




# Proposal for a Revised Degree Program: Departmental Approvals

This form can be digitally signed and submitted to [gso-forms@njit.edu](mailto:gso-forms@njit.edu)

Degree Program Revision (include name): PhD in CS College: YWCC Dept: CS


Date Proposed: 10/20/2019

Departmental Approval (include name) and Date:  Digitally signed by Baruch Schieber Date: 2019.11.07 13:07:31 -05'00' 11/07/2019

Dean's Approval and Date:  11/8/2019

Date to be presented to the Committee on Graduate Education: 11/21/2019

Additional Approvals and Dates (if any): (see below) \_\_\_\_\_

Department Chair	Signature and Date
Baruch Schieber	 <small>Digitally signed by Baruch Schieber Date: 2019.11.07 13:07:45 -05'00'</small>

When will the revision be offered?

- Spring 20\_\_     
  Summer 20\_\_     
  Fall 20\_\_

**Ph.D. in Computer Science program change description:**

The following sentence is added to the catalog description of the PhD in CS:  
"At least 6 credits must be for lecture-based courses at the 700 level."

As a result, the first two paragraphs in the catalog description will now read:

"Course Requirements

For students entering the program with a Master's degree in Computer Science or related areas, 12-24 credits at the 600 and 700 level (at least 12 credits at the 700 level). The default requirement is 24 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 four 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."

## Catalog Changes for MS Computer Engineering

### Requirement for Change:

The changes are required to (i) streamline the course offerings (reduce the cancellation of courses for low enrollment), (ii) address the needs of students and (iii) improving efficiency of advising.

### Summary of Changes:

1. The requirement of two focus area courses has changed.
2. It provides greater flexibility for the students to select courses and reflects the current situation with the MS programs enrollment.

## M.S. in Computer Engineering

### 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.

### 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.

<b>Bridge Courses (undergraduate degree in computer science)</b>		
<u>ECE 353</u>	Computer Organization and Architecture	3
<u>ECE 395</u>	Microprocessor Laboratory	2
<u>ECE 231</u>	Circuits and Systems I	3
<u>ECE 684</u>	Advanced Microprocessor Systems	3
<b>Total Credits</b>		<b>11</b>
<b>Bridge Courses (undergraduate degree in electrical engineering)</b>		
<u>CS 505</u>	Programming, Data Structures, and Algorithms	3
or <u>CS 506</u>	Foundations of Computer Science	
<u>ECE 353</u>	Computer Organization and Architecture	3
<u>ECE 395</u>	Microprocessor Laboratory	2
<u>ECE 684</u>	Advanced Microprocessor Systems	3
<b>Total Credits</b>		<b>11</b>

<b>MSCoE Required Core Courses</b>		
<u>CS 610</u>	Data Structures and Algorithms	3
<u>ECE 690</u>	Computer Systems Architecture	3
<b>Total Credits</b>		<b>6</b>

**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 credits, 3 contact hours.
- ECE 610. Power System Steady-State Analysis. 3 credits, 3 contact hours.
- ECE 611. Transients in Power Systems. 3 credits, 3 contact hours.
- ECE 613. Protection of Power Systems. 3 credits, 3 contact hours.
- ECE 616. Power Electronics. 3 credits, 3 contact hours.
- ECE 617. Economic Control of Interconnected Power Systems. 3 credits, 3 contact hours.
- ECE 618. Renewable Energy Systems. 3 credits, 3 contact hours.
- ECE 626. Optoelectronics. 3 credits, 3 contact hours.
- ECE 636. Computer Networking Laboratory. 3 credits, 3 contact hours.
- ECE 637. Internet and Higher-Layer Protocols. 3 credits, 3 contact hours.
- ECE 639 Principles of Broadband Networks. 3 credits, 3 contact hours.
- ECE 640. Digital Signal Processing. 3 credits, 3 contact hours.
- ECE 641. Laboratory for High Performance Digital Signal Processing. 3 credits, 3 contact hours.
- ECE 642. Communication Systems I. 3 credits, 3 contact hours.
- ECE 644. Wireless Communication. 3 credits, 3 contact hours.
- ECE 645. Wireless Networks. 3 credits, 3 contact hours.
- ECE 657. Semiconductor Devices. 3 credits, 3 contact hours.
- ECE 658. VLSI Design I. 3 credits, 3 contact hours.
- ECE 660. Control Systems I. 3 credits, 3 contact hours.
- ECE 661. Control System Components. 3 credits, 3 contact hours.
- ECE 681. High Performance Routers and Switches. 3 credits, 3 contact hours.
- ECE 683. Computer Network Design and Analysis. 3 credits, 3 contact hours.
- ECE 684. Advanced Microprocessor Systems. 3 credits, 3 contact hours.
- ECE 690. Computer Systems Architecture. 3 credits, 3 contact hours.
- ECE 692. Embedded Computing Systems. 3 credits, 3 contact hours.
- ECE 698. Selected Topics in Electrical and Computer Engineering. 3 credits, 3 contact hours.
- ECE 744. Optimization for Communication Networks. 3 credits, 3 contact hours.
- ECE 754. Statistical Machine Learning and Pattern Recognition. 3 credits, 3 contact hours.
- ECE 758. VLSI Design II. 3 credits, 3 contact hours.

ECE 776. Information Theory. 3 credits, 3 contact hours.

ECE 783. Computer Communication Networks. 3 credits, 3 contact hours.

ECE 788. ECE 788. Selected Topics in Electrical and Computer Engineering. 3 credits, 3 contact hours.

### **Project**

ECE 700B. Master's Project. 3 credits, 3 contact hours.

### **Thesis**

ECE 701B Master's Thesis. 3 credits, 3 contact hours.

ECE 791 Graduate Seminar<sup>1</sup>. 0 credits

<sup>1</sup>Not Mandatory for MS Students

## **Catalog Changes for MS Electrical Engineering**

### **Requirement for Change:**

The changes are required to (i) streamline the course offerings (reduce the cancellation of courses for low enrollment), (ii) address the needs of students and (iii) improving efficiency of advising.

### **Summary of Changes:**

1. The requirement of two focus area courses has changed.
2. It provides greater flexibility for the students to select courses and reflects the current situation with the MS programs enrollment.

## M.S. in Electrical Engineering

### Degree Requirements

The MSEE program at NJIT is flexible and customizable to a student's individual goals. It allows students to pursue electrical 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 engineering topics including physical devices, circuits and systems, communications and networking, signal, information and data processing. BS EE 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 MSEE 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 electrical engineering.

### 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.

Code	Title	Credits
<b>MSEE Bridge Courses</b>		
<u>ECE 321</u>	Random Signals and Noise	3
<u>ECE 232</u>	Circuits and Systems II	3
<u>ECE 333</u>	Signals and Systems	3
<u>ECE 361</u>	Electromagnetic Fields I	3
<u>ECE 362</u>	Electromagnetic Fields II	3
<u>ECE 372</u>	Electronic Circuits II	3
<b>Total Credits</b>		<b>18</b>
<b>MSEE Required Core Courses</b>		
<u>ECE 601</u>	Linear Systems	3
<u>ECE 673</u>	Random Signal Analysis I	3



**ECE Department Focused Areas:** Communications, Signal Processing and Microwave; Computer Networking; Computer Architecture; Solid State, VLSI and Electro-optics Systems; Intelligent Systems.

Students need to contact the MSEE Program Adviser or designee for guidance and suggested courses for different focus areas. Two non-ECE graduate courses of 600 level may be chosen and must be approved as not all outside ECE department courses are applied for MSEE.

**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 credits, 3 contact hours.
- ECE 610. Power System Steady-State Analysis. 3 credits, 3 contact hours.
- ECE 611. Transients in Power Systems. 3 credits, 3 contact hours.
- ECE 613. Protection of Power Systems. 3 credits, 3 contact hours.
- ECE 616. Power Electronics. 3 credits, 3 contact hours.
- ECE 617. Economic Control of Interconnected Power Systems. 3 credits, 3 contact hours.
- ECE 618. Renewable Energy Systems. 3 credits, 3 contact hours.
- ECE 626. Optoelectronics. 3 credits, 3 contact hours.
- ECE 636. Computer Networking Laboratory. 3 credits, 3 contact hours.
- ECE 637. Internet and Higher-Layer Protocols. 3 credits, 3 contact hours.
- ECE 639 Principles of Broadband Networks. 3 credits, 3 contact hours.
- ECE 640. Digital Signal Processing. 3 credits, 3 contact hours.
- ECE 641. Laboratory for High Performance Digital Signal Processing. 3 credits, 3 contact hours.
- ECE 642. Communication Systems I. 3 credits, 3 contact hours.
- ECE 644. Wireless Communication. 3 credits, 3 contact hours.
- ECE 645. Wireless Networks. 3 credits, 3 contact hours.
- ECE 657. Semiconductor Devices. 3 credits, 3 contact hours.
- ECE 658. VLSI Design I. 3 credits, 3 contact hours.
- ECE 660. Control Systems I. 3 credits, 3 contact hours.
- ECE 661. Control System Components. 3 credits, 3 contact hours.
- ECE 681. High Performance Routers and Switches. 3 credits, 3 contact hours.
- ECE 683. Computer Network Design and Analysis. 3 credits, 3 contact hours.
- ECE 684. Advanced Microprocessor Systems. 3 credits, 3 contact hours.
- ECE 690. Computer Systems Architecture. 3 credits, 3 contact hours.
- ECE 692. Embedded Computing Systems. 3 credits, 3 contact hours.
- ECE 698. Selected Topics in Electrical and Computer Engineering. 3 credits, 3 contact hours.
- ECE 744. Optimization for Communication Networks. 3 credits, 3 contact hours.
- ECE 754. Statistical Machine Learning and Pattern Recognition. 3 credits, 3 contact hours.
- ECE 758. VLSI Design II. 3 credits, 3 contact hours.
- ECE 776. Information Theory. 3 credits, 3 contact hours.
- ECE 783. Computer Communication Networks. 3 credits, 3 contact hours.
- ECE 788. ECE 788. Selected Topics in Electrical and Computer Engineering. 3 credits, 3 contact hours.

**Project**

- ECE 700B. Master's Project, 3 credits, 3 contact hours.

**Thesis**

ECE 701B Master's Thesis, 3 credits, 3 contact hours. For two semesters

ECE 791 Graduate Seminar<sup>1</sup>, 0 credits

<sup>1</sup>Not Mandatory for MS Students

Justification: The numbers of ME 791 and ME 794 were recently swapped. This change requires a minor curriculum update.

## MS in Mechanical Engineering

Please update the following webpage to reflect the recent change to the curriculum:

<https://catalog.njit.edu/graduate/newark-college-engineering/mechanical-industrial/mechanical-ms/index.html>

## Degree Requirements

Students who lack appropriate undergraduate preparation may be admitted and are asked to make up deficiencies by taking a program of bridge courses that is designed in consultation with the graduate advisor. These courses are taken in addition to the degree requirements and may include undergraduate courses.

The Master of Science in Mechanical Engineering program offers three areas of specialization.

1. *CAD/CAM, Mechanisms & Control* - computer aided engineering, mechanisms, biomechanical & medical devices, robotics and controls.
2. *Mechanics & Material Processing* - tissues & biomechanics, continuum mechanics, plastics, micro/nano materials, particle technology.
3. *Thermo-Fluid Systems & Energy* - biofluids, computational & multiphase fluid dynamics, granular science, HVAC, energy.

The student consults the graduate advisor to plan and develop an individualized and cohesive sequence of courses that meet program requirements of at least 30 degree credits. The MS degree students opting for the project or thesis option must make an arrangement with a faculty member for supervision and obtain the departmental approval in order to receive permits to register for the proper section. Students opting for a project must register for the M.S. project (ME 700) for 3 credits. Students opting for a thesis must register for the M.S. thesis (ME 701) for 6 credits and successfully defend the thesis before graduation. Thesis option is required of all students who receive departmental or research-based awards.

*Seminar:* In addition to the minimum 30 degree credits required, every student must take a minimum of two semesters of [ME 791](#) Mechanical Engineering Colloquium. Students who receive departmental or research-based awards must enroll every semester in [ME 791](#) Mechanical Engineering Colloquium.

### **M.S. in Mechanical Engineering (courses only)**

Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Required Courses		
<a href="#">ME 616</a>	Matrix Methods in Mechanical Engineering	3
or <a href="#">MATH 651</a>	Methods of Applied Mathematics I	
Select three of the following:		9
<a href="#">ME 610</a>	Applied Heat Transfer	
<a href="#">ME 611</a>	Dynamics of Incompressible Fluids	
<a href="#">ME 614</a>	Continuum Mechanics	
<a href="#">ME 620</a>	Mechanics of Materials	
<a href="#">ME 632</a>	Mechanical Engineering Measurements	
<a href="#">ME 635</a>	Computer-Aided Design	
Elective ME Graduate Courses		
Select three or more of the following:		9
<a href="#">ME 607</a>	Advanced Thermodynamics	
<a href="#">ME 618</a>	Selected Topics in Mechanical Engineering	
<a href="#">ME 621</a>	Advanced Mechanics of Material	
<a href="#">ME 622</a>	Finite Element Methods in Mechanical Engineering	
<a href="#">ME 624</a>	Microlevel Modeling in Particle Technology	
<a href="#">ME 625</a>	Introduction to Robotics	
<a href="#">ME 630</a>	Analytical Methods in Machine Design	
<a href="#">ME 636</a>	Mechanism Design: Analysis and Synthesis	
<a href="#">ME 637</a>	Kinematics of Spatial Mechanisms	
<a href="#">ME 655</a>	Introduction to Modern Control Methods	
<a href="#">ME 670</a>	Introduction to Biomechanical Engineering	
<a href="#">ME 678</a>	Engineering Design of Plastic Products	
<a href="#">ME 679</a>	Polymer Processing Techniques	
<a href="#">ME 712</a>	Mechanics of Viscous Fluids	

Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
<a href="#">ME 713</a>	Non-Newtonian Fluid Dynamics	
<a href="#">ME 714</a>	Principles of Particulate Multiphase Flows	
<a href="#">ME 717</a>	Selected Topics in Mechanical Engineering I	
<a href="#">ME 718</a>	ST: (Selected Topics in Mechanical Engineering II)	
<a href="#">ME 735</a>	Advanced Topics in Robotics	
<a href="#">ME 736</a>	Advanced Mechanism Design	
<a href="#">ME 738</a>	Computer Aided Engineering	
General Elective Courses		
Graduate courses from other departments or programs		9
Seminar		
<a href="#">ME 791</a>	Mechanical Engineering Colloquium <sup>1</sup>	0
Total Credits		30

<sup>1</sup> Required for two semesters.

**M.S. in Mechanical Engineering (Master's project)**

Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Required Courses		
<a href="#">ME 616</a>	Matrix Methods in Mechanical Engineering	3
or <a href="#">MATH 651</a>	Methods of Applied Mathematics I	
Select three of the following:		9
<a href="#">ME 610</a>	Applied Heat Transfer	
<a href="#">ME 611</a>	Dynamics of Incompressible Fluids	
<a href="#">ME 614</a>	Continuum Mechanics	
<a href="#">ME 620</a>	Mechanics of Materials	
<a href="#">ME 632</a>	Mechanical Engineering Measurements	
<a href="#">ME 635</a>	Computer-Aided Design	

Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Project		
<a href="#">ME 700B</a>	Master's Project	3
Elective ME Graduate Courses		
Select two or more of the following:		6
<a href="#">ME 607</a>	Advanced Thermodynamics	
<a href="#">ME 618</a>	Selected Topics in Mechanical Engineering	
<a href="#">ME 621</a>	Advanced Mechanics of Material	
<a href="#">ME 622</a>	Finite Element Methods in Mechanical Engineering	
<a href="#">ME 624</a>	Microlevel Modeling in Particle Technology	
<a href="#">ME 625</a>	Introduction to Robotics	
<a href="#">ME 630</a>	Analytical Methods in Machine Design	
<a href="#">ME 636</a>	Mechanism Design: Analysis and Synthesis	
<a href="#">ME 637</a>	Kinematics of Spatial Mechanisms	
<a href="#">ME 655</a>	Introduction to Modern Control Methods	
<a href="#">ME 670</a>	Introduction to Biomechanical Engineering	
<a href="#">ME 678</a>	Engineering Design of Plastic Products	
<a href="#">ME 679</a>	Polymer Processing Techniques	
<a href="#">ME 712</a>	Mechanics of Viscous Fluids	
<a href="#">ME 713</a>	Non-Newtonian Fluid Dynamics	
<a href="#">ME 714</a>	Principles of Particulate Multiphase Flows	
<a href="#">ME 717</a>	Selected Topics in Mechanical Engineering I	
<a href="#">ME 718</a>	ST: (Selected Topics in Mechanical Engineering II)	
<a href="#">ME 735</a>	Advanced Topics in Robotics	
<a href="#">ME 736</a>	Advanced Mechanism Design	
<a href="#">ME 738</a>	Computer Aided Engineering	

General Elective Courses

## Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Graduate courses from other departments or programs		9
Seminar		
<a href="#">ME 791</a>	Mechanical Engineering Colloquium <sup>1</sup>	0
Total Credits		30

<sup>1</sup> Required for two semesters.

## **M.S. in Mechanical Engineering (Master's thesis)**

### Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Required Courses		
<a href="#">ME 616</a>	Matrix Methods in Mechanical Engineering	3
or <a href="#">MATH 651</a>	Methods of Applied Mathematics I	
Select three of the following:		9
<a href="#">ME 610</a>	Applied Heat Transfer	
<a href="#">ME 611</a>	Dynamics of Incompressible Fluids	
<a href="#">ME 614</a>	Continuum Mechanics	
<a href="#">ME 620</a>	Mechanics of Materials	
<a href="#">ME 632</a>	Mechanical Engineering Measurements	
<a href="#">ME 635</a>	Computer-Aided Design	
Thesis <sup>1</sup>		
<a href="#">ME 701B</a> & <a href="#">ME 701B</a>	Master's Thesis and Master's Thesis	6
or <a href="#">ME 701C</a>	Master's Thesis	
Elective ME Graduate Courses		
Select one or more of the following:		3
<a href="#">ME 607</a>	Advanced Thermodynamics	
<a href="#">ME 618</a>	Selected Topics in Mechanical Engineering	

## Course List

<b>Code</b>	<b>Title</b>	<b>Credits</b>
<a href="#">ME 621</a>	Advanced Mechanics of Material	
<a href="#">ME 622</a>	Finite Element Methods in Mechanical Engineering	
<a href="#">ME 624</a>	Microlevel Modeling in Particle Technology	
<a href="#">ME 625</a>	Introduction to Robotics	
<a href="#">ME 630</a>	Analytical Methods in Machine Design	
<a href="#">ME 636</a>	Mechanism Design: Analysis and Synthesis	
<a href="#">ME 637</a>	Kinematics of Spatial Mechanisms	
<a href="#">ME 655</a>	Introduction to Modern Control Methods	
<a href="#">ME 670</a>	Introduction to Biomechanical Engineering	
<a href="#">ME 678</a>	Engineering Design of Plastic Products	
<a href="#">ME 679</a>	Polymer Processing Techniques	
<a href="#">ME 712</a>	Mechanics of Viscous Fluids	
<a href="#">ME 713</a>	Non-Newtonian Fluid Dynamics	
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<a href="#">ME 735</a>	Advanced Topics in Robotics	
<a href="#">ME 736</a>	Advanced Mechanism Design	
<a href="#">ME 738</a>	Computer Aided Engineering	
General Elective Courses		
Graduate courses from other departments or programs		9
Seminar		
<a href="#">ME 791</a>	Mechanical Engineering Colloquium <sup>2</sup>	0
Total Credits		30

<sup>1</sup> Required of all students who receive departmental or research-based awards.

<sup>2</sup> Required every semester.





## Master's Thesis motion

Students intending to do an MS thesis must first register in the MS project course (700B). They must receive a "B" or higher grade in 700B before MS thesis registration (701B) in the following semester with the same advisor. The MS thesis topic should be continuation of the work done in 700B.

# Ph.D. in Computer Science

Academic Advisor: <https://cs.njit.edu/phd-computer-science>

[Home](#) » [Graduate Catalog](#) » [Ying Wu College of Computing](#) » [Computer Science](#) » Ph.D. in Computer Science

## Course Requirements

For students entering the program with a Master's degree in Computer Science or related areas, 12-24 credits at the 600 and 700 level (at least 12 credits at the 700 level). The default requirement is 24 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 four 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

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 CS 790. A maximum of 6 credits of CS 792 Pre-Doctoral Research may be used toward the CS 790 requirement.

## 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 four areas.

**Two examinations are in the following two areas:**

<a href="#">CS 610</a>	Data Structures and Algorithms
<a href="#">CS 611</a>	Introduction to Computability and Complexity

**Two examinations are in the following areas:**

<a href="#">CS 630</a>	Operating System Design
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[CS 631](#) Data Management System Design

[CS 634](#) Data Mining

[CS 650](#) Computer Architecture

[CS 656](#) Internet and Higher-Layer Protocols

[CS 659](#) Image Processing and Analysis

[CS 661](#) Systems Simulation

[CS 670](#) Artificial Intelligence

[CS 675](#) Machine Learning

[BNFO 601](#) Foundations of Bioinformatics I

or [BNFO 602](#)

PhD students are allowed to take five qualifying examinations and are required to pass at least four out of the five (CS 610 and CS 611 must be among the four courses the students pass). If they fall short of the four examinations on 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.