

Date Submitted: 05/02/18 11:16 pm

Viewing: **BS-CS-1/MAS-CS-1 : Bachelor of Science in Computer Science/Master of Computer Science**

Last approved: 11/28/17 10:35 am

Last edit: 05/02/18 11:16 pm

Changes proposed by: agam

Requestor	Name	Gady Agam Sarah Pariseau	E-mail	agam@iit.edu sparisea@iit.edu
Origination Date	2018-5-2 2017-11-28			
Is this an interdisciplinary program?	No			
Academic Unit	Computer Science	College		
College of Science				
Program Title	Bachelor of Science in Computer Science/Master of Computer Science			
Effective Academic Year	2018 - 2019	Effective Term	Fall 2018	
Academic Level	Undergraduate			
Program Type	Co-Terminal Degree			
Degree Type	Bachelor of Science/Professional Master's(BSMAS)			
CIP Code	11.0701 - Computer Science.			
Is there more than one Academic Unit proposer?	No			
Second CIP	11.0701 - Computer Science.			
Program Code	BS-CS-1/MAS-CS-1			
Program Attribute				
Total Program Credit Hours	148			

In Workflow

1. **CSCI Chair**
2. **Academic Affairs**
3. **SI Dean**
4. **Undergraduate Studies Committee Chair**
5. Undergraduate Studies Committee Vote
6. Undergraduate Studies Committee Chair
7. Graduate Studies Committee Chair
8. Graduate Studies Committee Vote
9. Graduate Studies Committee Chair
10. Faculty Council Chair
11. Academic Affairs
12. Registrar

Approval Path

1. 05/02/18 11:11 pm
Eunice Santos (esantos2): Rollback to Initiator
2. 05/02/18 11:21 pm
Eunice Santos (esantos2):
Approved for CSCI Chair
3. 05/03/18 8:00 am
Sarah Pariseau (sparisea):
Approved for Academic Affairs
4. 05/03/18 4:42 pm
Xiaofan Li (lix):
Approved for SI Dean

Program Narrative and Justification

History

1. Nov 28, 2017 by Sarah Pariseau (sparisea)
2. Nov 28, 2017 by Sarah Pariseau (sparisea)

Narrative description of how the institution determined the need for the program. For example, describe what need this program will address and how the institution became aware of that need. If the program is replacing a current program(s), identify the current program(s) that is being replaced by the new program(s) and provide details describing the benefits of the new program(s). If the program will be offered in connection with, or in response to, an initiative by a governmental entity, provide details of that initiative.

Narrative description of how the program was designed to meet local market needs, or for an online program, regional or national market needs. For example, indicate if Bureau of Labor Statistics data or State labor data systems information was used, and/or if State, regional, or local workforce agencies were consulted. Include how the course content, program length, academic level, admission requirements, and prerequisites were decided; including information received from potential employers about course content; and information regarding the target students and employers.

Narrative description of any wage analysis the institution may have performed, including any consideration of Bureau of Labor Statistics wage data related to the new program.

Narrative description of how the program was reviewed or approved by, or developed in conjunction with, one or more of the following: a) business advisory committees; b) program integrity boards; c) public or private oversight or regulatory agencies (not including the state licensing/authorization agency and accrediting agency); and d) businesses that would likely employ graduates of the program. For example, describe the steps taken to develop the program, identify when and with whom discussions were held, provide relevant details of any proposals or correspondence generated, and/or describe any process used to evaluate the program.

What are the enrollment estimates?

Year 1

Year 2

Year 3

Attach Additional
Program
Justification
Document(s)

Academic Information

Advising

Since quality advising is a key component of good retention, graduation, and career placement, how will students be mentored? What student professional organizations will be formed? How will the department work with the Career Services office to develop industry connections?

Program Resources

Which program
resources are
necessary to offer
this program?

Proposed Bulletin Entry

Admission
Requirements

Course Requirements

Required Courses

Course List

Code	Title	Credit Hours
Computer Science Requirements		(36)
<u>CS 100</u>	Intro to the Profession	2

Code	Title	Credit Hours
CS 115	Object-Oriented Programming I	2
CS 116	Object-Oriented Programming II	2
CS 330	Discrete Structures	3
CS 331	Data Structures and Algorithms	3
CS 350	Cmptr Org&Asmby Lang Prgmmg	3
CS 351	Systems Programming	3
CS 425	Database Organization	3
CS 430	Introduction to Algorithms	3
CS 440	Prgmng Languages Translators	3
CS 450	Operating Systems	3
CS 485	Computers and Society	3
CS 487	Software Engineering	3
Computer Science Electives		(12)
Select 12 credit hours		12
Graduate Core Courses		(9)
Select one programming core course:		3
CS 511	Topics in Computer Graphics	3
CS 512	Computer Vision	3
CS 525	Advanced Database Organization	3
CS 540	Syntactic Anlys of Prgm Lang	3
CS 541	Topics in Complr Constrctn	3
CS 546	Parallel and Distributed Proc	3
CS 551	Operating Syst Design&Implemtn	3
CS 553	Cloud Computing	3
Select one systems core course:		3
CS 542	Computer Netwrks I:Fundamentals	3
CS 544	Computer Ntwrks II: Ntwrk Svc	3
CS 547	Wireless Networking	3
CS 550	Advanced Operating Systems	3
CS 555	Anlytc Mdls Simul Comp Syst	3
CS 570	Adv Computer Architecture	3
CS 586	Software Systems Arch	3
Select one theory core course:		3
CS 530	Theory of Computation	3
CS 533	Computational Geometry	3
CS 535	Dsgn and Anlys of Algorithms	3
CS 536	Science of Programming	3
CS 538	Combinatorial Optimization	3
CS 539	Game Theory: Algorithms & Apps	3
Graduate Electives		(12)
Select 12 credit hours		12
Mathematics Requirements		(20)
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 251	Multivariate & Vector Calculus	4
MATH 332	Elementary Linear Algebra	3
or MATH 333	Matrix Alg & Complex Variables	3
MATH 474	Probability and Statistics	3
or MATH 475	Probability	3
Mathematics Elective		(3)
Select one of the following:		3
MATH 252	Introduction to Diff Equations	4
MATH 350	Intro to Computational Mathe	3
MATH 410	Number Theory	3
MATH 435	Linear Optimization	3
MATH 453	Combinatorics	3
MATH 454	Graph Theory and Applications	3
MATH 476	Statistics	3
MATH 481	Intro to Stochastic Processes	3

Code	Title	Credit Hours
Science Requirements		(8)
PHYS 123	General Physics I: Mechanics	4
PHYS 221	Gen Physics II: Elect&Magntism	4
Science Electives		(6)
Select six credit hours		6
Communication Elective		(3)
Select one of the following:		3
COM 421	Technical Communication	3
COM 424	Document Design	3
COM 425	Editing	3
COM 428	Verbal Visual Communications	3
COM 435	Intercultural Communication	3
Interprofessional Projects (IPRO)		(6)
See IIT Core Curriculum, section E		6
Humanities and Social Sciences Requirements		(21)
See IIT Core Curriculum, sections B and C		21
Free Electives		(12)
Select 12 credit hours		12
Total Credit Hours		148

1 [CS 201](#) is a one-semester, accelerated course equivalent to the two-semester [CS 115/CS 116](#) sequence.

2 Computer science electives: Any computer science course at the 300-level or higher (including graduate CS courses) may be used as a computer science elective, except [CS 401](#) and [CS 402](#). [ECE 218](#) and [ECE 441](#) may also be used as computer science electives. Higher mathematics or computational science courses at the 300-level or above can also be used as computer science electives, with CS department approval.

3 Science electives (no lab required): Chosen from the natural sciences (biology, chemistry, material science, and physics), or courses marked with an (N) (natural science attribute) in the Undergraduate Bulletin. At least one course must be in a field other than physics.

Sample
Curriculum/Program
Requirements

Bachelor of Science in Computer Science/Master of Computer Science Curriculum

Semester 1	Credit Hours	Semester 2	Credit Hours	Year 1
CS 100	2	CS 116 ¹	2	
CS 115 ¹	2	MATH 152	5	
MATH 151	5	PHYS 123	4	
Humanities 200-level Course	3	Humanities Elective (300+)	3	
Social Sciences Elective	3	Social Sciences Elective (300+)	3	
	15		17	
				Year 2
Semester 1	Credit Hours	Semester 2	Credit Hours	
CS 330	3	CS 350	3	
CS 331	3	CS 425	3	
MATH 251	4	MATH 332 or 333	3	
PHYS 221	4	Humanities Elective (300+)	3	
Social Sciences Elective (300+)	3	Science Elective ²	3	
	17		15	
				Year 3
Semester 1	Credit Hours	Semester 2	Credit Hours	
CS 351	3	CS 430	3	
CS 440	3	CS 450	3	
MATH 474 or 475	3	IPRO Elective I	3	
Communication Elective ³	3	Mathematics Elective	3	
Computer Science Elective ⁴	3	Free Elective	3	
	15		15	

Semester 1		Credit Hours	Semester 2		Credit Hours	Year 4	
CS 487		3	CS 485		3		
IPRO Elective II		3	Computer Science Elective4		3		
Computer Science Elective4		3	Computer Science Elective4		3		
Science Elective2		3	Free Elective		3		
Humanities or Social Sciences Elective		3	Free Elective		3		
Free Elective		3					
		18			15		
Semester 1		Credit Hours	Semester 2		Credit Hours	Year 5	
Graduate Core Course		3	Graduate Core Course		3		
Graduate Core Course		3	Graduate Elective Course		3		
Graduate Elective Course		3	Graduate Elective Course		3		
Graduate Elective Course		3					
		12			9		

Total Credit Hours: 148

1 [CS 201](#) is a one-semester, accelerated course equivalent to the two-semester [CS 115/CS 116](#) sequence.

2 Science electives (no lab required): Chosen from the natural sciences (biology, chemistry, material science, and physics), or courses marked with an (N) (natural science attribute) in the Undergraduate Bulletin. At least one course must be in a field other than physics.

3 Communication elective must be [COM 421](#), [COM 424](#), [COM 425](#), [COM 428](#), or [COM 435](#).

4 Computer science electives: Any computer science course at the 300-level or higher (including graduate CS courses) may be used as a computer science elective, except [CS 401](#) and [CS 402](#). [ECE 218](#) and [ECE 441](#) may also be used as computer science electives. Higher mathematics or computational science courses at the 300-level or above can also be used as computer science electives, with CS department approval.

Specialization
Requirements

Data Science

A minimum of four courses are required for this specialization.

Code	Title	Credit Hours
BUS 371	Strategies for New Markets	3
CS 422	Data Mining	3
or CS 584	Machine Learning	
CS 451	Parallel/Distributed Computing	3
MATH 481	Intro to Stochastic Processes	3
or MATH 483	Design and Analysis of Exprmnt	

Note: [MATH 481](#) has prerequisites of [MATH 332](#) or [MATH 333](#) and [MATH 475](#); [MATH 483](#) has a prerequisite of [MATH 476](#).

Distributed and Cloud Computing

A minimum of four courses are required for this specialization.

Code	Title	Credit Hours
CS 442	Mobile Application Development	3
or CS 447	Distributed Objects	
CS 451	Parallel/Distributed Computing	3
CS 455	Data Communication	3
CS 553	Cloud Computing	3

Information and Knowledge Management Systems

A minimum of four courses are required for this specialization.

Code	Title	Credit Hours
CS 425	Database Organization	3
CS 482	Infor Knwldg Mgmt Syst	3

Code	Title	Credit Hours
Select a minimum of two courses from the following:		
CS 422	Data Mining	3
CS 429	Information Retrieval	3
CS 481	Intllgnc Txt Analys Knwldg Mgm	3
CS 585	Natural Language Processing	3

Information Security

A minimum of four courses are required for this specialization.

Code	Title	Credit Hours
Course List		
CS 425	Database Organization	3
CS 458	Intro to Information Security	3
CS 455	Data Communication	3
CS 549	Cryptography	3
or CS 558	Advanced Computer Security	

Graduate Specializations

Master of Computer Science with Specialization in Business

33 credit hours

This program is designed to help computer science professionals extend and deepen their technical and practical knowledge of the field while introducing themselves to core topics in modern business practices. To complete the program, students must satisfy the general Master of Computer Science requirements, and the plan of study must include 24 credit hours of CS/CSP courses and three specialization courses from the Stuart School of Business.

Code	Title	Credit Hours
Course List		
Specialization Courses		(9)
Select a minimum of three courses from the following:		
BUS 510	Bldg Innovative Sustain Bus	3
BUS 550	Bus Analytics for Comp Advntge	3
MBA 501	Acctng for Strategic Dec Mkng	3
MBA 502	Emerging Issues Global Bus Env	3
MBA 504	Analytics for Decision Making	3
MBA 506	Lead Knowledge-Intensive Orgs	3
MBA 509	Financial Mgmt in Global World	3
MBA 511	Customer Value	3
Total Credit Hours		9

Note: Stuart School of Business tuition and fees apply to these courses. Applicants to the program are not required to take the GMAT. Students who have already taken Stuart School of Business courses as part of a degree program cannot reuse those courses to satisfy specialization course requirements.

Master of Computer Science with Specialization in Computational Intelligence

30 credit hours

This program is intended for students who are interested in ways in which computers may learn and adapt based on data so as to solve complex problems in various areas of computer science. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Code	Title	Credit Hours
Course List		
Specialization Courses		(12)
Select a minimum of four courses from the following:		
CS 480	Artificial Intelligence	3
CS 512	Computer Vision 1	3

Code	Title	Credit Hours
CS 522	Advanced Data Mining	3
CS 579	Online Social Network Analysis	3
CS 583	Probabilistic Graphical Models	3
CS 584	Machine Learning	3
CS 585	Natural Language Processing	3
Total Credit Hours		12

1 [CS 512](#) serves simultaneously as a specialization and a Programming core course.

Master of Computer Science with Specialization in Cyber-Physical Systems

30 credit hours

This program is intended for students who are interested in learning how to work with embedded controllers with integrated sensors and networking abilities and to utilize them for real-world applications. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List		
Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 442	Mobile Application Development	3
CS 552	Distributed Real-Time Systems	3
CS 553	Cloud Computing 1	3
CS 555	Anlytc Mdls Simul Comp Syst 1	3
CS 556	Cyber-Physical Sys: Lang & Sys	3
CS 557	Cyber-Physical Sys Sec/Dsgn	3
CS 558	Advanced Computer Security	3
Total Credit Hours		12

1 [CS 553](#) serves simultaneously as a specialization course and a Programming core course. [CS 555](#) serves simultaneously as a specialization course and a Systems core course.

Master of Computer Science with Specialization in Data Analytics

30 credit hours

Intelligent analysis of large amounts of data is a crucial component in supporting business decisions. This program is intended for students interested in learning how to discover patterns in large amounts of data in information systems and how to use these to draw conclusions. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List		
Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 442	Mobile Application Development	3
CS 520	Data Integration Warehousing	3
CS 522	Advanced Data Mining	3
CS 554	Data-Intensive Computing	3
CS 579	Online Social Network Analysis	3
CS 583	Probabilistic Graphical Models	3
CS 584	Machine Learning	3
CS 585	Natural Language Processing	3
CSP 571	Data Preparation and Analysis	3
Total Credit Hours		12

Master of Computer Science with Specialization in Database Systems

30 credit hours

This program is designed to provide in-depth knowledge of the principles of design and development of database systems. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List		
Code	Title	Credit Hours

Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 425	Database Organization	3
CS 520	Data Integration Warehousing	3
CS 521	Object-Oriented Analysis/Dsgn	3
CS 522	Advanced Data Mining	3
CS 525	Advanced Database Organization 1	3
CS 529	Information Retrieval	3
CS 553	Cloud Computing 1	3
CS 554	Data-Intensive Computing	3
Total Credit Hours		12

1 [CS 525](#) and [CS 553](#) serve simultaneously as specialization courses and Programming core courses.

Master of Computer Science with Specialization in Distributed and Cloud Computing

30 credit hours

The Master of Computer Science with a Specialization in Distributed and Cloud Computing is intended for students who are interested to learn about distributed systems and how they are applied to real world problems, as well as how emerging cloud computing technologies can be used to implement some of the world's most popular services and applications. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List		
Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 451	Parallel/Distributed Computing	3
CS 546	Parallel and Distributed Proc 1	3
CS 550	Advanced Operating Systems 1	3
CS 552	Distributed Real-Time Systems	3
CS 553	Cloud Computing 1	3
CS 554	Data-Intensive Computing	3
CS 570	Adv Computer Architecture 1	3
Total Credit Hours		12

1 [CS 546](#) and [CS 553](#) both serve simultaneously as specialization courses and Programming core courses. [CS 550](#) and [CS 570](#) both serve simultaneously as specialization courses and Systems core courses.

Master of Computer Science with Specialization in Education

33 credit hours

The Master of Computer Science with a Specialization in Education is designed to enable computer science students to further their technical education while opening a career path toward teaching computer science.

Courses for the MCS/Education degree program are taken from the Department of Computer Science and the Department of Mathematics and Science Education (MSED). In addition to satisfying general Master of Computer Science degree requirements, the plan of study must include 24 credit hours of CS/CSP courses and the following three MSED courses, which are the first three required courses for a teaching certificate.

Course List		
Code	Title	Credit Hours
MSED Required Courses		(9)
MSED 300	Instrctnl Methods/Strategies I	3
MSED 500	Analysis of Classrooms II	3
MSED 554	Mid/Sec Lvl Science Curriculum	3
or MSED 555	Mid/Sec Lvl Math Curriculum	
Total Credit Hours		9

Master of Computer Science with Specialization in Finance

33 credit hours

The Master of Computer Science with a Specialization in Finance is designed to enable computer science students to further their technical education while opening a path toward a career in finance.

Courses for the MCS/Finance degree program are taken from the Department of Computer Science and the Stuart School of Business. In addition to satisfying the general Master of Computer Science degree requirements, the plan of study must include 24 credit hours of CS/CSP courses and three specified MSF courses.

Course List		
Code	Title	Credit Hours
Required Finance Courses		(9)
MSF 504	Valuation/Portfolio Management	3
MSF 505	Futures/Option/OTC Derivatives	3
MSF 506	Financial Statement Analysis	3
Total Credit Hours		9

Note: Stuart School of Business tuition and fees apply to these courses. Applicants to the program are not required to take the GMAT. Students who have already taken Stuart School of Business courses as part of a degree program cannot reuse those courses to satisfy specialization course requirements.

Master of Computer Science with Specialization in Information Security and Assurance

30 credit hours

Information security, privacy, and information assurance are of prime importance in modern computer systems where data can be accessed from nearly everywhere. The Master of Computer Science with a Specialization in Information Security and Assurance is intended for students interested in aspects of security and assurance in modern e-commerce applications. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

The U.S. government's [Information Assurance Courseware Evaluation \(IACE\) program](#) has certified the computer science department's courses as meeting the national training standards for [Information Systems Security Professionals \(NSTISSI 4011\)](#) and [Systems Certifiers \(NSTISSI 4015\)](#). These standards describe course content for studying telecommunications security and automated information systems security.

Course List		
Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four of the following courses:		12
CS 458	Intro to Information Security	3
CS 525	Advanced Database Organization 1	3
CS 549	Cryptography	3
CS 550	Advanced Operating Systems 1	3
CS 558	Advanced Computer Security	3
CSP 544	System and Network Security	3
Total Credit Hours		12

¹[CS 525](#) serves simultaneously as a specialization course and a Programming core course. [CS 550](#) serves simultaneously as a specialization course and a Systems core course.

Master of Computer Science with Specialization in Networking and Communications

30 credit hours

This program is designed to provide an in-depth knowledge of the theory and practice of computer networking and telecommunications. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List		
Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 455	Data Communication	3
CS 542	Computer Netwrks I: Fundamentals 1	3
CS 544	Computer Ntwrks II: Ntwrk Svc 1	3
CS 547	Wireless Networking 1	3
CS 548	High-Speed Networks	3
CS 549	Cryptography	3
CS 555	Anlytc Mdls Simul Comp Syst 1	3

Code	Title	Credit Hours
CS 557	Cyber-Physical Sys Sec/Dsgn	3

Total Credit Hours 12

1 [CS 542](#), [CS 544](#), [CS 547](#), and [CS 555](#) all serve simultaneously as specialization courses and Systems core courses.

Master of Computer Science with Specialization in Software Engineering

30 credit hours

This program is designed to provide an in-depth knowledge of theory and practices in software engineering, including hands-on experience in software design, development, and maintenance. Students must satisfy general Master of Computer Science requirements and complete four specialization courses.

Course List

Code	Title	Credit Hours
Specialization Courses		(12)
Select a minimum of four courses from the following:		12
CS 487	Software Engineering	3
CS 521	Object-Oriented Analysis/Dsgn	3
CS 536	Science of Programming 1	3
CS 537	Software Metric	3
CS 586	Software Systems Arch 1	3
CS 587	Software Project Management	3
CS 589	Software Testing and Anlys	3
Total Credit Hours		12

1 [CS 536](#) serves simultaneously as a specialization course and a Theory core course. [CS 586](#) serves simultaneously as a specialization course and a Systems core course.

Program Outcomes and Assessment Process

What are the learning goals for this program?

In what semesters will the data be collected to assess this learning goal, and by whom?

Provide the name of the rubric that will be used to assess the extent to which students are achieving this learning goal.

How often and by whom will the data be analyzed? What benchmarks or targets will be used to interpret your results?

Briefly describe the process that will be used to share the results with faculty and use these to

motivate program improvement.

Attach Additional Assessment Document(s)

Co-Terminal Degree Requirements

Undergraduate Degree Requirements

Minimum credit hours 148

Specialization required? Optional

Notes about specialization requirement

Minor required? No

Required minimum GPA for admission **3.25** ~~3.00~~

Number of shared credit hours allowed. 9

Which courses may be shared?

CS 400- or 500-level electives

Proposed General Curriculum

Degree credit hours required 127

Specialization credit hour requirement 12

List Major Course Requirements

List Mathematics Requirements

List Science Requirements

List Computer Science Requirements

List Humanities and Social Sciences Requirements

List Interprofessional Project (IPRO) Requirements

List Technical
Elective Course
Options

List Free Elective
Credit Hours (if
applicable) 12

Semester-by-
semester plan of
study for the
degree program

Professional Master's Degree

Minimum credit
hours

400-level credit hour limit? Yes How many hours allowed? 10

500-600-level credit hour limits: Minimum: 20 Maximum: **30**

700-level credit hour maximum: **0**

Project course
required? No

Comprehensive
exam required? No

Seminar/Colloquium
required? Not Required

Required
Specialization? Optional

Specialization credit hour requirement:

Notes about the
specialization/
concentration
requirement Certain specializations have program requirements different from the general track of the degree.

Is there a general track for this degree?
Yes

Proposed General Curriculum

List Core Course
Requirements

List Elective Course
Options

Specialization

Report to Faculty
Council

Reviewer
Comments

Gady Agam (agam) (05/02/18 10:13 pm): The change to maximum MS credits as 32 is a mistake. It should be 30.

Eunice Santos (esantos2) (05/02/18 11:11 pm): Rollback: Per Gady Agam's request

Sarah Pariseau (sparisea) (05/03/18 7:59 am): Increasing admission GPA requirement to 3.25.