

Glemaud, Rose-Ketlie

From: Mallery, Charles H.
Sent: Thursday, February 6, 2020 2:07 PM
To: Glemaud, Rose-Ketlie
Subject: CSC Data Science Track
Attachments: Data Science Track in CSC BS Major.pdf

Rose,

At its regularly scheduled meeting of January 17, 2020 the College Curriculum Committee approved a new CSC major's track in Computer Science, a Data Science Track, pending a letter of support from the Mathematics Department re: MTH 542 (Statistical Analysis).

A copy of the proposal is attached. It is in the New CIM form at present.

Thanks,

Charles Mallery
Assoc. Dean Graduate & Admin. Svcs
Merrick Bldg. Room 304
305-284-3188

Proposed Data Science Track

COMP_BS,COMP1_BS,COMP1_BS_P,COMP2_BS,COMP3_BS,COMP4_BS,COMP6_BS,COMP1_AS_A,COMP2_AS_A,COMP3_AS_A,COMP4_AS_A,COMP6_AS_A: B.S. IN COMPUTER SCIENCE

In Workflow

1. PG CSC UG Director (vjm@miami.edu)
2. PG CSC Chair (geoff@cs.miami.edu)
3. PG AS Sr Admin I (cmallery@miami.edu)
4. PG AS UG Sr Assoc Dean (j.ferrisshill@miami.edu)
5. PG AS Dean (bachas@miami.edu)
6. PG Assessment and Accreditation (pxm491@miami.edu)
7. PG FS Office for UCC (rhardeman@miami.edu)
8. PG University Curriculum Committee (dchin@miami.edu)
9. PG FS Office for GWC (rhardeman@miami.edu;%20kxr616@miami.edu;%20yvaldes1@miami.edu)
10. PG FS GWC (rhardeman@miami.edu;%20kxr616@miami.edu;%20yvaldes1@miami.edu)
11. PG Faculty Senate (rhardeman@miami.edu;%20kxr616@miami.edu;%20yvaldes1@miami.edu)
12. PG FS Office for President (rhardeman@miami.edu)
13. PG Registrar (j.zwanziger@miami.edu)

Approval Path

1. Tue, 17 Dec 2019 19:44:55 GMT
Victor Milenkovic (vmilenkovic): Approved for PG CSC UG Director
2. Tue, 17 Dec 2019 19:46:37 GMT
Geoff Sutcliffe (gsutcliffe): Approved for PG CSC Chair
3. Wed, 15 Jan 2020 19:27:10 GMT
Patty Murphy (pxm491): Rollback to PG CSC Chair for PG AS Sr Admin I
4. Wed, 15 Jan 2020 19:32:17 GMT
Geoff Sutcliffe (gsutcliffe): Approved for PG CSC Chair
5. Fri, 31 Jan 2020 13:42:52 GMT
Charles Mallery (cmallery): Rollback to PG CSC Chair for PG AS Sr Admin I
6. Fri, 31 Jan 2020 13:50:55 GMT
Geoff Sutcliffe (gsutcliffe): Approved for PG CSC Chair
7. Fri, 31 Jan 2020 13:56:04 GMT
Charles Mallery (cmallery): Approved for PG AS Sr Admin I

History

1. Dec 3, 2019 by Jenny Vargas (j.zwanziger)

Date Submitted: Tue, 17 Dec 2019 19:08:28 GMT

Viewing:

COMP_BS,COMP1_BS,COMP1_BS_P,COMP2_BS,COMP3_BS,COMP4_BS,COMP6_BS,COMP1_AS_A,COMP2_AS_A,COMP3_AS_A,COMP4_AS_A,COMP6_AS_A: B.S. in Computer Science

Last approved: Tue, 03 Dec 2019 20:41:34 GMT

Last edit: Wed, 05 Feb 2020 22:21:18 GMT

Changes proposed by: Geoff Sutcliffe (gsutcliffe)

Date Entered in CaneLink

Date Entered in CaneLink

Please list the authors of this proposal including name, rank/title, program/department, and school.

Proposer(s) Name

Geoff Sutcliffe, Professor, Department of Computer Science

Change Type

All Other Changes

Provide a brief summary of the change

Added Data Science track

Career

Undergraduate

Academic Structure

School/ College

College of Arts and Sciences

Department

Computer Science

Plan Type

Major and/or Degree

Degree Type

Bachelor's

Degree Name

B.S.

Proposed Plan Code

COMP7_BS and COMP7_AS_A

Plan Name

B.S. in Computer Science

Will there be any subcomponents within the program such as concentrations, specializations, thesis/non-thesis options, or tracks?

Yes

Subcomponents

Subcomponent Type

Subcomponent Name

Track

Comprehensive Track

Track

Flexible Track

Track

Computational Science Track

Track

Cryptography and Security Track

Track

Graphics and Games Track

Track

Data Science Track

Effective Term

Fall 2020

First Term Valid

Fall 2020

Program Instruction Mode

In Person

Where is the program offered?

Location

Please provide the % of instruction at each location.

Coral Gables Campus

100

Program Length (Years)

4

Total Credits

120

Areas of Knowledge

STEM

To Be Published in the Academic Bulletin

Program Overview

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.

Program Mission Statement

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.

Program Goals

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

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.

Curriculum Requirements

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 [†]		
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
 - 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 Bioinformatics Algorithms
- 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
- CSC 411 Computer Science Project Implementation

Select a minimum of 6 credit hours of approved electives

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 ^{7,8}

- BTE 535 Information Security
- 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 ⁹	
ECE 482	Senior Project II ⁹	
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	
Additional Requirements for the B.S. ¹⁰		
ENG 105	English Composition I	3
ENG 106	English Composition II	3
Language Requirement		3-9
Arts and Humanities Cognate		9
People and Society Cognate		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 416, CIM 424, MMI 504, and MMI 505 are approved for the Graphics and Games track.
- 6 In addition to the generally approved electives, JMM 429 is approved for the Data Science track.
- 7 This course may also be applied towards the Science requirement.
- 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 ECE 481 and ECE 482 may be used to replace any requirement for CSC 410 and CSC411.
- 11 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.

Plan of Study

Suggested Plan of Study

Year One		Credit Hours
Fall		
CSC 120	Computer Programming I	4
MTH 161	Calculus I	4
ENG 105	English Composition I	3
Language Course		3
Elective		3
		Credit Hours
		17
Spring		
CSC 220	Computer Programming II	4
MTH 162	Calculus II	4
ENG 106	English Composition II	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
ENG 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	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

Rationale

Rationale

Data Science is a broad term referring to scientific investigations through analysis of datasets that are large in size, heterogeneous in nature, in multiple formats, coming from disparate data sources. Analysis of data sets can find new correlations, revealing emerging business trends and opportunities, and leading to new scientific discoveries. Professionals in many parts of society, including scientists, business executives, practitioners of media and advertising, and government analysts, regularly have difficulties with

large data sets in areas such as internet search, finance, healthcare, and business. The ability to analyze large and complex data sets accurately for modeling and prediction leads to more confident decision-making, and better decisions can mean greater operational efficiency, cost reduction, and reduced risk.

The new track in Data Science will serve students who wish to use computing techniques to analyze large amounts of data. The track will include 11 credits of core skill courses, and 6 credits of data science application courses.

Market Demand

Many large companies today have data science departments. Data scientists who can not only perform various data analysis techniques but also are able to interpret the results by drawing on their domain knowledge into actionable items are in high demand, as executives seek talented individuals capable of unlocking the hidden value in big data to garner strategic insights and business results. The challenges of modern data science require data scientists to possess strong training in both data analysis technologies and also domain specific issues. The Harvard Business Review has dubbed data science as "the sexiest job of the 21st century."

Relationship to Other Programs

The track in Data Science will naturally feed into our recently approved MS in Data Science.

Library Resources Available and Needed to Support the Program

No new resources required.

Laboratory Facilities, Equipment, and Space Available and Needed to Support the Program

The Department of Computer Science has the necessary space and equipment to support the track.

Other Resources Available or Needed to Support the Program

No further resources required.

Documents

Attach Supporting Documentation

BSDSTrack.pdf

For Administrative Use Only

Plan Code

COMP_BS,COMP1_BS,COMP1_BS_P,COMP2_BS,COMP3_BS,COMP4_BS,COMP6_BS,COMP1_AS_A,COMP2_AS_A,COMP3_AS_A,COMP4_AS_A,C

CIP Code - Admin

11.0701,27.0101

Degree Code

BS

Reviewer Comments

Geoff Sutcliffe (gsutcliffe) (Tue, 17 Dec 2019 19:46:20 GMT): Approved by a vote of the faculty of the Department of Computer Science.

Charles Mallery (cmallery) (Fri, 31 Jan 2020 13:42:52 GMT): Rollback: CIM shows CSC546 as not found.. could be typo... please correct and resubmit

Geoff Sutcliffe (gsutcliffe) (Fri, 31 Jan 2020 13:50:39 GMT): Fixed. Found CSC546 in the system now. It was approved by CCC on 2020/01/17.

Key: 445

