Date Submitted: 10/09/22 12:26 pm

Viewing: CC-BNFO-MS : M.S. in Bioinformatics

Last approved: 06/27/22 1:43 pm

Last edit: 10/10/22 8:50 am

Changes proposed by: Ioannis Koutis (ikoutis)

Catalog Pages Using this Program	M.S. in Bioinformatics

Department(s) / College(s)

Department	College
Computer Science (CS)	Ying Wu Coll of Computing (CC)

Name of Program	M.S. in Bioinformatics
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **CS Chair**
2. **AIS**
3. **CC Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 10/09/22 2:57 pm Vincent Oria (oria): Approved for CS Chair
2. 10/10/22 9:01 am Mesfin Ayne (ayne): Approved for AIS
3. 10/10/22 10:00 am Ali Mili (mili): Approved for CC Dean
4. 10/13/22 12:04 pm Sotirios Ziavras (ziavras): Approved

Related Department(s)	Department(s)
	Computer Science (CS)

for Vice Provost of Graduate Studies

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

History

1. May 10, 2020 by Zhi Wei (zhiwei)
2. May 21, 2020 by Zhi Wei (zhiwei)
3. Jul 11, 2021 by Mesfin Ayne (ayne)
4. Jun 27, 2022 by Mesfin Ayne (ayne)

Objectives

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

Relationship to Similar Programs in the State and Region

List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

Distinguished Programs Nationally

For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

Degree Requirements

A minimum of 30 credits is required for the degree, excluding bridge courses. The graduate curriculum consists of five core courses and additional elective courses, with an optional thesis (six credits) or research project (three credits).

Students with non-computing STEM background may be accepted and required to take the following bridge courses (CS 506 may count toward the credits required for the MS degree):

Bridge Courses

CS 280	Programming Language Concepts	3
CS 332	Principles of Operating Systems	3
CS 505	Programming, Data Structures, and Algorithms	3
CS 506	Foundations of Computer Science	3
Total Credits		12

Curriculum

Core Courses		6
CS 636	Data Analytics with R Program	3
MATH 663	Introduction to Biostatistics	3
Select at least three from the following		at least 9 credits
Core Electives		
CS 644	Introduction to Big Data	
CS 675	Machine Learning	
MATH 615	Approaches to Quantitative Analysis in the Life Sciences	
MATH 678	Stat Methods in Data Science	
MATH 680	Advanced Statistical Learning	

BIOL 605 Prin of Bioscience Processing

BIOL 630 Critical Thinking for the Life Sciences

R120 512 Cell Biology: Methods & Appl

R120 515 Molecular Bio Of Eukaryotes

R120 524 Cell Molec Dev

Select remaining courses from the following:

NJIT Electives

BME 661 Neural Engineering

BME 671 Biomechanics of Human Structure and Motion

CHEM 658 Advanced Physical Chemistry

CHEM 673 Biochemistry

CS 631 Data Management System Design

CS 632 Advanced Database System Design

CS 659 Image Processing and Analysis

CS 634 Data Mining

CS 670 Artificial Intelligence

CS 677 Deep Learning

CS 681 Computer Vision

CS 731 Applications of Database Systems

CS 732 Advanced Machine Learning

CS 782 Pattern Recognition and Applications

IS 634 Information Retrieval

ECE 640 Digital Signal and Data Processing

ECE 673 Random Signal Analysis

MATH 635 Analytical Computational Neuroscience

MATH 636 Systems Computational Neuroscience

MATH 637 Foundations of Mathematical Biology

MATH 644 Regression Analysis Methods

MATH 654 Clinical Trials Design and Analysis

MATH 659 Survival Analysis

MATH 662	Probability Distributions
MATH 665	Statistical Inference
YWCC 691	Graduate Capstone Project (Counting towards the elective credits requires the program director's prior approval. In addition, it needs to be completed with an external partner (industry, lab, or government), or with a faculty only if the same faculty is not the student's MS project or MS thesis advisor.)
Rutgers-Newark Electives	
R120 512	Cell Biology: Methods & Appl
R120 515	Molecular Bio Of Eukaryotes
R120 516	Microbial Ecology
R120 526	Topics in Cell Biology
R120 548	Biology Of Cancer
R120 573	Pharmacology
~~RBHS Electives~~	
UMD 5002	
UMD 5200	
Total Credits	12

Is licensure required of program graduates to gain employment?

Will the institution seek accreditation for this program?

Add any additional information you would like brought to the attention of CUE/ CGE here: The RBHS electives were removed from "Rutgers-Newark Electives". These have not been offered in many recent years. That is the only proposed changed. ~~ECE 640, ECE 673 Title changes~~

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

Reviewer
Comments

Key: 119

Date Submitted: 09/16/22 3:06 pm

Viewing: EN-COE-MS : M.S. in Computer Engineering

Last approved: 06/21/22 10:45 am

Last edit: 09/16/22 3:06 pm

Changes proposed by: Cong Wang (wangcong)

Catalog Pages Using this Program	M.S. in Computer Engineering

Department(s) / College(s)

Department	College
Electrical & Computer Engr. (ECE)	Newark College of Engineering (EN)

Name of Program	M.S. in Computer Engineering
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **ECE Chair**
2. **AIS**
3. **EN Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 09/16/22 5:24 pm Durga Misra (dmisra): Approved for ECE Chair
2. 09/19/22 3:07 pm Mesfin Ayne (ayne): Approved for AIS
3. 10/06/22 2:03 pm Kam Moshe (kam): Approved for EN Dean
4. 10/13/22 12:04 pm Sotirios Ziavras (ziavras): Approved

Related Department(s)	for Vice Provost of Graduate Studies

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

History

1. Feb 21, 2020 by Mesfin Ayne (ayne)
2. May 12, 2021 by Durga Misra (dmisra)
3. Nov 24, 2021 by Mengchu Zhou (zhou)
4. Jun 21, 2022 by Mesfin Ayne (ayne)

Objectives

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

Relationship to Similar Programs in the State and Region

List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

Distinguished Programs Nationally

For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

Degree Requirements

The MS CoE ~~MSCoE~~ program at NJIT is flexible and customizable to a student's individual goals. It allows students to pursue computer engineering disciplines in depth, as well as to take a selection of courses from other NJIT engineering, computer science or management majors. The program provides in-depth studies of modern computer engineering topics including computer architecture and embedded systems, intelligent systems, communications and networking, signal, information and data processing, machine learning, and cyber-physical systems. BS CoE degree (or equivalent) is a general enrollment requirement.

Program Requirements and Options

Upon entering the program, students select an area of specialization supervised by the MS CoE ~~MSCoE~~ Program Advisor. The master's program consists of 30 credits. There are three program options: 24 course credits and 6 credits of master's thesis; or 27 course credits and 3 credits of master's project; or 30 course credits not to include either a master's project or thesis. Students should consult with the Program Advisor or designee before registering for courses to make sure they are meeting degree requirements. As a requirement for graduation, students must achieve a 3.0 cumulative GPA in graduate-level courses not including the master's thesis. Courses at the 500-or-below level are not acceptable for credit toward a graduate degree in computer engineering.
With permission of their research advisor, students intending to do an MS thesis may first register in the 700B MS Project course. They must receive a satisfactory (S) grade in 700B before 701B MS Thesis registration in the immediate following semester with the same advisor. The MS thesis topic should be continuation of the work done in 700B.

Bridge Program

Students who lack an appropriate background may be admitted and be required to take selected courses in addition to the degree requirements in order to make up deficiencies. They must attain a grade of B or better in each course. At the discretion of the department, students who have taken courses equivalent to these may have their bridge programs reduced accordingly.

Bridge Courses (undergraduate degree in computer science)

ECE 353	Computer Organization and Architecture	3
ECE 395	Microprocessor Laboratory	2
ECE 231	Circuits and Systems I	3
ECE 684	Advanced Microprocessor Systems	3
Total Credits		11

Bridge Courses (undergraduate degree in electrical engineering)

CS 505	Programming, Data Structures, and Algorithms	3
or CS 506	Foundations of Computer Science	
ECE 353	Computer Organization and Architecture	3
ECE 395	Microprocessor Laboratory	2
ECE 684	Advanced Microprocessor Systems	3
Total Credits		11

MS CoE Required Core Courses

CS 610	Data Structures and Algorithms	3
ECE 690	Computer Systems Architecture	3
Total Credits		6

ECE Department Focused Areas:

Communications, Signal Processing and Microwave; Computer Networking; Computer Architecture; Solid State, VLSI and Electro-optics Systems; and Intelligent Systems.

Students need to contact the MS CoE ~~MSCoE~~ Program Adviser or designee for guidance and suggested courses for different focus areas. Three non-ECE graduate courses of 600 level may be chosen including CS 610 and must be approved as not all outside ECE department courses are applied for MS CoE. ~~MSCoE.~~

Recommended MS CoE Technical Electives – total 8 courses/24 credits

(additional courses including those in Computer Science and Management can be selected and approved by the program advisor)

ECE 601	Linear Systems	3
ECE 605	Discrete Event Dynamic Systems	3
ECE 610	Power System Steady-State Analysis	3
ECE 611	Transients in Power Systems	3

ECE 613	Protection of Power Systems	3
ECE 616	Power Electronics	3
ECE 617	Economic Control of Interconnected Power Systems	3
ECE 618	Photovoltaic Semiconductors and Renewable Energy	3
ECE 619	Intelligent Sensing for Smart Grid and Smart City	3
ECE 626	Optoelectronics - Nonlinear Modulators for Optical Communication	3
ECE 636	Computer Networking Laboratory	3
ECE 637	Internet and Higher-Layer Protocols	3
~~ECE 639~~	~~Principles of Broadband Networks~~	~~3~~
ECE 640	Digital Signal and Data Processing	3
ECE 641	Laboratory for High Performance Digital Signal Processing	3
ECE 642	Introduction to Communication Systems: Evolution to 5G and Beyond	3
ECE 644	Wireless Communications: Fundamentals to 5G	3
ECE 645	Design of Wireless Networks: 5G Architecture and Services	3
ECE 657	Semiconductor Devices	3
ECE 658	VLSI Design I	3
ECE 660	Control Systems I	3
ECE 661	Control System Components	3
ECE 664	Applied Advanced Control Systems	3
ECE 673	Random Signal Analysis	3
ECE 681	High Performance Routers and Switches	3
ECE 683	Cloud and IoT Networking and Security	3
ECE 684	Advanced Microprocessor Systems	3
ECE 690	Computer Systems Architecture	3
ECE 692	Embedded Computing Systems	3
ECE 698	Selected Topics in Electrical and Computer Engineering	3
ECE 744	Optimization for Data Engineering	3
ECE 754	Statistical Machine Learning and Pattern Recognition	3
ECE 758	VLSI Design II	3
ECE 760	Control Systems II	3

ECE 776	Information Theory	3
ECE 783	Computer Communication Networks	3
ECE 788	Selected Topics in Electrical and Computer Engineering	3
Project		
ECE 700B	Master's Project	3
Thesis		
ECE 701B	Master's Thesis	3
ECE 791	Graduate Seminar [1]	0

1
Not Mandatory for MS Students

Is licensure required of program graduates to gain employment?

Will the institution seek accreditation for this program?

Add any additional information you would like brought to the attention of CUE/ CGE here

> Added ECE 619 (new course) and ECE 664 (previously missing from the list) to the list of elective courses.

> Removed ECE 639 (haven't been offered for years) from the list of elective courses. ~~Add ECE 760 Control Systems II to the MSCOE Technical Electives~~

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

Reviewer Comments

Key: 157

Date Submitted: 10/09/22 4:43 pm

Viewing: CC-CS-MS : M.S. in Computer Science

Last approved: 11/24/21 7:43 pm

Last edit: 10/10/22 8:51 am

Changes proposed by: Ioannis Koutis (ikoutis)

Catalog Pages Using this Program	M.S. in Computer Science

Department(s) / College(s)

Department	College
Computer Science (CS)	Ying Wu Coll of Computing (CC)

Name of Program	M.S. in Computer Science
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **CS Chair**
2. **AIS**
3. **CC Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 10/09/22 6:10 pm Vincent Oria (oria): Approved for CS Chair
2. 10/10/22 9:01 am Mesfin Ayne (ayne): Approved for AIS
3. 10/10/22 10:00 am Ali Mili (mili): Approved for CC Dean
4. 10/13/22 12:03 pm Sotirios Ziavras (ziavras): Approved

Related Department(s)	Department(s)
	Computer Science (CS)

for Vice Provost of Graduate Studies

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

History

1. May 21, 2020 by Zhi Wei (zhiwei)
2. Sep 21, 2020 by Zhi Wei (zhiwei)
3. Nov 24, 2021 by Zhi Wei (zhiwei)

Objectives

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

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List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

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For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

Degree Requirements

Students will meet with an academic ~~the graduate~~ advisor to assist them in formulating a program of study and selecting a possible specialization. These degree requirements apply to all on-campus and online programs.

The 30 credit requirement may be satisfied in one of three ways:

Courses (30 credits)

Courses (27 credits) + MS Project (3 credits)

Courses (24 credits) + MS Thesis (6 credits)

Students with non-computing STEM background may be accepted and required to take the following bridge courses (CS 506 may count toward the credits required for the MS degree):

M.S. in Computer Science (courses only)

Bridge Courses		
~~CS 280~~	~~Programming Language Concepts~~	~~3~~
CS 332	Principles of Operating Systems	3
CS 350	Intro to Computer Systems	3
CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		12

1 CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of a high-level programming language. For students with no prior programming experience, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

2 The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Core Courses

CS 610	Data Structures and Algorithms	3
~~Select three of the following:~~		~~9~~
CS 630	Operating System Design	3
~~CS 650~~	~~Computer Architecture~~	
CS 631	Data Management System Design	3
CS 656	Internet and Higher-Layer Protocols	3
Elective Courses		
Two courses from the list of CS Advanced Courses		6
~~Course either from the Computer Science graduate catalog or from another department's graduate catalog [1]~~		~~3~~
~~Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]~~		~~9~~
A total of four courses accumulated with any combination of the following:		12
CS 506, only when taken as part of a prior graduate certificate, or as a bridge course		
Up to one course from another department's graduate catalog [1]		
Up to one course from IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]		
Courses from the list of all Computer Science Courses, 600-level or higher (up to 4 courses)		
Total Credits		30

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.

2 YWCC 691 can be counted towards the 30 credits required for the degree only if no more than 6 out of the 30 credits are earned from non-lecture courses.

3 List of all Computer Science Courses. Taking CS 700 level courses requires permission from an academic advisor.

M.S. in Computer Science (Master's project)

Bridge Courses		
CS 332	Principles of Operating Systems	3
CS 350	Intro to Computer Systems	3
CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		12

1

CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of a high-level programming language. For students with no prior programming experience, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

2 The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Core Courses		
CS 610	Data Structures and Algorithms	3
~~Select three of the following:~~		~~9~~
CS 630	Operating System Design	3
~~CS 650~~	~~Computer Architecture~~	
CS 631	Data Management System Design	3
CS 656	Internet and Higher-Layer Protocols	3
Project		
CS 700B	Master's Project [3]	3
Elective Courses		
One course from the list of CS Advanced Courses		3
~~Course either from the Computer Science graduate catalog or from another department's graduate catalog [1]~~		~~3~~
~~Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]~~		~~9~~
A total of four courses (12 credits) accumulated with any combination of the following:		12
CS 506, only when taken as part of a prior graduate certificate, or as a bridge course		
Up to one course from another department's graduate catalog [1]		
Up to one course from IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691 [2]		
Courses from the list of Computer Science Courses, 600-level or higher (up to 4 courses) [3]		
Total Credits		30

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.

2 YWCC 691 can be counted towards the 30 credits required for the degree only if no more than 6 out of the 30 credits are earned from non-lecture courses.

3 List of all Computer Science Courses. Taking CS 700 level courses requires permission from academic advisors.

M.S. in Computer Science (Master's thesis)

Bridge Courses		
CS 332	Principles of Operating Systems	3
CS 350	Intro to Computer Systems	3
CS 505	Programming, Data Structures, and Algorithms [1]	3
CS 506	Foundations of Computer Science [2]	3
Total Credits		12

[1] CS 505 Programming, Data Structures, and Algorithms requires prior knowledge of a high-level programming language. For students with no prior programming experience, CS 113 Introduction to Computer Science and CS 114 Introduction to Computer Science II are recommended for replacement.

[2] The credits earned for CS 506 Foundations of Computer Science count towards the 30 credits required for the degree.

Core Courses		
CS 610	Data Structures and Algorithms	3
~~Select three of the following:~~		~~9~~
CS 630	Operating System Design	3
~~CS 650~~	~~Computer Architecture~~	
CS 631	Data Management System Design	3
CS 656	Internet and Higher-Layer Protocols	3
Thesis		
~~CS 701B~~	~~Master's Thesis~~	~~6~~
~~& CS 701B~~	~~and Master's Thesis~~	
~~or CS 701C~~	~~Master's Thesis~~	
CS 700B	Master's Project	6
& CS 701B	and Master's Thesis [3]	
Elective Courses		
~~Course either from the Computer Science graduate catalog or from another department's graduate catalog~~ [1]		~~3~~
~~Three courses from the Computer Science graduate catalog or IS 601, IS 650, IS 657, IS 665, MATH 661~~		~~9~~
A total of four courses (12 credits) accumulated with any combination of the following:		12

CS 506, only when taken as part of a prior graduate certificate, or as a bridge course	
Up to one course from another department's graduate catalog [1]	
Up to one course from IS 601, IS 650, IS 657, IS 665, MATH 661, YWCC 691	
Courses from the list of Computer Science Courses, 600-level or higher (up to 4 courses) [3]	
Total Credits	30

1 Courses from outside the Computer Science Department must be relevant to the Computer Science program and require prior approval.

2 A student must select a specialization, and the thesis must match the selected specialization.

3 List of all Computer Science Courses. Taking CS 700 level courses requires permission from an academic advisor.

Specializations

Students can optionally specialize in a specific area (see below) by taking a minimum of three (3) courses listed in the specialization in accordance with requirements (b) and (c). Note that some specialization courses have prerequisites that must be fulfilled before enrolling in these courses.

Computer Networking and Security

Select three of the following:	9
CS 608 Cryptography and Security	
CS 633 Distributed Systems	
CS 652 Cognitive Cloud Networking - Architectures and Applications	
CS 696 Network Management and Security	
IS 681 Computer Security Auditing	
Total Credits	9

Databases and Data Mining

Select three of the following:	9
CS 632 Advanced Database System Design	
CS 731 Applications of Database Systems	
CS 634 Data Mining	
BNFO 644 Data Mining and Management in Bioinformatics	
CS 744 Data Mining and Management in Bioinformatics [1]	
CS 700B Master's Project [1]	

Total Credits	9

[1] Taking CS 700 level courses requires permission from an academic advisor.

Image Processing and Pattern Recognition

Select three of the following:		9
CS 659	Image Processing and Analysis	
CS 681	Computer Vision	
CS 759	Advanced Image Processing and Analysis [1]	
CS 700B	Master's Project [1]	
Total Credits		9

[1] Taking CS 700 level courses requires permission from an academic advisor.

Computer Algorithms

CS 611	Introduction to Computability and Complexity	3
CS 667	Design Techniques for Algorithms	3
CS 700B	Master's Project	3
Total Credits		9

Bioinformatics

Select three of the following:		9
BNFO 601	Foundations of Bioinformatics I	
BNFO 602	Foundations of Bioinformatics II	
CS 744	Data Mining and Management in Bioinformatics [1]	
MATH 663	Introduction to Biostatistics	
CS 700B	Master's Project [1]	
Total Credits		9

[1] Taking CS 700 level courses requires permission from an academic advisor.

Master's Project

Students must

Enroll in CS 700B Master's Project.

In the semester prior to enrolling in CS 700B Master's Project, the student must prepare and submit a project proposal to the Department no later than the last weekday class day of the 8th week of the
Fall semester for a spring project, or
Spring semester for a summer or fall project.
The student must have an advisor in the Computer Science Department who is a tenure-track ~~tenure- track~~ faculty member or who holds a joint appointment in the department.

Project Requirements

Before a student pursues a Master's Project, the following requirements must be fully satisfied:
All bridge courses must be completed - In the semester prior to the project, a student prepares and submits a project proposal to the Department no later than the last weekday class day of the 8th week of the Fall semester for a spring project and no later than the last weekday class day of the 8th week of the Spring semester for a summer or fall project. The preparatory work for the proposal may be accomplished within the framework of a required course or an independent study course offered by the prospective advisor. Therefore, such a course must be taken in the semester prior to the project.
A CS Department tenure-track faculty member or a faculty member who holds a joint appointment in the computer science department can advise an MS project.
Proposal preparation must adhere to the existing departmental guidelines; the information and templates are available online.

Thesis Option

(30 credits)
Students intending to do an MS Thesis must first select a specialization. Then, with permission of their research advisor, students must first register in the CS 700B MS Project course. They must receive a satisfactory (S) grade in CS 700B before CS 701B MS Thesis registration in the immediately following semester, with the same advisor. The MS thesis topic should be continuation of the work done in CS 700B.
~~Students mustselect a specialization, andenroll in the Thesis CS 701 course for two (2) semesters (Thesis must matchspecialization).A student can enroll in CS 701 during the second semester of full timestudy.Normally the student enrolls for two semesters of CS 701 to prepare the thesis proposal, perform the research, and prepare thethesis.~~The thesis must be orally defended and follow the style set forth by the NJIT Graduate Academic Policies and Procedures. ~~School at NJIT.~~ The thesis committee is composed of a Computer Science tenure-track committee chair and two other tenure-track members of the Computer Science Department or Faculty holding a joint appointment to the department.

Thesis Requirements

Before a student pursues a Master's Thesis, the following requirements must be fully satisfied:
All bridge courses must be completed.

In the semester prior to the thesis, a student prepares and submits a thesis proposal to the department no later than week 8 of the Fall semester for a spring thesis and week 8 of the Spring semester for a summer of fall thesis. The preparatory work for the proposal may be accomplished within the framework of a required course or an independent study course offered by the prospective advisor. Therefore, such a course must be taken in the semester prior to the thesis.

A CS department tenure-track faculty member or a faculty member who holds a joint appointment in the Computer Science Department can advise an MS thesis.

A thesis must adhere to the style requirements set forth by the Graduate School: https://www.njit.edu/graduatestudies/thesis.php.

An oral defense is required. The defense must take place between one week prior to the Reading Day of the semester and the last day of the Examination period. A committee of at least three tenure-track faculty members from the CS Department, including the thesis advisor, collectively determines the grade for CS 701 at the conclusion of the oral defense.

Other Policies

Transfer: Transfer of computer science courses from other US/Canada institutions is allowed as per university regulations provided that these courses are related to the program. Graduate Advisor and Graduate Studies Office approvals are required.

MS/MS Program: Under the University MS/MS program, up to six credits of courses taken in other departments can be used for graduate credits toward the degree as long as these courses are related to computer science. Graduate advisor and Graduate Studies Office approvals are required.

Co-op Program: Before a student applies for CS 590 Course CS 590 Not Found/CS 591 Course CS 591 Not Found/CS 592 Course CS 592 Not Found registration, the successful completion of the bridge program, all ESL requirements, and at least four graduate courses is required.

The same course cannot satisfy two or more requirements.

CS Advanced Courses

CS 632	Advanced Database System Design	3
CS 636	Data Analytics with R Program	3
CS 644	Introduction to Big Data	3
CS 647	Counter Hacking Techniques	3
CS 650	Computer Architecture	3
CS 667	Design Techniques for Algorithms	3
CS 675	Machine Learning	3
CS 676	Cognitive Computing	3
CS 643	Cloud Computing	3
CS 659	Image Processing and Analysis	3

CS 661	Systems Simulation	3
CS 670	Artificial Intelligence	3
CS 673	Software Design and Production Methodology	3
CS 677	Deep Learning	3
CS 680	Linux Kernel Programming	3
CS 681	Computer Vision	3
CS 696	Network Management and Security	3
CS 782	Pattern Recognition and Applications	3

Is licensure required of program graduates to gain employment?

Will the institution seek accreditation for this program?

Add any additional information you would like brought to the attention of CUE/ CGE here

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

Reviewer Comments

Key: 123

Date Submitted: 10/14/22 10:23 am

Viewing: CC-CSP-MS : M.S. in Cyber Security and Privacy

Last approved: 03/29/21 4:13 pm

Last edit: 10/14/22 10:23 am

Changes proposed by: Reza Curtmola (crix)

Catalog Pages Using this Program	M.S. in Cyber Security and Privacy

Department(s) / College(s)

Department	College
Computer Science (CS)	Ying Wu Coll of Computing (CC)

Name of Program	M.S. in Cyber Security and Privacy
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **CS Chair**
2. **AIS**
3. **CC Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 10/09/22 9:53 am Vincent Oria (oria): Approved for CS Chair
2. 10/10/22 9:01 am Mesfin Ayne (ayne): Approved for AIS
3. 10/10/22 10:01 am Ali Mili (mili): Approved for CC Dean
4. 10/13/22 11:58 am Sotirios Ziavras

Related Department(s)	Department(s)
	Computer Science (CS)

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

Objectives

(ziavras): Rollback to Initiator

5. 10/14/22 10:26 am Vincent Oria (oria): Approved for CS Chair
6. 10/14/22 10:28 am Mesfin Ayne (ayne): Approved for AIS
7. 10/14/22 10:34 am Ali Mili (mili): Approved for CC Dean
8. 10/14/22 10:42 am Sotirios Ziavras (ziavras): Approved for Vice Provost of Graduate Studies

History

1. May 21, 2020 by Reza Curtmola (crix)
2. Sep 21, 2020 by Reza Curtmola (crix)
3. Oct 13, 2020 by Reza Curtmola (crix)
4. Nov 19, 2020 by Reza Curtmola (crix)
5. Nov 19, 2020 by Mesfin Ayne (ayne)

6. Nov 19, 2020 by Mesfin Ayne (ayne)
7. Mar 29, 2021 by Reza Curtmola (crix)

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

Relationship to Similar Programs in the State and Region

List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

Distinguished Programs Nationally

For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

Degree Requirements

An MSCSP course program must satisfy the following distribution requirement:
30 credits are required, which can be satisfied as either one of the following options:
Courses (30 credits)

Courses (27 credits) + MS Project (3 credits)
Courses (24 credits) + MS Thesis (6 credits)
All Core courses are required.
At most two courses can be Foundational courses.
At most two courses can be chosen from outside the Department of Computer Science.
If a student chooses the MS project or MS thesis option, the following two additional rules apply:
The project or thesis must be related to cyber security.
YWCC 691 cannot be taken as an elective course.
Students with non-computing STEM background may be accepted and required to take the following bridge courses (CS 506 may count toward the credits required for the MS degree):

Bridge Courses		
CS 280	Programming Language Concepts	3
CS 332	Principles of Operating Systems	3
CS 505	Programming, Data Structures, and Algorithms	3
CS 506	Foundations of Computer Science	3

M.S. in Cyber Security and Privacy (courses only)

Core Course Requirements		15
CS 608	Cryptography and Security	3
CS 645	Security and Privacy in Computer Systems	3
CS 646	Network Protocols Security	3
CS 647	Counter Hacking Techniques	3
CS 656	Internet and Higher-Layer Protocols	3
Electives and Foundational Courses		15
Elective Courses		
CS 633	Distributed Systems	3
CS 634	Data Mining	3
CS 643	Cloud Computing	3
CS 648	Cyber Sec Investigations & Law	3
CS 660	Digital Watermarking	3

CS 673	Software Design and Production Methodology	3
CS 678	Topics in Smartphone Sec & Rel	3
CS 680	Linux Kernel Programming	3
CS 684	Software Testing and Quality Assurance	3
CS 696	Network Management and Security [1]	3
or ECE 638	Network Management and Security	
CS 708	Advanced Data Security and Privacy	3
CS 755	Security and Privacy in Wireless Networks	3
IS 601	Web Systems Development	3
IS 650	Data Visualization and Interpretation	3
IS 657	Spatiotemporal Urban Analytics	3
IS 665	Data Analytics for Info System	3
IS 680	Information Systems Auditing	3
IS 681	Computer Security Auditing	3
IS 682	Forensic Auditing for Computing Security	3
IS 687	Transaction Mining and Fraud Detection	3
IT 620	Wireless Networks Security and Administration	3
IT 640	Network Services Administration	3
ECE 636	Computer Networking Laboratory	3
MGMT 688	Information Technology, Business and the Law	3
MGMT 691	Legal and Ethical Issues in a Digital World	3
MATH 661	Applied Statistics	3
YWCC 691	Graduate Capstone Project	3
Foundational Courses		
CS 610	Data Structures and Algorithms	3
CS 630	Operating System Design	3
CS 631	Data Management System Design	3

1 Substitution allowed only for students with ECE background and with the permission of the graduate advisor.

M.S. in Cyber Security and Privacy (Master's project option)

Core Course Requirements		15
CS 608	Cryptography and Security	3
CS 645	Security and Privacy in Computer Systems	3
CS 646	Network Protocols Security	3
CS 647	Counter Hacking Techniques	3
CS 656	Internet and Higher-Layer Protocols	3
Project		3
CS 700B	Master's Project [2]	3
Electives and Foundational Courses		12
Elective Courses		
CS 633	Distributed Systems	3
CS 634	Data Mining	3
CS 643	Cloud Computing	3
CS 648	Cyber Sec Investigations & Law	3
CS 660	Digital Watermarking	3
CS 673	Software Design and Production Methodology	3
CS 678	Topics in Smartphone Sec & Rel	3
CS 680	Linux Kernel Programming	3
CS 684	Software Testing and Quality Assurance	3
CS 696	Network Management and Security [1]	3
or ECE 638	Network Management and Security	
CS 708	Advanced Data Security and Privacy	3
CS 755	Security and Privacy in Wireless Networks	3
IS 601	Web Systems Development	3
IS 650	Data Visualization and Interpretation	3
IS 657	Spatiotemporal Urban Analytics	3
IS 665	Data Analytics for Info System	3
IS 680	Information Systems Auditing	3
IS 681	Computer Security Auditing	3
IS 682	Forensic Auditing for Computing Security	3

IS 687	Transaction Mining and Fraud Detection	3
IT 620	Wireless Networks Security and Administration	3
IT 640	Network Services Administration	3
ECE 636	Computer Networking Laboratory	3
MGMT 688	Information Technology, Business and the Law	3
MGMT 691	Legal and Ethical Issues in a Digital World	3
MATH 661	Applied Statistics	3
Foundational Courses		
CS 610	Data Structures and Algorithms	3
CS 630	Operating System Design	3
CS 631	Data Management System Design	3

1 Substitution allowed only for students with ECE background and with the permission of the graduate advisor.

2 The project must be related to cyber security.

M.S. in Cyber Security and Privacy (Master's thesis option)

Core Course Requirements		15
CS 608	Cryptography and Security	3
CS 645	Security and Privacy in Computer Systems	3
CS 646	Network Protocols Security	3
CS 647	Counter Hacking Techniques	3
CS 656	Internet and Higher-Layer Protocols	3
Thesis		6
CS 701C	Master's Thesis [2]	6
Electives and Foundational Courses		9
Elective Courses		
CS 633	Distributed Systems	3
CS 634	Data Mining	3
CS 643	Cloud Computing	3
CS 648	Cyber Sec Investigations & Law	3

CS 660	Digital Watermarking	3
CS 673	Software Design and Production Methodology	3
CS 678	Topics in Smartphone Sec & Rel	3
CS 684	Software Testing and Quality Assurance	3
CS 680	Linux Kernel Programming	3
CS 696	Network Management and Security [1]	3
or ECE 638	Network Management and Security	
CS 708	Advanced Data Security and Privacy	3
CS 755	Security and Privacy in Wireless Networks	3
IS 601	Web Systems Development	3
IS 650	Data Visualization and Interpretation	3
IS 657	Spatiotemporal Urban Analytics	3
IS 665	Data Analytics for Info System	3
IS 680	Information Systems Auditing	3
IS 681	Computer Security Auditing	3
IS 682	Forensic Auditing for Computing Security	3
IS 687	Transaction Mining and Fraud Detection	3
IT 620	Wireless Networks Security and Administration	3
IT 640	Network Services Administration	3
ECE 636	Computer Networking Laboratory	3
MGMT 688	Information Technology, Business and the Law	3
MGMT 691	Legal and Ethical Issues in a Digital World	3
MATH 661	Applied Statistics	3
Foundational Courses		
CS 610	Data Structures and Algorithms	3
CS 630	Operating System Design	3
CS 631	Data Management System Design	3

1

Substitution allowed only for students with ECE background and with the permission of the graduate advisor.

2

The thesis must be related to cyber security.

Master of Science in Cyber Security and Privacy (CSP) - Cyber Defense Option

The objective of the Cyber Defense Professional Science Master (PSM), an option of the MS CSP, is to create leaders with strong communication and management skills in addition to the strong technical knowledge in security and privacy of computer systems, networks and web applications. This PSM is designed for working professionals or students who already have acquired some professional experience. The Cyber Defense PSM is affiliated with the PSM National Office.

A student in the MS CSP – Cyber Defense Option must satisfy the following distribution of requirements:

36 credits are required.

All Cybersecurity Core courses are required (18 credits)

The rest of 18 credits must be taken from the combined list of PTC (Professional and Technical Communications), Management, and Computing electives, with at least 3 credits, and no more than 6, from each of the 3 elective lists

Among the required Cybersecurity Core courses, the program includes an MS Project, YWCC 691. These projects are part of a project course, supervised by a CS faculty member, and done in collaboration with industrial partners. These partners will propose projects, and they will co-supervise the students together with the instructor of the course. Students who have a job are allowed to work on projects from their companies, in which case their employer will be actively engaged in the project supervision. The projects will generally be done in teams of 3 students.

Core Course Requirements:		18
CS 608	Cryptography and Security	3
CS 645	Security and Privacy in Computer Systems	3
CS 646	Network Protocols Security	3
CS 647	Counter Hacking Techniques	3
CS 656	Internet and Higher-Layer Protocols	3
YWCC 691	Graduate Capstone Project	3
Professional and Technical Communication Courses		6
~~PTC 601~~	~~Advanced Professional and Technical Communication~~	~~3~~
~~PTC 620~~	~~Proposal Writing~~	~~3~~
~~PTC 622~~	~~Working in Teams: Collaborative and Interpersonal Communications~~	~~3~~
~~PTC 624~~	~~Professional and Technical Editing~~	~~3~~
~~PTC 628~~	~~Analyzing Social Networks~~	~~3~~
~~PTC 629~~	~~Theory and Practice of Social Media~~	~~3~~
~~PTC 632~~	~~Content Management and Information Architecture~~	~~3~~
ENGL 603	Speaking English in Professional Situations (Professional and Technical Communications) Courses)	3

ENGL 621	Technical Writing for Graduate Students	3
IS 661	User Experience Design	3
Management Courses		6
Select two of the following:		
ACCT 615	Management Accounting	3
EM 636	Project Management	3
FIN 600	Corporate Finance I	3
MGMT 641	Global Project Management	3
MGMT 650	Knowledge Management	3
MGMT 682	Business Research Methods I	3
MGMT 688	Information Technology, Business and the Law	3
MGMT 691	Legal and Ethical Issues in a Digital World	3
Cybersecurity Elective Courses		6
CS 610	Data Structures and Algorithms	3
CS 630	Operating System Design	3
CS 631	Data Management System Design	3
CS 632	Advanced Database System Design	3
CS 634	Data Mining	3
CS 643	Cloud Computing	3
CS 648	Cyber Sec Investigations & Law	3
CS 660	Digital Watermarking	3
CS 673	Software Design and Production Methodology	3
CS 696	Network Management and Security	3
CS 700B	Master's Project	3
CS 708	Advanced Data Security and Privacy	3
CS 678	Topics in Smartphone Sec & Rel	3
CS 684	Software Testing and Quality Assurance	3
CS 708	Advanced Data Security and Privacy	3
CS 755	Security and Privacy in Wireless Networks	3
IS 601	Web Systems Development	3

IS 650	Data Visualization and Interpretation	3
IS 657	Spatiotemporal Urban Analytics	3
IS 665	Data Analytics for Info System	3
IS 680	Information Systems Auditing	3
IS 681	Computer Security Auditing	3
IS 682	Forensic Auditing for Computing Security	3
IT 620	Wireless Networks Security and Administration	3
IT 640	Network Services Administration	3
ECE 636	Computer Networking Laboratory	3
MATH 661	Applied Statistics	3

Is licensure required of program graduates to gain employment?

No

Will the institution seek accreditation for this program?

No

Add any additional information you would like brought to the attention of CUE/ CGE here

PTC (professional and technical communication) courses are no longer offered at NJIT. However, NJIT's PSM (Professional Science Master's) programs specifically require professional technical communication courses ~~This update includes two previous updates that were already approved by the CGE, but were reverted in CIM due to a system misconfiguration:1) CGE meting on November 12, 2020:removed ECE 637 as an alternative to the core course CS 656 2) CGE meeting on October 8, 2020:Moved CS 696 from the set of Core courses into the set of Elective courses in the MS CSP program and in the professional science master option of the program.~~

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

2020-10-08-MS-CSP.pdf

2020-11-12-MS CSP.pdf

Reviewer Comments

Sotirios Ziavras (ziavras) (10/13/22 11:58 am): Rollback: To add ENG 621

Date Submitted: 10/09/22 1:47 pm

Viewing: CC-SOE-MS : M.S. in Software Engineering

Last approved: 06/27/22 2:14 pm

Last edit: 10/10/22 8:52 am

Changes proposed by: Ioannis Koutis (ikoutis)

Catalog Pages Using this Program	M.S. in Software Engineering

Department(s) / College(s)

Department	College
Computer Science (CS)	Ying Wu Coll of Computing (CC)

Name of Program	M.S. in Software Engineering
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **CS Chair**
2. **AIS**
3. **CC Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 10/09/22 2:58 pm Vincent Oria (oria): Approved for CS Chair
2. 10/10/22 9:01 am Mesfin Ayne (ayne): Approved for AIS
3. 10/10/22 10:01 am Ali Mili (mili): Approved for CC Dean
4. 10/13/22 12:03 pm Sotirios Ziavras (ziavras): Approved

Related Department(s)	Department(s)
	Computer Science (CS)

for Vice Provost of Graduate Studies

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

History

1. May 21, 2020 by Zhi Wei (zhiwei)
2. Jun 27, 2022 by Mesfin Ayne (ayne)

Objectives

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

Relationship to Similar Programs in the State and Region

List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

Distinguished Programs Nationally

For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

The program requires the completion of 30 credits.

Students with non-computing STEM background may be accepted and required to take the following bridge courses (CS 506 may count toward the credits required for the MS degree):

Bridge Courses [1]		
CS 280	Programming Language Concepts	3
CS 332	Principles of Operating Systems	3
CS 505	Programming, Data Structures, and Algorithms	3
CS 506	Foundations of Computer Science	3
Total Credits		12

1 Students can take other CS courses with advisor approval

Required Courses (18 Credits)		
CS 684	Software Testing and Quality Assurance	3
CS 685	Software Architecture	3
CS 683	Software Project Management	3
IS 676	Requirement Engineering	3
CS 673	Software Design and Production Methodology	3
CS 700B	Master's Project	3
~~Elective Courses~~		
~~Select three of the following:~~		~~9~~
Elective Courses (12 credits) [1]		
Select four of the following:		12
CS 602	Java Programming	
CS 630	Operating System Design	
CS 631	Data Management System Design	
CS 632	Advanced Database System Design	
CS 633	Distributed Systems	

CS 634	Data Mining
CS 635	Computer Programming Languages
CS 652	Cognitive Cloud Networking - Architectures and Applications
CS 656	Internet and Higher-Layer Protocols
CS 659	Image Processing and Analysis
CS 670	Artificial Intelligence
CS 675	Machine Learning
CS 678	Topics in Smartphone Sec & Rel
CS 690	Software Studio
CS 696	Network Management and Security
IS 690	Web Services and Middleware
IS 663	System Analysis and Design
EM 636	Project Management
EM 637	Project Control
MGMT 620	Management of Technology
YWCC 691	Graduate Capstone Project [2]
Total Credits	30

1

Students can take other CS courses with advisor approval

2

Count towards the 12 Elective credits only when completed with an industrial partner, AND with Program Director's approval

Is licensure required of program graduates to gain employment?

Will the institution seek accreditation for this program?

Add any additional information you would like brought

[Comment on October-22 change]: CS 690 is not currently offered. Despite previous efforts, the course has been offered only once so far. Currently, substitutes are found on an individual student basis, requiring individual handling by advisors and faculty. The proposed changes constitute a permanent solution. Also, one course previously omitted has been added (CS 678),

to the attention of CUE/ CGE here	and adjusted footnotes to reflect the other changes. The CS faculty have approved the proposed changes. ~~Title changes CS 652~~

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

Reviewer Comments

Key: 125

Date Submitted: 10/13/22 12:27 pm

Viewing: CC-CS-PHD : PHD. in Computer Science

Last approved: 03/29/21 4:13 pm

Last edit: 10/13/22 12:27 pm

Changes proposed by: Reza Curtmola (crix)

Catalog Pages Using this Program	Ph.D. in Computer Science

Department(s) / College(s)

Department	College
Computer Science (CS)	Ying Wu Coll of Computing (CC)

Name of Program	PHD. in Computer Science
Academic Level(s)	Doctoral
Degree Designation	PHD
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2023-2024

In Workflow

1. **CS Chair**
2. **AIS**
3. **CC Dean**
4. **Vice Provost of Graduate Studies**
5. **President of the Faculty Senate**
6. Provost's Office
7. Academic Issues Committee

Approval Path

1. 10/09/22 9:52 am Vincent Oria (oria): Approved for CS Chair
2. 10/10/22 9:01 am Mesfin Ayne (ayne): Approved for AIS
3. 10/10/22 10:01 am Ali Mili (mili): Approved for CC Dean
4. 10/13/22 11:54 am Sotirios Ziavras

Related Department(s)

If the change involves altering the department's curriculum paradigm as currently outlined in the NJIT catalog, please attach existing and proposed paradigms.

Articulation with other institutions, if any

Objectives

(ziavras): Rollback to Initiator

5. 10/13/22 12:33 pm Vincent Oria (oria): Approved for CS Chair
6. 10/13/22 1:46 pm Mesfin Ayne (ayne): Approved for AIS
7. 10/13/22 3:00 pm Ali Mili (mili): Approved for CC Dean
8. 10/13/22 3:04 pm Sotirios Ziavras (ziavras): Approved for Vice Provost of Graduate Studies

History

1. Feb 23, 2020 by Mesfin Ayne (ayne)
2. Dec 21, 2020 by Reza Curtmola (crix)
3. Feb 28, 2021 by Reza Curtmola (crix)
4. Mar 29, 2021 by Reza Curtmola (crix)

Briefly summarize the program and indicate its objectives; e.g., the nature and focus of the program, the knowledge and skills students will acquire, any cooperative arrangements with other institutions or external agencies in offering this program, etc.

Need

Provide justification of the need for this program. If the program falls within the liberal arts and sciences and does not specifically prepare students for a career, then provide evidence of student demand and indicate opportunities for students to pursue advanced study (if the degree is not terminal with regard to further education). If the program is career-oriented or professional in nature, then in addition to student demand give evidence of labor market need and results of prospective employer surveys. Report labor market need as appropriate on local, regional, and national bases. Specify job titles and entry-level positions for program graduates, and/or indicate opportunities for graduates to pursue additional studies.

Relationship to the University and State Master Plans

Describe the relationship of the program to the following: institutional master plans and priorities.

Relationship to Similar Programs in the State and Region

List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

Distinguished Programs Nationally

For doctoral programs: Supply a select list of distinguished programs nationally in this discipline.

Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

Course
Development Plan

Names of faculty
involved

Libraries and
Computing
Facilities

Classrooms and
Laboratories Needs

Catalog Description (For PHD programs, include information about the qualifying exams, and other program milestones.)

Curriculum

Course Requirements

For students entering the program with a Master's degree in Computer Science or related areas, 12-21 credits at the 600 and 700 level (at least 12 credits at the 700 level) are required. The default requirement is 21 credits, but waivers for 600 level courses may be determined in consultation with and written approval by the PhD committee based on the student's prior background in the three areas of the qualifying examinations. At most 6 credits can be Independent Study in Computer Science (CS 725 and/or CS 726). If a student takes two Independent Study courses, then they should be done with two different professors. At least 6 credits must be for lecture-based courses at the 700 level.
For students entering the program without a Master's degree in Computer Science or related areas, 36 credits at the 600 and 700 level. At least 12 credits must be at the 700 level, and out of those at most 6 credits can be Independent Study in Computer Science (CS 725 and/or CS 726). If a student

takes two Independent Studies, then they should be done with two different professors. At least 6 credits must be for lecture-based courses at the 700 level.

Doctoral Dissertation Credits

The ~~For students who were admitted in the program in the Fall 2015 semester or after, the~~ rules are described at: http://www5.njit.edu/graduatestudies/content/new-phd-credit-requirements/

~~For students who were admitted in the program before the Fall 2015 semester, students must complete 30 credits of CS790.A maximum of 6 credits of CS 792 Pre-Doctoral Research may be used toward the CS 790requirement.~~

CS 791: Doctoral Seminar

Full-time students are required to enroll in CS 791 every semester. *Full-time PhD students are required to attend 2/3 of the weekly Wednesday departmental seminars.*

Qualifying Examinations

All PhD students are required to take qualifying examinations in three areas.

One examination is in the combined area of:

- CS 610Data Structures and Algorithms
- CS 611Introduction to Computability and Complexity

Two examinations are in the following areas:

- CS 630Operating System Design
- CS 631Data Management System Design
- CS 634Data Mining
- CS 656Internet and Higher-Layer Protocols
- CS 659Image Processing and Analysis

CS 670Artificial Intelligence

CS 675Machine Learning

PhD students are allowed to take up to four qualifying examinations and are required to pass at least three out of the four (the combined CS 610 and CS 611 examination must be among the three examinations the students pass). If they fall short of the three examinations in the first year, then they must make up the number of missing examinations the second year and may take one more examination than the number they are required to pass.

Is licensure required of program graduates to gain employment?

No

Will the institution seek accreditation for this program?

No

Add any additional information you would like brought to the attention of CUE/ CGE here

There are no more PhD students in the program who started before Fall 2015. ~~A reduction in the number of required credits from 24 to 21 credits, based on the previously approved reduction in the number of Qual Exams from 4 to 3.~~

Attach any additional information you would like brought to the attention of CUE/ CGE here: Uploaded Files:

Reviewer Comments

Sotirios Ziavras (ziavras) (10/13/22 11:54 am): Rollback: to fix formatting problems

Key: 124