Program Change Request

Date Submitted: 10/05/21 2:28 pm

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

Last approved: 05/12/21 7:09 pm

Last edit: 10/05/21 2:28 pm

Changes proposed by: Mengchu Zhou (zhou)

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

Department(s) /
College(s)

Approval Path

1. 10/26/21 12:56 pm Durga Misra (dmisra): Approved for ECE Chair
2. 10/27/21 8:26 am Mesfin Ayne (ayne): Approved for AIS
3. 11/03/21 11:24 am Kam Moshe (kam): Approved for EN Dean

History

1. Feb 21, 2020 by Mesfin Ayne (ayne)
2. May 12, 2021 by Durga Misra (dmisra)

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	2022-2023
Faculty Senate Review required?	
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

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 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 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)

Course	Title	Credits
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)

Course	Title	Credits
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

MSCoE Required Core Courses

Course	Title	Credits
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 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 MSCoE.

Recommended MSEE 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 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	Renewable Energy Systems	3
ECE 626	Optoelectronics	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 Processing	3
ECE 641	Laboratory for High Performance Digital Signal Processing	3
ECE 642	Communication Systems I	3
ECE 644	Wireless Communication	3
ECE 645	Wireless Networks	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 673	Random Signal Analysis I	3
ECE 681	High Performance Routers and Switches	3
ECE 683	Computer Network Design and Analysis	3
ECE 684	Advanced Microprocessor Systems	3
ECE 690	Computer Systems Architecture	3
ECE 692	Embedded Computing Systems	3
ECE 601	Linear Systems	3
ECE 698	Selected Topics in Electrical and Computer Engineering	3
ECE 744	Optimization for Communication Networks	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 | 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

Program Change Request

Date Submitted: 10/26/21 5:08 pm

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

Last approved: 09/21/20 5:50 pm

Last edit: 10/26/21 5:08 pm

Changes proposed by: Zhi Wei (zhiwei)

Catalog Pages Using
this Program

M.S. in Computer Science

Department(s) /
College(s)

Approval Path

1. 10/26/21 5:43 pm
   Baruch Schieber
   (sbar): Approved for
   CS Chair
2. 10/27/21 8:28 am
   Mesfin Ayne (ayne):
   Approved for AIS
3. 10/27/21 9:42 am
   Ali Mili (mili):
   Approved for CC
   Dean

History

1. May 21, 2020 by Zhi
   Wei (zhiwei)
2. Sep 21, 2020 by Zhi
   Wei (zhiwei)

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	2022-2023

Faculty Senate Review required?

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

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

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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

Students will meet with 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. specialization.

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 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 higher level programming language. For students with no prior programming experiences, 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
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	
CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	

Elective Courses

Two courses from an approved list of 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
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.

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

Bridge Courses

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

[1]

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
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	
CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	
Project		
CS 700B	Master's Project	3
Elective Courses		
One course from an approved list of 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
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.

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 higher level programming language. For students with no prior programming experiences, **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
or CS 667	Design Techniques for Algorithms	
Select three of the following:		9
CS 631	Data Management System Design	

CS 630	Operating System Design	
CS 650	Computer Architecture	
CS 656	Internet and Higher-Layer Protocols	
Thesis		
CS 701B	Master's Thesis	6
& CS 701B	and Master's Thesis	
or CS 701C	Master's Thesis	
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
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.

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 require permission of the graduate 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 require permission of the graduate 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 require permission of the graduate 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 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 must

select a specialization, and

enroll in the Thesis CS 701 course for two (2) semesters (Thesis must match specialization).

A student can enroll in CS 701 during the second semester of full time study. Normally the student enrolls for two semesters of CS 701 to prepare the thesis proposal, perform the research, and prepare the thesis. The thesis must be orally defended and follow the style set forth by the Graduate 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 611	Introduction to Computability and Complexity	3
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 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 667~~	~~Design Techniques for Algorithms~~	~~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 704~~	~~Sequencing and Scheduling~~	~~3~~
~~CS 731~~	~~Applications of Database Systems~~	~~3~~
~~CS 744~~	~~Data Mining and Management in Bioinformatics~~	~~3~~
~~CS 750~~	~~High Performance Computing~~	~~3~~
~~CS 759~~	~~Advanced Image Processing and Analysis~~	~~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

Program Change Request

Date Submitted: 10/05/21 2:33 pm

Viewing: **EN-PES-MS : M.S. in Power and Energy Systems**

Last approved: 05/12/21 7:10 pm

Last edit: 10/27/21 9:36 am

Changes proposed by: Mengchu Zhou (zhou)

Catalog Pages Using
this Program

M.S. in Power and Energy Systems

Department(s) /
College(s)

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

Name of Program	M.S. in Power and Energy Systems
Academic Level(s)	Graduate
Degree Designation	MS
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2022-2023
Faculty Senate Review required?	
Related Department(s)	

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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

Bridge Program

Students who have earned a Bachelor of Science in Engineering Technology (B.S.E.T.) degree, or 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.

Master's Program

This master's program consists of 30 credits. As a requirement for graduation, students must achieve a 3.0 cumulative GPA in graduate-level courses, not including the master's thesis or project. The project grade must be B or better.

Master's Project/Master's Thesis

If you do a Master's Project, you need to take in total 9 courses plus ECE 700B Master's Project; and if you do a Master's thesis, you need to take 8 courses plus two semesters of ECE 701B Master's Thesis. These options are highly recommended if you like research and plan to pursue for your Ph.D. degree.

Additional Thesis Option:

With permission of their research advisor, in MS PES program 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.

M.S. in Power and Energy Systems

Bridge Courses

ECE 321	Random Signals and Noise	3
ECE 232	Circuits and Systems II	3
ECE 333	Signals and Systems	3
ECE 341	Energy Conversion	3
ECE 361	Electromagnetic Fields I	3
ECE 372	Electronic Circuits II	3
Total Credits		18

Core Courses

ECE 601	Linear Systems	3
ECE 610	Power System Steady-State Analysis	3

Specialized Courses/Electives

Select three of the following:		9
ECE 611	Transients in Power Systems	
ECE 616	Power Electronics	
ECE 618	Renewable Energy Systems	
ECE 698	Selected Topics in Electrical and Computer Engineering	
MGMT 620	Management of Technology	

Electives		15
ECE 613	Protection of Power Systems	
ECE 617	Economic Control of Interconnected Power Systems	
ECE 698	Selected Topics in Electrical and Computer Engineering	
ECE 698	Selected Topics in Electrical and Computer Engineering	

ECE 605	Discrete Event Dynamic Systems	
ECE 620	Electromagnetic Field Theory	
ECE 637	Internet and Higher-Layer Protocols	
ECE 658	VLSI Design I	
ECE 661	Control System Components	
ECE 664	Real-time Computer Control Systems	
ECE 673	Random Signal Analysis I	
ECE 681	High Performance Routers and Switches	
ECE 692	Embedded Computing Systems	
ECE 788	Selected Topics in Electrical and Computer Engineering	
ME 607	Advanced Thermodynamics	
ME 610	Applied Heat Transfer	
ENE 671	Environmental Impact Analysis [1]	
IE 614	Safety Engineering Methods	
ARCH 665	Sustainable Design of Energy Efficient Buildings	
Total Credits		30

[1]

MGMT 692 Strategic Management and other business and management courses can be included as optional electives based on the student background, instructor approval and advisor approval.

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

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

Reviewer Comments	**Mesfin Ayne (ayne) (10/27/21 8:25 am):** Rollback: Please review the total credits it mentions 45. The courses need to be indented.

Date Submitted: 11/03/21 3:50 pm

Viewing: **SL-CHEM-PHD : PHD. ~~Phdd.~~in Chemistry**

Last edit: 11/12/21 12:46 pm

Changes proposed by: Edgardo Farinas (edgardo)

Catalog Pages Using
this Program
  Ph.D. in Chemistry

In Workflow

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

Department(s) /
College(s)

Approval Path

1. 11/04/21 12:13 pm
   Omowunmi Sadik
   (sadik): Approved
   for CHES Chair
2. 11/04/21 2:58 pm
   Mesfin Ayne (ayne):
   Approved for AIS
3. 11/04/21 3:37 pm
   John Wolf (jwolf):
   Approved for SL
   Dean
4. 11/12/21 12:46 pm
   Sotirios Ziavras
   (ziavras): Approved
   for Vice Provost of
   Graduate Studies

Department	College
Chemistry & Environmental Sci. (CHES)	Coll of Science & Liberal Arts (SL)

Name of Program   **PHD.** ~~Phdd.~~in Chemistry

Academic Level(s)   Doctoral

Degree Designation   PHD

Campus(es) where   Newark
the program will be

offered

CIP Code

Effective Catalog
Edition
2022-2023

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

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

Ph.D. in Chemistry

Independent Learning

The grounding in scientific research methodology provided by the dissertation requirement is a central focus of the PhD program. One of the primary means of education and training in the PhD program is achieved through successful completion of an original research project in close mentorship by their research adviser and the presentation and defense of the PhD dissertation. This intense research experience provides the education and training necessary for the student to substantiate his/her expertise and develop the skills necessary to become an independent professional. By the end of the second semester, students will choose a dissertation adviser. Students will conduct research either on site at NJIT or at the professional laboratories where they work. In either case, a member of the NJIT Department of Chemistry and Environmental Science faculty will serve as research adviser and approve the research topic. This research culminates in the writing and presentation of the dissertation. The student will present his/her dissertation for examination by a committee consisting of a minimum of five members including the research adviser. One of the committee members will be from outside the

department. A majority of the program committee members will hold tenure-earning faculty appointments in the Department of Chemistry and Environmental Science. The committee has to be approved by the director of the PhD chemistry graduate program, the department chair and the Office of Graduate Studies. With the exception of the outside member, the other committee members need to have graduate faculty status. The dissertation must be judged worthy of publication by the dissertation committee and may not be submitted for examination until so deemed. For students performing their dissertation research off campus, the dissertation adviser will visit the student's laboratory, where their research is to be performed, before the research begins and on a regular basis until the work is complete.

Total Minimum Hours Required for PhD for students entering with Bachelor's Degree (without MS degree) - 36 Credit Hours of 600/700-level Courses

Total Minimum Hours Required for PhD for students entering with MS degree - 12 Credit Hours of 700-level Courses

I. For Students Entering Without a MS Degree

Required Courses   12

Take four of the following five core courses:

CHEM 605	Advanced Organic Chemistry I: Structure	
CHEM 610	Advanced Inorganic Chemistry	
CHEM 658	Advanced Physical Chemistry	
CHEM 661	Instrumental Analysis Laboratory	
CHEM 673	Biochemistry	

If a student successfully completes all five core courses, one course will count towards fulfilling the electives requirement. Students must maintain a 3.0 GPA or higher.

Elective Courses   24

Students are required to take a minimum of eight 600- or 700-level courses (24 credit hours) with at least four (12 credit hours) of these at the 700-level. Courses are to be chosen from the departmental offerings while up to six credit hours may be selected from outside of the department. Up to six credit hours of Independent Study courses may be earned in fulfillment of the elective courses requirement.

CHEM 714	Pharmaceutical Analysis
CHEM 716	Integrated Drug Dev & Discover
CHEM 719	Drug Delivery Systems
CHEM 725	Independent Study I
CHEM 726	Independent Study II
CHEM 737	Applications of Computational Chemistry and Molecular Modeling
CHEM 748	Nanomaterials
CHEM 764	Advanced Analytical Chemistry
CHEM 777	Principles Pharm Chemistry
CHE 681	Course CHE 681 Not Found
CHE 724	Sustainable Energy
EVSC 622	Bioremediation
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
BIOL 645	Biological Imaging Techniques
BME 651	Principles of Tissue Engineering
BME 653	Micro/Nanotechnologies for Interfacing Live Cells
BME 668	Medical Imaging Systems

BME 672	Biomaterials
BME 772	Adv Biomats for Lab and Clinic
MTSE 719	Physical Principles of Characterization of Solids
MTSE 722	Science and Technology of Thin Films
MTSE 724	Transport of Electrons and Phonons in Solids
MTSE 725	Crystallography and Diffraction
MTSE 780	Current Topics in Materials Science and Engineering
Total Credits	36

Dissertation Research Credits

CHEM 792B Pre-Doctoral Research ~~CHEM 792 Pre-Doctoral Research~~ (after completing qualifying exam requirements)

CHEM 790A Doctoral Dissertation ~~CHEM 790 Doctoral Dissertation~~ (after completing research proposal requirements)

Qualifying Examination

By the end of the second year, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee required). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the dissertation committee prior to development of the proposal. Failure to pass the PhD qualifying exam will result in dismissal from the program.

Dissertation Research Proposal

By the end of the first year of passing the qualifying exam, students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

Dissertation Defense

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

II. For Students Entering With a MS Degree

Students with a recognized MS degree in the chemical sciences or closely related field may, with approval of the PhD Chemistry Graduate Committee, be admitted to pursue the PhD degree in chemistry and be required to earn a minimum of 12 credit hours of coursework at the 700-level. In cases where a student with a previous MS degree is not approved to pursue this (accelerated) program, they will follow the program outlined in I above and be eligible to transfer up to nine credit hours from previous graduate courses, similar to students that have prior graduate course credits but no MS degree.

| Elective Courses | 12 |

Students are required to take a minimum of four 700-level courses (12 credit hours). Courses are to be chosen from the departmental offerings while up to three credit hours may be selected from outside of the department.

CHEM 714	Pharmaceutical Analysis
CHEM 716	Integrated Drug Dev & Discover
CHEM 719	Drug Delivery Systems
CHEM 725	Independent Study I
CHEM 726	Independent Study II
CHEM 737	Applications of Computational Chemistry and Molecular Modeling
CHEM 748	Nanomaterials
CHEM 764	Advanced Analytical Chemistry

CHEM 777	Principles Pharm Chemistry
CHE 724	Sustainable Energy
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
BME 772	Adv Biomats for Lab and Clinic
MTSE 719	Physical Principles of Characterization of Solids
MTSE 722	Science and Technology of Thin Films
MTSE 724	Transport of Electrons and Phonons in Solids
MTSE 725	Crystallography and Diffraction
MTSE 780	Current Topics in Materials Science and Engineering

Total Credits   12

Dissertation Research Credits

CHEM 792B **Pre-Doctoral Research** ~~CHEM 792 Pre-Doctoral Research~~ (after completing qualifying exam requirements)

CHEM 790A **Doctoral Dissertation** ~~CHEM 790 Doctoral Dissertation~~ (after completing research proposal requirements)

Qualifying Examination

By the end of the third semester, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the adviser and advisory committee prior to development of the proposal. Failure to pass the PhD proficiency exam will result in dismissal from the program.

Dissertation Research Proposal

Within a year of passing the qualifying exam, students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

Dissertation Defense

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

Grades

All students must maintain a grade point average of at least 3.0.

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

Date Submitted: 11/03/21 3:51 pm

Viewing: **SL-EVSC-PHD : PHD. in Environmental Science**

Last approved: 05/12/21 7:11 pm

Last edit: 11/12/21 12:47 pm

Changes proposed by: Edgardo Farinas (edgardo)

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

Department(s) /
College(s)

History

1. May 12, 2021 by Somenath Mitra (mitra)

Department	College
Chemistry & Environmental Sci. (CHES)	Coll of Science & Liberal Arts (SL)

Name of Program   PHD. in Environmental Science

Academic Level(s)	Doctoral
Degree Designation	PHD
Campus(es) where the program will be offered	Newark
CIP Code	
Effective Catalog Edition	2022-2023
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

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

Ph.D. in Environmental Science

Independent Learning

The grounding in scientific research methodology provided by the dissertation requirement is a central focus of the PhD program. One of the primary means of education and training in the PhD program is achieved through successful completion of an original research project in close mentorship by their research adviser and the presentation and defense of the PhD dissertation. This intense research experience provides the education and training necessary for the student to substantiate his/her expertise and develop the skills necessary to become an independent professional. By the end of the second

semester, students will choose a dissertation adviser. Students will conduct research either on site at NJIT or at the professional laboratories/organizations where they work. In either case, a member of the NJIT Department of Chemistry and Environmental Science faculty will serve as research adviser and approve the research topic. This research culminates in the writing and presentation of the dissertation. The student will present his/her dissertation for examination by a committee consisting of a minimum of five members including the research adviser. One of the committee members will be from outside the department. A majority of the program committee members will hold tenure-earning faculty appointments in the Department of Chemistry and Environmental Science. The committee has to be approved by the director of the PhD Environmental Science graduate program, the department chair and the Office of Graduate Studies. With the exception of the outside member the other committee members need to have graduate faculty status. The dissertation must be judged worthy of publication by the dissertation committee and may not be submitted for examination until so deemed. For students performing their dissertation research off campus, the dissertation adviser will visit the student's laboratory/organization, where their research is to be performed, before the research begins and on a regular basis until the work is complete.

Total Minimum Hours Required for PhD for students entering with Bachelor's Degree (without MS degree) - 36 Credit Hours of 600/700-level Courses

Total Minimum Hours Required for PhD for students entering with MS degree - 12 Credit Hours of 700-level Courses

I. For Students Entering Without a MS Degree

Required Courses

Students must take the following five core courses and maintain a 3.0 GPA or higher: 15

EVSC 610	Environmental Chemical Science
EVSC 612	Environmental Analysis
EVSC 616	Toxicology
EVSC 627	Environmental Microbiology
EM 631	Legal Aspects in Environmental Engineering

Elective Courses   21

Students are required to take a minimum of seven 600- or 700-level courses (21 credit hours) with at least four (12 credit hours) of these at the 700-level. Courses are to be chosen from the departmental offerings or from outside of the department as deemed necessary. Up to six credit hours of Independent Study courses may be earned in fulfillment of the elective courses requirements.

EVSC 622	Bioremediation
EVSC 613	Environmental Problem Solving
EVSC 614	Quantitative Environmental Risk Assessment
EVSC 615	Global Environmental Problems
EVSC 702	Special Topics in Environmental Science II
EVSC 711	Advanced Environmental Analysis
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
EVSC 725	Independent Study I
EVSC 726	Independent Study II
ENE 630	Physical Processes of Env Syst
ENE 660	Introduction to Solid and Hazardous Waste Problems
ENE 661	Environmental Microbiology
ENE 662	Site Remediation

ENE 663	Water Chemistry	
ENE 664	Physical and Chemical Treatment	
ENE 665	Biological Treatment	
ENE 672	Stormwater Management	
ENE 673	Sustainability and Life Cycle Analysis	
IE 615	Industrial Hygiene and Occupational Health	
EPS 612	Introduction to Environmental Policy Studies	
EPS 614	Environmental Economics and Management	
EPS 622	Sustainable Politics and Policy	
EPS 638	Physical Geography	
CHEM 714	Pharmaceutical Analysis	
CHEM 748	Nanomaterials	
CHEM 764	Advanced Analytical Chemistry	
CHE 724	Sustainable Energy	
MTSE 719	Physical Principles of Characterization of Solids	
Total Credits		36

Dissertation Research Credits

EVSC 792B Pre-Doctoral Research (after completing qualifying exam requirements)

EVSC 790A **Doctoral Dissertation** ~~EVSC 790 Doctoral Dissertation~~ (after completing research proposal requirements)

Qualifying Examination

By the end of the second year, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee required). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the dissertation committee prior to development of the proposal. Failure to pass the PhD qualifying exam will result in dismissal from the program.

Dissertation Research Proposal

By the end of the first year of passing the qualifying exam (excluding summers), students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

Dissertation Defense

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

II. For Students Entering With a MS Degree

Students with a recognized MS degree in environmental, chemical and biological sciences or closely related field such as engineering may, with approval of the PhD Graduate Committee be admitted to pursue the PhD degree in Environmental Science and be required to earn a minimum of 12 credit hours of coursework at the 700-level. Students entering the program without a MS in Environmental Science are required to take the core courses outlined in I along with the 700 level credits. Students with a MS in Environmental Science will be waived core requirements if they have taken similar courses before, and will complete only those among the core that they have not completed before.

Elective Courses	12

Students are required to take a minimum of four 700-level courses (12 credit hours). Courses are to be chosen from the departmental offerings while up to three credit hours may be selected from outside of the department.

EVSC 702	Special Topics in Environmental Science II
EVSC 711	Advanced Environmental Analysis
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
EVSC 725	Independent Study I
EVSC 726	Independent Study II
CHEM 714	Pharmaceutical Analysis
CHEM 748	Nanomaterials
CHEM 764	Advanced Analytical Chemistry
CHEM 777	Principles Pharm Chemistry
CHE 724	Sustainable Energy
MTSE 719	Physical Principles of Characterization of Solids
Total Credits	12

Dissertation Research Credits

EVSC 792B Pre-Doctoral Research (after completing qualifying exam requirements)

EVSC 790A **Doctoral Dissertation** ~~EVSC 790 Doctoral Dissertation~~ (after completing research proposal requirements)

Qualifying Examination

By the end of the second year, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the adviser and advisory committee prior to development of the proposal. Failure to pass the PhD proficiency exam will result in dismissal from the program.

Dissertation Research Proposal

Within a year of passing the qualifying exam, students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

Dissertation Defense

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

Grades

All students must maintain a grade point average of at least 3.0.

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