

Information Technology

Associate in Applied Science Degree

The CCM Associate of Applied Science in Information Technology provides curriculum that prepares students for entry level positions in the field of Information Technology. Core courses include operating systems, database systems, networking, information security, programming and web development. In addition, the AAS in Information Technology offers students five separate tracks of specialization to choose from as part of the degree program: Web Development, Mobile Application Development, Digital Forensics, Security and Networking. This curriculum provides students with the knowledge and skills required for A+, Security+ and Network+ certification.

For more information, visit the Department of Information Technologies (<http://www.ccm.edu/academics/divdep/bmet/departments-of-information-technologies>) website.

Degrees

AAS Information Technology

(P3525)

The CCM Associate of Applied Science in Information Technology provides curriculum that prepares students for entry level positions in the field of Information Technology. Core courses include operating systems, database systems, networking, information security, programming, and web development. In addition, the AAS in Information Technology will offer the student five separate tracks of specialization to choose from as part of the degree program: Web Development, Mobile Application Development, Digital Forensics, Security and Networking. This will allow the student to specialize in currently popular areas of study while still focusing on a core skill set that will maintain its value for years to come even when the requirements of business/commerce change as the result of changing technology.

GENERAL EDUCATION FOUNDATION

Communication	6
ENG-111 English Composition I	
ENG-112 English Composition II	
Math/Science/Technology	3
CMP-128 Computer Science I	
Social Science	3
Choose from General Education list (Social Science)	
General Education Electives	8
Laboratory Science	
MAT-130 Probability and Statistics	
GENERAL EDUCATION FOUNDATION Credits	20
INFORMATION TECHNOLOGIES CORE	
CMP-130 Introduction to Information Technology	3
TEL-107 Computers and Data Networks	3
TEL-110 Routing I (CISCO)	3

CMP-124 Network Security	3
CMP-200 Computer Operating Systems and Utilities	3
CMP-209 Introduction to UNIX	3
CMP-235 Advanced UNIX	3
CMP-237 Visual Basic (VB.Net)	3
CMP-239 The Internet and Web Page Design	3
CMP-241 Database Programming (Oracle)	3
CMP-280 Software Engineering	3
IT Track Electives (below)	9
INFORMATION TECHNOLOGIES CORE Credits	42
Total Credits	62

Web Development Track

CMP-244 Web Design II	3
CMP-245 Web Design Tools	3
CMP-249 Advanced Web Programming	3
Web Development Track Credits	9

Mobile Applications Development

CMP-129 Computer Science II	3
CMP-170 Mobile App Design	3
CMP-271 Mobile App Programming	3
Mobile Applications Development Credits	9

Digital Forensics

CMP-160 Digital Forensics I	3
CMP-261 Digital Forensics II	3
CJS-215 Investigative Function	3
Digital Forensics Credits	9

Security

CMP-120 Foundations of Information Security	3
CMP-125 Information Security Management	3
CMP-243 Ethical Hacking and Systems Defense	3
Security Credits	9

Networking

TEL-120 Routing II (CISCO)	3
TEL-220 Routing III (CISCO CCNA3 & CCNA4)	4
TEL-233 Network Operating Systems	3
Networking Credits	10

Faculty

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Certificates of Achievement

Information Security

A Certificate of Achievement within Computer Information Systems

(P0354)

CMP-120	Foundations of Information Security	3
CMP-124	Network Security	3
CMP-125	Information Security Management	3
Restricted Electives ¹		6
Select two of the following:		
CJS-116	Introduction to Criminology	
CJS-121	Criminal Justice System	
CMP-128	Computer Science I	
CMP-160	Digital Forensics I	
CMP-243	Ethical Hacking and Systems Defense	
CMP-261	Digital Forensics II	
CMP-280	Software Engineering	
CMP-292	Special Topics in Information Technology	
CMP-293	Special Topics in Information Technology II	
PHL-114	Ethics	
TEL-110	Routing I (CISCO)	
TEL-120	Routing II (CISCO)	
Total Credits		15

¹ Students should consult their academic advisors when selecting these courses.

Web Development

A Certificate of Achievement within Computer Information Systems

(P0352)

CMP-239	The Internet and Web Page Design	3
CMP-244	Web Design II	3
CMP-245	Web Design Tools	3
Restricted Electives ¹		6
Select two courses from the following list:		
CMP-120	Foundations of Information Security	
CMP-128	Computer Science I	
CMP-170	Mobile App Design	
CMP-205	Database Programming (MS Access)	
CMP-249	Advanced Web Programming	
MED-110	Multimedia I	
MED-113	Multimedia II	
MED-119	Digital Media Production	
MED-220	Animation	
MED-240	Advanced Animation	
Total Credits		15

¹ Students should consult their academic advisors when selecting these courses.

Media Technology

A Certificate of Achievement within Digital Media Technology

(P0360)

MED-110	Multimedia I	3
MED-119	Digital Media Production	3
Restricted Electives ¹		9
Select three of the following:		
MED-113	Multimedia II	
MED-210	Digital Video Editing	
MED-220	Animation	
MED-240	Advanced Animation	
MED-292	Special Topics in Media	
	or MED-293 Special Topics in Media	
COM-114	Media Aesthetics	
COM-120	Broadcast Journalism	
COM-211	Television Production I	
COM-212	Television Production II	
CMP-108	Game Design Concepts	
CMP-239	The Internet and Web Page Design	
CMP-245	Web Design Tools	
MUS-112	Introduction to Electronic Music	
MUS-165	Introduction to Music Recording	

PHO-115	Photography I	
PHO-204	Digital Imaging I	
Total Credits		15

¹ Students should consult their academic advisors when selecting these courses.

Courses

CMP-101. Computer Information Literacy. 1 Credit.

LAB 2 hrs

This general education course provides students with an introduction to basic computer concepts that include learning the fundamentals of Windows, accessing the Internet and using Microsoft Word. Not for Information Technologies Department majors.

Additional Fees: Course fee applies.

CMP-108. Game Design Concepts. 3 Credits.

LECT 3 hrs

This course provides the student with an introduction to fundamental game design concepts. The range of topics includes game worlds and settings, character creation, storytelling, game audio, game art and animation, gameplay and user interface design. In addition, the history of the game industry, social impact and the future of gaming are discussed. Students analyze various games and genres and create their own game design document.

Additional Fees: Course fee applies.

CMP-120. Foundations of Information Security. 3 Credits.

LECT 3 hrs

This course provides a principled introduction to the field of information security. History, characteristics and models of information and computer security are explored. Topics such as risk management, logical and physical security, continuity, cryptography, and architecture are discussed. The National Centers of Academic Excellence in Cyber Defense Education Knowledge Units and the CISSP CBK domains are incorporated into the course content affording the student reinforcement and mastery of information security terminology and concepts.

Additional Fees: Course fee applies.

CMP-124. Network Security. 3 Credits.

LECT 3 hrs

This course provides an in-depth study of network attack techniques and methods to defend against them. Areas of study include communication security, infrastructure security, cryptography, and operational and organizational security as it relates to network hardware, software and data. Topics include authentication, attacks, virtual private networks, email protection, web security, wireless, firewalls, intrusion detection, cryptography, disaster recovery and computer forensics regarding networked systems. Using a hands-on approach, powerful tools to diagnose and correct security breaches are investigated and manipulated. This course is mapped to the National Centers of Academic Excellence in Cyber Defense Education Knowledge Units and vendor-neutral certification exam.

Additional Fees: Course fee applies.

CMP-125. Information Security Management. 3 Credits.

LECT 3 hrs

This course entails identifying an organization's information assets and the development, documentation and implementation of policies, standards, procedures and guidelines that ensure confidentiality, integrity and availability of those assets. This course, which is mapped to the National Centers of Academic Excellence in Cyber Defense Education Knowledge Units, prepares students to understand the planning, organization and roles of individuals involved in security, to develop security policies, and to utilize management tools to identify threats, classify assets and rate vulnerabilities. A detailed, real-world security plan is developed using customized strategies.

Additional Fees: Course fee applies.

CMP-126. Computer Technology and Applications. 4 Credits.

LECT 3 hrs, LAB 2 hrs

This general education course teaches: (1) basic computer-use concepts such as hardware and peripherals, file organization and management, and operating system use; (2) Internet use, browsers and search engines; (3) software applications including word processing, spreadsheet, electronic slideshow presentations, database use and calendaring; (4) netiquette, ethics and copyright policies; (5) downloading and installing software and plug-ins; (6) communications technologies including email, blogs and Web technologies; (7) personal computer and information security; and (8) career exploration, job search strategies and portfolio development. Students are required to complete a series of laboratory assignments that illustrate skills and use technologies in the areas listed including a cross-applications/technologies project. Not for Information Technologies Department majors. Students will not receive credit towards graduation for more than one of the following courses: CMP-126, CMP-135, or BUS-119.

Additional Fees: Course fee applies.

CMP-128. Computer Science I. 3 Credits.

LECT 2 hrs, LAB 2 hrs

In this introductory course, students obtain fundamental computer science knowledge and develop programming skills using an object-oriented approach, incorporating security awareness, human-computer interactions and social responsibility. This course provides students with a basic foundation in computing history, computing careers, computer organization, operating system responsibilities, software development process, algorithm design and analysis, programming paradigms, and human interaction design.

Prerequisites: MAT-007 or equivalent

Additional Fees: Course fee applies.

CMP-129. Computer Science II. 3 Credits.

LECT 2 hrs, LAB 2 hrs

This course is the second in a three-course sequence that provides students with a foundation in Computer Science. Students develop intermediate-level programming skills using an object-oriented approach with an emphasis on software development, fundamental algorithms and data structures, software assurance, and ethical conduct.

Prerequisites: CMP-128 or equivalent

Additional Fees: Course fee applies.

CMP-130. Introduction to Information Technology. 3 Credits.

LECT 2 hrs, LAB 2 hrs

This is the introductory course in the field of study of Information Technology. This course introduces the student to the software and hardware found in today's computing environment and the basic skills and tools required to install, support and upgrade common information technology used by businesses, organizations and academic institutions. This course helps the student prepare for the CompTIA A+ certification examination. In addition, the basics of network architecture, database management, information security and web infrastructure are covered. At completion the student will be prepared for further study in the curriculum of Information Technology and equipped with the fundamental knowledge required of an IT Professional. The students use popular desktop applications to organize and perform IT laboratory activities.

Additional Fees: Course fee applies.**CMP-135. Computer Concepts With Applications. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This general education course is designed to provide familiarity with current software for word processing, spreadsheet, presentation and database applications. An introduction to web browsers, computer and information security, social impact of computing, concepts in computer hardware, and application and system software is also included. Students are required to complete a series of laboratory assignments that illustrate skills in using the above software applications. Students must allocate time to complete assignments using the same software (available on campus). Not for Computer Information Systems majors. Students will not receive credit towards graduation for more than one of the following courses: CMP-135, CMP-126 or BUS-119.

Additional Fees: Course fee applies.**CMP-150. Game Programming. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This course covers fundamental game programming techniques using an industry-standard scripting language. Students learn how to use a popular game engine to build game programs. Topics include sprites, animation, collisions, timers, game state variables, player input, audio, user interface design and storyboarding. Laboratory work includes several game element programming exercises, leading up to a final game project.

Prerequisites: CMP-128 or equivalent**Additional Fees:** Course fee applies.**CMP-160. Digital Forensics I. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This course introduces the student to the fundamental concepts of computer forensics. By conducting a detailed examination of data media for structure, file system type, volumes, lost and hidden areas, the student will develop the ability to collect and analyze computer data for digital evidence. An understanding of specific resources and an exploration of software tools available for data recovery and forensic analysis will be conducted in a laboratory setting. Upon completion of this course the student will demonstrate various data recovery techniques as the basis for forensic evaluation.

Additional Fees: Course fee applies.**CMP-170. Mobile App Design. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This course introduces students to the design and development of mobile applications. Students will learn how to install and use a leading mobile app software development kit, design the user interfaces using different design patterns, create and edit app resources, and design and develop native source code. Students will strengthen their programming skills in user input, variables, operations, decision control structures, methods, lists and arrays. Audio, images, animation and other application controls will be incorporated into apps. Other topics include testing, deployment and publishing apps.

Prerequisites: CMP-128**Additional Fees:** Course fee applies.**CMP-200. Computer Operating Systems and Utilities. 3 Credits.**

LECT 3 hrs, LAB 1 hr

This is an introductory course in personal computer operating systems. Topics include the features and characteristics of operating system software; installation and configuration including customization, file organization and management; memory and storage management; control of peripheral devices; troubleshooting; networking wizards; and the use of utilities to monitor system performance, backup data and optimize disks. Laboratory assignments provide hands-on opportunities for students to apply the information related in lectures.

Additional Fees: Course fee applies.**CMP-205. Database Programming (MS Access). 3 Credits.**

LECT 3 hrs, LAB 1 hr

It is recommended that students take CMP-207 Electronic Spreadsheets before taking CMP-205. This course is designed to develop skill in the use of a leading database management system. Topics include the design and maintenance of relational databases and their objects (tables, queries, forms and reports). Also covered is the use of macros to implement procedures. The final portion of the course covers automation techniques by introducing the Visual Basic for Applications programming language and the use of this code to create a user-friendly interface.

Additional Fees: Course fee applies.**CMP-207. Electronic Spreadsheets (MS Excel). 3 Credits.**

LECT 3 hrs, LAB 1 hr

It is recommended that students take CMP-207 Electronic Spreadsheets before taking CMP-205. This is a course in problem solving using a popular spreadsheet program. Emphasis is on construction of elementary to moderately complex worksheets; charting worksheet data, database definitions and reporting; and using VBA (Visual Basic for Applications) to construct simple macros.

Additional Fees: Course fee applies.**CMP-209. Introduction to UNIX. 3 Credits.**

LECT 3 hrs, LAB 1 hr

This course combines lecture with hands-on training in the UNIX Operating System. Upon successful completion of this course, students are proficient in using the UNIX Operating System commands and utilities. Topics include purpose and functions of an operating system, hierarchical file system, the shell, vi editor, file security, process management, sorting, networking theory and communications, redirection, piping, and an introduction to shell scripts.

Prerequisites: CMP-128 or equivalent**Additional Fees:** Course fee applies.

CMP-230. Computer Architecture and Assembly Language. 3 Credits.

LECT 3 hrs, LAB 1 hr

This course is an introduction to computer architecture and assembly language programming. Topics covered include digital logic and data representation, computer architecture and organization, interfacing and input/output strategies, memory architecture, functional organization, and multiprocessing. Students are exposed to basic assembly language programming techniques in laboratory assignments.

Prerequisites: CMP-128 or equivalent**Additional Fees:** Course fee applies.**CMP-233. Data Structures and Algorithms. 3 Credits.**

LECT 3 hrs, LAB 1 hr

The course includes advanced computer science topics dealing with logical structures of data and the design and analysis of computer algorithms operating on these structures. The course concentrates on data structures such as linked lists, trees, queues, stacks, hash tables and graphs. Algorithms covered include stacks, queues, hash tables, trees, graphs, heaps, sorting and searching. Both iterative and recursive algorithms are explored with analysis of their efficiency. Problems and computer exercises implementing the above structures and techniques are assigned.

Prerequisites: CMP-129 or equivalent and MAT-123 or higher**Additional Fees:** Course fee applies.**CMP-235. Advanced UNIX. 3 Credits.**

LECT 3 hrs, LAB 1 hr

This is a continuation course in UNIX programming with emphasis on building upon the previously developed skills. Topics include an in-depth coverage of shell scripts, system administration, GUIs, differences and similarities between shells, higher-level programming languages in the UNIX environment, the Internet, sorting, and other advanced topics.

Prerequisites: CMP-209**Additional Fees:** Course fee applies.**CMP-237. Visual Basic (VB.Net). 3 Credits.**

LECT 3 hrs, LAB 1 hr

This is a fundamental course in object-oriented programming in a Windows environment. Topics include form design, managing controls, handling variables and constants, using decision and loop structures to construct efficient code, handling built-in functions, and simple debugging techniques for detecting errors. Basic fundamentals of classes are introduced.

Prerequisites: CMP-128 or equivalent**Additional Fees:** Course fee applies.**CMP-239. The Internet and Web Page Design. 3 Credits.**

LECT 3 hrs, LAB 1 hr

This course is an in-depth study of the Internet and its various services that allows students to appreciate the impact of the Internet in society. Students create World Wide Web home pages using strict Hypertext Markup Language, Cascading Style Sheets (CSS) and XHTML. Other current specifications also are discussed.

Additional Fees: Course fee applies.**CMP-241. Database Programming (Oracle). 3 Credits.**

LECT 3 hrs, LAB 1 hr

This course uses the rules and syntax of an "industrial-strength" database programming language that can be used on all types of computers. Topics include relational database aspects, data input and validation, creation and maintenance of files, query, user control center, and application generator. Emphasis is on development of programs related to business database applications.

Prerequisites: CMP-128 or equivalent or permission of department chair**Additional Fees:** Course fee applies.**CMP-243. Ethical Hacking and Systems Defense. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This course combines an ethical methodology with the hands-on application of security tools, techniques, and methodologies in performing computer system and network security vulnerability - risk analyses - to better help students secure and defend their systems. Topics to be covered include internal and external penetration tests, risk analysis methodology, and security audits. Students are introduced to common countermeasures that effectively reduce and/or mitigate attacks. This class is designed to help students prepare for professional careers in the information security field and the Certified Ethical Hacker (CEH) certification exam.

Prerequisites: CMP-124**Additional Fees:** Course fee applies.**CMP-244. Web Design II. 3 Credits.**

LECT 3 hrs, LAB 1 hr

This course is a continuation of The Internet and Web Page Design with an emphasis on more advanced concepts and techniques. Topics include Cascading Style Sheets, forms, JavaScript and other current scripting languages. Students learn to work with hosting and web server technology. For their final project, students build a website using these techniques.

Prerequisites: CMP-239**Additional Fees:** Course fee applies.**CMP-245. Web Design Tools. 3 Credits.**

LECT 2 hrs, LAB 3 hrs

Students learn the leading web design and development tools including the Adobe Creative Suite. Instruction and practice in the suite provides seamless integration and a unified user interface across all tools to streamline multimedia and web development. Through hands-on practice, activities and relevant project application, students develop competence in the use of industry-leading development tools.

Prerequisites: CMP-108 or CMP-128 or CMP-239 or MED-110 or GRD-111**Additional Fees:** Course fee applies.**CMP-246. Operating Systems. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This course introduces students to operating systems and their uses and design concerns. Covered are the roles and responsibilities of operating systems including scheduling, concurrency and process synchronization, memory management, file organization and management, and control of peripheral devices. Security and protection topics are also addressed. Laboratory assignments provide interactive learning experiences which demonstrate operating system concepts using programming, operating system commands and scripting.

Prerequisites: CMP-129**Additional Fees:** Course fee applies.

CMP-249. Advanced Web Programming. 3 Credits.

LECT 2 hrs, LAB 2 hrs

This advanced course in Web Development introduces the student to creating interactive and dynamic Web sites using current Web programming. Building on concepts and principles of computer programming and scripting languages, students will interact with Web server technologies and develop front end, advanced professional Web sites with fully functioning back end support.

Prerequisites: CMP-128 and CMP-244**Additional Fees:** Course fee applies.**CMP-250. Game Production. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

Working in teams, students combine their game design and programming skills to explore the practical challenges of managing the development of games. Industry-standard software and advanced programming are used in this capstone course to develop a functioning game of the highest professional quality. Emphasis is placed on the game design document, storyboarding, the game production process, user interface and game design, interactive storytelling, character development, 3D animation, special effects, audio, the collaborative process, and usability testing.

Prerequisites: CMP-150 or MED-220**Additional Fees:** Course fee applies.**CMP-261. Digital Forensics II. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This advanced course in digital forensics will enable the student to understand advanced file system forensics, the theory of forensic procedures, review of identification, imaging, and authentication, review of FAT file system, NTFS and EXT3 file systems, partitioning, Window's logical analysis, email analysis, and web history analysis conducted in a laboratory setting. Upon completion of this course the student will apply investigative methodology as it applies to data artifacts, including where they are found in computer operating systems, and how they are deployed in digital forensics. The student will perform forensic media acquisition and verification.

Prerequisites: CMP-160**Additional Fees:** Course fee applies.**CMP-271. Mobile App Programming. 3 Credits.**

LECT 2 hrs, LAB 2 hrs

This second course in a series of mobile app development courses covers advanced design elements and programming constructs. Topics include accessing device resources including the camera, accelerometer, and GPS; utilizing local and networked database services; animation and gaming; accessing background services; file management; designing for multiple devices including wearables; and localization/internationalization and accessibility design. Students will create apps individually and as part of a team and their learning will culminate with the development of a final project that will be of industry-level quality.

Prerequisites: CMP-170**Additional Fees:** Course fee applies.**CMP-280. Software Engineering. 3 Credits.**

LECT 2 hrs, LAB 1 hr

Software engineering practices are examined in the context of the system development life cycle, comparing traditional structured approach and the object-oriented approach, with the main focus on object-oriented approach. Topics include user stories, use cases, object-oriented modeling, comprehensive project management, the Unified Modeling Language (UML) diagrams, Agile techniques, and user-interface design. Class projects provide students with practice in developing soft skills necessary to work as part of a team. Students participate in a semester-long team project to design an application using system analysis and design techniques.

Prerequisites: CMP-128 and one of the following: CMP-129, CMP-150, or CMP-237**Additional Fees:** Course fee applies.**CMP-290. Independent Study in Information Technology. 3 Credits.**

LECT 3 hrs

Students, in consultation with the department chair, undertake an in-depth analysis of a selected topic, problem or issue related to information technology or pursue additional computer-related work experience. Students are responsible for developing a statement of goals and strategies, maintaining a weekly log, and preparing a written and oral summary report. Computer Information Systems majors only.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.**CMP-291. Special Topics in Information Technology. 3 Credits.**

LECT 3 hrs, LAB 1 hr

An examination of selected topics or issues in information technologies. Topics may differ each time the course is offered. Students should consult the department chair for additional information. Computer Information Systems majors only.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.**CMP-292. Special Topics in Information Technology. 3 Credits.**

LECT 3 hrs, LAB 1 hr

An examination of selected topics or issues in information technologies. Topics may differ each time the course(s) is offered. Students should consult the department chair for additional information. Computer Information Systems majors only.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.**CMP-293. Special Topics in Information Technology II. 1 Credit.**

LECT 1 hr

An examination of selected topics or issues in information technologies. Topics may differ each time the course is offered. Students should consult the department chair for additional information. Computer Information Systems majors only.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.

CMP-296. Cooperative Work Experience-Information Technology (45-100 Hours). 1 Credit.

COOP 1 hr

This course provides students in the Department of Information Technologies programs with job training and practical experience in a work environment prior to permanent employment amounting to between 45-100 hours in duration. The course may be taken in fulfillment of a Computer Information System (CIS) elective. Students desiring to participate in this experience should make their intention known to the department at the beginning of their second semester. Computing majors only.

Prerequisites: Permission of department chair.**CMP-297. Cooperative Work Experience-Information Technology (90-200 Hours). 2 Credits.**

COOP 2 hrs

This course provides students in the Department of Information Technologies programs with job training and practical experience in a work environment prior to permanent employment amounting to between 90 to 200 hours in duration. The course may be taken in fulfillment of a Computer Information System(CIS) elective. Students desiring to participate in this experience should make their intention known to the department at the beginning of their second semester. Computing majors only.

Prerequisites: Permission of department chair.**CMP-298. Cooperative Work Experience-Information Technology (135-300 Hours). 3 Credits.**

COOP 3 hrs

This course provides students in the Department of Information Technologies programs with job training and practical experience in a work environment prior to permanent employment amounting to between 135 to 300 hours in duration. The course may be taken in fulfillment of a Computer Information System(CIS) elective. Students desiring to participate in this experience should make their intention known to the department at the beginning of their second semester. Computing majors only.

Prerequisites: Permission of department chair.**TEL-107. Computers and Data Networks. 3 Credits.**

LECT 2 hrs, LAB 1 hr

This course is a continuation of topics introduced in earlier courses. Data networking, including concepts of essential computer components, data storage, network operating systems, computer networking models and communication framework for the transmission of voice, text and video data will be explored in greater detail. The laboratory component will cover topics on computer setup, network setup and integration and operating system utilities.

Prerequisites: CMP-130 and CMP-200.**TEL-109. Introduction to Telecommunications. 3 Credits.**

LECT 3 hrs

This course is an introduction to the terminology and standard practices of the telecommunications industry, including concepts of integrating office automation procedures with telecommunications networks (wired and wireless) using voice, data, text and video information. Coverage includes various transmission and switching media as well as an understanding of message routing hierarchies. Issues of regulation and deregulation are discussed together with equipment selection and management topics. The mechanics of the Internet also are introduced with a description of Voice over Internet Protocol (VoIP). Other topics covered include laser communication links, teleconferencing, data network protocols and architectures and satellite technology.

TEL-110. Routing I (CISCO). 3 Credits.

LECT 2 hrs, LAB 3 hrs

The course follows CISCO's CCNA1 curriculum for Networking Basics. Lecture and laboratory assignments are an integral part of the course. The course focuses on network terminology and protocols, local area networks (LANs), wide area networks (WANs), Open System Interconnection (OSI) networking model, cabling, cabling tools, routers, router programming, Ethernet, Internet Protocol addressing/subnetting and network standards.

Additional Fees: Course fee applies.**TEL-120. Routing II (CISCO). 3 Credits.**

LECT 2 hrs, LAB 3 hrs

The course follows CISCO's CCNA2 curriculum for Routers and Routing Basics. The course focuses on initial router configuration, CISCO IOS software management, routing protocol configuration, TCP/IP and access control lists (ACLs). Through lectures and laboratory assignments, students develop the skills to configure and maintain a router as well as the creation of software firewalls.

Prerequisites: TEL-110**Additional Fees:** Course fee applies.**TEL-220. Routing III (CISCO CCNA3 & CCNA4). 4 Credits.**

LECT 3 hrs, LAB 3 hrs

This course follows CISCO's CCNA3 curriculum for Switching and Intermediate Routing and CISCO's CCNA4 curriculum for WAN Technologies. The first half of the course focuses on advanced IP addressing techniques (Variable Length Subnet Masking (VLSM), intermediate routing protocols (RIP v2, single-area OSPF, EIGRP), command-line interface configuration of switches, Ethernet switches, Virtual LANs (VLANs), Spanning Tree Protocol (STP) and VLAN Trunking Protocol (VTP). The second half of the course focuses on advances IP addressing techniques (Network Address Translation (NAT), Port Address Translation (PAT), and (DHCP), WAN terminology and technology, PPP, ISDN, DDR, Frame Relay, network management and an introduction to optical networking. Preparation is also given to the study of CISCO's CCNA certification examination. Students learn through lecture and laboratory assignments.

Prerequisites: TEL-120**Additional Fees:** Course fee applies.

TEL-232. Data Communication. 3 Credits.

LECT 2 hrs, LAB 3 hrs

This course is a study of systems and equipment used in the transmission of data, interfacing data links to computers and troubleshooting of data links. Topics include VoIP (Voice over Internet Protocol), wireless technology, optical networking, serial interfaces, routing, link analysis, modems, data link and protocols, networking. The laboratory makes extensive use of protocol analysis for diagnostics.

Prerequisites: ELT-209 or TEL-110**Additional Fees:** Course fee applies.**TEL-233. Network Operating Systems. 3 Credits.**

LECT 2 hrs, LAB 3 hrs

This course is an introduction to various network operating systems. Emphasis is placed on the study of a server in a client/server computer network. Topics of study include installation of a network operating system, securing a system, creating users and groups, partitioning of hard drive, installation of transport protocols, creating and maintaining printers, event viewing, performance monitoring, registry modification, configuring a server, creating and maintaining the active directory and troubleshooting the network.

Additional Fees: Course fee applies.**TEL-234. Telecommunications Systems. 3 Credits.**

LECT 2 hrs, LAB 3 hrs

This course includes the study of the elements of telecommunications systems, emphasizing both voice and digital communications. Telephone loop operation and signaling, central office interface, switching, routing, transmission protocols, network architecture, T1 multiplexing and high-speed transmission are major topics. Advanced telecommunications topics such as ISDN and DSL are studied. Laboratory includes configuration, maintenance and diagnostic telecommunication systems.

Prerequisites: ELT-209 or CMP-230 and TEL-110**Additional Fees:** Course fee applies.**TEL-239. Cooperative Work Experience - Telecommunications Systems Technology. 3 Credits.**

COOP 3 hrs

This course is a field experience in the laboratory facilities of an industrial firm. Designed for students in Telecommunication Systems Technology programs to obtain industrial experience as a supplement to their college studies prior to career employment. Seminar evaluation visitations are included. Completion of the first year of the program is required to enroll.

Prerequisites: Permission of department chair.**TEL-290. Independent Study in Telecommunications Systems Technology. 3 Credits.**

LECT 3 hrs

Students, in consultation with a Telecommunications Technology advisor, undertake an in-depth analysis of a selected topic, problem or issue related to the telecommunications industry or pursue additional related work experience. Students are responsible for developing a statement of goals and strategies, maintaining a weekly log and preparing a written and oral summary report. Written permission must be obtained from the department before registering for this course.

Prerequisites: Permission of department chair.**TEL-291. Special Topics in Telecommunications Systems Technology. 3 Credits.**

LECT 2 hrs, LAB 3 hrs

These courses provide students with an examination of selected topics or issues in telecommunications systems technology. Topics may differ each time the course is offered. Students should consult a Telecommunications Technology advisor for additional information.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.**TEL-292. Special Topics in Telecommunications Systems Technology. 3 Credits.**

LECT 2 hrs, LAB 3 hrs

These courses provide students with an examination of selected topics or issues in telecommunications systems technology. Topics may differ each time the course is offered. Students should consult a Telecommunications Technology advisor for additional information.

Prerequisites: Permission of department chair**Additional Fees:** Course fee applies.