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

Computer Science Courses Computer Programming			
CSC 120 Computer Programming I 4	Code	Title	Credit Hours
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 421 Introduction to Software Engineering 3 Core Mathematics Courses ¹ MTH 161 Calculus II (or equivalent - MTH 140 and MTH 141, MTH 151, or MTH 171) 4 MTH 162 Calculus II (or equivalent - MTH 172) 4 MTH 244 Introduction to Linear Algebra 3 MTH 250 Introduction to Inear Algebra 3 MTH 244 Introduction to Inear Algebra 3 MTH 250 Discrete Mathematics I 3 MTH 250 Discrete Mathema	Core Computer Science Courses		
SCS 214 Computer Organization and Architecture	CSC 120	Computer Programming I	4
SCS 17	CSC 220	Computer Programming II	4
SCS 17	CSC 314	Computer Organization and Architecture	3
CSC 427	CSC 317	Data Structures and Algorithm Analysis	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) MTH 162 Calculus I (or equivalent - MTH 172) 4 MTH 161 Introduction to Linear Algebra 3 MTH 201 Introduction to Linear Algebra 3 MTH 224 Introduction to Linear Algebra 3 MTH 309 Discrete Mathematics I 3 Tracks Select one of the following Tracks: 7 Comprehensive Track: 2-3 CSC 419 Programming Languages 1 Or SC 546 Introduction to Machine Learning with Applications 1 CSC 421 Principles of Computer Operating Systems 1 CSC 423 Database Systems 2 CSC 424 Computer Networks 2 Select a minimum of 5 credit hours of approved electives 1 Flexible Track: 2 Select a minimum of 17 credit hours of approved electives 1 CSC 528 Introduction to Parallel Computing (CSC 541 Computational Geometry CCSC 542 Computational Geometry CCSC 543 Computational Geometry CCSC 544 Computational Computational Computation (CSC 541 Computational Computati	CSC 322	System Programming	3
Core Mathematics Courses 1 Calculus I (or equivalent - MTH 140 and MTH 141, MTH 151, or MTH 161 Calculus II (or equivalent - MTH 170) 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: 7 Comprehensive Track: **3 CSC 419 Programming Languages CSC 421 Principles of Computer Operating Systems CSC 422 Computer Networks Select a minimum of 5 credit hours of approved electives Flexible Track: * Select a minimum of 17 credit hours of approved electives Computational Science Track: * CSC 210 Computing for Scientists CSC 523 Introduction to Parallel Computing CSC 543 Problem Solving for Bioinformatics CSC 543 Computer Science Project Implementation CSC 5410	CSC 427	Theory of Computing	3
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 17 Select one of the following Tracks: 2-3 17 CSC 419 Programming Languages 9 Or CSC 546 Introduction to Machine Learning with Applications 1-1 CSC 421 Principles of Computer Operating Systems 2-1 CSC 423 Database Systems 2-1 CSC 424 Computer Networks Select a minimum of 5 credit hours of approved electives Select a minimum of 17 credit hours of approved electives Select a minimum of 17 credit hours of approved electives Computer Selective Project Planning 2-1 CSC 528 Introduction to Parallel Computing 2-2 2-2 CSC 548 Problem Solving for Bioinformatics 3-2 3-2 CSC 549 Computer Science Project Planning <td>CSC 431</td> <td>Introduction to Software Engineering</td> <td>3</td>	CSC 431	Introduction to Software Engineering	3
MTH 171) 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 MTH 309 Discrete Mathematics I 3 **Tracks** **********************************	Core Mathematics Courses ¹		
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:	MTH 161	•	4
MTH 224 Introduction to Probability and Statistics 3 MTH 309 Discrete Mathematics I 3 Tracks 7 Comprehensive Track: 2-3 CSC 419 Programming Languages 8 or CSC 546 Introduction to Machine Learning with Applications 6 CSC 421 Principles of Computer Operating Systems 6 CSC 423 Database Systems 6 CSC 424 Computer Networks 8 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 CSC 210 Computational Geometry CSC 528 Introduction to Parallel Computing CSC 549 Problem Solving for Bioinformatics CSC 5410 Computer Science Project Planning or CSC 411 Computer Science Project Implementation MTH 320 Introduction to Numerical Analysis or MTH 520 Numerical Linear Algebra BlL 150 General Biology 5	MTH 162	Calculus II (or equivalent - MTH 172)	4
MTH 224 Introduction to Probability and Statistics 3 MTH 309 Discrete Mathematics I 3 Tracks 7 Comprehensive Track: 2-3 CSC 419 Programming Languages 8 or CSC 546 Introduction to Machine Learning with Applications 6 CSC 421 Principles of Computer Operating Systems 6 CSC 423 Database Systems 6 CSC 424 Computer Networks 8 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 CSC 210 Computational Geometry CSC 528 Introduction to Parallel Computing CSC 549 Problem Solving for Bioinformatics CSC 5410 Computer Science Project Planning or CSC 411 Computer Science Project Implementation MTH 320 Introduction to Numerical Analysis or MTH 520 Numerical Linear Algebra BlL 150 General Biology 5	MTH 210	Introduction to Linear Algebra	3
Select one of the following Tracks: Select one of the following Tracks: 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 Select a minimum of 5 credit hours of approved electives Flexible Track: Select a minimum of 17 credit hours of approved electives Flexible Track: CSC 210 Computational Science Track: CSC 528 Introduction to Parallel Computing CSC 547 Computational Geometry CSC 548 Problem Solving for Bioinformatics CSC 548 Problem Solving for Bioinformatics CSC 5410 Computer Science Project Planning or CSC 411 Or CSC 411 NTH 320 Introduction to Numerical Analysis or MTH 520 Introduction to Numerical Analysis or MTH 520 Introduction to Numerical Analysis Or MTH 520 BIL 150 General Biology BIL 151 General Biology COMPUTE Science Project Planning CSC 5424 Computer Science Project Implementation Numerical Linear Algebra BIL 150 General Biology Laboratory CSC 5424 Computer Networks CSC 5507	MTH 224	Introduction to Probability and Statistics	3
Select one of the following Tracks: 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 CSC 426 Computer Networks Select a minimum of 17 credit hours of approved electives Flexible Track: 1 CSC 210 Computer Networks CSC 528 Introduction to Parallel Computing 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 Inplementation MTH 320 Introduction to Numerical Analysis or MTH 520 Numerical Linear Algebra BIL 150 General Biology 5 BIL 150 General Biology 5 BIL 151 General Biology 5 CORPORTION OF Track: 4 CSC 421 Principles of Computer Operating Systems CSC 422 Principles of Computer Operating Systems CSC 424 Computer Networks CSC 5507 Data Security and Cryptography	MTH 309	Discrete Mathematics I	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: Select a minimum of 17 credit hours of approved electives Computer and incomposed selectives CSC 528 Introduction to Parallel Computing CSC 547 Computer Science Project Planning CSC 548 Problem Solving for Bioinformatics CSC 549 Computer Science Project Planning or CSC 540 Computer Science Project Planning or CSC 410 Computer Science Project Planning or CSC 410 Computer Science Project Implementation MTH 320 Introduction to Numerical Analysis or MTH 520 Numerical Linear Algebra Bil L 150 General Biology Bil L 151 General Biology COtyptography and Security Track: CSC 421 Principles of Computer Operating Systems CSC 424 Computer Networks CSC 424 Computer Networks CSC 424 Computer Networks CSC 424 Computer Networks CSC 526 Computer Networks CSC 527 Computer Networks CSC 527 Computer Networks CSC 528 Computer Networks CSC 529 Computer Networks	Tracks		
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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 Computational Science Track: 4 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 Introduction to Numerical Analysis or MTH 520 Seneral Biology 5 Bil 150 General Biology 5 Bil 151 General Biology 5 CSC 421 Principles of Computer Operating Systems CSC 421 Principles of Computer Operating Systems CSC 421 Computer Networks CSC 424 Computer Networks CSC 424 Computer Networks CSC 424 Computer Networks Data Security and Cryptography	Comprehensive Track: 2,3		
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CSC 423 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 Computational Science Track: 4 CSC 258 Introduction to Parallel Computing 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 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 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	or CSC 546	Introduction to Machine Learning with Applications	
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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 5 Cryptography and Security Track: ⁴ CSC 421 Principles of Computer Operating Systems CSC 424 Computer Networks CSC 424 Computer Networks CSC 507 Data Security and Cryptography	Flexible Track: ²		
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CSC 547 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 210	Computing for Scientists	
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 528	Introduction to Parallel Computing	
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 BIL 151 General Biology Laboratory Cryptography and Security Track: CSC 421 Principles of Computer Operating Systems CSC 424 CSC 507 Data Security and Cryptography	CSC 547	Computational Geometry	
or CSC 411 MTH 320 Introduction to Numerical Analysis or MTH 520 Numerical Linear Algebra BIL 150 General Biology ⁵ BIL 151 Cryptography and Security Track: ⁴ CSC 421 Principles of Computer Operating Systems CSC 424 CSC 507 Data Security and Cryptography	CSC 548	Problem Solving for Bioinformatics	
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 MTH 520 BIL 150 General Biology 5 BIL 151 General Biology Laboratory 5 Cryptography and Security Track: 4 CSC 421 CSC 421 CSC 424 CSC 507 Numerical Linear Algebra General Biology Laboratory 5 Computer Operating Systems Computer Networks Computer Networks Data Security and Cryptography	or CSC 411	Computer Science Project Implementation	
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	MTH 320	Introduction to Numerical Analysis	
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	or MTH 520	Numerical Linear Algebra	
Cryptography and Security Track: 4 CSC 421 Principles of Computer Operating Systems CSC 424 Computer Networks CSC 507 Data Security and Cryptography	BIL 150	General Biology ⁵	
CSC 421 Principles of Computer Operating Systems CSC 424 Computer Networks CSC 507 Data Security and Cryptography	BIL 151	General Biology Laboratory ⁵	
CSC 424 Computer Networks CSC 507 Data Security and Cryptography	Cryptography and Security Track: ⁴		
CSC 507 Data Security and Cryptography	CSC 421	Principles of Computer Operating Systems	
	CSC 424	Computer Networks	
CSC 410 Computer Science Project Planning	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 app	proved 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 app		
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 app	proved electives ⁷	
Science & Ethics Requirement		
An approved two semester sequence of cour	ses 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 5X	X ^{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	Network Client-Server Programming	
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	Stationion / maryons	
Written Communication Skills:		
WRS 105	First-Year Writing I	
WRS 106	First-Year Writing II	3
or ENG 106	Writing About Literature and Culture	3
OI LING TOO	Witting About Eiterature and Guiture	

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

- 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).
- Available to all students.
- 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.
- In addition to the generally approved electives, CIM 423, CIM 433, MMI 504, and MMI 505 are approved for the Graphics and Games track.
- This course may also be applied towards the Science requirement.
- 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.
- Maximally 6 credit hours from CSC 481 Computer Science Teaching Assistant.
- CSC115 can be used as an elective towards the major only if taken before CSC120.
- ECE 481 and ECE 482 may be used to replace any requirement for CSC 410 and CSC411.
- 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	3
	or Writing About Literature and Culture	
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

4 B.S. in Computer Science

Language Course	One dis Herrie	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 Cour	se 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	. p p	3
CSC 405	Computer Science Seminars	1
Arts and Humanities Cognate Course		3
People and Society Cognate Course		3
	Credit Hours	13
Spring	orean riodio	
CSC 419	Programming Languages	3
CSC 431	Introduction to Software Engineering	3
Arts and Humanities Cognate Course	introduction to contware Engineering	
Elective		3
Elective		3
LIEGUIVE	Cuadit Harma	<u> </u>
	Credit Hours	
	Total Credit Hours	121

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.