

# **Northeastern University**

## **Graduate Program Guide**

**Department of Electrical and Computer Engineering**

**Spring 2016**

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## **Acronyms**

**CCSP:** Communications, Control, and Signal Processing

**CMPE:** Computer Engineering

**CNWS:** Computer Networks and Security

**COE:** College of Engineering

**CSYS:** Computer Systems and Software

**CVLA:** Computer Vision, Machine Learning, and Algorithms

**DF:** Dean's Fellow(ship)

**DDF:** Distinguished Dean's Fellow(ship)

**ECE:** Electrical and Computer Engineering

**ELPO:** Electromagnetics, Plasma, and Optics

**FT:** Full-time

**GAC:** Graduate Affairs Committee

**GSE:** Graduate School of Engineering

**IP:** In Progress

**ISSI:** International Students and Scholars Institute

**MSC:** MSECE, course-only track

**MSECE:** Master of Science in Electrical and Computer Engineering

**MSMD:** Microsystems, materials, and devices

**MST:** MSECE, course-thesis track

**NU:** Northeastern University

**NUID:** Northeastern University Identification Number

**PhDCE:** PhD in Computer Engineering

**PhDEE:** PhD in Electrical Engineering

**POWR:** Power Systems, Power Electronics, and Motion Control

**PT:** Part-time

**QE:** Qualifying Exam

**RA:** Research Assistant(ship)

**SH:** Semester Hour

**S/U:** Satisfactory or Unsatisfactory

# 1 General Information

This document provides information about the graduate program at the ECE Department, Northeastern University. Graduate students are expected to read this document and be familiar with the rules and regulations and refer to it when they have questions about the program.

## 1.1 Graduate Programs and Degrees

The ECE Department offers three graduate programs, MSECE, PhDEE, and PhDCE. All programs can be pursued full-time or part-time (FT or PT). Applicants with a BS or MS degree in electrical engineering, or a closely related field, can apply either to the MSECE or one of the PhD programs. In other words, for applying to the PhD programs it is not required to hold an MS degree.

## 1.2 MSECE Tracks

MSECE applicants, at the time they apply to the program, select one of the two tracks: the course-thesis track (MST), or the course-only track (MSC). Students applying to the MST program will also be considered for admission to the MSC program. Applicants to the PhD, who are not admitted to PhD, will be automatically considered for MSECE admission. Changing tracks is possible after finishing one semester in the original track. Please refer to Section 13 for details, conditions, and requirements.

## 1.3 MSECE Concentrations

Starting with spring 2016, MSECE applicants select one of the seven concentrations of study at the time they apply for admission. These concentrations are:

1. Communications, Control, and Signal Processing (CCSP)
2. Computer Networks and Security (CNWS)
3. Computer Systems and Software (CSYS)
4. Computer Vision, Machine Learning, and Algorithms (CVLA)
5. Electromagnetics, Plasma, and Optics (ELPO)
6. Microsystems, Materials, and Devices (MSMD)
7. Power Systems, Power Electronics, and Motion Control (POWR)

Prior to spring 2016, the three new concentrations CNWS, CSYS, and CVLA, were one concentration, Computer Engineering (CMPE). The continuing CMPE students who do not graduate in spring or summer 2016, can change to one of the three new concentrations if they so desire. The details of the process will be communicated to the students in early spring semester 2016. Students graduating in spring and summer 2016 will graduate in Computer Engineering (CMPE). The CMPE concentration will continue to exist at the PhD level. At the MSECE level, no new students will be admitted in this concentration.

Change of concentration after finishing one semester in the original concentration is possible by filing a petition. Only a fraction of petitions for changing concentration are approved. Details can be found in Sections 13 and 9.

## 1.4 PhD Concentrations

PhD students can enter the PhD program either with a BS degree or with a Master's degree.

**1) PhD students entering the program with a BS degree:** PhDCE students need to first complete Master's degree requirements in one of the three concentrations of CNWS, CSYS, or CVLA. PhDEE students will complete their Master's program requirements in one of the four concentrations of CCSP, ELPO, MSMD, or POWR.

After finishing Master's requirements, PhDCE students will be collectively in the CMPE concentration and PhDEE students continue to be in the concentration that they finished their Master's in.

**2) PhD students entering the program with a Master's degree:** PhDCE students will be in the CMPE concentration and PhDEE students will be in one of the four concentrations of CCSP, ELPO, MSMD, or POWR.

Change of concentration and program (from PhDCE to PhDEE or vice versa, and from PhD programs to MSECE) is possible after completing one semester in the original program/concentration. For details see Section 13.

## 1.5 Graduate Advising

PhD students are assigned academic advisors before matriculation. For the students who are supported by Research Assistantship (RA), Dean's Fellowship (DF), and Distinguished Dean's Fellowships (DDF), the academic advisor is the supporting faculty who is their research advisor as well.

As soon as PhD and MST students have the agreement of a faculty member to be their research advisor, and have completed and submitted the **PhD Research Advisor Form**, their research advisor will also serve as their academic advisor.

MST students, and MST students before having a research advisor, will be advised by Faith Crisley, the student services coordinator of the ECE department, or Matthew Podgurski, the student services specialist in the GSE, on rules and regulations. If needed, they will be referred to the relevant faculty for advise on course content.

## 2 The ECE Graduate Curriculum

It is essential to know the meaning of **DEPTH**, **BREADTH**, and **EXCLUDED** courses in the graduate curriculum. These notions are only relevant to MSECE students and PhD students while they are completing the MSECE requirements.

### 2.1 Depth Courses

These courses provide depth of knowledge in one of the seven MSECE concentrations. Depth courses depend on concentration and are listed under "Depth Courses" for each concentration (see pages 21-27). Some courses are listed as depth course for multiple concentrations.

Depth courses can be ECE or non-ECE courses (for instance, a number of CS and MATH courses are listed under CNWS, CSYS, and CVLA as "Depth Courses"). *No petition is required* to register in depth courses; this applies to both ECE and non-ECE depth courses. Please note that in some

older documents “Depth Courses” are referred to as “Approved Concentration Courses”; there is no difference between these two names.

## 2.2 Breadth Courses

These courses are required to provide knowledge in areas besides student’s concentration. Any graduate-level course **that is not a depth course for a student’s concentration** (i.e., is not listed under the "Depth Courses" of *his/her concentration*) can be a *potential* "Breadth Course".

There are two categories of breadth courses:

- 1) **Courses not listed as depth course for a student’s concentration but listed as a depth course for another concentration:** These can be ECE or non-ECE courses. Registering in these courses *does not require a petition*.
- 2) **Non-ECE graduate courses that are not depth for any ECE concentration:** These are usually graduate courses in a department closely related to ECE. Registration in these courses *requires filing a petition, and getting its approval, before registering in the course*. The details of how to file a petition are explained in Section 9.

## 2.3 Excluded Courses

These courses *cannot* be selected as part of your MSECE program and, therefore, cannot be petitioned. These are generally non-ECE courses. Please see Section 14.10 for the list of excluded courses.

## 3 Checklist for MSECE Course-only Track (MSC) Students

Please use the following checklist for successful progress towards MSECE (course-only track):

- Step 1** Make sure that you read this document thoroughly and you know all the requirements for your degree.
- Step 2** Plan a program of study for your degree based on depth and breadth requirements as explained below. When in doubt, contact Faith Crisley at [f.crisley@neu.edu](mailto:f.crisley@neu.edu) or Matthew Podgurski at [m.podgurski@neu.edu](mailto:m.podgurski@neu.edu). Make sure that in your plan of study all prerequisites are taken before the time you plan to register in a course (for course description and pre-requisites see [here](#)). You need to complete **32 SH of graduate-level course work** to graduate. The details are given below.
- Step 3** **Depth Requirements:** Refer to the list of “Depth Courses” for *your concentration* on pages 21–27). You need to take and successfully complete **at least five** “Depth Courses” (20 SH).
- Step 4** **Breadth Requirements:** Graduate level courses outside your “Depth Courses”, whether in ECE or in a closely related department, can be taken as “Breadth Courses”. You need to complete **at least two** “Breadth Courses” (8 SH) to graduate.

- Note 1** If you plan to take a non-ECE breadth course that is *not* on the list of “Depth Courses” of one of the ECE concentration, you need to file a petition *before registration in the course*. See Section 9 on how to file a petition.
- Note 2** Courses that are listed under “Excluded Courses” **cannot** be taken towards the MSECE degree. Please do not file petition to take these courses. Such petitions are automatically rejected. See Section 14.10 for the list of excluded courses.
- Note 3** The total number of non-ECE courses that you can take, *whether they are depth or breadth courses*, cannot be more than two courses (8 SH) for CCSP, ELPO, MSMD, and POWR students. CMPE, CNWS, CSYS, and CVLA students can take up to three non-ECE courses (12 SH).
- Note 4** If you want to register in a CS class and you find the course is closed, you need to send an email to Danielle DiFazio at [d.difazio@neu.edu](mailto:d.difazio@neu.edu). She will help you to override registration limitation or will add your name to the course waiting list.
- Note 5** You may register for EECE7400 (Special Problems in ECE, 1–4 SH) for *at most* 4 SH in your MSECE program. Registration in this course requires filing a petition and the override form (see Section 9).
- Note 6** A maximum of 9 SH of graduate level course work can be transferred from other institutions. Transfer credit is subject to approval of the Graduate Affairs Committee (GAC) and requires filing a petition (see Section 9 on how to file a petition). You need to have a grade of at least B in transfer courses. Transfer courses should not have been previously counted towards obtaining a degree. For more details see Section 12.
- Note 7** You graduate when you have successfully passed 32 SH of courses and have fulfilled the requirements as described above. To graduate you must have a cumulative GPA of at least 3.00 with no more than 8 semester hours of grades below B– in all courses applied to the degree.

## 4 Checklist for MSECE Thesis-Course Track (MST) Students

Please use the following checklist for successful progress towards MSECE (thesis-course track):

- Step 1** Make sure that you read this document thoroughly and you know all the requirements for your degree.
- Step 2** Plan a program of study for your degree based on depth and breadth requirements as explained below. When in doubt, if you have a research advisor, consult with him/her. If you do not yet have a research advisor contact Faith Crisley at [f.crisley@neu.edu](mailto:f.crisley@neu.edu) or Matthew Podgurski at [m.podgurski@neu.edu](mailto:m.podgurski@neu.edu). Make sure that in your plan of study all prerequisites are taken before the time you plan to register in a course (for course description and pre-requisites see [here](#)). You need to complete **24 SH of graduate-level course work plus 8 SH of thesis** to graduate. The details are given below.
- Step 3** Talk to the ECE faculty about their research interests and find a research advisor whose research matches your interests and background. Your research advisor can be any



tenured, tenure-track, affiliated, or adjunct ECE faculty. A list of ECE faculty can be found on the ECE website. After finding a research advisor, he/she will be your academic advisor as well. The deadline for finding a research advisor is *one year after your matriculation* at NEU. If you cannot find a research advisor, you need to file a petition to change to MSECE course-only track (MSC).

**Step 4** **Depth Requirements:** Refer to the list of “Depth Courses” for *your concentration* on pages 21-27). You need to take and successfully complete **at least three** “Depth Courses” (12 SH).

**Step 5** **Breadth Requirements:** Graduate level courses outside your “Depth Courses”, whether in ECE or in a closely related department, can be taken as “Breadth Courses”. You need to complete **at least two** “Breadth Courses” (8 SH). If your research advisor recommends, the number of “Breadth Courses” can be reduced to one (4SH); you need to file a petition for this. See Section 9 on how to file a petition.

**Note 1** If you plan to take a non-ECE breadth course that is *not* on the list of “Depth Courses” of one of the ECE concentration, you need to file a petition *before registration in the course*. See Section 9 on how to file a petition.

**Note 2** Courses that are listed under “Excluded Courses” **cannot** be taken towards the MSECE degree. Please do not file petition to take these courses. Such petitions are automatically rejected. See Section 14.10 for the list of excluded courses.

**Note 3** The total number of non-ECE courses that you can take, *whether they are depth or breadth courses*, cannot be more than three courses (12 SH).

**Note 4** If you want to register in a CS class and you find the course is closed, you need to send an email to Danielle DiFazio at [d.difazio@neu.edu](mailto:d.difazio@neu.edu). She will help you to override registration limitation or will add your name to the course waiting list.

**Note 5** You may register for EECE7400 (Special Problems in ECE, 1-4 SH) for *at most* 4 SH in your MSECE program. Registration in this course requires filing a petition and the override form (see Section 9).

**Note 6** A maximum of 9 SH of graduate level course work can be transferred from other institutions. Transfer credit is subject to approval of the Graduate Affairs Committee (GAC) and requires filing a petition (see Note 1 above on how to file a petition). You need to have a grade of at least B in transfer courses. Transfer courses should not have been previously counted towards obtaining a degree. For details see Section 12.

**Step 6** **Thesis Requirements:** You need to register for 8 SH in EECE 7990 (Master’s Thesis). This is usually done in two semesters, each semester 4 SH, but can also be done in one semester for 8 SH.

**Note 1** If after taking 8 SH of EECE 7990 (Master’s Thesis), you have not yet successfully defended your thesis, you need to register each semester in EECE 7996 (Master’s Thesis Continuation, 0 SH) until you defend your thesis.

**Note 2** When you are ready to defend your thesis, you need to form a “Thesis Committee” in consultation with your advisor. The Committee must have at least three

members, and at least two of the members must be tenured or tenure-track ECE faculty. After successful defense of your thesis a letter grade will be assigned to EECE 7990 (Master's Thesis). Your MS thesis defense date and location must be announced at least one week before the date of defense. The MS thesis announcement form can be found [here](#).

**Note 3** L<sup>A</sup>T<sub>E</sub>X templates for writing MS thesis can be found [here](#).

**Step 7** You graduate when you have successfully defended your thesis and fulfilled your course requirements. To graduate you must have a cumulative GPA of at least 3.00 with no more than 8 semester hours of grades below B– in all courses applied to the degree.

## 5 Checklist for PhD Students Entering with MS Degree

**Step 1** Make sure that you know your assigned academic advisor and consult with him/her regularly. It is essential that you meet your academic advisor *prior to the registration period for each semester* and review your course selection with him/her.

**Step 2** Plan a program of study for your degree *in consultation with your academic advisor*. Make sure that all prerequisites are taken before the time you plan to register in a course (for course description and pre-requisites see [here](#)).

**Step 3** If you do not already have a research advisor, talk to the ECE faculty about their research interests and find a research advisor whose research matches your interests and background. Your research advisor can be any tenured, tenure-track, affiliated, or adjunct ECE faculty. A list of ECE faculty can be found on the ECE website. After finding a research advisor, he/she will be your academic advisor as well. The deadline for finding a research advisor is *one year after your matriculation* at NEU. For details see Section 7.

**Step 4** **Course Requirements:** You need to complete at least 16 SH of graduate level course work beyond Master's degree.

**Note 1** Typically, students take more than 16 SH; usually 24 SH or more.

**Note 2** Courses are selected in consultation with your research advisor.

**Note 3** At least 8 SH of your courses must be graduate-level ECE courses.

**Note 4** If you plan to register in a non-ECE course that is *not* on the list of "Depth Courses" of any ECE concentration, you need to file a petition *before registration in the course*. Please see Section 9 on how to file a petition.

**Note 5** You may register for EECE7400 (Special Problems in ECE, 1–4 SH) for *at most* 4 SH in your PhD program. Registration in this course requires filing a petition (see Section 9).

**Note 6** A maximum of 9 SH of graduate level course work can be transferred from other institutions. Transfer credit is subject to approval of the Graduate Affairs Committee (GAC) and requires filing a petition (see Section 9). You need to have a grade of at least B in transfer courses. Transfer courses should not have been previously counted towards obtaining a degree.

**Note 7** To graduate you must have a cumulative GPA of at least 3.00 with no more than 8 semester hours of grades below B– in all courses applied to the degree.

**Step 5** **Qualifying Exam:** You have to register for and take the qualifying exam in the spring of your first year at Northeastern. If you start your program in the spring semester, or if you are a part-time student, you can postpone the exam until the next spring. Failure to taking the qualifying exam at the time you are supposed to take it *is equivalent to failure in the exam*. For details see Section 7.

**Note 1** PhDCE students take the qualifying exam in Computer Engineering, PhDEE students can take the exam in any of the other four concentration based on their advisor's recommendation.

**Note 2** If you do not pass the qualifying exam in your first attempt, you have to retake it the next spring. This will be your last chance to pass the qualifying exam.

**Note 3** The outcome of the qualifying exam can be “pass”, “fail”, or “conditional pass”. In this latter case, certain conditions are set to be fulfilled to achieve full pass.

**Note 4** After passing the qualifying exam (full passing, or completing all conditions if passed conditionally), your status changes from “Predoctoral Student” to “PhD Candidate”.

**Note 5** If you want to do research before achieving PhD candidacy (i.e., before becoming a PhD candidate as explained above), you need to register in EECE 9986 (Research, 0 SH) under your advisor's name. Registration in this course requires filing a registration override form (see Section 9). PhD students who start the program in summer also register in this course.

**Step 6** You must register in EECE 9990 (Dissertation, 0 SH) for *two consecutive semesters immediately after passing the qualifying exam*.

**Note** If after two consecutive semesters of taking EECE 9990 you have not yet defended your dissertation (this is very typical), you must register in EECE 9996 (Dissertation Continuation, 0SH) in each fall and spring semester until you successfully defend your dissertation. During the summer semester you are not required to register in EECE 9996, unless you are graduating at the end of that summer (August graduation). If you are graduating in August you need to be registered in EECE 9996 *for the entire summer semester*.

**Step 7** **PhD Committee:** You should form your “PhD Committee” in consultation with your advisor, not later than the last day of the spring semester following the spring in which you passed the qualifying exam. For part-time students this deadline is the last day of the second spring after passing the qualifying exam. This Committee must have at least three members of which at least two must be tenured or tenure-track ECE faculty. After forming the Committee you fill in the **PhD Committee Form** and submit it. For details, see Section 7.

**Step 8** **Dissertation Proposal Review (previously known as “Comprehensive Exam” or “Proposal Defense”):** The date of the Dissertation Proposal Review is determined by your

research advisor and PhD Committee. This date is after you have achieved PhD candidacy, have passed the 16 SH course requirements after MS, and have formed your PhD Committee. It is recommended that the Dissertation Proposal Review be scheduled within two years after passing the qualifying exam. To announce your PhD proposal review please complete and submit the [proposal review announcement form](#). After successful defense of the proposal, you completes the [Dissertation Proposal Review Form](#). This form is signed by your advisor and PhD committee members and is filed with Faith Crisley, the student services coordinator. If the proposal review is not successful, the Committee submits written recommendations on the direction of the research and arranges a date for future review. For details, see Section 7.

**Note 1** The Dissertation Proposal Review consists of a presentation of your research proposal followed by a question/answer session by your PhD Committee. The presentation part of this exam is open to faculty and students.

**Note 2** Before the review, you should download the “Dissertation Proposal Review Form” from [here](#) and complete it. After the exam, this form is signed by the PhD Committee members. You should then scan the form and save it as a pdf file and email it to Faith Crisley at [f.crisley@neu.edu](mailto:f.crisley@neu.edu) with subject “Dissertation Proposal Review form from XXX ID number YYY”, where XXX is your complete name and YYY is your NUID.

**Step 9** **Dissertation Defense:** Dissertation defense is the last stage in PhD requirements. The dissertation defense consists of a presentation of your research results followed by a question/answer session by your PhD Committee. The presentation part of this exam is open to faculty and students. The dissertation defense must be scheduled not sooner than six months after the date of the dissertation proposal review. To announce your PhD defense please complete and submit the [dissertation defense announcement form](#). For details, see Section 7.

**Step 10** **Residency Requirement:** You need to be registered full-time at NU for at least two semesters after candidacy to be eligible for your degree. The two summer half-semester count as a full semester. For part-time PhD students, four semesters of part-time registration fulfills the residency requirement.

**Step 11** You graduate when you have successfully defended your dissertation and fulfilled your course and residency requirements.

For more details on stages and deadlines for PhD students see Section 7.

## 6 Checklist for PhD Students with no MS Degree

**Step 1** Make sure that you know your assigned academic advisor and consult with him/her regularly. It is essential that you meet your academic advisor *prior to the registration period for each semester* and review your course selection with him/her.

- Step 2** Plan a program of study for your degree *in consultation with your academic advisor*. Make sure that all prerequisites are taken before the time you plan to register in a course (for course description and pre-requisites see [here](#)).
- Step 3** If you do not already have a research advisor, talk to the ECE faculty about their research interests and find a research advisor whose research matches your interests and background. Your research advisor can be any tenured, tenure-track, affiliated, or adjunct ECE faculty. A list of ECE faculty can be found on the ECE website. After finding a research advisor, he/she will be your academic advisor as well. The deadline for finding a research advisor is *one year after your matriculation* at NEU. For details see Section 7.
- Step 4** **Course Requirements:** You need to satisfy the requirements of MSC or MST, plus the course requirements for PhD students with MS. Please refer to the corresponding sections in this document for details.
- Note 1** The decision on whether you should follow the requirements of MST or MSC is made in consultation with your research advisor.
- Note 2** PhDCE students must complete the MSECE requirements for one of the three concentrations CNWS, CSYS, CVLA (or the legacy CMPE concentration for students entering the program in fall 2015 or before). PhDEE students must complete MSECE requirements in one of the four concentrations CCSP, ELPO, MSMD, POWR.
- Note 3** After completing the requirements for MST or MSC, if interested, you can file a petition to receive an MSECE degree. Please produce a list of the courses that you want to count towards your MS degree and attach the list to your petition.
- Step 5** **Qualifying Exam, Dissertation Proposal Review, Dissertation Defense:** These requirements are similar to those on “Checklist for PhD Students with MS Degree”. Please refer to pages [10-12](#).

For more details on stages and deadlines for PhD students see Section 7.

## 7 Stages and Deadlines in the PhD Program

The ECE PhD programs (PhDEE and PhDCE) have certain course and dissertation requirements. The course requirements depend on whether the student matriculates with a BS degree or with an MS degree. These requirements are at least 16 SH of graduate-level courses for those matriculating with MS and 40 or 48 SH for those matriculating with BS; depending on whether they complete an MS thesis or not. The details of the PhD course requirements are given on pages [10-13](#).

The purpose of this section is to present procedures and deadlines, beyond the course requirements, needed to complete the ECE PhD degrees. These requirements are:

1. Passing the qualifying exam
2. Finding a research advisor and completing and filing the PhD Research Advisor Form found [here](#)

3. Forming the PhD committee and filing the PhD Committee Form found [here](#)
4. Completing the “Dissertation Proposal Review” stage and filing the Dissertation Proposal Review Form found here [here](#)
5. Defending the dissertation and filing it with the GSE

## 7.1 The Qualifying Exam

All full-time PhD students holding an MS degree who matriculate in fall are required to take the qualifying exam the first time it is offered (in spring). Students matriculating in fall with a BS degree, all students matriculating in spring, and all part-time students matriculating in fall can choose to take the qualifying exam in their second spring at NU. Part-time students matriculating in spring can take the exam in their third spring semester at NU. Under extenuating circumstances students can petition to delay their qualifying exam for one year *only once*. This petition should be filed *by January 31 of the year the student is supposed to take the exam*. **Failure to take the qualifying exam on time is considered as failure in the exam.**

PhDCE students take the QE in Computer Engineering; PhDEE students can take the exam in one of the four concentrations of CCSP, EMPO, MSMD, and POWR, depending on their research focus. Students who fail the QE in their first attempt have one more chance to take the exam and must take it the first time it is administered after their first attempt. The result of the QE can be “pass”, “fail”, or “conditional pass”. If a student passes the QE conditionally, a set of conditions and corresponding deadlines are set to be achieved by him/her to fully pass the QE. Upon full passing of the QE, the status of the student changes from “Predoctoral Student” to “PhD Candidate”. After achieving PhD candidacy, the student must register in “PhD Dissertation” in two consecutive semesters.

To register in the qualifying exam, please download and complete the PhD qualifying exam registration form from [here](#) and follow the instructions.

## 7.2 Finding a Research Advisor

A student has formally a research advisor when the [PhD Research Advisor Form](#) is completed, signed by the student and the advisor, and filed with the students services coordinator of the ECE department. The research advisor can be any tenured, tenure-track, affiliated, or adjunct ECE faculty. All PhD students must have a research advisor within one calendar year after their matriculation at NU; otherwise, their status changes to MS course-only track. If, after change of status, these students can find a research advisor, their status will be reset to PhD.

After finding a research advisor, please complete and submit the research advisor form found [here](#).

## 7.3 Forming the PhD Committee

The PhD committee must have at least three members, of which at least two must be tenured or tenure-track ECE faculty. After forming this committee the PhD Committee Form is completed, signed by the advisor, the Committee members, and the student, and is filed with the students services coordinator. This form can be found [here](#). The deadline for filing this form is the last day of the spring semester following the spring semester in which the qualifying exam was passed (full, or conditional); however, it is strongly recommended that the students form their PhD committee by

the end of the fall semester after passing their qualifying exam. For part-time students this deadline is the last day of the second spring semester after passing the qualifying exam.

The composition of the P.D. committee can change as a result of availability of faculty, change in the direction of research, etc. After each change in the PhD committee, a new [PhD Committee Form](#) should be filed.

#### 7.4 Dissertation Proposal Review

For the dissertation proposal review, the student prepares a written research proposal and presents it orally. The presentation is open to the faculty and the students and is followed by a closed question/answer session by the PhD committee. The form to announce the presentation can be found [here](#). The main factors considered by the committee in reviewing the proposal are:

1. Merit of the proposed research as a PhD dissertation
2. Substantial evidence of progress in research
3. Knowledge of general area of research and related work
4. Ability of oral presentation of the results and answering questions related to the proposal

The date of the Dissertation Proposal Review is determined by the research advisor and the student's PhD committee. This date is after the student has achieved PhD candidacy, has passed the 16 SH course requirements after MS, and has formed his/her PhD Committee. It is highly recommended that the Dissertation Proposal Review be scheduled within two years after passing the qualifying exam.

After successful defense of the proposal, the student completes the Dissertation Proposal Review Form found [here](#). This form is signed by the advisor and the PhD committee and is filed with the student services coordinator. If the proposal review is not successful, the PhD committee submits written recommendations to the student on the direction of the research and arranges a date for a future review.

#### 7.5 Dissertation Defense

Dissertation defense must be scheduled **not sooner than six months after the date of the dissertation proposal review**. The form to announce dissertation defense can be found [here](#).  $\LaTeX$  templates for preparing PhD dissertation can be found [here](#).

The deadlines outlined above are applicable to all students matriculating in fall 2015 and after. The students matriculating before fall 2015 who have already passed the qualifying exam, must file the [PhD Research Advisor Form](#) and the [PhD Committee Form](#) by the last day of spring semester 2016.

### 8 The PhD Annual Review

All PhD students are reviewed annually starting with their second year at the ECE Department. The review process is carried out by the student's "PhD Committee". Before the review process, the student completes a form and submits a one page report of his/her progress during the past year.

The committee, based on the recommendation of the advisor, and its own review of the student's progress, evaluates the performance of the student and each committee member gives the student a grade of "excellent", "satisfactory", or "unsatisfactory". The PhD annual review form can be found [here](#).

If the committee deems necessary, it can provide more detailed feedback and set goals to be achieved by the student in the next year. The scores and the reports of the committee are filed with the students services coordinator. If the student receives two or more unsatisfactory grades, a meeting with the student is scheduled to provide the necessary feedback and set goals for next year.

Students who receive two or more "unsatisfactory" grades from the committee members in two consecutive years are terminated from the PhD program unless they can find another advisor by the end of the spring semester of the review year.

The deadline for students' reports to their committees is the last day of September and the Committees' reports to the students services administrator are due by the end of October. Students who have not yet formed their PhD committee are reviewed by three-member committees assigned by the GAC.

## 9 Petition and Registration Override Procedures

Please note the following:

1. Petitions/overrides for taking courses must be filed and approved **BEFORE** registration in the course.
2. Filing a petition/override does not mean that it will be approved, you need to receive the approval to go ahead.
3. Please file your petitions/overrides well in advance. Processing a petition/override takes at least 5 business days.
4. When submitting your petition/override make sure it is completed and signed by you. If you are a PhD or MST student and have a research advisor the form must be signed by him/her as well. If the signature of the instructor is needed (for override forms), please make sure that you obtain this signature.
5. All petitions/overrides must be submitted with a pdf copy of your current transcripts.
6. The only acceptable format for petitions/overrides and transcripts is PDF. Other formats like JPEG, PNG, etc. are not acceptable.

Here are the steps for filing petitions/overrides:

1. To file a petition:
  - (a) Download the petition form from [here](#).
  - (b) Complete the form. Sign it and get other necessary signatures as described in part 4 above.
  - (c) Save the completed form as a pdf file.



- (d) Download a copy of your current transcripts and save it as a pdf file.
  - (e) Send both pdf files to Faith Crisley at [f.crisley@neu.edu](mailto:f.crisley@neu.edu) in a *single* email. The subject of your email should be “Petition by XXX NUID YYY”, where XXX is your complete official name (first and last name as appears on your transcripts) and YYY is your NUID number. Make sure that you send your email from your husky email account.
2. To file a registration override form (these forms are used to register in courses that have restrictions, for example, EECE7674, EECE7400, EECE8986, EECE9986):
- (a) Download the override form from [here](#).
  - (b) Complete the form and get the necessary signatures as explained in part 4 above.
  - (c) If the form is for pre-requisite waiver, get the signature of the instructor too.
  - (d) Save the completed form as a pdf file.
  - (e) Download a copy of your current transcripts and save it as a pdf file.
  - (f) Send both pdf files to Faith Crisley at [f.crisley@neu.edu](mailto:f.crisley@neu.edu) in a single email. The subject of your email should be “registration override Form by XXX NUID YYY”, where XXX is your complete official name (as appears on your transcripts) and YYY is your NUID number. Make sure that you send your email from your husky email account.
3. If you want to register in a CS class and you find the course is closed, you need to send an email to Danielle DiFazio at [d.difazio@neu.edu](mailto:d.difazio@neu.edu). She will help you to override registration limitation or will add your name to the course waiting list.

## 10 Probation Policies and Procedures

For details please refer to the College of Engineering web site at [Probation Policies](#)

## 11 Coop and Internship Policies and Procedures

Both coop and internship allow students to integrate a practical learning experience into their graduate program.

Internship is an option for PhD and MST students to provide them with work experience that is directly related to their research topic. Internship provides the opportunity to further the students’ training and knowledge in an area central to advancement of their research.

Coop is available to **all** graduate students (MSC, MST, and PhD) and its goal is to provide students with actual work experience in their field of study and need not be research oriented (though it often is).

### 11.1 Eligibility and Requirements

**Coop:**

1. All full-time MSC students who:
  - Have finished at least two semesters of graduate work at Northeastern

- Have taken and passed the EECE 6000 course (Introduction to Coop)
- Have a GPA of 3.4 or higher
- Have a TOEFL score of at least 90
- Have passed at least 16 SH and at most 24 SH of course work (including any transfer credits).

are eligible to apply for coop.

2. All full-time MST and PhD students who, *in addition to* the conditions listed above for MSC students, have a research advisor and their research advisor has approved their participation in coop are eligible to apply for coop.
3. During coop the student must be registered in EECE 6964 (Coop Work Experience, 0 SH) to maintain full-time status.

For more information on eligibility for coop, please see this link [coop eligibility](#).

### **Internship:**

1. All MST and PhD students who have a research advisor and their research advisor has approved their participation in internship are eligible to apply.
2. During internship the student must be registered in one of the following courses (or course combinations) to maintain full-time status:
  - (a) EECE 9990 (PhD Dissertation, 0 SH)
  - (b) EECE 9996 (PhD Dissertation Continuation, 0 SH)
  - (c) EECE 9986 (PhD Research, 0 SH)
  - (d) EECE 8986 (Master's Research, 0 SH)
  - (e) EECE 7990 (Master's Thesis, 8 SH). This case is very rare.
  - (f) EECE 7990 (Master's Thesis, 4 SH) and EECE 8986 (Master's Research, 0 SH)
  - (g) EECE 7996 (Master's Thesis Continuation, 0 SH)

## **11.2 Duration and Timeline**

The total duration of coop and/or internship cannot exceed twelve months over the length of the entire degree program.

The starting and ending dates of an internship can be at any time during the student's degree program, except during their last semester at Northeastern. A coop work experience, however, must match the Northeastern academic calendar, and as such will be over the summer or during a semester, or a combination thereof.

## **11.3 How to Apply for Coop and Internship**

1. Coop application for MSECE (course-only track) students:
  - (a) Download the coop application form [here](#). Complete and sign the form and email it to Professor Kent at [g.kent@neu.edu](mailto:g.kent@neu.edu) early in the semester before you plan to do a coop.

- (b) When you have received an offer of employment, download Form 152 from [here](#). Complete the student part of Form 152 and set up an appointment to meet with your coop advisor, Prof. Kent, [g.kent@neu.edu](mailto:g.kent@neu.edu) to get approval.
  - (c) When meeting with your coop advisor, make sure to bring a copy of your transcripts.
2. Coop application for MSECE (thesis track) and PhD students:
- (a) Download the coop application form from [here](#). Complete, sign the form, *and have your research advisor sign it*, then email it as a pdf file to Professor Kent at [g.kent@neu.edu](mailto:g.kent@neu.edu) early in the semester before you plan to do a coop.
  - (b) When you have received an offer of employment, download Form 152 from [here](#). Complete the student part of Form 152 and set up an appointment to meet with your coop advisor, Prof. Kent, [g.kent@neu.edu](mailto:g.kent@neu.edu) to get approval.
  - (c) When meeting with your coop advisor, make sure to bring a copy of your transcripts.
3. Internship application for MSECE (thesis) and PhD students:
- (a) Download Form 105 and, if needed, Form 133 from [here](#).
  - (b) Complete and sign the forms
  - (c) Have your research advisor sign the form(s)
  - (d) Take the form(s) and the letter you have received from the company where you will do your internship to the Graduate School of Engineering (GSE), 130 SN for processing

## 12 Policies and Procedures for Course Transfer

Graduate students can transfer a maximum of 9 SH (or equivalent) course work from other institutions. 4 SH of course work is defined as 45 hours of lecture. For credit transfer from other institutions, the following conditions must be satisfied:

1. Student should have a grade at least B (or equivalent) in the course.
2. The course must be passed during the past seven years.
3. The course should not be part of the requirements of a degree received by the student in the past.
4. The course will be reviewed by the Graduate Affairs Committee and should be approved as equivalent to a graduate-level Northeastern course that students can take as part of their degree program.

The process for transfer credit requires filing a petition (see Section 9). The petition should be accompanied by the detailed syllabus of the course (including textbook information) and the equivalent NU course as well as sufficient evidence that the course has not been part of the requirements of a degree received by the student. Evidence should be noted on the transcripts *or* be sent in a letter/formal email from the Student Service Coordinator (or equivalent) confirming credits were not used towards a degree in the former institution.

## 13 Policies and Procedures for Requesting Changes in the Graduate Program

In general, changes to the graduate program are possible after completing at least one semester at Northeastern. This gives the students an opportunity to get accurate information about each program in order to make an informed decision. The only request for change in the program that is accepted during the first semester is change from full-time to part-time or from part-time to full-time. This change does not apply to those who hold an F-1 student visa.

1. Change from FT to PT or PT to FT. This is the only change that can be petitioned during the first semester. To request this change you need to file a petition as explained in Section 9. FT PhD students cannot change to PT before having a research advisor. Change from FT to PT for international students is only possible if it complies with the ISSI rules.
2. Change of concentration for MS students: To apply for change of concentration, a minimum cumulative GPA of 3.00 is required. You need to file a petition (see Section 9) after you have been at least one semester at Northeastern. If you are a thesis-course student (MST) you also need to request an email or a letter from a faculty in your destination concentration sent to Faith Crisley in which it is clearly stated that he/she will be your thesis advisor. Change of concentration petitions are reviewed by the Graduate Affairs Committee and approved or rejected.
3. Change from MST to MSC: This is done by filing a petition (see Section 9) after finishing at least one semester at NU.
4. Change from MSC to MST: In addition to filing a petition (see Section 9) you need the approval of an ECE faculty (tenured/tenure track, affiliated, or adjunct) to be your thesis advisor. To do this, first get a letter or an email from the faculty clearly stating that he/she would be your thesis advisor and email it with your petition to Faith Crisley.
5. Change from PhDEE to PhDCE or from PhDCE to PhDEE: This is done by filing a petition (see Section 9) if as a result of this change your research advisor does not change. If this change is the result of change in your research advisor, in addition to filing a petition, you need to file a new [PhD Research Advisor Form](#) too.
6. Change from PhD to MS: This is done by filing a petition (see Section 9). Approval of your research advisor is required in filing the petition.
7. Change from MS to PhD: This cannot be done by filing a petition. Students have to apply for the PhD program as a new student using the AppyYourself portal. If an ECE faculty is willing to be your PhD advisor, please ask him/her to write a recommendation letter for you.

## 14 Depth and Excluded Courses for ECE Concentrations

### 14.1 Depth Courses for Communication, Control, and Signal Processing (CCSP)

EECE 5576 Wireless Communication Systems 4 SH  
EECE 5580 Classical Control Systems 4 SH  
EECE 5610 Digital Control Systems 4 SH  
EECE 5626 Image Processing and Pattern Recognition 4SH  
EECE 5639 Computer Vision 4SH  
EECE 5642 Data Visualization 4SH  
EECE 5664 Biomedical Signal Processing 4SH  
EECE 5666 Digital Signal Processing 4SH  
EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH  
EECE 5698 Special Topics: Mobile Robotics 4SH  
EECE 5698 Special Topics: Principles of Assistive Robotics 4SH  
EECE 7200 Linear Systems Analysis 4 SH  
EECE 7203 Complex Variable Theory and Differential Equations 4 SH  
EECE 7204 Applied Probability and Stochastic Processes 4 SH  
EECE 7211 Nonlinear Control 4 SH  
EECE 7213 System Identification and Adaptive Control 4 SH  
EECE 7214 Optimal and Robust Control 4 SH  
EECE 7242 Integrated Circuits for Communications & Mixed-Signal Processing 4 SH  
EECE 7245 Microwave Circuit Design for Wireless Communications 4 SH  
EECE 7293 Modern Imaging 4 SH  
EECE 7310 Modern Signal Processing 4 SH  
EECE 7311 Two Dimensional Signal and Image Processing 4 SH  
EECE 7312 Statistical and Adaptive Signal Processing 4 SH  
EECE 7313 Pattern Recognition 4 SH  
EECE 7315 Digital Image Processing 4 SH  
EECE 7323 Numerical Optimization Methods 4 SH  
EECE 7332 Error Correcting Codes 4 SH  
EECE 7334 Wireless Communications 4 SH  
EECE 7335 Detection and Estimation Theory 4 SH  
EECE 7336 Digital Communications 4 SH  
EECE 7337 Information Theory 4 SH  
EECE 7364 Mobile and Wireless Networking 4 SH  
EECE 7370 Advanced Computer Vision 4 SH  
EECE 7393 Analysis and Design of Data Networks 4 SH

EECE 7397 Advanced Machine Learning 4SH  
EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH  
EECE 7398 Special Topics: Wireless Cognitive Radio Networks 4 SH

**14.2 Depth Courses for Computer Engineering (CMPE) This list applies only to students who have entered the program in fall 2015 or before; this concentration will retire soon**

**ECE Courses**

EECE 5626 Image Processing and Pattern Recognition 4SH  
EECE 5627 Arithmetic and Circuit Design for Inexact Computing 4SH  
EECE 5639 Computer Vision 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5642 Data Visualization 4SH  
EECE 5643 Simulation and Performance Evaluation 4SH  
EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH  
EECE 5698 Special Topics in Software Security 4SH  
EECE 5698 Special Topics: Mobile Robotics 4SH  
EECE 7205 Fundamentals of Computer Engineering 4 SH  
EECE 7240 Analog Integrated Circuit Designs 4 SH  
EECE 7313 Pattern Recognition 4 SH  
EECE 7332 Error Correcting Codes 4 SH  
EECE 7334 Wireless Communications 4 SH  
EECE 7352 Computer Architecture 4 SH  
EECE 7353 VLSI Design 4 SH  
EECE 7357 Fault-Tolerant Computers 4 SH  
EECE 7360 Combinatorial Optimization 4 SH  
EECE 7364 Mobile and Wireless Networking 4 SH  
EECE 7368 High Level Design of Hardware Software Systems 4 SH  
EECE 7370 Advanced Computer Vision 4 SH  
EECE 7374 Fundamentals of Computer Networks 4SH  
EECE 7375 Compilers for Modern Architecture 4SH  
EECE 7376 Operating Systems: Interface and Implementation 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7393 Analysis and Design of Data Networks 4 SH  
EECE 7394 Network and System Security 4SH  
EECE 7397 Advanced Machine Learning 4SH

EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH

EECE 7398 Special Topics: Human Centered Computing 4SH

### **Mathematics Courses**

MATH 7232 Combinatorial Analysis 4 SH

MATH 7233 Graph Theory 4 SH

### **CCIS Courses** (subject to space availability, offering and approval from CCIS)

CS 5100 Foundations of Artificial Intelligence 4 SH

CS 5200 Database Management Systems 4 SH

CS 5310 Computer Graphics 4 SH

CS 5340 Computer-Human Interaction 4 SH

CS 5400 Principles of Programming Languages 4 SH

CS 5500 Managing Software Development 4 SH

CS 5600 Computer Systems 4 SH

CS 5770 Software Vulnerabilities and Security 4 SH

CS 6110 Knowledge-based Systems 4 SH

CS 6200 Information Retrieval 4 SH

CS 6310 Computational Imaging 4 SH

CS 6410 Compilers 4 SH

CS 6510 Advanced Software Development 4 SH

CS 6520 Methods of Software Development 4 SH

CS 6530 Analysis of Software Artifacts 4 SH

CS 6540 Foundations of Formal Methods and Software Analysis 4 SH

CS 6610 Parallel Computing 4 SH

CS 6740 Network Security 4 SH

CS 6750 Cryptography and Communication Security 4 SH

CS 6760 Privacy, Security and Usability 4 SH

CS 6810 Distributed Algorithms 4 SH

CS 7800 Advanced Algorithms 4 SH

### **14.3 Depth Courses for Computer Networks and Security (CNWS)**

EECE 5576 Wireless Communication Systems 4SH

EECE 5640 High Performance Computing 4SH

EECE 5698 Special Topics: Networks: Technology, Economics, Social Interactions 4SH

EECE 5698 Special Topics in Software Security 4SH

EECE 7204 Applied Probability and Stochastic Processes 4SH

EECE 7205 Fundamentals Computer Engineering 4SH

EECE 7352 Computer Architecture 4SH  
EECE 7364 Mobile and Wireless Networking 4SH  
EECE 7360 Combinatorial Optimization 4SH  
EECE 7393 Analysis and Design of Data Networks 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7374 Fundamentals of Computer Networks 4SH  
EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH  
EECE 7393 Analysis and Design of Data Networks 4 SH  
CS 5700 Fundamentals of Computer Networks 4SH  
CS 6754 Secure Wireless Ad-hoc Robots on Mission 1 4SH  
CS 7785 Special Topics in Network Science 4SH  
CS 5770 Software Vulnerabilities and Security 4SH  
CS 6610 Parallel Computing 4SH  
CS 6740 Network Security 4SH  
CS 6750 Cryptography and Communication Security 4SH  
CS 6760 Privacy, Security and Usability 4SH  
CS 6810 Distributed Algorithms 4SH

#### **14.4 Depth Courses for Computer Systems and Software (CSYS)**

EECE 5627 Arithmetic and Circuit Design for Inexact Computing 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5643 Simulation and Performance Evaluation 4SH  
EECE 5698 Special Topics: Principles of Assistive Robotics 4SH  
EECE 7205 Fundamentals Computer Engineering 4SH  
EECE 7352 Computer Architecture 4SH  
EECE 7353 VLSI Design 4SH  
EECE 7357 Fault Tolerant Computers 4SH  
EECE 7360 Combinatorial Optimization 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7376 Operating Systems: Interface and Implementation 4SH  
EECE 7368 High-Level Design of HW/SW Systems 4SH  
EECE 7375 Compilers for Modern Architectures 4SH  
EECE 7398 Special Topics: Advanced Computer Architecture 4SH  
CS 5200 Database Systems Management 4SH  
CS 5600 Computer Systems 4SH  
CS 6410 Compilers 4SH  
CS 6510 Advanced Software Development 4SH



CS 6520 Methods of Software Development 4SH  
CS 6610 Parallel Computing 4SH  
CS 6810 Distributed Algorithms  
CS 7800 Advanced Algorithms

#### **14.5 Depth Courses for Computer Vision, Machine Learning, and Algorithms (CVLA)**

EECE 5626 Image Processing and Pattern Recognition 4SH  
EECE 5639 Computer Vision 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH  
EECE 5642 Data Visualization 4SH  
EECE 5698 Special Topics: Mobile Robotics 4SH  
EECE 7204 Applied Probability and Stochastic Processes 4SH  
EECE 7205 Fundamentals Computer Engineering 4SH  
EECE 7313 Pattern Recognition 4SH  
EECE 7323 Numerical Optimization Methods 4SH  
EECE 7352 Computer Architecture 4SH  
EECE 7360 Combinatorial Optimization 4SH  
EECE 7370 Advanced Computer Vision 4SH  
EECE 7397 Advanced Machine Learning 4SH  
EECE 7398 Special Topics: Human Centered Computing 4SH  
MATH 7232 Combinatorial Analysis 4SH  
MATH 7233 Graph Theory 4SH  
CS 5100 Foundations of Artificial Intelligence 4SH  
CS 6110 Knowledge-based System 4SH  
CS 6200 Information Retrieval 4SH  
CS 6310 Computational Imaging 4SH  
CS 6810 Distributed Algorithms 4SH  
CS 7800 Advanced Algorithms 4SH

#### **14.6 Depth Courses for Electromagnetics, Plasma, and Optics (ELPO)**

EECE 5648 Biomedical Optics 4 SH  
EECE 5694 EM and Photonic Devices 4 SH  
EECE 5695 RF and Optical Antennas 4 SH  
EECE 5697 Acoustics and Sensing 4 SH  
EECE 7105 Optics for Engineers 4 SH

EECE 7202 Electromagnetic Theory 1 4 SH  
EECE 7203 Complex Variable Theory and Differential Equations 4 SH  
EECE 7245 Microwave Circuit Design for Wireless Communication 4 SH  
EECE 7270 Electromagnetic Theory 2 4 SH  
EECE 7271 Computational Methods in Electromagnetics 4 SH  
EECE 7275 Antennas and Radiation 4 SH  
EECE 7276 Microwave Properties of Materials 4 SH  
EECE 7284 Optical Properties of Matter 4 SH  
EECE 7285 Optoelectronics and Fiber Optics 4 SH  
EECE 7287 Optical Detection 4 SH  
EECE 7293 Modern Imaging 4 SH  
EECE 7295 Applied Magnetism 4 SH  
EECE 7296 Electronic Materials 4 SH  
EECE 7297 Advanced Magnetic Materials 4 SH  
EECE 7298 Magnetic Materials Fundamentals and Measurements 4 SH  
EECE 7309 Special Topics in Electromagnetics, Plasma, Optics 4 SH

#### **14.7 Depth Courses for Microsystems, Materials, and Devices (MSMD)**

EECE 5606 Micro- and Nanofabrication 4 SH  
EECE 5647 Nanophotonics 4 SH  
EECE 5648 Biomedical Optics 4 SH  
EECE 5649 CMOS Analog Integrated Circuits 4 SH  
EECE 5680 Electric Drives 4 SH  
EECE 5696 Energy Harvesting Systems 4 SH  
EECE 7201 Solid State Devices 4 SH  
EECE 7240 Analog Integrated Circuit Design 4 SH  
EECE 7241 Advanced Solid State Devices 4 SH  
EECE 7242 Integrated Circuits for Communications & Mixed-Signal Processing 4 SH  
EECE 7243 Integrated Circuit Fabrication 4 SH  
EECE 7244 Introduction to Microelectromechanical Systems (MEMS) 4 SH  
EECE 7245 Microwave Circuit Design for Wireless Communication 4 SH  
EECE 7246 Design and Analysis of Digital Integrated Circuits 4 SH  
EECE 7247 Radio Frequency Integrated Circuit Design 4 SH  
EECE 7353 VLSI Design 4 SH  
EECE 7276 Microwave Properties of Materials 4 SH  
EECE 7284 Optical Properties of Matter 4 SH

EECE 7295 Applied Magnetism 4 SH  
EECE 7296 Electronic Materials 4 SH  
EECE 7297 Advanced Magnetic Materials 4 SH  
EECE 7298 Magnetic Materials Fundamentals and Measurements 4 SH

#### **14.8 Depth Courses for Power Systems, Power Electronics, and Motion Control (POWR)**

EECE 5580 Classical Control Systems 4 SH  
EECE 5610 Digital Control Systems 4SH  
EECE 5666 Digital Signal Processing 4SH  
EECE 5680 Electric Drives 1 4SH  
EECE 5682 Power Systems Analysis 1 4SH  
EECE 5684 Power Electronics 4SH  
EECE 5686 Electrical Machines 4SH  
EECE 5688 Analysis of Unbalanced Power Networks 4SH  
EECE 5696 Energy Harvesting Systems 4 SH  
EECE 7200 Linear System Analysis 4SH  
EECE 7211 Nonlinear Control 4SH  
EECE 7212 Multivariable Control Systems 4SH  
EECE 7213 System Identification and Adaptive Control 4SH  
EECE 7214 Optimal and Robust Control 4SH  
EECE 7220 Power System Analysis 2 4SH  
EECE 7221 Power Systems Operation and Control 4SH  
EECE 7323 Numerical Optimization Methods 4SH  
EECE 7224 Power System State Estimation 4SH  
EECE 7226 Modeling of Transients in Power Systems 4SH  
EECE 7335 Detection and Estimation 4SH  
EECE 7236 Special Topics in Control 4SH  
EECE 7237 Special Topics in Power Electronics 4SH  
EECE 7238 Special Topics in Electric Drive 4SH  
EECE 7239 Special Topics in Power Systems 4SH  
ENGR 5670 Sustainable Energy 4SH

#### **14.9 Breadth Course for All Concentrations**

The following course can be taken as breadth for all concentration but cannot be taken as depth for any concentration

#### **14.10 Excluded Courses for All Concentrations**

CS 5010 Programming Design Paradigm 4SH

CS 5320 Digital Image Processing 4SH

CS 5330 Pattern Recognition and Computer Vision 4SH

CS 5520 Mobile Application Development 4SH

CS 5610 Web Development 4SH

CS 5700 Computer Networks 4SH

CS 5800 Algorithms 4SH

CS 6350 Empirical Research Methods 4SH

CS 6120 Natural Language Processing 4SH

CS 6710 Wireless Networks 4SH

In addition to these courses, all courses offered by the Professional Masters Programs, also known as Interdisciplinary Masters Programs, (Computer Systems Engineering, Software Engineering, Energy Systems, Engineering Management, Information Systems, Sustainable Building Systems, and Telecommunications Systems Management) are also excluded, except those explicitly listed under “Depth Courses” of one of the ECE concentrations.

## 15 Grading Guide for Special Graduate Courses

Course #	Course Title	Credits	Grading	Comments
EECE 7400*	Special Problems in EE	1-4 SH	A to C- or F	Can be taken for up to 4 SH in the MSECE and up to 4 SH in the PhD program. Usually taken as 4 SH.
EECE 7674*	Master's Project	4 SH	IP (in progress) if not completed in one semester; otherwise A to C- or F	
EECE 7990	Master's Thesis	4 or 8 SH (usually two semesters, 4 SH in each)	IP before defense, after defense changed to A to C- or F.	8 SH total, can be taken in one or two semesters.
EECE 7996	Master's Thesis Continuation	0 SH	S/U (satisfactory or unsatisfactory)	For students who, after taking 8 SH of EECE 7990, have not yet defended their MS thesis. This course maintains FT** status.
EECE 8986*	(MS) Research	0 SH	S/U	For MSECE project students who, after taking 4 SH of EECE 7674, have not yet finished their project. This course maintains FT** status.
EECE 9986*	(PhD) Research	0 SH	S/U	For PhD students who have not fully passed the qualifying exam but want to do research. Also PhD students who commence the program in summer should register in this course. This course maintains FT** status.
EECE 9990	Dissertation	0 SH	S/U	Taken in two consecutive semesters after fully passing the qualifying exam. This course maintains FT** status.
EECE 9996	Dissertation Continuation	0 SH	S/U	For PhD students that after taking two semesters of EECE 9990 have not yet defended their dissertation. This course maintains FT** status.

See next page for details

Please note the following:

- During internship students must be enrolled in one of the following courses or course combinations:
    1. EECE 9990 (PhD Dissertation, 0 SH, FT\*\* Equivalent)
    2. EECE 9996 (PhD Dissertation Continuation, , 0 SH, FT\*\* Equivalent)
    3. EECE 9986 (PhD Research, 0 SH, FT\*\* Equivalent)
    4. EECE 8986 (Master's Research, 0 SH, FT\*\* Equivalent)
    5. EECE 7990 (Master's Thesis, 4 SH) and EECE 8986 (Master's Research, 0 SH, FT\*\* Equivalent)
    6. EECE 7996 (Master's Thesis Continuation, 0 SH, FT\*\* Equivalent)
  - Students on Coop must be enrolled in EECE 6964 (Coop Work Experience, 0 SH, FT\*\* Equivalent).
  - During the summer terms, registration in these courses is for full summer *not* summer 1 or 2.
  - Continuing PhD students who have passed two semesters of EECE 9990 (PhD Dissertation) must be registered in EECE 9996 (PhD Dissertation Continuation, 0 SH, FT Equivalent) in all fall and spring semesters until they graduate. They do not need to register in this course in summer *unless they are graduating in August of that summer*. If they are graduating in August, they have to register in this course *for the entire summer semester*.
- (\*) You need to file a registration override form for this course. Please see Section 9. *This process needs to be repeated each semester and for all starred courses.*
- (\*\*) Registering in this course is equivalent to registering full-time.

## 16 Useful Links

- General Information Links
  1. [ECE Department website](#)
  2. [ECE Graduate Studies website](#)
  3. [Graduate School of Engineering](#)
  4. [Course Descriptions and Prerequisites](#)
  5. [COE Coop Eligibility Page](#)
  6. [COE Probation Policies](#)
  7. [Gordon Leadership Program](#)
  8. [Registrar's Office](#)
  9. [Official University Calendar](#)
  10. [NU 2015-16 Graduate Catalog](#)
  11. [Academic Integrity Policies](#)
  12. [Code of Student Conduct](#)
  13. [University Health and Counseling Services](#)
  14. [NU Graduate Students Government](#)
  
- Links to Forms
  1. [Petition Form](#)
  2. [Registration Override Form](#)
  3. [Coop Application Form](#)
  4. [PhD Annual Review Form](#)
  5. [Qualifying Exam Registration Form](#)
  6. [PhD Research Advisor Form](#)
  7. [PhD Committee Form](#)
  8. [Dissertation Proposal Review Form](#)
  9. [Announcement form for MS Thesis Defence, PhD Proposal Review, or Dissertation Defense](#)
  10. [L<sup>A</sup>T<sub>E</sub>X templates for MS thesis and PhD dissertation](#)
  11. [Various ECE Forms](#)
  12. [Various Graduate School of Engineering Forms](#)
  13. [ISSI Forms](#)