B.S. IN COMPUTER SCIENCE

Overview

The major in Computer Science for BS students consists of a core of 23 credits of Computer Science courses, 17 credits of Mathematics courses (which may apply towards a mathematics minor), 17 credits from a chosen track, and 12-14 credits of required science and ethics courses.

Curriculum Requirements for B.S. in Computer Science and for Additional Major in Computer Science with Tracks

Code	Title	Credit Hours
Core Computer Science Courses		
CSC 120	Computer Programming I	4
CSC 220	Computer Programming II	4
CSC 314	Computer Organization and Architecture	3
CSC 317	Data Structures and Algorithm Analysis	3
CSC 322	System Programming	3
CSC 427	Theory of Computing	3
CSC 431	Introduction to Software Engineering	3
Core Mathematics Courses [1]		
MTH 161	Calculus I (or equivalent - MTH 140 and MTH 141, MTH 151, or MTH 171)	4
MTH 162	Calculus II (or equivalent - MTH 172)	4
MTH 210	Introduction to Linear Algebra	3
MTH 224	Introduction to Probability and Statistics	3
MTH 309	Discrete Mathematics I	3
Tracks		
Select one of the following Tracks:		17
Comprehensive Track: [2,3]		
CSC 419	Programming Languages	
or CSC 546	Introduction to Machine Learning with Applications	
CSC 421	Principles of Computer Operating Systems	
CSC 423	Database Systems	
CSC 424	Computer Networks	
Select a minimum of 5 credit hours of approved electives		
Flexible Track: [2]		
Select a minimum of 17 credit hours of approved electives		
Computational Science Track: [4]		
CSC 210	Computing for Scientists	
CSC 528	Introduction to Parallel Computing	
CSC 547	Computational Geometry	
CSC 548	Problem Solving for Bioinformatics	
CSC 410	Computer Science Project Planning	
or CSC 411	Computer Science Project Implementation	
MTH 320	Introduction to Numerical Analysis	
or MTH 520	Numerical Linear Algebra	
BIL 150	General Biology [5]	
BIL 151	General Biology Laboratory [5]	
Cryptography and Security Track: [4]		
CSC 421	Principles of Computer Operating Systems	
CSC 424	Computer Networks	
CSC 507	Data Security and Cryptography	
CSC 410	Computer Science Project Planning	

or CSC 411	Computer Science Project Implementation	
MTH 461	Survey of Modern Algebra	
or MTH 505	Theory of Numbers	
or MTH 561	Abstract Algebra I	
Select a minimum of 2 credit hours of approved electives		
Graphics and Games Track: [4]		
CSC 329	Introduction to Game Programming	
CSC 529	Introduction to Computer Graphics	
CSC 545	Introduction to Artificial Intelligence	
CSC 410	Computer Science Project Planning	
or CSC 411	Computer Science Project Implementation	
Select a minimum of 5 credit hours of approved electives [5]		
PHY 201	University Physics I for the Sciences [6]	
or PHY 221	University Physics I	
Data Science Track: [4]		
CSC 315	Introduction to Python for Scientists	
MTH 542	Statistical Analysis	
CSC 546	Introduction to Machine Learning with Applications	
CSC 410	Computer Science Project Planning	
or CSC 411	Computer Science Project Implementation	
Select a minimum of 6 credit hours of approved electives [7]		
Science & Ethics Requirement		
An approved two semester sequence of courses with laboratory in Biology, Chemistry, Physics, or Geological Sciences		8-11
PHI 115	Social and Ethical Issues in Computing	3
Approved Electives		
Any CSC 2XX, CSC 3XX, CSC 4XX, CSC 5XX [8, 9]		
CSC 115	Python Programming for Everyone [10]	
BTE 535	Cybersecurity	
BTE 565	Mobile to Cloud: Developing Distributed Applications	
ECE 414	Computer Organization and Design	
ECE 514	Computer Architecture	
ECE 548	Machine Learning	
ECE 553	Neural Networks	
ECE 570		
ECE 572	Object-Oriented and Distributed Database Management Systems	
ECE 574	Agent Technology	
ECE 576	Internet and Intranet Security	
ECE 577	Data Mining	
ECE 481	Senior Project I [11]	
ECE 482	Senior Project II [11]	
MTH 320	Introduction to Numerical Analysis	
MTH 505	Theory of Numbers	
MTH 520	Numerical Linear Algebra	
MTH 521	Numerical Methods in Differential Equations	
MTH 524	Introduction to Probability	
MTH 525	Introduction to Mathematical Statistics	
MTH 542	Statistical Analysis	
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 106	First-Year Writing II	3
or ENG 106	Writing About Literature and Culture	

Quantitative Skills:		
MTH 161	Calculus I (fulfilled through the major)	
or MTH 140	Calculus Concepts with Foundations A	
or MTH 151	Calculus I for Engineers	
or MTH 171	Calculus I	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Additional Requirements for the B.S. [12]		
Language Requirement		3-9
Electives		25-16
Total Credit Hours		**120**

1 These mathematics courses can also fulfill the requirements for a Minor in Mathematics (see here (http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/mathematics/mathematics-minor/) for details).
2 Available to all students.
3 The Comprehensive Track provides coverage of the topics in Computer Science prescribed by the Association of Computing Machinery curriculum and the ABET Computing Accreditation Commission.
4 Requires permission of the Director of Undergraduate Studies.
5 In addition to the generally approved electives, CIM 423, CIM 433, MMI 504, and MMI 505 are approved for the Graphics and Games track.
6 This course may also be applied towards the Science requirement.
7 In addition to the generally approved electives, JMM 331 and JMM 429 are approved for the Data Science track.
8 CSC 40X - Computer Science Practicum must be taken at the same time as host course.
9 Maximally 6 credit hours from CSC 481 - Computer Science Teaching Assistant.
10 CSC115 can be used as an elective towards the major only if taken before CSC120.
11 ECE 481 and ECE 482 may be used to replace any requirement for CSC 410 and CSC411.
12 For the Additional Major in Computer Science, with Tracks, students not in the College of Arts and Sciences should use the requirements of their school or college's degree in place of the additional requirements listed here.

Suggested Plan of Study

Year One		
Fall		**Credit Hours**
CSC 120	Computer Programming I [1]	4
MTH 161	Calculus I	4
WRS 105	First-Year Writing I	3
Language Course		3
Elective		3
	Credit Hours	**17**
Spring		
CSC 220	Computer Programming II	4
MTH 162	Calculus II	4
WRS 106 or ENG 106	First-Year Writing II or Writing About Literature and Culture	3
Language Course		3
Elective		3
	Credit Hours	**17**
Year Two		
Fall		
CSC 314	Computer Organization and Architecture	3
MTH 309	Discrete Mathematics I	3
BIL or CHM or PHY Course I		4
BIL or CHM or PHY Associated Lab I		1

Language Course		3
	Credit Hours	**14**
Spring		
CSC 322	System Programming	3
MTH 210	Introduction to Linear Algebra	3
BIL or CHM or PHY Course II		4
BIL or CHM or PHY Associated Lab Course II		1
PHI 115	Social and Ethical Issues in Computing	3
	Credit Hours	**14**
Year Three		
Fall		
CSC 317	Data Structures and Algorithm Analysis	3
CSC 401	Computer Science Practicum I	1
CSC 423	Database Systems	3
MTH 224	Introduction to Probability and Statistics	3
People and Society Cognate Course		3
Writing Intensive Course		3
	Credit Hours	**16**
Spring		
CSC 424	Computer Networks	3
CSC 427	Theory of Computing	3
WRS 233	Advanced Writing for STEM	3
Arts and Humanities Cognate Course		3
People and Society Cognate Course		3
	Credit Hours	**15**
Year Four		
Fall		
CSC 421	Principles of Computer Operating Systems	3
Computer Science Elective		3
CSC 405	Computer Science Seminars Reports	1
Arts and Humanities Cognate Course		3
People and Society Cognate Course		3
	Credit Hours	**13**
Spring		
CSC 419	Programming Languages	3
CSC 431	Introduction to Software Engineering	3
Arts and Humanities Cognate Course		3
Elective		3
Elective		3
	Credit Hours	**15**
	Total Credit Hours	**121**

[1] The prerequisites for CSC 120 are CSC 115 or MTH 141 or MTH 151 or MTH 161 or MTH 171 or MAS 110 or a score of 4 or 5 in AP Computer Science Principles (UM equivalency CSC 119).

Mission

The Department's mission is to educate and perform scholarly activities in the discipline of Computer Science, in order to meet national and international demand for trained computer scientists who are capable of building the robust computation structures upon which society is becoming increasingly dependent.

Goals

Students will acquire understanding and capability for the structure and developmental processes of software systems, from the translation of domain problems to forms amenable to software solution, through the production of efficient and robust computer programs, to the supporting systems and hardware components.

Students will acquire these abilities through a combination of classroom instruction, laboratory work, independent project work, and group project work.

Graduates will be prepared to work in industries that are directly involved in the development of fundamental computing resources (e.g., Microsoft, Apple, IBM, Intel, etc.), and in industries that rely on computation in support of their core businesses (e.g., banking, transport, manufacturing, medical, etc.).

Faculty and students will engage in activities that support and achieve the development of new techniques and software that can contribute to the science, and where appropriate contribute to the teaching objectives. Examples of such activities include academic research, development of novel techniques and software products, consulting and internship activities in local industries, and maintaining awareness of cutting edge approaches to Computer Science.

Student Learning Outcomes

- Students must be able to translate domain problems to forms amenable to software solution.
- Students must be able to produce efficient and robust computer programs.
- Students must be able to build and deploy a completed, integrated, and documented (Advanced Writing and Communication Skills) software solution to a domain problem.
- Students must have understanding and competence in the mathematical foundations of Computer Science.