COMPUTER SCIENCE AND INFORMATION SYSTEMS

(413) 662-5014
Chairperson: Mike Dalton, Ph.D.
Email: Mike.Dalton@mcla.edu

PROGRAMS AVAILABLE
BACHELOR OF SCIENCE IN COMPUTER SCIENCE
BIOINFORMATICS CONCENTRATION
COMPUTER SCIENCE MINOR
INFORMATION TECHNOLOGY MINOR

COMPUTER SCIENCE MAJOR PROGRAM
The Department of Computer Science offers a four-year program leading to a Bachelor of Science in Computer Science, with one of four concentrations. Students majoring in other departments may complete a minor in computer science or a minor in information technology.

Computer science encompasses a broad range of computing and communications technologies that are used for the development of business, commerce, robotics, entertainment, educational, medical and information system products. The dependence on modern computer systems has created a growing demand for software developers who can meet the needs of businesses and consumers. The application of these technologies now stretches from the factory floor to the office, boardroom and home. Current products range from standalone applications to fully distributed networked systems, and are made possible by the concepts of object oriented programming and design. Career opportunities for graduates with these skills exist both in Internet companies and in more traditional companies that have a need for
distributed systems of networked computers and software systems. Recent graduates have found employment with Internet startup companies, the insurance industry, communications companies and government contractors. The major program is designed to provide students with a strong grounding in several areas. Students graduating with a degree in computer science will be able to:

- Develop and maintain professional quality software applications, products, and systems;
- Competently use major software applications found in industry;
- Communicate ideas effectively with others;
- Create and maintain hardware systems.

COMPUTER SCIENCE MAJOR
Students must select one of the following concentrations: Information Technology, Software Development, Bioinformatics, or Business Information Systems.

SOFTWARE DEVELOPMENT CONCENTRATION
Requirements

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<tr>
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<td>Data Structures and Algorithms</td>
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<td>CSCI 362</td>
<td>Operating Systems</td>
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<td>CSCI 390</td>
<td>Junior Qualification</td>
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<td>CSCI 462</td>
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<tr>
<td>ENGL 306</td>
<td>Business Writing and Presentation</td>
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<td>MATH 250</td>
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<td>PHYS 131</td>
<td>General Physics I</td>
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<tr>
<td>OR PHYS 151</td>
<td>Introduction to Mechanics</td>
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**TOTAL SOFTWARE DEVELOPMENT CONCENTRATION REQUIREMENTS**  
62 cr

**INFORMATION TECHNOLOGY CONCENTRATION Requirements**

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<td>OR CSCI 248</td>
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<td>CSCI 210</td>
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<td>CSCI 243</td>
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<td>CSCI 302</td>
<td>Computer Triage</td>
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<td>CSCI 330</td>
<td>Programming in C++</td>
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CSCI 360  Network Security I       3 cr
CSCI 363  Network Security II       3 cr
CSCI 343  Server-Side Software Development       3 cr
CSCI 461  Senior Project I         1 cr
CSCI 462  Senior Project II        1 cr
ENGL 306  Business Writing        3 cr
MATH 200  Level                   3 cr
MATH 250  Discrete Mathematics    3 cr

TOTAL INFORMATION TECHNOLOGY CONCENTRATION REQUIREMENTS                 51 cr

BUSINESS INFORMATION SYSTEMS CONCENTRATION
Requirements
BADM 206  Math Methods for Business and Economics               3 cr
BADM 210  Information Technology for Business              3 cr
BADM 224  Financial Accounting                                3 cr
BADM 310  Advanced Information Technology for Business     3 cr
BADM 340  Financial Management                               3 cr
CSCI 101  Introduction to Computer Science                 3 cr
CSCI 236  Web Development                                     3 cr
CSCI 243  Database Development                               3 cr
CSCI 246  Programming in C# I                                3 cr
CSCI 248  Programming in C# II                               3 cr
CSCI 252  Systems Development                                 3 cr
CSCI 346  Programming in Visual Studio                       3 cr
CSCI 352  Business Information Systems                      3 cr
CSCI 461  Senior Project I                                    1 cr
CSCI 462  Senior Project II                                   1 cr
ECON 141  Macroeconomics                                     3 cr
ENGL 306  Business Writing                                   3 cr
TOTAL BUSINESS INFORMATION SYSTEMS CONCENTRATION REQUIREMENTS  47 cr

BIOINFORMATICS CONCENTRATION
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<td>BIOL</td>
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<tr>
<td>BIOL</td>
<td>235 Botany OR BIOL 245 Zoology</td>
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<tr>
<td>BIOL</td>
<td>240 Genetics</td>
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<tr>
<td>BIOL</td>
<td>390 Biometry</td>
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<tr>
<td>BIOL</td>
<td>410 Biotechniques</td>
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TOTAL BIOINFORMATICS CONCENTRATION REQUIREMENTS  51 cr

* Senior project must be related to bioinformatics and must be co-advised by CS and Biology faculty
COMPUTER SCIENCE MINOR

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TOTAL COMPUTER SCIENCE MINOR REQUIREMENTS 25 cr

INFORMATION TECHNOLOGY MINOR

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<td>CSCI</td>
<td>352 Business Information Systems</td>
<td>3 cr</td>
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TOTAL INFORMATION TECHNOLOGY MINOR REQUIREMENTS 21 cr
COURSE DESCRIPTIONS

CSCI 101        Introduction to Computer Science 3  cr
Introduces entering computer science majors to various topics used throughout the curriculum. Topics include computer hardware, operating systems, file systems, file types, protocols and networking.
Prerequisite: None

CSCI 121        Programming in Java I 3  cr
Introduces the concepts of program development using the Java programming language. Topics include variables, control structures, arrays, string manipulation and an introduction to object oriented concepts.
Prerequisite: None

CSCI 122        Programming in Java II 3  cr
Continues the study of object oriented programming and the Java language. Topics include file manipulation, method and class definitions, graphic applications, applets, multimedia, events and interfaces.
Prerequisite: CSCI 121

CSCI 208        Graphics I 3  cr
Provides a broad overview of computer graphics. Students will use proprietary and open source software to integrate images and text. The course includes demonstrations, lectures, presentations and hands-on projects. It is expected that students will have access to a digital camera and that students will work with their own images.
Prerequisite: None
CSCI 210  Networking Theory and Administration I  3  cr
Introduces students to topics in networking theory such as protocols, protocol stacks, encryption and security. Basic network troubleshooting and administration will also be covered.
Prerequisite: None

CSCI 211  Networking Theory and Administration II  3  cr
Introduces students to advanced topics in networking theory such as flow control and congestion control algorithms, routing algorithms, multiple access algorithms, and error detection and correction algorithms. Advanced troubleshooting and network administration will be covered.
Prerequisite: CSCI 210

CSCI 221  Programming in Java III  3  cr
Continues the study of object oriented programming and the Java language. This course focuses on the development of graphical user interfaces and animated simulations and games using object oriented programming techniques.
Prerequisite: CSCI 122

CSCI 222  Programming in Java IV  3  cr
Continues the study of object-oriented programming and the Java language. Topics include advanced data structures, input and output streams and serialization, multithreading, networking and object-oriented design methodology.
Prerequisite: CSCI 221

CSCI 235  Digital Circuit Design  4  cr
Introduces the fundamental concepts involved in the analysis and design of digital logic circuits. Topics include number systems, Boolean algebra, logic
minimization, and combinational and sequential circuits. Students design, implement, test and debug digital systems. Required laboratory.

**Prerequisite:** None

**CSCI 236 Web Development 3 cr**
Emphasizes the client side tools and techniques used to develop web applications. Topics include XHTML, cascading style sheets, file transfer protocol and browser compatibility. The course will also discuss effective web page design considerations, including usability, accessibility and information design.

**Prerequisite:** None

**CSCI 240 Introduction to Robotics 3 cr**
Introduces the student to the field of robotics. Students work in teams to build a small robot and program it to perform various tasks. Additionally, the course will discuss the essential elements of robotic systems, including motors, sensors, physical design and control.

**Prerequisite:** None

**CSCI 243 Database Development 3 cr**
Introduces the design, management and programming of database systems. This course focuses on the design of database systems using the SQL language, and will provide hands-on experience with one or more database management system products. It also examines the role of a database administrator.

**Prerequisite:** None

**CSCI 246 Programming in C# I 3 cr**
Introduces the concepts of program development using the C# programming language. Intended for business information majors, this course focuses on an introduction to the visual studio development environment, simple
variables and control structures, and an introduction to object-oriented concepts.

**Prerequisite:** None

**CSCI 247 Introductory Topics in Computing 3 cr**
Provides an understanding of a topic in computing that may be of interest to majors or non-majors. This course introduces a topic that is not currently part of the department curriculum. Depending on the specific topic, students will demonstrate mastery of course content through programs, papers, and/or portfolio development.

**Prerequisite:** None

**CSCI 248 Programming in C# II 3 cr**
Continues the study of program development using the C# programming language. Intended for business information majors, this course focuses on advanced C# concepts including structured variables, additional control structures, object creation, code reuse and dynamic storage allocation.

**Prerequisite:** CSCI 246

**CSCI 252 Systems Development 3 cr**
Introduces the systems-development life cycle, information gathering techniques and techniques of systems analysis, design and implementation. Computer-Assisted Software Development (CASE) will be introduced. Teams will analyze and design portions of computer based systems.

**Prerequisite:** None

**CSCI 288 Web Page Design 3 cr**
Introduces the study of web page design using contemporary design tools and development environments. Intended for non-computer science majors, the course takes a creative approach to web design that is facilitated by a good working knowledge of technical skills. Course explores theoretical, aesthetic
and technical perspectives of effective web page design. Upon completion, students will be able to employ design techniques to create beautiful and highly functional web pages.

**Prerequisite:** None

**CSCI 302  Computer Triage 3 cr**
Intended for computer science majors. Topics include: troubleshooting, problem solving and maintaining network hardware and software.

**Prerequisite:** CSCI 101

**CSCI 308  Graphics II 3 cr**
Builds on CSCI 208 and provides a broad overview of 3-D computer graphics. Students will use proprietary and open source software to create and render three-dimensional objects and scenes. The course includes demonstrations, lectures, presentations and many "hands-on" projects.

**Prerequisite:** CSCI 208

**CSCI 318  Computer Organization and Assembly Language 3 cr**
Introduces students to the major hardware components of a computer system and to the organization of computers as a hierarchy of hardware and software. Considers the basic functional units of a computer system and then examines the following levels: digital logic, microprogramming, conventional machine language, operating system and assembly languages.

**Prerequisite:** CSCI 235

**CSCI 328  Object Oriented Design 3 cr**
Investigates system design using the standard object oriented design methodology. The Unified Modeling Language (UML) is covered extensively, as are the tools and diagrams associated with it. The course incorporates the use of software design tools and applications used in industry.
Prerequisite: CSCI 221

CSCI 330    Programming in C++    3 cr
Applies programming concepts to the C++ language. This course is intended for students who have studied another object-oriented programming language for at least two semesters. Topics include C++ syntax, data structures, libraries, graphics and GUI applications.
Prerequisite: CSCI 122

CSCI 336    Advanced Web Development    3 cr
Continues the study of World Wide Web application development. This course emphasizes both client-side and server-side tools and techniques used to develop web applications, and will include various scripting languages.
Prerequisite: CSCI 236

CSCI 340    Robotics Development    3 cr
Introduces the student to various development areas associated with robotics. Topics include motors, motor control, sensors, microcontrollers, physical design, basic analog and digital circuit theory, software design, interfacing and artificial intelligence. Students will construct a robot or robotic system and choose to focus on one or more of these areas.
Prerequisite: CSCI 122, or CSCI 235, or CSCI 240, or PHYS 251

CSCI 343    Server-Side Software Development    3 cr
Focuses on the development of server-side applications with database connectivity. This course merges the concepts learned in Web Development and Database Development to form traditional persistent multi-client systems.
Prerequisite: CSCI 122, CSCI 236, CSCI 243
CSCI 346  Programming in Visual Studio  3  cr
Applies programming concepts to the language found in the Visual Studio programming environment. This course is intended for students who have studied another programming language for at least two semesters. Topics include syntax, data structures, graphics and GUI application in a Windows environment.
**Prerequisite:** CSCI 122 or CSCI 248

CSCI 347  Intermediate Topics in Computing  3  cr
Provides in-depth study of a topic introduced in an earlier course. Depending on the specific topic, students will demonstrate mastery of course content through programs, papers and/or portfolio development.
**Prerequisite:** Department approval

CSCI 350  Introduction to Parallel Computing  3  cr
Introduces parallel computing methods for both distributed memory and shared memory architectures. In this course, students will learn how to design and implement parallel algorithms for solving classic computer science problems, and analyze their performance. This course covers several parallel programming techniques such as Open MPI, POSIX Threads, Open MP, and Java Threads.
**Prerequisite:** CSCI 122

CSCI 352  Business Information Systems  3  cr
Provides an examination of business information systems that apply to all strata of organizations. The course will view organizations as information systems and demonstrate how computers are integrated in these organizations. Students will engage in service learning projects and gain practical experience off-campus, solving real problems for various companies.
**Prerequisite:** CSCI 252
CSCI 360      Network Security I       3 cr
Examines client based/end user security. This course is intended for computer science majors. Topics include: identification, prevention and recovery from security vulnerabilities and threats to PCs, tablets and mobile devices.
Prerequisite: CSCI 211

CSCI 361      Data Structures and Algorithms       3 cr
Introduces fundamental data structures such as stacks, queues, dictionaries, trees, and graphs. This course also covers the development and analysis of algorithms that sort, search, traverse, and divide and conquer. Algorithm analysis techniques covered include the RAM model of computation, best-case, worst-case, and average-case complexity. Students will implement data structures and algorithms using a contemporary programming language and serial and parallel programming techniques.
Prerequisite: CSCI 122

CSCI 362      Operating Systems       3 cr
Students learn about and implement the fundamental principles used by operating systems to manage processes, memory, storage, and security. In addition, case studies will be introduced to explore the implementation of at least two modern operating systems.
Prerequisite: CSCI 361

CSCI 363      Network Security II       3 cr
Continues CSCI 360, Network Security I and examines networked systems security. This course is intended for computer science majors. Topics include: identification, prevention and recovery for security vulnerabilities and threats to network data and networked resources.
Prerequisite: CSCI 360
CSCI 390  Junior Qualification Symposium  1 cr
Ensures that students are prepared for their senior year of study in the Computer Sciences Software Development Program. Students attend class for one hour each week to review material from the lower level courses in the program, (100 and 200 level). Near the end of the semester, each student will take a multi-part exam, which must be passed to continue on.
Prerequisite: CSCI 222, 235, 236, 243

CSCI 408  Graphics III  3 cr
Explores the history of CG animation and produces an animation short using a 3-D graphics program. Students will build on their skills developed in CSCI 208 and CSCI 308 and, working in teams, develop, refine and build a computer generated short animation.
Prerequisite: CSCI 308

CSCI 420  Bioinformatics  3 cr
Introduces the fundamental algorithms used in bioinformatics and how these algorithms can be used to solve biological problems. In this class, students will learn how bioinformatics algorithms work, as well as how to obtain sequence data from scientific databases and analyze these data using tools available on the MCLA high-performance cluster.
Prerequisite: CSCI 243, BIOL 240

CSCI 441  Teaching Assistant in Computer Science  3 cr
Assigns students to assist a member of the computer science faculty. Students will be involved in developing materials for class, giving workshops and help sessions, and evaluating computer science projects. A member of the computer science faculty will coordinate, counsel and evaluate students enrolled in the course.
Prerequisite: Department approval
CSCI 447  Advanced Topics in Computing  3  cr
Provides advanced study of a topic introduced in an earlier course.
Depending on the specific topic, students will demonstrate mastery of course content through programs, papers and/or portfolio development.
Prerequisite: Department approval

CSCI 452  Software Engineering  3  cr
Prepares students for work in industry. This course introduces students to modern tools and approaches that will allow them to design professional quality software.
Prerequisite: CSCI 343, CSCI 390

CSCI 461  Senior Project I  1  cr
Prepares senior computer science majors for their final projects and life beyond graduation. In addition to writing and presenting proposals for senior projects, students prepare portfolios and resumes. Course topics include various writing styles, presentation techniques and networking and communication skills. Students choose a faculty advisor and begin work on the senior project during this semester.
Prerequisite: CSCI 328, CSCI 343

CSCI 462  Senior Project II  1  cr
Provides students with a final and substantial project. Students work with a faculty advisor to complete the senior project started in senior seminar. Projects are presented during a public senior project day at the end of the semester.
Prerequisite: CSCI 461
CSCI 500  Independent Study  1 to 3 cr
Designed for students who wish to undertake an in-depth examination of some topic of interest. The project will be carried out under the direction of a computer science faculty sponsor.

Prerequisite: Junior/senior status, department approval

CSCI 540  Internship in Computer Science  3 to 12 cr
Open to juniors and seniors who would like to gain practical field experience in the computer industry. The intern will work under close supervision of both industry and department personnel.

Prerequisite: CSCI 222, or junior/senior status, or department approval