side) and back end (server side) web development. This course will include basic HTML, CSS, CSS templates, and JavaScript. Students will also work with servers, databases, and other back end technologies, such as MySQL and Node.js. Prerequisites: ENG 101 and completion of any 100 level math class (or corequisites), or permission of the Dean. Spring.

CIS 121. Spreadsheet Applications. 3 Credits.
Students should be comfortable with basic computer usage prior to enrolling in this course. Essential computer skills include utilizing web browsers and email as well as managing files and folders (save, locate, open, create, delete). This course is designed to develop spreadsheet skills, with an in-depth study of spreadsheet design and analysis as they relate to business applications. Topics include the fundamentals of spreadsheet design, coverage of business formulas and functions, linking multiple worksheets and files, proper layout and design, and an introduction to macros using the Visual BASIC for Applications (VBA) language. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

CIS 123. Microcomputer Database Management. 3 Credits.
This course is for students who are already familiar with computer use. Students must know how to use web browsers, email and manage files and folders (save, locate, open, create, delete). This course uses a database software package for a wide range of applications. Students create tables, construct queries, design forms, and generate reports. Students will also utilize constraints, data types, primary and foreign keys; define relationships and database design concepts; as well as import and export external data. Students will create action queries as well as select queries that use aggregate functions, calculated fields, wildcards, keywords, comparison criteria, Boolean terms, and table joins. Prerequisite: MAT 092.

CIS 128. Introduction to Information Systems. 3 Credits.
This course provides a broad overview of information systems, their components (such as ERP and CRM) and the use of them by business to achieve operational excellence, improve decision making and achieve competitive advantage through the use of social tools, mobile technology, cloud computing, big data and emerging technologies. Spreadsheet and database applications are utilized throughout the course to develop foundational, yet essential data skills for success in business and information technology career paths. Several different types of IT and business professions are explored to assess technical skill, knowledge and education requirements. Prerequisite: ENG 098, RDG 098, FYE 101, or placement.

CIS 129. Data Literacy and Management. 3 Credits.
Students will learn data literacy and data management skills while utilizing a variety of file types and software. Students will study topics such as the four elements of data (Volume, velocity, variety, and veracity), data governance, ownership, and stewardship, as well as data architecture, modeling, and warehouses. Students will also be introduced to data security and privacy concepts. Additionally, students will get hands on experience with data quality, anomalies, and missing and noise values as they import, scrape, clean, and organize data. Prerequisites: FYE 101, MAT 092, (RDG 098, or placement) and CIS 121 or CIS 128 (or corequisite). Fall.

CIS 131. Linux Programming. 3 Credits.
This course provides students a solid foundation in the fundamentals of the Linux operation system. Students gain system level experience through problem solving exercises at the command line and in the graphical use interface. Students learn the essential command-line commands necessary to be accomplished users of their Linux workstations, as well as be able to use the GUI when appropriate. Prerequisite: CIS 140.

CIS 133. Data Visualization. 3 Credits.
This course will help students to interpret quantitative information; formulate and support ideas; and present information in a variety of visual formats while utilizing data visualization software such as Tableau. Students will learn basic data literacy skills and how to create visualizations that communicate clearly and effectively. Students will also work with datasets; import different data sources (such as Excel, SQL, XML, CSV, etc.); identify the audience and the related purpose; create calculated fields; use the Data Interpreter; and create multiple visualizations, dashboards, and story lines. Students will also learn to apply filters, joins, blends, clusters, bins, custom territories, and geographic roles. The course will also work with important topics such as aggregation, granularity, and level of detail while utilizing peer review and quality assessment to verify the accuracy of visualizations. Prerequisites: FYE 101, MAT 092, RDG 098, or placement.

CIS 136. Data Ethics. 3 Credits.
Students will learn about the five principles of data ethics: ownership, transparency, privacy, intention, and outcomes as well as the data ethics tenets set by the Federal Data Strategy Team. Students will focus on ethical standards and practices specifically related to collecting, using, and selling data, security, privacy, policy, advocacy, and legal requirements. Additionally, students will review case studies; identify the importance of working with domain experts; compare strategies such as Data Feminism with traditional approaches; learn how discrimination impacts data and society; utilize visualizations; and complete writing assignments. Prerequisites: ENG 101 and (CIS 121, CIS 128 or CIS 133) or permission from the Dean. Spring.

CIS 140. Microcomputer Networking Applications. 3 Credits.
This course provides students with the necessary knowledge and skills to perform competently in the role of network administrator or system manager. Major topics include networking concepts, setting up user and group accounts, securing network resources, configuring and administering network printers, backup, auditing events, and monitoring network resources. Prerequisites: FYE 101, MAT 092, RDG 098, or placement.

CIS 141. Supporting Private Clouds. 3 Credits.
This course will instruct future network administrators how to effectively implement and maintain private clouds with a balance of conceptual expertise and hands-on skills. With a focus on server administration, this course will introduce working with Virtual Machines and prepares students to work with large providers such as Amazon, Microsoft, and Google, as well as implement smaller scale cloud computing solutions within their own network environments. Specific topic coverage includes: Introduction to the Private Cloud, Creating and Managing Virtual Machines, Configuring the Hyper-V Environment, Installing and Using Virtual Machine Manager, Installing and Using the Self-Service Portal Using the Virtual Desktop Infrastructure (VDI), Implementing High Availability in the Private Cloud, Managing High-Availability Clusters and Managing the Private Cloud with PowerShell. Prerequisite: CIS 140.

CIS 143. Introduction to Helpdesk Support. 3 Credits.
This course is designed to introduce students to both technical and soft skills needed to work within an entry level IT Helpdesk position. Students will complete tasks which help them to prepare for a customer support role including but not limited to the following: explore potential solutions to a variety of software, hardware, and cloud-based issues; install and upgrade software; identify key elements of user accounts, password procedures and best practices, and Active Directory management; utilize windows services and diagnostic tools; remove viruses and navigate a helpdesk ticket program. Emphasis will be placed on active, hands-on learning and/or working within a virtual environment. Best practices for customer service skills will also be identified throughout the course. Prerequisites: FYE 101, MAT 092, RDG 098, or placement.

CIS 144. Network Security. 3 Credits.
This hands-on course is designed to prepare students for the security challenges they will face as a networking professional. Specific topic coverage includes designing a secure network framework, securing servers based on function, designing a secure public key infrastructure, securing the network management process, securing network services and protocols, securing Internet information services, securing VPN and extranet communications, securing active directory, securing network resources, and securing network clients. Prerequisite: CIS 140 or permission of division dean.

CIS 150. Computer Science I. 3 Credits.
This course introduces students to Computer Science through software development using an object oriented programming approach. Programming topics include: data types, expressions, conditions, iteration, arrays, methods, classes and objects. Algorithm development, integrated development environments, debuggers, test plans and documentation is also covered. Prerequisites: FYE 101, RDG 098, (or placement); Completion of any 100 Level Math Class with a "C" or higher or permission of the Dean.

CIS 152. Computer Science II. 3 Credits.
This course builds on the concepts covered in Computer Science I. Programming topics include: inheritance, polymorphism, GUI programming, exceptions, recursion, and file and database input/output. Using object oriented programming(OOP) techniques, an introduction to data structures including stacks and queues is included as well as an introduction to sorting algorithms. Prerequisites: Grade of C or higher in CIS 150 or comparable programming experience. Spring.

CIS 219. Principles Of Information Security. 3 Credits.
This course provides students with a broad overview of information security and serves as the capstone course for the Computer Information Systems degree program. The required networking, database and programming courses for the Information Systems degree program lays a solid foundation for learning information security terminology and measures that protect confidentiality, preserve integrity, and promote availability of data. Topics include security policies, security models, business continuity plans, computer crime and security laws, physical security, operations security, access control, cryptography, Internet security and application development security. Students will complete at least one major research and writing project, at least one oral class presentation, and work on at least one team project. Students should find the topics covered informative and useful for their career in the Information Technology field, and the topics serve as a foundation for advance studies in Information Security. Prerequisite: Completion of 24 CIS credits or permission of division dean.

CIS 224. Database Design and Implementation. 3 Credits.
This course is designed to teach data modeling and SQL skills. Students will be able to define a well-structured relational database; use database design concepts to apply business rules and normalization models while creating Entity Relationship Diagrams (ERDs) and data dictionaries. Students will also write and run scripts; create select queries (using 'where' and 'order by' clauses, aggregate functions, inner and outer joins, and 'having' and 'group by' clauses), as well as action queries to update, delete, and append data. Students will also work with SQL to create a two-layer application. Prerequisites: CIS 150 or CIS 118 (or corequisites). Spring.

CIS 225. Introduction to Data Analytics. 3 Credits.
Students will be introduced to Data Analytics and will utilize a variety of tools while they practice skills to describe, summarize, and make inferences about data sets leading to modeling for decision making. Topics within this course will include: probability and probability distributions, regression analysis, logistic regression, supervised learning (Decision Trees) and unsupervised learning (Clustering). Prerequisites: ENG 101, MAT 143, CIS 121 and (corequisite of CIS 150 or CIS 109) or permission from the Dean. Spring.

CIS 250. Systems Programming. 3 Credits.
This course covers the fundamentals of systems programming. The Linux application programming interface (API) and the C language are used to introduce students to lower-level programming by using system calls and key components of the C library to develop applications and scripts that interface with the operating system. Prerequisites: C or higher in CIS 152, MAT 180. Fall.

CIS 252. Algorithms and Data Structures. 3 Credits.
This course introduces essential data structures and algorithmic analysis for the design of efficient computer programs using an object oriented programming language. Some of the data structures designed and implemented include linked lists, stacks, queues, trees, heaps, hash tables, and graphs. A mathematical framework for evaluating efficiency of algorithms is covered. The analysis of algorithms for searching, traversing trees, hashing, manipulating priority queues, sorting, and finding shortest paths in graphs is included. Recursive algorithms are used when they can improve efficiency. Prerequisites: C or higher in CIS 152, MAT 180. Spring.