Computer Science

Associate of Science Degree

The Associate of Science degree in Computer Science prepares students for transfer to a bachelor's-level degree program in Computer Science. Degree requirements are based on national standards. Core Computer Science knowledge and skills are acquired in the following courses: Computer Science I, II and III (Data Structures and Algorithms), Computer Assembly Language, and Software Engineering.

Today most career opportunities in Computer Science require a minimum of a bachelor's degree. This is due to not only increased competition for IT jobs on a worldwide basis but also because the demands of an IT position require a solid foundation in several and varied areas of computing, a broad range that simply cannot be completed in two years. The US Bureau of Labor Statistics predicts that overall employment in computer science and information technology will grow much faster than the average for all occupations from 2024 to 2033, with about 356,700 opening projected each year. Some examples of positions available to B.S. Computer Science degree graduates include programmer, database manager, game developer, web developer, mobile applications developer, systems engineer, software engineer, and systems analyst.

The CCM Associate of Science program provides numerous opportunities to transfer to a four-year institution and study Computer Science. The following public and private New Jersey colleges and universities offer a bachelor's-level Computer Science degree: The College of New Jersey, Kean University, Montclair State University, New Jersey City University, Ramapo College, Richard Stockton State College, Rowan University, Thomas Edison State College, William Paterson University, New Jersey Institute of Technology, Rutgers University, Drew University, Fairleigh Dickinson University, Monmouth University, Princeton University, Caldwell University, College of Saint Elizabeth, Saint Peter's College, Seton Hall University, and Stevens Institute of Technology.

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

Degrees

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AS Computer Science

(P2500)

General Education Foundation		
Communication		6
ENG-111	English Composition I	
ENG-112	English Composition II	
Math-Science-Technology		12
MAT-123	Precalculus	
MAT-131	Analytic Geometry and Calculus I	
MAT-132	Analytic Geometry and Calculus II	
Social Science/ Humanities		9
Choose from General Education list (Social Science) [1]		
Choose from General Education list (Humanities) [1]		
Choose from General Education list (Humanities/Social Science) [1]		
General Education		8
Laboratory Science Sequence		
Laboratory Science Sequence		
General Education Foundation Credits		35
Computer Science Core		
CMP-128	Computer Science I	3
CMP-129	Computer Science II	3
CMP-230	Computer Architecture and Assembly Language	3
CMP-233	Data Structures and Algorithms	3
CMP-280	Software Engineering	3
MAT-225	Discrete Mathematics	4
CIS Electives		6
Computer Science Core Credits		25
Total Credits		**60**

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

AS Computer Science - Data Science Option

(P2501)

General Education Foundation		
Communication		6
ENG-111	English Composition I	
ENG-112	English Composition II	
Math-Science-Techonology		12
MAT-130	Probability and Statistics	
MAT-123	Precalculus	
MAT-131	Analytic Geometry and Calculus I	
Social Science		3
Choose from General Education list (Social Science) [1]		
Humanities		3
Choose from General Education course list (Humanities) [2]		
Humanities/Social Science		3
Choose from General Education course list (Humanities/Social Science) [3]		
General Education [4]		8
Laboratory Science Sequence I		
Laboratory Science Sequence II		
General Education Foundation Credits		35
Computer Science Core		
MAT-114	Introduction to Data Science	3
CMP-131	Fundamentals of Programming (Python)	3
CMP-128	Computer Science I	3

CMP-129	Computer Science II	3
CMP-233	Data Structures and Algorithms	3
CMP-241	Database Programming (SQL)	3
MAT-225	Discrete Mathematics	4
CMP-262	Data Science Programming	3
Computer Science Core Credits		25
Total Credits		**60**

1 Social Science Elective: Select one three-credit Social Science elective from the list of approved Gen Ed courses. RECOMMENDED elective PSY-113 General Psychology

2 Humanities Elective: Select one three-credit Humanities elective from the list of approved Gen Ed courses. RECOMMENDED elective PHL-114 Ethics

3 Humanities/Social Science Elective: Select one three-credit from either Humanities or Social Science elective from the list of approved Gen Ed courses.

4 Laboratory Science Sequence I & II: Choose a two part laboratory science sequence from the following: PHY 125/126 and PHY 127/128, General Physics Lab and Lecture I & II, CHM 125/126 and CHM 127/128, General Chemistry Lab and Lecture I & II or BIO 101 and BIO 102, Anatomy and Physiology I & II.

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		
CMP-280	Software Engineering	3
CMP-292	Special Topics in Information Technology	
CMP-293	Special Topics in Information Technology II	
PHL-114	Ethics	
TEL-110	Routing I	
TEL-120	Routing II (CISCO)	
Total Credits		**18**

1 Students should consult their academic advisors when selecting these courses

Courses

CMP-000. Technology Literacy Test. 0 Credits.
LECT hrs
Technology Literacy Test.

CMP-101. Computer Information Literacy. 1 Credit.
LAB 30 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 45 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 45 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 45 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 45 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 45 hrs LAB 30 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 30 hrs LAB 30 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 30 hrs LAB 30 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 (grade of C or better) or equivalent
Additional Fees: Course fee applies.

CMP-130. Introduction to Information Technology. 3 Credits.
LECT 30 hrs LAB 30 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 is one of three courses that 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-131. Fundamentals of Programming (Python). 3 Credits.
LECT 30 hrs LAB 30 hrs
This is a fundamental course in problem solving and programming. This course introduces concepts such as how to solve problems by designing and implementing algorithms using a popular programming language. Topics include: pseudocode, algorithms, variables, constants, using decisions and loop structures to construct effective code, using built-in functions, creating functions and modules, and simple debugging techniques for detecting errors. Use of real-world problems in Web Development, Cybersecurity and Data Science are explored. No prior programming experience is required.
Additional Fees: Course fee applies.

CMP-135. Computer Concepts With Applications. 3 Credits.
LECT 30 hrs LAB 30 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-149. Critical Game Play. 3 Credits.
LECT 30 hrs LAB 30 hrs
This is an introductory course designed to increase games literacy and foster a shared understanding of the history of games, culturally and aesthetically. A thorough knowledge of the games that have shaped this industry is integral for all students considering entering the field. The class covers a wide spectrum of digital and analogue games. Students will take part in discussions and lectures.They will compose a short analyses of different games and justify their stances in group-wide presentations. The primary activity of the class is critical play - playing games and analyzing them in order to better understand the medium on a personal and professional level.
Additional Fees: Course fee applies.

CMP-150. Game Programming. 3 Credits.
LECT 30 hrs LAB 30 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 30 hrs LAB 30 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 coursed the student will demonstrate various data recovery techniques as the basis for forensic evaluation.
Additional Fees: Course fee applies.

CMP-200. Computer Operating Systems and Utilities. 3 Credits.
LECT 45 hrs LAB 15 hrs
This introductory course provides essential concepts related to operating systems, particularly within the Microsoft ecosystem. Students navigate various aspects of operating systems and manage files and folders, and develop analytical skills to troubleshoot hardware problems using dedicated tools such as the Hardware manager.
Additional Fees: Course fee applies.

CMP-230. Computer Architecture and Assembly Language. 3 Credits.
LECT 45 hrs LAB 15 hrs
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 45 hrs LAB 15 hrs
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 abstract data structures (ADTs) such as lists, queues, stacks, hash tables, dictionaries, and trees. Both iterative and recursive algorithms are explored with analysis of their efficiency for these ADTs. 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-239. The Internet and Web Page Design. 3 Credits.
LECT 45 hrs LAB 15 hrs
This course introduces students to the design and development of static, front-end websites using current markup language and styling standards. Fundamental structures and multi-media content are addressed, along with responsive design, accessibility guidelines and Search Engine Optimization (SEO). Also, considered is the history, architecture and societal impacts of the Internet. Students will use their creativity to construct a professional-quality, multi-page website in a semester-long project, which will be stored in an online portfolio. No prior programming experience is required.
Additional Fees: Course fee applies.

CMP-241. Database Programming (SQL). 3 Credits.
LECT 45 hrs LAB 15 hrs
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 CMP-131 or permission of department chair
Additional Fees: Course fee applies.

CMP-243. Ethical Hacking and Systems Defense. 3 Credits.
LECT 30 hrs LAB 30 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 45 hrs LAB 15 hrs
This is an intermediate front-end web design and development course with a strong focus on incorporating dynamic content, such as animation, that is interactive and user engaging through the introduction of modern scripting languages and frameworks. Students will gain experience with web server and hosting technology for publishing website projects live on the Internet. Using their prior course final project as a baseline for their own growth potential in the course students will design and develop a new semester-long multi-page website that demonstrates marked improvement in design skills while incorporating the dynamic skills learned throughout the course.
Prerequisites: CMP-239
Additional Fees: Course fee applies.

CMP-249. Advanced Web Programming. 3 Credits.
LECT 30 hrs LAB 30 hrs
This advanced course in Web Development introduces the student to creating interactive and dynamic Websites 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 Websites with fully functioning back end support.
Prerequisites: CMP-128 and CMP-244
Additional Fees: Course fee applies.

CMP-250. Game Production. 3 Credits.
LECT 30 hrs LAB 30 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-255. Linux. 4 Credits.
LECT 45 hrs LAB 30 hrs
This is a hands-on course in the administration of a Linux Operating System. Students utilize the command line interface to control the operating system and its utilities. Focus is placed on the file system, user system, file security, process and job management, X-Windows, shells and shell scripting. A POSIX-compliant shell, such as ash, dash, bash or ksh, is introduced. Concepts include redirection, piping, and regular expressions. Upon successful completion of this course, students are proficient in using the Linux operating system, with combined lecture and lab exercises focusing on basic/intermediate skills essential to an IT professional.
Prerequisites: CMP-128
Additional Fees: Course fee applies.

CMP-262. Data Science Programming. 3 Credits.
LECT 30 hrs LAB 30 hrs
This course covers problem solving strategies and programming techniques specific to data analytics using an industry-standard, general-purpose programming language and tool set. Students will learn how to gather input from structured and unstructured sources of various formats, stored locally and remotely through cloud computing, and use programming libraries and application programming interfaces to efficiently process data and present information. Team and individual projects will analyze real-world, large datasets. Data integrity, privacy and security will be considered.
Prerequisites: CMP-131 Fundamentals of Programming (Python) or approval of IT Department Chairperson
Additional Fees: Course fee applies.

CMP-263. Web Development Workflow. 4 Credits.
LECT 45 hrs LAB 30 hrs
This course provides students with cutting edge Web development skills to create and maintain Web sites that are modern, responsive, and dynamically delivered across a wide range of devices. Students learn leading Web design and development tools including current industry standard Web interactive tools, Git, JQuery Framework, and content management systems. Instruction and practice on available platforms provide seamless integration and unified interface across all tools to streamline Web development from local development to staging to production. Students will develop competence in the use of industry-leading development tools in building a current, engaging, and dynamic Web site.
Prerequisites: CMP-239 or MED-110 or GRD-108
Additional Fees: Course fee applies.

CMP-264. Machine Learning. 3 Credits.
LECT 15 hrs LAB 60 hrs
This course provides a practical understanding and foundational principles of Machine Learning techniques. It offers the concepts, the intuitions, and the tools the students need to implement programs capable of learning from data. A large number of techniques are covered, from supervised learning algorithms, unsupervised learning algorithms to Deep Learning techniques and applications. The main goal of this course is to equip students with the skills to tackle real Machine Learning problems encountered in real life and business and establish a project portfolio
Prerequisites: MAT-114 AND CMP-131, OR Equivalent AND Department Permission
Additional Fees: Course fee applies.

CMP-280. Software Engineering. 3 Credits.
LECT 30 hrs LAB 30 hrs
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-241
Corequisites: CMP-241
Additional Fees: Course fee applies.

CMP-290. Independent Study in Information Technology. 3 Credits.
LECT 45 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 45 hrs LAB 15 hrs
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.
Prerequisites: Permission of department chair
Additional Fees: Course fee applies.

CMP-292. Special Topics in Information Technology. 3 Credits.
LECT 45 hrs LAB 15 hrs
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.
Prerequisites: Permission of department chair
Additional Fees: Course fee applies.

CMP-293. Special Topics in Information Technology II. 1 Credit.
LECT 15 hrs
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 45 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 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 90 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 135 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.