

# COMPUTER SCIENCE, B.S.

## Program Description

The Department offers three separate programs in computing. Two of these programs provide a foundation in the discipline of computer science, one leading to a B.A. and the other to a B.S. The remaining program leads to a B.S. in Information Technology.

The primary goal of these programs is the preparation of graduates for direct entry into the computing profession with sufficient background to make continuing contributions in the field. The B.S. in Computer Science program provides the foundation for remaining current in computer science. It requires courses in related fields and provides breadth and depth in the discipline. The B.A. program is applications-oriented and has fewer required courses to provide greater flexibility. The Information Technology major is designed for those students interested in the study of networks and client support systems.

## Mission Statement

With student learning having the highest priority, goals for the Computer Science Program are in accord with those of the University. Our mission is to help our students to think logically, to analyze problems and develop algorithmic and computer-based solutions to these problems, to communicate effectively, and to work collaboratively as part of a team. With the ultimate goal of developing all of our students as self-learners, members of our faculty strive to research and implement teaching strategies that effectively serve all of our students.

Ultimately, our mission is to prepare students for professional careers in computer science. In addition, students who demonstrate the ability and determination to continue academically in computer science will be prepared for graduate studies. We expect that participants in our program, both students and faculty, will expand their thirst for learning and develop a deeper appreciation and respect for related disciplines. To these ends, we work to provide a classical foundation in the core of the discipline, introduce current theories, research areas, and technologies, and demonstrate the links between theory and its embodiment in the world of applications.

## 4+1 Graduate Program Option

During their senior year, students with a GPA of at least 3.0 may apply for the 4+1 BS/MS Computer Science option. Students who are accepted into this program will receive their bachelor's degree once they complete its requirements and will then begin the master's program immediately upon graduation. Up to three courses from the undergraduate program will then count towards the completion of the masters degree. Students must earn a grade of B or higher in any course that is being transferred to the graduate program. Eligible masters programs are as follows:

- Computer Information Science (CIS) - a total of 7 additional classes (21 credits) are required to complete the M.S. in CIS; this degree can be completed in as few as four semesters after graduation (approximately 15 months)
- Cybersecurity (CYB) - a total of 7 additional classes (21 credits) are required to complete the M.S. in CYB; this degree can be completed in as few as four semesters after graduation (approximately 15 months)

## Why Take This Major?

Students who pursue Computer Science as a major enjoy programming (writing code) and the software side of computing. Graduates pursue

careers as software developers, computer analysts, systems engineers, and web developers.

## Degree Earned

Bachelor of Science (B.S.)

## Required for Graduation

- Courses
  - Major: 21
- Credits
  - Major: 69-70
  - Total: 120
- GPA
  - Major: 2.0
  - Cumulative: 2.0

## Student Learning Outcomes

Upon completion of the program, students will be able to:

- demonstrate the use of computer science in solving problems
- critically evaluate problems to determine project requirements
- plan, develop and create solutions to problems incorporating current and emerging computer technologies
- critically evaluate results and impact of their problem solving
- demonstrate the use of various programming languages and computing environments
- incorporate oral and written presentation skills as well as teamwork and collaboration tools into their problem-solving methodology
- explain the computer science theory underlying the solutions to practical problems

## Progress Chart

### Level One - Core Courses

12 courses and 2 modules required.

### Major Requirements

Major requirements include 4 Level Two ILO requirements, *fulfilled through the major*.

Code	Title	Credits
<b>Level One - Core Courses</b>		
<i>Universal Required Courses</i>		
Students must complete the following 4 courses.		
ILO 8.1: Written Communication ( <a href="https://catalog.lasalle.edu/undergraduate/ilo/">https://catalog.lasalle.edu/undergraduate/ilo/</a> )		
ENG 110	College Writing I: Persuasion	3
ILO 5.1: Information Literacy ( <a href="https://catalog.lasalle.edu/undergraduate/ilo/">https://catalog.lasalle.edu/undergraduate/ilo/</a> )		
ENG 210	College Writing II: Research	3
ILO 1.1: Understanding Diverse Perspectives ( <a href="https://catalog.lasalle.edu/undergraduate/ilo/">https://catalog.lasalle.edu/undergraduate/ilo/</a> )		
FYS 130	First-Year Academic Seminar <sup>1</sup>	3
ILO 2.1: Reflective Thinking and Valuing ( <a href="https://catalog.lasalle.edu/undergraduate/ilo/">https://catalog.lasalle.edu/undergraduate/ilo/</a> )		
REL 100	Religion Matters	3

**Elective Core Courses**

Students must complete 1 course in each of the following 4 ILOs.

ILO 3.1a: Scientific Reasoning (<https://catalog.lasalle.edu/undergraduate/ilo/>)

PHY 201 Computer Electronics 3

ILO 3.1b: Quantitative Reasoning (<https://catalog.lasalle.edu/undergraduate/ilo/>)

ILO 6.1: Technological Competency (<https://catalog.lasalle.edu/undergraduate/ilo/>)

CSC 280 Object Programming 4

ILO 8.1a/12.1: Oral Communication/Collaborative Engagement (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Choose course within ILO (<https://catalog.lasalle.edu/undergraduate/ilo/>) 3

**Distinct Discipline Core Courses**

Students must complete 1 course in each of the following 4 ILOs. Each course must be from a different discipline. (A "discipline" is represented by the 3- or 4-letter prefix attached to each course.)

ILO 4.1: Critical Analysis and Reasoning (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Choose course within ILO (<https://catalog.lasalle.edu/undergraduate/ilo/>) 3

ILO 9.1: Creative and Artistic Expression (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Choose course within ILO (<https://catalog.lasalle.edu/undergraduate/ilo/>) 3

ILO 10.1: Ethical Understanding and Reasoning (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Choose course within ILO (<https://catalog.lasalle.edu/undergraduate/ilo/>) 3

ILO 11.1: Cultural and Global Awareness and Sensitivity (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Choose course within ILO (<https://catalog.lasalle.edu/undergraduate/ilo/>) 3

**Universal Required Modules**

Students must complete the following 2 non-credit modules.<sup>2</sup>

ILO 7.1a (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Health Literacy Module

ILO 7.1b (<https://catalog.lasalle.edu/undergraduate/ilo/>)

Financial Literacy Module

**Major Requirements****Level Two**

Students must complete 1 course/learning experience in each of the 4 commitments.

ILO 2.2: Broader Identity (Capstone Course/Experience) (<https://catalog.lasalle.edu/undergraduate/ilo/>)

CSC 481 Project Implementation (ILO 2.2) 3

Select one ILO from 3.2a, 3.2b, 4.2, 5.2, 6.2, 7.2a, or 7.2b: Expanded Literacies (<https://catalog.lasalle.edu/undergraduate/ilo/>)

CSC 301 Computer Architecture (ILO 6.2) 3

ILO 8.2b: Effective Expression (Writing-Intensive Course) (<https://catalog.lasalle.edu/undergraduate/ilo/>)

CSC 290 Introduction to Data Structures and Algorithms (ILO 8.2b) 4

Select one ILO from 10.2, 11.2, or 12.2: Active Responsibility (<https://catalog.lasalle.edu/undergraduate/ilo/>)

CSC 381 Software Engineering (ILO 10.2) 3

**All Other Major Requirements**

CSIT 220 Data Communication 3

CSC 230 Programming Concepts and User Interfaces 4

CSC 240 Database Management Systems 3

CSC 280 Object Programming 4

CSC 290 Introduction to Data Structures and Algorithms 4

CSC 301 Computer Architecture 3

CSC 366 Language Theory and Design 3

CSC 381 Software Engineering 3

CSC 457 Operating Systems 3

CSC 464 Theory of Algorithms 3

CSC 481 Project Implementation 3

Select one of the following: 3

CSC 340 .Net Programming

CSC 341 Open-Source Application Development

CSC 343 Client-Side Scripting

CSC 349 Mobile Computing

One CSC elective 300-level or higher 3

One CSC or CSIT elective 300-level or higher 3

MTH 120 Calculus I 4

Select one of the following: 3-4

MTH 121 Calculus II

MTH 240 Linear Algebra

ECN 213 Statistics for Economics and Political Science

MTH 260 Discrete Structures I 3

MTH 261 Discrete Structures II 3

PHY 105 General Physics I 4

PHY 106 General Physics II 4

PHY 201 Computer Electronics 3

**Free Electives**

In addition to the requirements listed above, students must take enough courses to the fulfill graduation credit requirements for their School and major.

1

NOTE. The following students use Level 2 Capstone Experience in Major instead of FYS 130 First-Year Academic Seminar: Honors, BUSCA, Core-to-Core, Transfer, and Non-Traditional/Evening.

2

The Modules are **not** required for Transfer Students, Core-to-Core Students, or BUSCA Students. BUSCA students are required to take modules if/when they pursue a bachelor's degree.

**Recommended Course Sequence**

The following is a sample course sequence for the required major-level courses. It is possible that the order in which you take the courses will vary due to when certain courses are offered. The typical student should take five courses each semester, filling out the remaining slots with Core courses and/or free electives.

Course	Title	Credits
<b>First Year</b>		
<b>First Semester</b>		
CSC 230	Programming Concepts and User Interfaces	4
CSC 240	Database Management Systems	3
MTH 120	Calculus I	4
<b>Credits</b>		<b>11</b>
<b>Second Semester</b>		
CSC 280	Object Programming	4
CSIT 220	Data Communication	3
MTH 121, MTH 240, or ECN 213		3-4
<b>Credits</b>		<b>10-11</b>
<b>Second Year</b>		
<b>First Semester</b>		
CSC 290	Introduction to Data Structures and Algorithms	4
MTH 260	Discrete Structures I	3
<b>Credits</b>		<b>7</b>
<b>Second Semester</b>		
MTH 261	Discrete Structures II	3
PHY 201	Computer Electronics	3
CSC 340, CSC 341, CSC 343, or CSC 349		3
<b>Credits</b>		<b>9</b>
<b>Third Year</b>		
<b>First Semester</b>		
CSC 457	Operating Systems	3
PHY 105	General Physics I	4
<b>Credits</b>		<b>7</b>
<b>Second Semester</b>		
CSC 301	Computer Architecture	3
PHY 106	General Physics II	4
<b>Credits</b>		<b>7</b>
<b>Fourth Year</b>		
<b>First Semester</b>		
CSC 381	Software Engineering	3
CSC 464	Theory of Algorithms	3
CSC/CSIT Elective <sup>1</sup>		3
<b>Credits</b>		<b>9</b>
<b>Second Semester</b>		
CSC 366	Language Theory and Design	3
CSC 481	Project Implementation	3
CSC Elective <sup>2</sup>		3
<b>Credits</b>		<b>9</b>
<b>Total Credits</b>		<b>69-70</b>

1

Any CSC or CSIT course numbered 300 or higher

2

Any CSC course numbered 300 or higher

## Dual Major Requirements

Due to the theoretical nature of the Computer Science BS program and the overlap between the two programs, students will often double major or minor in Mathematics. Please see the Department Chair for more information on our double major offerings.

## Course Descriptions

### Computer Science

#### CSC 151 Introduction to Computing Using Packages

This course offers a survey of computers and computer systems as well as problem-solving and computer applications for business and social science and an introduction to a PC-based Graphical User Interface/ windowed operating system. Computer packages include a word processor, electronic spreadsheet, and presentation software. Internet use includes electronic mail and the World Wide Web. Restriction(s): Credit will be given for only one of CSC 151, 152, 154, and 155.

#### CSC 152 Computer Technology for the Sciences

This course provides a survey of computers and computer systems as well as problem-solving and computer applications for science and mathematics, including data analysis and regression. It includes an introduction to a PC-based Graphical User Interface/ windowed operating system and covers word processing, design and use of electronic spreadsheets, and presentation software. Internet use includes electronic mail and the World Wide Web. Restriction(s): Credit will be given for only one of CSC 151, 152, 154, and 155. Prerequisites: Mth 101 or 102M Math Placement Score

#### CSC 154 Healthcare Informatics

This course promotes an understanding of computer systems and related technologies as they are utilized by healthcare professionals across a variety of settings. The role and value of medical record technology such as Electronic Medical Records (EMRs) and Electronic Health Records (EHRs) are explored. Also studied is the relationship of healthcare informatics to patient safety and legal and ethical issues associated with the collection of personal and health data. Students collaborate and discuss these issues using technologies such as email, blogs, wikis, Websites, e-Portfolios, and mobile devices. Strategies for searching relevant library databases as well as government and health organization Websites are developed. Restriction(s): Credit will be given for only one of CSC 151, 152, 154, and 155.

#### CSC 155 Introduction to Computer Applications for Business

This course addresses effective analysis, design, and presentation of information for business, including advanced word processing, presentation graphics, spreadsheets, and databases, with emphasis on analysis. Topics include formulas, functions, charting, sorting, filtering, pivot tables, what-if analysis, database queries and reports, and business-specific library databases. Restriction(s): Credit will be given for only one of CSC 151, 152, 154, and 155.

#### CSC 171 Spec Topics (Variable Credit)

#### CSC 230 Programming Concepts and User Interfaces

This course addresses problem solving and programming using problem-based learning; variables, control flow, iteration, modules, arrays, file processing, classes, and objects; and basic graphical-user interface concepts (forms/pages and controls) for desktop and/or Web or mobile environments. The course consists of three hours of lecture and three hours of laboratory per week. Prerequisite(s): MTH 101 or Math Placement Score 102M Corequisite(s): CSL 230

#### CSC 240 Database Management Systems

This course includes components of database systems, database models: entity-relationship, relational, hierarchical, network; normalization, integrity, relational algebra, query languages, system security, distributed databases, and social and ethical concerns. In addition, case studies using a relational DBMS will be implemented.

## CSC 270 Special Topics

## CSC 280 Object Programming

This course involves problem solving using a high-level object-oriented language, such as Java; analyzing problems, designing a solution, implementing a solution, testing, and debugging; abstraction, encapsulation, and inheritance; using, designing, creating, and testing classes; and selection, iteration, and simple collections, such as arrays. The course consists of three hours of lecture and three hours of laboratory per week. Prerequisite(s): CSC 230. Corequisite(s): CSL 280

## CSC 290 Introduction to Data Structures and Algorithms

This course is a continuation of CSC 280. It focuses on abstract data types, including lists, stacks, queues, binary trees, and hash tables; recursive techniques; iterators; and use of classes in the Java Collections Framework for problem solving. The course consists of three hours of lecture and three hours of laboratory per week. Prerequisite(s): CSC 280. Corequisite(s): CSL 290

## CSC 301 Computer Architecture

This course is an introduction to computer architecture and hardware; underlying structures needed to accomplish tasks electronically; and hardware and software architecture components relative to memory management, I/O control, and processing capabilities. Prerequisite(s): CSIT 220

## CSC 340 .Net Programming

This course focuses on programming in .NET (such as Visual Basic.NET or C#) and Active Server Pages (ASP.NET) that supports work with databases and the Web; models that support database access, such as MS SQL, Entity Framework, and LINQ; design and development of solutions to problems using database tools and programming; and database-driven Web sites, including validation, navigation, and security. (offered in alternate years) Prerequisite(s): CSC 230 and CSC 240

## CSC 341 Open-Source Application Development

Students will develop Web solutions that integrate client- and server-side interfaces. The emphasis for the course will be on development for server side, with results being viewed and designed for the client. At least half of the course will include database maintenance using the open-source solution, including development of authentication and authorization. (offered in alternate years) Prerequisite(s): CSC 230 and CSC 240

## CSC 343 Client-Side Scripting

This course will require students to design and develop standards-based client interfaces for Web/client-side applications using the latest versions of HTML, CSS, and Javascript. Students will study Web-based standards and application/design styles. Students will also use popular Web-development tools. Some mobile development will be included in the course. (offered in alternate years) Prerequisite(s): CSC 230

## CSC 349 Mobile Computing

This course covers software mobile application development, its architecture and lifecycle as well as its inherent design considerations. Students will learn about mobile resources, activities, views, layouts, and intents in addition to interacting with the location-based services, messaging services, multimedia interfaces, and sensors available on the mobile device. The applications developed will manage data input from and output to files, databases, and content providers. After developing applications in an emulation environment, students will install them on individual mobile devices as well as prepare them for marketplace distribution. (offered in alternate years) Prerequisite(s): CSC 280

## CSC 366 Language Theory and Design

This course involves programming languages; historical perspective and underlying serial computation model; theory: finite automata, Backus-Naur Form, representations, and grammars; and design: syntax, semantics, run-time implementation, and application domains. Language paradigms will include procedural, functional, logical, object-oriented, and non-sequential processing. (offered in alternate years) Prerequisite(s): CSC 290 and MTH 261

## CSC 370 Selected Topics in Computer Science

This course is an introduction to specialized areas of computer science. The topics will vary from term to term. Prerequisite(s): junior or senior standing

## CSC 381 Software Engineering

The intent of this course is to focus on basic concepts and major issues of project design using a software engineering approach; the software development life cycle; structured analysis and object-oriented design techniques; and modeling, project planning, requirements definition, and requirements testing. Prerequisite(s): CSC 290

## CSC 444 Research in CSC I

This course provides the student with an opportunity to do research with a faculty member. The student and the faculty member agree on the research project before the student registers for the course.

## CSC 445 Research in CSC II

This course is a continuation of the 444 research course. It provides the student with an opportunity to continue to conduct research with a faculty member.

## CSC 446 Data Mining

This course introduces data mining, with an emphasis on applying machine learning techniques for data mining; popular methods, such as learning of decision trees, decision tables, rules, and cases; algorithms and applicability; practical applications; data preparation and evaluation of results, including human role in data mining; and ethical issues. (offered in alternate years) Prerequisite(s): CSC 280

## CSC 456 Artificial Intelligence

Intelligent systems technologies that have or may become practical for organizational use will be addressed in this course. Topics may include simple expert systems and expert systems with certainty factors, case-based reasoning, machine learning, neural networks, genetic algorithms, fuzzy logic, and two-person game playing. (offered in alternate years) Prerequisite(s): CSC 230 and MTH 260

## CSC 457 Operating Systems

Principles and concepts of process and resource management in operating systems will be the focus of this course. I/O programming; interrupt mechanism and memory management; processor management; scheduler; priority queues; traffic controller; device management; and information management and file systems are select topics. (offered in alternate years) Prerequisite(s): CSC 290

## CSC 460 Internship

Internships offer part-time, paid, or non-paid employment in a cooperating site to provide practical experience in the discipline. Working under professional supervision for at least 20 hours per week, students learn how to apply their education to the everyday demands of the world of work. Students will meet regularly with a faculty member and will be encouraged to reflect on the relationship between coursework and their internship experience. Prerequisite(s): junior or senior standing, 2.5 GPA overall and in the major, and departmental approval

**CSC 464 Theory of Algorithms**

Students will engage in problem-solving strategies, including divide and conquer, greedy, backtracking, and dynamic programming; will focus on the complexity analysis of algorithms; and will be introduced to complexity classes P and NP, with strategies for NP-complete problems. (offered in alternate years) Prerequisite(s): CSC 290 and MTH 261

**CSC 470 Selected Topics in Computer Science**

This course provides an introduction to specialized research in computers and computing, concentrating on one particular aspect of computer science. The subject matter will vary from term to term. Prerequisite(s): junior or senior standing

**CSC 481 Project Implementation**

This course addresses implementation issues, programming language features, validation and verification techniques, and software maintenance. It requires a team project to develop, document, test, and maintain a software system. Prerequisite(s): CSC 381

## **Program Contact Information**

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