

ECE Graduate Student Handbook

August 2011

General Information

The Department of Electrical and Computer Engineering offers programs leading to the Master of Science (MS) and Doctor of Philosophy (PhD) degrees. The MS degree may be earned under either the thesis or non-thesis options. The MS degree with the thesis option or with the non-thesis option may be earned in Electrical Engineering (EE), in Computer Engineering (CPE), or in Computer Networking (CNE). The PhD can be earned in EE or in CPE.

Many of the requirements listed in this document are set by the university. The department must follow these rules. The details of these requirements can be found in the NCSU Graduate Handbook, <http://www.ncsu.edu/grad/handbook>. We have denoted these rules in this handbook with an asterisk, *.

Admission Requirements

*Admission Fee**

No student will be considered for admission without paying the application fee. There are no application fee waivers.

Full Admission

Satisfying the minimum requirements for admission does not guarantee admission, and denial of admission does not necessarily imply a negative evaluation of an applicant's qualifications. The Department is required to limit both total enrollment and international student enrollment. Limited space and resources sometime force limits on the number of students in certain specialties. Admission is on a competitive basis with other applicants, and the minimum admission requirements must often be exceeded to gain admission.

Minimum Requirements for Admission

The minimum requirements for admission to the MS degree programs in Electrical Engineering or Computer Engineering are as follows:

- A bachelor's degree from an accredited college or university in electrical engineering or computer engineering,
- An overall GPA of at least 3.25/4.00 or equivalent,
- GRE scores within the last four years from the date of intended admission. Generally successful applicants achieve minimal GRE percentiles of 70 percentile verbal, 90 percentile quantitative, and 50 percentile writing. GRE scores for students who are graduates from NCSU may be waived.

- Three strong recommendations from persons able to comment on the applicant's qualifications for graduate study.
- All international applicants must submit TOEFL scores. The TOEFL must have been taken within two years of date of intended admission. On the TOEFL iBT, students must have a minimum of 18 on each section of the test with a minimum total of 90. Scores on previous versions of the TOEFL are considered with the same qualitative standard. On the IELTS, we require a minimum score of 6.5 in each section. This requirement also applies to US citizens whose principal language of instruction has not been English (for example, most applicants from Puerto Rico and the Virgin Islands).
- For GRE/TOEFL, use institution code 5496 and department code 1203 for GRE. For TOEFL, use Dept. Code of 66.

Students who do not have a bachelor's degree from an accredited college or university in electrical engineering or computer engineering must satisfy the completion of the following courses or the equivalent:

- Applicants for the MS and PhD programs in electrical engineering must have completed electrical engineering courses equivalent to ECE 109, ECE209, ECE 212, ECE 220, ECE 301(signals and systems), ECE 302, ECE 303 and ECE 305 or ECE 403.
- Applicants for the MS and PhD programs in computer engineering must have completed computer engineering courses equivalent to ECE 109, ECE209, ECE 212, ECE 220, ECE 301 (signals and systems), ECE 302, CSC 226 and ECE 309.
- Applicants for all of the MS and PhD programs in Electrical and Computer Engineering must have also completed the following courses or equivalent courses:
 - Three semesters of calculus
 - One semester of probability/statistics
 - Two semesters of physics and one semester of chemistry
- Applicants for the MS program in Computer Network Engineering must have also completed the following additional courses or equivalent:(also see <http://networking.ncsu.edu/admissions.php>):
 - Two semesters of an object-oriented language
 - Data structures
 - One semester of computer organization
 - One semester of signals and systems or discrete mathematics.

Provisional Admission

Students not satisfying minimum requirements may be granted Provisional Admission pending completion of additional work. A student holding Provisional Admission is

ineligible for financial support. Students with Provisional Admission will be granted Full Admission upon completion of nine graded credit hours with a minimum GPA of 3.333 and no grade lower than B, and fulfillment of minimum entrance requirements as specified under the heading above.

Financial Support

Financial Support for highly qualified students is available in the form of teaching assistantships, research assistantships, supplementary fellowships, and full fellowships. Students who have financial support in the form of teaching assistantships and research assistantships will usually meet the requirements for the Graduate Student Support Plan (GSSP). Students in the GSSP receive tuition support and health insurance.

New Student Applications for Financial Support

Prospective students may request consideration for financial assistance by completing the appropriate sections on the admission application form. All awards are made on a competitive basis.

Teaching Assistantships

Teaching assistantships (TAs) are offered semester-by-semester to qualified students upon the recommendation by a research faculty member in the student's specialty area. Entering students are automatically considered for financial aid at the time of admission. Continuing students can be recommended using the [TA endorsement form](#) available via the ECE web site http://www.ece.ncsu.edu/graduate/Faculty_Endorsement_for_Teaching_Assistantship.pdf. A half-time appointment requires approximately twenty hours of service per week. TAs may teach laboratories, grade papers or assist the department/faculty in various other ways. Reappointment as a TA is dependent upon satisfactory performance of the TA assignment and the following:

- MS students are eligible to hold a TA for four semesters.
- PhD students with an MS are eligible to hold a TA for four semesters following enrollment.
- PhD students who hold only the BS degree are eligible to hold a TA for six semesters.
- All students holding TAs are expected to be registered in full-time status, and maintain an overall GPA of at least 3.333. Full-time is defined in the Graduate Handbook, <http://www.ncsu.edu/grad/handbook/index.php>, section 3.15c. A maximum of nine credit hours is permitted during each semester that the student holds a TA. Special permission can be obtained to allow up to 12 hours under unusual circumstances.
- International students must demonstrate their proficiency to speak and understand spoken English in order to have a satisfactory performance rating. The Spoken English Assessment (SPEAK) test may be used to demonstrate proficiency. (see <http://www.ncsu.edu/grad/handbook/sections/4.1-assistantships.html>)

A SPEAK test score of 45, or the equivalent score on the oral re-exam, is required to maintain a TA after two semesters at NCSU. Alternatively, a score of at least 23 on the Speaking section of the TOEFL iBT is acceptable.

Research Assistantships

ECE Faculty Members provide most Research Assistantships (RAs). They are usually twelve-month appointments, and carry stipends that depend on the assistant's qualifications and available funding.

University Research Assistantships

These are non-renewable one-year Research Assistantships that provide competitive recruiting supplements for outstanding new doctoral students. They carry work requirements of up to ¼ time (ten hours per week) and stipend.

These awards must be used as a supplement to a full Teaching Assistantship, Research Assistantship, or Fellowship/Traineeship. There is no longer a requirement that one of these awards be offered to a student appointed to an RA paid on a ledger 5 account.

Fellowships

College of Engineering - Dean's Fellowships

The College of Engineering offers supplementary fellowships for U.S. citizens. These fellowships provide payment of tuition, stipends of \$10,000, \$5,000 or \$2,000 and have no service requirement. These are one-year fellowships, and offered to new students only. In order for applicants to be considered, GRE scores are required. The recipient must hold at least a 1/4-time assistantship. The ECE Director of Graduate Programs selects nominees and awards are made by the College of Engineering.

Special Awards for Minority Students

- **African-American Assistance Grants**

These grants may be awarded to either new or continuing students holding assistantships. They carry no additional service requirement and stipends of either \$2000 or \$3000, depending on need. The ECE Director of Graduate Programs submits nominations and the Graduate School makes the awards.
- **Minority Presence Grants**

These grants are non-renewable and are primarily for new students. They are restricted to residents of North Carolina. The ECE Director of Graduate Programs submits nominations and the Graduate School makes the awards.

- **GEM Fellowship Program**

The GEM fellowship programs are designed to provide opportunities for under-represented ethnic minority US students to obtain MS degrees in engineering and PhD degrees in engineering and the sciences through a program of paid summer internships and graduate financial assistance during the academic year.

See <http://www.ncsu.edu/grad/financial-support/gem.html>

Other Fellowships

Numerous other companies and government agencies award grants and fellowships. Typical applicants for these fellowships have exceptional academic records (GPA of at least 3.75) and GRE Scores above the 90th percentile. They have superior recommendations and usually participate in several honor/professional societies and extracurricular activities. Notices for these grants and fellowships are posted on the ECE Graduate Office bulletin board.

Nationally Competitive Graduate Fellowships with nominations throughout the year can be found at <http://www.ncsu.edu/grad/financial-support/fellowships.html>

Course Load

Students appointed to assistantships are restricted in the number of credit hours for which they can register in any given fall or spring semester as well as in their external employment obligations. These restrictions are listed below.

Assistantship Classification	Maximum Credit Hours
Full Time	9
3/4 Time	9
1/2 Time	9
1/4 Time	12

With advance written permission from the Graduate School, a student may take more than the maximum semester course load during a particular semester if the total credit hours do not exceed the maximum for the term of the appointment.

Any student holding a TA or RA who receives tuition remission and health insurance must register for full-time enrollment. This is usually at least nine credit hours each term. For details: <http://www.ncsu.edu/grad/handbook/sections/4.2-assistantship-appointments.html> However, to ensure that a student can devote sufficient time to courses and other duties, the Graduate School limits the number of credit hours a TA or RA may register for to nine credit hours per term. A TA or RA who registers for more than the maximum number of credit hours allowed will be required to drop one or more

courses unless special permission is granted by the Director of Graduate Programs. The maximum number of credits an assistant may complete during the terms of various appointments are given in the table below:

TABLE III: Maximum Course Loads – TA/RA Assistantship(s)

ASSISTANT CLASSIFICATION	LENGTH OF APPOINTMENT	MAXIMUM LOAD (credit-hours/term)
1/2 time (20 hrs/wk)	9 months	09 (12 with permission)
1/4 time (10 hrs/wk)	9 months	12

Advising

It is the responsibility of the research student to locate a faculty advisor who can help the student develop a plan of work. The plan of work should be consistent with the goals of the student and satisfy the requirements of the department and Graduate School. It is suggested that the student actively search for an appropriate advisor early in his/her graduate career. The faculty directory by research area on the departmental web page is a good place to start. <http://www.ece.ncsu.edu/research/faculty/>

Registration Requirements & Continuous Registration*

After a student is admitted and enrolls for the first time, he/she is required to maintain continuous registration, i.e., be enrolled each semester, excluding summer sessions, until she/he has either graduated or her/his graduate program at NC State University has been terminated. The following exceptions may apply:

- A student in good academic standing who must interrupt his/her graduate program for good reasons must request a leave of absence from graduate study for a definite period of time. The leave absolutely may not exceed two semesters. The student should initiate the request with the Chair of his/her Advisory Committee and have it endorsed by his/her Director of Graduate Programs before submitting it to the Graduate School. The Graduate School should receive the request at least one month prior to the first day of the term involved.
- All students who take their Final Oral Examination or submit their thesis or dissertation to the Graduate School during either Summer Session must be registered for either the first or second Summer Session.
- Students who complete all requirements for their degree *after* the deadline for a given semester, but *prior* to the first day of classes of the next, do not have to register for the next semester. However, the degree will be awarded at the end of the next semester.
- Students are not required to be registered if their only remaining requirement for graduation is the removal of an incomplete (IN). However, students who do not remove any remaining IN grade(s) in the semester or summer following completion of all other requirements will be terminated at the end of that

semester or summer due to non-compliance with the continuous registration policy.

- For students conducting research and/or who are in the process of preparing their theses, the following courses may be taken for credit to satisfy University and/or Departmental credit requirements and/or Residency requirements. Also, students who have completed essentially all their credit requirements, but must remain enrolled, can take one of the appropriate courses listed below:

ECE 695 - Thesis Research: For MS students who will be devoting the appropriate amount of time to thesis research.

ECE 699 - Thesis Preparation: For MS students who have completed all course work (including any hours of *ECE 695*), research, and residence requirements, and are involved in writing their thesis. *ECE 699* cannot be used toward the minimum 30-hour requirement for the MS degree. Only 3 hours of *ECE699* is required for full-time enrollment status.

ECE 895 - Dissertation Research: For doctoral students who have passed the Qualifying Review, and are devoting a substantial portion of their time to research toward the dissertation.

ECE 899 - Thesis Preparation: For doctoral students who have completed all course work (including all required hours of *ECE 895*), research, residence requirements, and have passed the preliminary oral exam. *ECE 899* may not be used toward the minimum requirements for the degree. Only 3 hours of *ECE899* is required for full-time enrollment status.

- Students who are not enrolled and are not granted a leave of absence will have their programs terminated.

Academic Difficulty*

Each student is required to maintain a graduate GPA of at least 3.0. Graduate students will be placed on academic probation if they have accumulated more than 18 hours at the 400 level or above and have a GPA in the range of 2.667 to 2.999. Graduate students will be terminated from their program of study if they have accumulated more than 18 hours at the 400 level or above and have a GPA below 2.667, or if they have accumulated 30 or more hours and have less than a 3.00 GPA. In the case of program termination, no further registration in a graduate classification will be permitted. In extenuating circumstances, a student who has been terminated may be reinstated once. The student's advisor/advisory committee and the Director of Graduate Programs must endorse a recommendation for such reinstatement. The Dean of the Graduate School must then approve this. The committee/advisor recommendation must be written, must be unanimous, must justify the reinstatement, and must include a reasonable program or plan for raising the GPA to 3.0.

Degree Requirements

A concise table of the timeline and milestones for ECE degree programs is available via the ECE Graduate Handbook, <http://www.ece.ncsu.edu/graduate/handbook.pdf> , Appendix C.

Minor in Electrical and Computer Engineering (ECE)

A minimum of 9 semester credit hours of graduate-level (500/700) graded courses is required for a minor in ECE for MS Students; 12 credit hours are required for PhD students. MS Thesis and PhD students should have an ECE faculty member on their committee.

Master of Science (NCSU)*

A minimum of 30 semester credit hours is required for all Master's degrees; however, many programs require more than thirty. Also, many students, in order to gain the breadth desired in their programs or to make up deficits in their undergraduate degrees, will actually take more credit hours than the minimum required by their programs. The following rules are from the NCSU Graduate Handbook, <http://www.ncsu.edu/grad/handbook>

1. No more than two credit hours of departmental seminar may be included in the minimum 30-credit program.
2. No more than three credit hours of Master's supervised teaching (685) may be included in the minimum 30-credit program
3. Programs that require a thesis may include no more than six hours of Thesis Research credit (695) in the minimum 30-credit-hour program. Thesis Research credit is not appropriate in non-thesis programs.
4. Non-thesis programs may include no more than three hours of independent study credits in the minimum 30-credit program. *Note: NCSU allows six in other disciplines.*
5. ECE limits program to one 400-level course from outside ECE. *Note: The University limit of no more than ten hours of 400-level courses may be counted toward the minimal 30-hour requirement, and they may not come from the major field.*
6. Master's Thesis Preparation (699) credits may not be used to satisfy the 30-credit hour requirement.
7. Non-thesis Master's Examination (690) credits may not be used to satisfy the 30-credit hour requirement. *Note: ECE does not require a non-thesis MS exam.*
8. At least 18 hours of the minimum 30 hours required for the Master's degree must be graduate credits earned while the student is enrolled in a graduate classification at NC State.
9. At least 18 hours of the 30-hour requirement may not have been, and may not be, used to satisfy degree requirements for another Master's degree at NC State.
10. Also, at least 18 of the 30-hour requirement may not have been taken while the student was enrolled in another Master's degree program, unless the student

did not complete the other program. In addition, students pursuing a Master's degree after having completed a doctoral degree at NC State must complete at least 18 graduate credit hours at NC State after enrollment in the Master's program.

11. The remaining 12 credit hours, or more depending on the requirements of the specific program, may be transferred from any of several sources. For details see the Graduate Handbook. <http://www.ece.ncsu.edu/graduate/handbook.pdf>

Submitting Transfer Credit for Graduate School Approval

All requests for transfer credit must be made BEFORE submission of the Plan of Graduate Work. Students may request transfer credit by submitting the form for "Transfer Credits," <http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/transf-credit.pdf> along with the course syllabus. Any transfer credits accepted as part of the student's graduate program may be used to fulfill degree requirements and should be listed on the Plan of Graduate Work.

MS Requirements (ECE)

Timing and Plan of Graduate Work

A Master of Science in CPE, CNE or EE may be obtained without a thesis. Each such non-thesis MS student is advised by the Assistant DGP. The MS student with thesis must formally select a thesis advisor by the end of his/her second semester's enrollment. Students failing to establish an advisor within the prescribed time limits may be prevented from registering, asked to withdraw from the program, lose any assistantships, or have their admission status revoked. A student may submit a written request to change his/her advisor at any time. Requests to appoint, or change the advisor, are subject to the approval of the current advisor, the Director of Graduate Programs, and the Graduate School. An advisor must be either a regular or associate member of the ECE Graduate Faculty. Forms for advisor appointments and changes are available online via the ECE Graduate Program webpage, <http://www.ece.ncsu.edu/graduate/forms.pdf>.

A formal **Plan of Graduate Work** must be submitted before the end of the second semester's enrollment. Students failing to establish a Plan of Graduate Work within the prescribed time limits may be prevented from registering, asked to withdraw from the program, or have their admission terminated. A student submits a Plan of Graduate work through MyPackPortal using their unity user Id and password by selecting **Student Self Service>Academic Records>Graduate Plan of Work**. For assistance in preparing the plan of work, refer to <http://www.ncsu.edu/grad/faculty-and-staff/docs/GRAD-SIS-training-manual-students.pdf>

The Plan of Graduate Work may be changed at any time EXCEPT when the student has applied to graduate and been approved by Department. If the student wishes to make changes, once the plan has been submitted and approved, the student should contact the ECE Graduate Office and request the the POW be re-set so that it can be revised. This “reset” starts the approval process all over again.

All EE and CPE Students

1. All graduate students must attend the ECE 600 seminar (a one credit-hour course) in the first semester. This seminar deals with topics important for the graduate career of the student.
2. The MS degree requires at least 30 credit hours. The MS program requires both breadth and depth.
3. Breadth is obtained by at least one ECE course from each of three (3) specialty areas as listed below in Table 1.
4. Depth is achieved by taking at least two **advanced graduate level** courses. Advanced courses are 700-level regularly scheduled ECE courses. Special topics courses, 79x, may not be counted as advanced. At least one of the advanced courses must come from the major track (EE or CPE). For thesis MS students, 3 hours of ECE695 can count as one advanced course.
5. The major, EE or CPE, is obtained by taking **five (5)** courses from the major track from the entire list of courses in ECE. At least one of the advanced courses must come from the major track. Three hours of thesis can be credited as one course in the major. Only one course in the major track is subject to this substitution.
6. The student must take 21 hours of ECE courses, 18 hours must be graded, i.e., only one S/U course allowed, (ECE633, 634), exclusive of ECE695. ECE695 cannot be used for credit by non-thesis students. The student must have a GPA of at least 3.000 in ECE courses. This includes courses cross-listed with other departments.
7. Maximum of six(6) hours of ECE695 is allowed for MST students – an MST student may have up to nine hours of S/U, e.g., 6 hours ECE695 + 3 hours ECE633/634.
8. Up to nine hours of graduate-level (500,700) courses outside of ECE may be taken. At most, one senior-level (400) course may be included in these nine hours. These courses must be part of a unified plan of study for an advanced ECE degree. These courses should be taken with PRIOR approval of the Director of Graduate Programs or the ECE Graduate Studies Committee.
(As a guideline, note that the common graduate-level, technical courses in CSC, MA, STAT, PHYS, CH, or any engineering department are acceptable. BUS courses that are listed for the CNE program are acceptable. Substitutions for BUS courses require prior approval. It is wise to check with the graduate office before taking courses outside of the above mentioned areas.)
9. Examples for plans of work for various areas can be found at <http://www.ece.ncsu.edu/graduate/plansofwork>

TABLE 1: Specialty Areas for EE and CPE	
Specialty	Course Numbers
Computer Architecture (CPE)	ECE506(FS) ECE521(FS), ECE561(S), ECE721(FO), ECE743(V), ECE747(S), ECE705(V), ECE706(S), ECE785(F), ECE786(S)
Software (CPE)	ECE 517(F), ECE 566(S)
VLSI Systems (CPE)	ECE 520(S), ECE546(F), ECE745(F), ECE761(S)
Networking(CPE)	ECE 570(FS), ECE573(FS), ECE574(FS), ECE575(S), ECE 576(FS), ECE579(FS), ECE773(S), ECE774(S), ECE775(F), ECE 776(S), ECE 777(F), ECE779(S)
Circuits (EE)	ECE 511(F), ECE 712 (S), ECE718(S), ECE 733(S)
Microwave Circuits and Applied Electromagnetics (EE)	ECE 540(S), ECE549(F), ECE719(F)
Communications (EE)	ECE515(S), ECE582 (F), ECE 751(SO), ECE752(SO), ECE 762(F), ECE766(S), ECE767(SE)
Signal Processing and Computational Intelligence (EE)	ECE 513(F), ECE559(SE), ECE742 (S), ECE763(F)
Robotics, Mechatronics, Control & Instrumentation (EE)	ECE 516(S), ECE522(F), ECE555(S), ECE556(F), ECE 726(V), ECE755(F)
Power Electronics and Power Systems (EE)	ECE 534 (F), ECE550 (FE), ECE553 (S), ECE734 (S), ECE 736(F), ECE753(SE), ECE792P* (SO), ECE792S* (SE), * these courses may count as advanced, pending CAF
Nanoelectronics and Photonics (EE)	ECE523(S), ECE 530**(F), ECE531(F), ECE538(F), ECE557(F), ECE 722(F), ECE 723(SO), ECE 724(S) ** Required for students majoring in nanoelectronics and photonics.
Key to course offerings: F- fall, S – spring, FS – both fall and spring, FO – fall odd years, FE – fall even years, SO – spring odd years, SE – spring even years, V – variable, depending on instructor availability, Sum – summer, for courses that have an inconsistent history, we have noted the last time it was offered.	

All CNE Students:

The following information is taken from the Computer Networking website: <http://networking.ncsu.edu/program.php> . Additional information and details can be found there.

A minimum of 31 credit hours is required for all students. The computer networking core courses constitute 10 of these 31 credit hours. Students must take 12 credit hours of additional computer networking courses from one of four technical concentration areas. Each technical concentration area includes both required and elective courses.

The remaining 9 credit hours may be taken from

- List of approved business courses
- Additional courses from the Computer Networking technical concentration areas
- Pool of graduate level CSC courses
- Pool of graduate level ECE courses that form the CPE major (refer to the ECE graduate student handbook)

The above is the only way to earn the 9 credits for students pursuing the MS without-thesis option. Students earning the MS with a thesis option may substitute a maximum of six credit hours of the 9 with thesis work (ECE 695)

At least 6 of the 31 credits must come from the 700-level. Individual study courses cannot account for more than 3 credit hours.

Core Course Requirements

All students must take the following four core courses for a total of 10 credit hours:

- CSC/ECE 570: Computer Networks
- CSC/ECE 579: Computer Performance Modeling
- Graduate Orientation - CSC 600 for CSC students, ECE 600 for ECE students
- One BUS course from the list approved of business core courses. Students pursuing the service engineering initiative should take the "service management" course.

Technical Concentrations

All students must earn 12 credits by taking four courses from one of the defined technical concentration areas for the MS Computer Networking degree. Each technical concentration has a set of two courses that are required for students electing that concentration.

- Network Design
- Network Hardware
- Network Software
- Networking Services

The remaining 9 hours of credit

Students in the MS without-thesis program (Option B) can either take three approved electives chosen from any of the approved technical concentrations or from the pool of CSC graduate level courses and ECE graduate level courses that form the CPE major, or from the list of approved business courses. Students pursuing the service engineering initiative are encouraged (but not required) to take one or more of the following courses: Process Analysis and Design, Organizational Structure, Management of Technology. Students pursuing the MS with thesis option (Option A) may use a maximum of six credit hours of the remaining 9 hours for thesis research.

Application to PhD Program

An MS student who wishes to apply for admission to the PhD program should ask his/her advisor **and** one additional ECE graduate faculty member to complete a Recommendation for Admission **during the final semester** of the MS degree program and submit the request to the ECE Graduate Office. The form is available online via the ECE Graduate Forms webpage, [http://www.ece.ncsu.edu/graduate/Application for Admission to the PhD Program.pdf](http://www.ece.ncsu.edu/graduate/Application%20for%20Admission%20to%20the%20PhD%20Program.pdf).

Notes on MS Thesis Option (all programs)

A student who wishes to pursue the MS with thesis option is permitted to do so if a member of the ECE Graduate Faculty agrees to serve as the student's advisory committee chair and to direct the student's thesis research. A student who enters the program under the non-thesis (Option B) option may change to the thesis option if a faculty member agrees to serve as the student's advisory committee chair and to direct the student's thesis research.

A graduate student pursuing a Masters with thesis will not be allowed to change to a Masters without thesis without approval from both the student's advisor and the Director of Graduate Programs. Approvals will only be rarely granted and must be justified in writing. Only if the Chair of the student's committee becomes unable or unwilling to direct the work to completion, and the student is unable to find another graduate faculty member willing to direct the work, will the student be approved to transfer to the non-thesis option.

Advisory Committee

Each MS with thesis student must form a Graduate Advisory Committee by the end of the semester in which 18 or more credits are completed toward the degree sought. The Advisory Committee consists of two representatives from the student's elected major (EE, CNE or CPE), and a graduate faculty member from outside the major. The intent of this rule is to add breadth to the committee. The member from outside the major area can be from a different department or be from ECE but have as his/her major interest in an area different from that of the student. The Director of Graduate Programs may determine if a faculty member is from outside the major area. Major representation may be either Full Members of the Graduate Faculty of the major, or Associate Members (Associate Members can be faculty members in other departments who hold Associate status in ECE). However, the number of Associate Members may not exceed the number of Full Members. Students with thesis can enter their committee members into the MyPackPortal Graduate Plan of Work at any time. Faculty member's names may appear multiple times in the system. You must select the name of the committee member that aligns with your curriculum for at least 2 members.

The following is from the NCSU Graduate School Handbook,
<http://www.ncsu.edu/grad/handbook/index.php>

Membership*

All required members of the Advisory Committee must be members of the NCSU Graduate Faculty. Others may serve only in an ex-officio capacity, and must be identified as such on the appointment form. A vita for ex-officio members must be attached to the appointment form. A student may submit a written request to change the membership of his/her advisory committee at any time. The request is subject to the approval of the Committee Chair, the Director of Graduate Programs, and the Graduate School. If a minor is elected, a minor representative on the committee is required. Only one representative is required for regular or interdisciplinary minors. There must be a representative from each component of a split minor.

Final Oral Examination*

Each MS student electing the thesis option must submit to a Final Oral Examination conducted by the student's Graduate Advisory Committee. Unanimous approval by the Advisory Committee is required for unconditionally passing the examination. Approval may be conditioned on satisfactory completion of additional work. Failure of the examination terminates the student's graduate study unless the student's Graduate Advisory Committee unanimously recommends re-examination. Only one re-examination is permitted and at least three full weeks must elapse before such a re-examination is held. The Final Oral Examination may be held no earlier than the semester during which the student will complete all courses on his or her Plan of Graduate Work. The examination must be held before the Graduate School's Deadline for Final Oral Examinations if the degree is to be awarded at the end of the semester in which the examination is given.

Scheduling*

The Final Oral Examination is scheduled only at the request of the student and upon the approval of his or her Advisory Committee. A student may not submit a request to schedule the examination until the Graduate School has approved his/her Plan of Graduate Work. Copies of the thesis must be distributed to the members of the Advisory Committee at least two weeks prior to the exam. The student must be in good academic standing when the request is submitted and when the examination is held. *The request must be submitted to the ECE Graduate Office at least 3 weeks prior to the date of the examination.* If a committee member cannot attend a scheduled examination, the Graduate School must approve a substitute prior to the examination. It is the responsibility of the chair of the committee to obtain a substitute and the required permission.

Conduct of Final Oral Exams*

The Chair of the Graduate Advisory Committee has an obligation to maintain a scholarly atmosphere and to keep the student's best interest foremost. The student is expected to defend the methodology used and the conclusions reached in the research as reported in the thesis. It is the Chair's option to allow visitors to ask questions of the candidate during the presentation. Any Graduate Faculty Member in attendance must be allowed to express his or her opinions to the committee in the absence of the student, but the final deliberations and the vote are private to the Graduate Advisory Committee. A unanimous vote of approval is required for passing, although approval may be conditioned on the student's meeting additional requirements, specified in writing by the committee at the time of the examination. Failure to pass the examination terminates the student's work at this institution unless the Graduate Advisory Committee recommends a re-examination. Only one re-examination is permitted and at least 3 weeks must elapse from the date of the initial examination before the examination can be rescheduled. If a conditional pass is awarded, it is the responsibility of the Committee Chair to notify the ECE Graduate Office when all the requirements have been met for the student to be awarded an "unconditional" pass.

Normal Practice*

While it is entirely up to the Chair as to how to conduct the exam, within the requirements set forth above, the following practice is normally used. As a convenience, the Chair normally has the student's entire folder, obtained from the Graduate Office, so that the Graduate Advisory Committee members may review pertinent data. The Graduate Advisory Committee may or may not meet in private session for a short time immediately before the student enters to be examined, as deemed necessary by any committee member. Introductions and any special considerations may be discussed during this time.

The student and visitors then enter, and the Committee, with the Chair of the Graduate Advisory Committee moderating, examines the student. The Chair should announce his/her decision as to whether to allow visitor questions during the examination. When the examination is concluded, the Chair should ask those present for further questions/comments. Then he/she should ask all non-Graduate Faculty Members to leave, and invite comments from any non-committee Graduate Faculty who are in attendance. After non-committee Graduate Faculty comments have been received, the Chair should meet with the Graduate Advisory Committee in private session for final deliberations and then vote. The student is then invited to return and the Chair advises the student of the Graduate Advisory Committee's decision. Thesis signature sheets are normally available for signature at this time for signature by all Graduate Advisory Committee members.

Submission of Thesis*

Upon passing the MS Final Oral Examination, each MS thesis student must have the thesis approved by each member of the student's Advisory Committee. The thesis must be submitted to the Graduate School by the deadline given in the academic calendar, and must conform to the Electronic and Thesis Dissertation Guide which can be found at <http://www.ncsu.edu/grad/etd/>

Application to PhD Program (ECE only)

A master of science with thesis (MST) student who wishes to apply for admission to the PhD program should ask his/her advisor and one additional ECE Graduate Faculty Member to complete a Recommendation for Admission during the final semester of the MS degree program. The request should be submitted to the ECE Graduate Office via the form which can be found at:

[http://www.ece.ncsu.edu/graduate/Application for Admission to the PhD Program.pdf](http://www.ece.ncsu.edu/graduate/Application%20for%20Admission%20to%20the%20PhD%20Program.pdf)

PhD Degree

The department offers the PhD degree in either Electrical Engineering or Computer Engineering. The information below applies to either track.

Graduate students who have entered the PhD program, who already have a Master's degree prior to entering NCSU and who have been receiving financial aid in the form of a research assistantship, may not be approved for a change from a PhD to a Master's degree. Students changing from PhD to Master's will also be limited to a total of two semesters of financial aid through a teaching assistantship. A student in this category must convince the Director of Graduate Programs that they cannot find any faculty member who will supervise their research or that they can obtain no financial support via a research assistantship.

Credit-Hour Guidelines*

A typical full-time PhD graduate student registers for at least nine credit hours per semester. The student and his Graduate Advisor develop a Plan of Graduate Work leading to the PhD. The student's Graduate Advisory Committee determines the courses required for the PhD program through the development of the Plan of Graduate Work. It is a requirement of the University that the Plan of Work account for at least 72 credit hours past the baccalaureate degree. This Plan must be submitted via MyPackPortal (**Student Self Service > Academic Records > Graduate Plan of Work**) and requires the approval of the Director of Graduate Programs.

1. All PhD students are required to complete, with a grade of B+ or better, at least one course from each of three ECE specialty areas, as defined by Table 1. in the MS Requirements section (page 10). These courses must be taken at NC State. Courses

taken during the MS at NCSU may be used to satisfy this requirement. These courses should be taken *prior to or concurrent with* semester of the Qualifying Review.

2. A minimum of 42 hours of graded coursework past the BS degree is required, or a minimum of 18 graded credit hours past the MS degree. Since the PhD degree is more advanced than the MS degree, the total PhD plan must exceed all requirements for an MS degree at NC State.

3. A minimum of 36 hours of graded graduate-level ECE courses should be included in the total PhD career. At least 12 of these ECE course hours must be taken at NC State. Courses taken during the NCSU MS may be used to satisfy this requirement. An MS degree in ECE from another university counts as 18 hours toward this requirement.

4. Breadth at the PhD level is beneficial to the student and is required. All PhD students must take at least 9 hours of graded graduate-level coursework outside the major track (defined as EE or CPE) – see Appendix A. NOTE: a course that is listed in both tracks cannot be used as outside the major track.

Courses outside the ECE Department also qualify as outside the major track. These credit hours must be at the 500-level or above.

Courses taken during the NCSU MS degree may be used to satisfy this requirement. (Courses from other universities must be approved by the Director of Graduate Studies.) A formal minor may be used to meet this requirement, but it is not required. The requirements of the minor, if elected, will be determined by the Committee Representative in the minor area, in conjunction with the remainder of the committee.

5. All graduate students in ECE must attend the ECE600 seminar in either their first or second semester at NCSU. THIS IS A MANDATORY REQUIREMENT.

A table of example cases of PhD requirements is shown in Appendix B, page 27.

Credits from Outside Sources*

Transfer credits or credits from extension courses are not acceptable for credit toward the PhD degree. Credits obtained in regular, graded graduate-level courses through life-long learning (NDS) at NCSU may be accepted in certain circumstances to satisfy the overall credit-hour requirements for the degree. The maximum number of NDS credits that can be considered for acceptance is 12 graded credit hours toward the PhD.

Dissertation Research*

The emphasis for the PhD is on original research. Therefore, there is no limit as to the number of credit hours that can be applied toward the PhD in the form of Dissertation Research Credits.

Residence Requirements for PhD Students*

A student working toward a doctoral degree is expected to be registered for graduate work at NC State for at least six (6) semesters beyond the Bachelor's degree. Each PhD student must secure at least two residence credits through registration in continuous semesters. Residence credit is determined by the number of semester hours completed during a regular semester, according to the table below:

Table II. Residence Credits	
Semester Credits	Residence Credits
9 or more	1
6 to 8	2/3
0 to 5	1/3

Graduate Advisory Committee

A full-time student must establish a Graduate Advisory Committee before the completion of the second semester following admission. Students who are employed full-time, and enrolled on a part-time basis, may add two semesters to the time required to form a committee. A written statement from the employer may be required. The formation of a Graduate Advisory Committee is a critical step in the progression toward completion of the degree. No progress toward a degree can be assured until after the committee has been formed. Establishment of the committee must be done formally by entering the faculty member's names under the Committee tab in the Graduate Plan of Work in MyPackPortal. **It is the student's responsibility to establish a Graduate Advisory Committee within the time limits specified above. Students should begin to explore faculty for membership on their committee early in their program.** Students are advised that faculty serve on advisory committees at the individual faculty member's discretion. Students failing to establish a committee within the prescribed time limits may not be permitted to register for classes, may be asked to withdraw from the program, or may have their admission revoked.

Membership of the Graduate Advisory Committee

All required members of a student's Graduate Advisory Committee must be members of the NCSU Graduate Faculty. Others may serve only in an ex-officio capacity, and must be identified as such on the appointment form. <http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/adv-ext.pdf> A vita for ex-officio members must be attached to the appointment form. A student may change the membership of his/her Graduate Advisory Committee at any time via

MyPackPortal. A request for a change in the Graduate Advisory Committee after the student has passed the Preliminary Oral Exam requires strong justification. All requests for change in the composition of the Graduate Advisory Committee are subject to the approval of the Committee Chair, the Director of Graduate Programs, and the Graduate School.

The Graduate Advisory Committee for a PhD student has two membership formats. A committee may consist of a Chair and at least two other members from the ECE Graduate Faculty, and a representative from outside the Department (a minor representative, if elected). Alternatively, the committee may have a Chair, at least three members from the ECE Graduate Faculty, and a Graduate School representative. The Graduate School representative is appointed by the Graduate School at the time the Request to Schedule Doctoral preliminary oral examination is received by the Graduate School. Either the Chair must be a full member of the Graduate Faculty or a Full Member must serve as a Co-Chair. Major representatives may be either Full Members of the major or Associate/Inter-institutional Members. However, the number of Associated/Inter-institutional Members may not exceed the number of Full Members.

A list of the EE and CPE graduate faculties is available in the Graduate Office. The Graduate School will appoint, if desired by the Committee Chair, a fifth member, the Graduate School Representative. The Graduate School Representative attends the Preliminary and Final Oral Examinations, and must sign the reports of those examinations, but does not otherwise participate in directing the student's work. As stated above, each student must have at least one representative from outside the ECE Department. If a minor is elected, a minor representative on the committee is required, and this member may satisfy the need for a representative from outside the department. Only one representative is required for a regular or interdisciplinary minor. There must be a representative from each component of a split minor.

Plan of Graduate Work

All graduate students must submit a Plan of Graduate Work to the ECE Graduate Office no later than the end of the second semester. The Graduate Plan of Work must be submitted via MyPackPortal using their unity user ID and password. Select **Student Self Service>Academic Records>Graduate Plan of Work**. The Graduate School must approve the Graduate Advisory Committee at the time the Graduate Plan of Work is submitted. A student may enter a partial Plan of Work (POW) and save to come back to finish it later. Once submitted, changes can be made to the Plans of Work. The student needs to request the ECE Graduate Office to re-set the Plan of Work so that he/she can access it to make the needed changes and re-submit. Students failing to establish a Plan of Graduate Work within the prescribed time limits may not be permitted to

register for a future semester or they may have their admission terminated. NOTE: changes can be made at any time EXCEPT when a student has been approved to hold an exam or when a student has applied to graduate.

Qualifying Review

PhD students must request a Qualifying Review no later than their third semester of enrollment. The enrollment and process for the Qualifying Review are determined by each Research Area (as posted in the guidelines on the Research Area pages <<http://www.ece.ncsu.edu/research/>>). The student should be enrolled in the Qualifying Review course (ECE834) during the semester in which the Qualifying Review takes place.

Each Research Area establishes the exact nature of the Qualifying Review, which serves the purpose of the qualifying exam given in many universities.

The Qualifying Review may take many forms, including a formal written exam. However, it must have both oral and written components. At the conclusion of this review, the Committee will recommend, by majority vote, for or against allowing the student to continue in the PhD program. The written component should be submitted to the Graduate Office to be entered into the student's file. Students failing to obtain a majority recommendation to continue will be asked to withdraw from the program after the third semester. No student will be allowed to enroll for a fourth semester without a favorable Qualifying Review. Failure to withdraw will result in termination of admission to the program. Students in good standing who entered the PhD program without having completed a master's degree may elect to transfer to the MS program for a terminal MS degree if they have completed less than six semesters at NCSU. The results of the Qualifying recommendation will be: Unconditional Pass, Conditional Pass or Failure and reported to the ECE Graduate Office for recording in the student's milestones in GradWatch. Conditional passes must be cleared by written notification by the Committee Chair to the ECE Graduate Office and so noted in the student's milestones. The Qualifying Review reporting is internal to the ECE Department.

Part-Time Students

Students who are employed full-time may add two semesters to the time required to complete the core course work and to receive committee approval to continue in the program. A written statement from the employer may be required.

Timing for Students Who Enter Without an MS degree

Students who enter the PhD program without an MS degree may request that the Qualifying Review be delayed to their fourth semester on recommendation of their Graduate Advisory Committee.

Preliminary Written Examination

Each PhD student is required to pass a Preliminary Written Examination conducted by the student's Graduate Advisory Committee. A copy of the written report must be provided to the Graduate Office for inclusion in the student's folder along with the committee's recommendation. The student's Graduate Advisory Committee determines the requirements for the Preliminary Written Examination and any re-examinations. In any event, at least one full semester (four calendar months) must elapse before any re-examination is held.

Timing*

The Preliminary Written Examination may not be held until the student has passed the Qualifying Review. It can be held no earlier than the end (final examination week) of the first year of graduate study and no later than one semester (four calendar months) prior to the PhD final oral examination.

Scheduling

Students should consult with their Committee Chair (after passing the Qualifying Review) regarding the scheduling of the Preliminary Written Examination.

Preliminary Oral Examination*

After completion of the Preliminary Written Examination, each PhD student must submit to a Preliminary Oral Examination conducted by the student's Graduate Advisory Committee, including the Graduate School Representative, if one is required. If a Committee Member cannot attend a scheduled Preliminary Oral, a substitute approved by the Graduate School prior to the examination must be used. It is the responsibility of the Chair to obtain a substitute and the required permission. No examination may be held unless all Committee Members are present or represented by an approved substitute. Oral examinations where one or more of the participants are located remotely from the others may occasionally become necessary, but they should never be normal practice. If such circumstances arise, please see Section 3.6 of the Graduate Handbook for rules for requesting and conducting a remote exam.

Unanimous approval by the Graduate Advisory Committee is required to pass the examination. Such approval may be conditioned on satisfactory completion of additional work. Any Conditional Pass must be cleared by written notification from the Committee Chair that the student has fulfilled the requirements of the conditional pass and now merits an "unconditional" pass. The Graduate School will be notified for update of student's permanent record.

Timing*

The Preliminary Oral Examination may be held no earlier than the end (final exam week) of the second year of graduate study and no later than one semester (or four calendar months) prior to the PhD final oral examination.

Scheduling*

The Preliminary Oral Examination is scheduled only at the request of the student and only upon the approval of his/her Graduate Advisory Committee. A student may not submit a Request to Schedule an Oral Examination until the Graduate School has approved the student's Graduate Plan of Work and the student has passed the Preliminary Written Examination. The student must be in good academic standing when the request is submitted, and when the examination is held. The request must be submitted to the ECE Graduate Office as soon as possible, but at least three weeks prior to the planned date of the examination.

Conduct of PhD Preliminary Oral Exams*

The Chair of the Graduate Advisory Committee has an obligation to maintain a scholarly atmosphere and to keep the student's best interest foremost. The student is expected to defend the methodology used and the conclusions reached in the research as reported in the dissertation. It is the Chair's option to allow visitors to ask questions of the candidate. Any Graduate Faculty in attendance must be allowed to express their opinions to the committee in the absence of the student, but the final deliberations and the vote are private to the advisory committee. A unanimous vote of approval is required for passing, although approval may be conditioned on the student's meeting additional requirements specified in writing by the committee at the time of the examination. Failure to pass terminates the student's work at this institution unless the examining committee recommends a reexamination. Only one re-examination is permitted, and at least one full semester (four calendar months) must elapse before the re-examination can be scheduled.

Normal Practice*

While it is entirely up to the Chair to conduct the exam within the requirements above, the following practice is normally used. The Advisory Committee may meet in private session for a short time immediately before the student enters to be examined, if necessary. Introductions and any special considerations may be discussed during this time.

The student and visitors then enter and the student is examined with the Chair of the Advisory Committee in charge. The Chair should announce his/her decision on allowance of visitor's questions. When the examination is concluded and all questions have been asked, the Chair should ask the student and all non-graduate faculty members to leave, and invite comments from any non-committee graduate faculty who are in attendance. After non-committee graduate faculty comments have been received, the Chair should meet with the Graduate Advisory Committee in private for final deliberations and vote. The student is then invited to return and the Chair advises the student of the Advisory Committee's decision.

As a convenience, the Chair normally has the student's entire folder from the Graduate Office so that the Advisory Committee members may review pertinent data.

Advancement to Candidacy*

Although a student's University classification is 'DR' when accepted into the program, a student is only admitted to candidacy for the PhD degree upon unconditionally passing the Preliminary Oral Examination.

NOTE: If student has a teaching assistantship or research assistantship which qualifies him/her for GSSP (Graduate Student Support Plan), then student must pass the Prelim doctoral exam as follows: doctoral with previous MS must be admitted to candidacy by the 9th semester; doctoral student without previous MS must be admitted to candidacy by the 11th semester.

Final Oral Examination*

Each PhD student must submit to a Final Oral Examination conducted by the student's Graduate Advisory Committee, including the Graduate School Representative, if one is required. If a Committee Member cannot attend a scheduled Final Oral Examination, a substitute approved by the Graduate School prior to the examination must be used. Oral examinations where one or more of the participants are located remotely from the others may occasionally become necessary, but they should never be normal practice. If such circumstances arise, please see Section 3.6 of the Administrative Handbook for rules for requesting and conducting a remote exam. It is the responsibility of the Chair to obtain a substitute and the required permission. Failure of the examination terminates the student's graduate study unless the student's Graduate Advisory Committee unanimously recommends re-examination. Only one re-examination is permitted and at least one full semester must elapse before the re-examination can be scheduled. The final examination may be held no earlier than four calendar months after admission to candidacy. The examination must be held at least four weeks before the end of the semester or prior to the time designated by the Graduate School, if the degree is to be awarded at the end of that semester. Otherwise the degree will not be awarded until the end of the following semester.

Scheduling*

The examination is scheduled only upon the request of the student and the approval of his/her Graduate Advisory Committee. The dissertation must be completed and the preliminary copies of it must be distributed to the members of the student's Graduate Advisory Committee and Graduate School Representative, if one required, before the Request to Schedule the Final Examination is submitted to the ECE Graduate Office. The request must be

submitted to the ECE Graduate Office at least three weeks prior to the date of the examination.

Conduct of PhD Final Oral Exams*

The Chair of the Graduate Advisory Committee has an obligation to maintain a scholarly atmosphere and to keep the student's best interests foremost. The student is expected to defend the methodology used and the conclusions reached in the research as reported in the dissertation. It is the Chair's option to allow visitors to ask questions of the candidate. Any Graduate Faculty in attendance must be allowed to express their opinions to the committee in the absence of the student, but the final deliberations and the vote are private to the Advisory Committee. A unanimous vote of approval is required for passing, although approval may be conditioned on the student's meeting additional requirements specified in writing by the committee at the time of the examination. Failure to pass terminates the student's work at this institution unless the examining committee recommends a re-examination. Only one re-examination is permitted and at least one full semester (four calendar months) must elapse before the re-examination can be scheduled.

Normal Practice*

While it is entirely up to the Chair to conduct the exam within the requirements above, the following practice is normally used. The Advisory Committee meets in private session for a short time immediately before the student enters to be examined. Introductions and any special considerations may be discussed during this time.

The student and visitors then enter and the student is examined with the Chair of the Advisory Committee in charge. The Chair should announce his/her decision on allowance of visitor's questions. When the examination is concluded, the Chair should ask all visitors and non-Graduate Faculty to leave, and invite comments from any non-committee Graduate Faculty who are in attendance. After non-committee Graduate Faculty comments have been received, the Chair should meet with the Advisory Committee in private for final deliberations and vote. The student is then invited to return and the Chair advises the student of the Advisory Committee's decision.

As a convenience, the Chair normally has the student's entire folder from the Graduate Office so that Graduate Advisory Committee members may review pertinent data. Dissertation signature sheets are normally available for signature at the PhD Final Oral Exam.

Submission of Theses and Dissertations*

Upon passing the PhD Final Oral Examination, each PhD student must have the dissertation approved by each member of the student's Graduate Advisory

Committee. The dissertation must be submitted to the Graduate School by the deadline given in the academic calendar, and must conform to the Electronic Theses and Dissertation Guide <http://www.ncsu.edu/grad/etd/>.

Graduation*

***APPLICATION FOR GRADUATION**

An application for graduation has to be submitted by all students who wish to graduate in a specific academic term. To submit, go to **Student Self Service>Degree Progress/Graduation>Apply for Graduation in MyPackPortal**.

Thesis/Dissertation Students: due when Final Oral Exam is scheduled but no later than the Apply to Graduate deadline. See <http://www.ncsu.edu/grad/faculty-and-staff/academic-calendar.html>

Non-Thesis Students: no later than the Apply to Graduate Deadline. *ECE Departmental policy is that students cannot Apply to Graduate until the Plan of Work has been approved by the Director of Graduate Programs.*

ECE Non-thesis students must perform “self-check” GRADUATION CLEARANCE CHECKLIST <http://www.ece.ncsu.edu/graduate/forms> and Apply to Graduate in MyPackPortal 10 business day prior to Graduate School deadline, which is “No later than the fourth (4th) week after the first day of the semester in which the student plans to graduate (7 working days after the first day of SS I for summer graduates). See <http://www.ncsu.edu/grad/faculty-and--staff/academic-calendar.html>.

****NOTE:** NO STUDENT CAN WITHDRAW THEIR GRADUATION APPLICATION ONCE IT IS CREATED--ONLY AN ADMINISTRATOR CAN DO THAT. Email the ECE Graduate Office and request “application to graduate” be withdrawn and provide reason.

Commencement

Commencement ceremonies are held at the end of the fall and spring semesters. All students who will have completed the requirements for the degree prior to the commencement ceremony are encouraged to participate. Each student who wishes to participate must inform the ECE Graduate Office at the time they apply to graduate. Late requests may be denied.

Diplomas for ALL MS graduates are mailed to the Home/Mailing address listed in MyPackPortal.

PhD students receive their diplomas at the University commencement ceremonies. If the diplomas are not collected, the student can obtain from Registration and Records for up to two (2) weeks. After then, the diplomas are mailed to the Home/Mailing address listed in MyPackPortal.

Diplomas for ALL summer graduates are mailed to the Home/Mailing address in MyPackPortal. For schedule of mailings, see <http://www.ncsu.edu/registrar/graduation/process.html>.

Late Diplomas

A student who has satisfied all degree requirements (including passing the final oral), but fails to meet the deadline for passing the final oral/ submitting the thesis or dissertation, or applying to graduate will receive the diploma as of the next regular graduation.

A letter stating that all requirements for the degree have been met may be obtained from the Graduate School. The ECE Department is not authorized to write such letter.

NOTE: Students with a Financial Hold set by the Cashier's Office will not receive their diploma until the hold is released neither can they receive an official transcript from the University.

APPENDIX A (revised 6/10)								
CONSULT COURSE CATALOG FOR AVAILABILITY EACH TERM								
ECE COURSE MAJOR ASSOCIATION								
				MAJOR		SPECIALTY AREA	SEM OFR	
COURSE NO.		EE	CPE	COURSE TITLE				
ECE	506		X	ARCHITECTURE OF PARALLEL COMPUTERS			COMP. ARC	F/S
ECE	511	X		ANALOG ELECTRONICS			CIRCUITS	F
ECE	513	X		DIGITAL SIGNAL PROCESSING			SIG PROC COMPINTEL	F
ECE	514	X		RANDOM PROCESSES			SEE FOOTNOTE	F
ECE	515	X		DIGITAL COMMUNICATIONS			COMM	S
ECE	516	X		SYSTEM CONTROL ENGINEERING			ROBOMECH CON INSTR	S
ECE(CSC)	517		X	OBJECT-ORIENTED LANGUAGE & SYSTEMS			SOFTWARE	F
ECE	520		X	DIGITAL ASIC DESIGN			VLSI SYS	S
ECE	521		X	DIGITAL COMPUTER TECHNOLOGY AND DESIGN			COMP. ARC	S
ECE(BME)	522	X		MEDICAL INSTRUMENTATION			ROBOMECH CON INSTR	F
ECE	523	X		PHOTONICS AND OPTICAL COMMUNICATIONS			NEP	S
ECE	528	X		SEMICONDUCTOR CHARACTERIZATION			NEP	F
ECE	530	X		PHYSICAL ELECTRONICS (REQ'D FOR NEP MAJORS)			NEP	F
ECE	531	X		PRINCIPLES OF TRANSISTOR DEVICES			NEP	F
ECE	532	X		PRINCIPLES OF MICROWAVE CIRCUITS			MW CKTS/ APP ELMG	S
ECE	534	X		POWER ELECTRONICS			PWR ELEC/ PWR SYS	F
ECE(MAE)	535	X		DESIGN OF ELECTROMECHANICAL SYSTEMS			SEE FOOTNOTE	F
ECE	538	X		INTEGRATED CKT TECHNOLOGY AND FABRICATION			NEP	F
ECE	540	X		ELECTROMAGNETIC FIELDS			MW CKTS/ APP ELMG	S
ECE	544	X		DESIGN OF ELECTRONIC PACKAG. & INTERCONNECTS			VLSI SYS	S
ECE	546	X	X	VLSI SYSTEMS DESIGN (NOTE CROSSLISTING)			VLSI SYS	F
ECE	549	X		RF WIRELESS DESIGN			MW CKTS/ APP ELMG	F
ECE	550	X		POWER SYSTEM OPERATION AND CONTROL			PWR ELEC/ PWR SYS	F-E
ECE	553	X		SEMICONDUCTOR POWER DEVICES			PWR ELEC/ PWR SYS	S
ECE	555	X		COMPUTER CONTROL OF ROBOTS			ROBOMECH CON INSTR	S

APPENDIX A (revised 6/10)						
ECE	556		X		AGENT-BASED MECHATRONICS SYSTEMS	ROBOMECH CON INSTR F
ECE	557		X		PRINCIPLES OF MOS TRANSISTORS	NEP F
ECE	561			X	EMBEDDED SYSTEM DESIGN	COMP ARC S
ECE	566			X	COMPILER OPTIMIZATION AND SCHEDULING	SOFTWARE S
ECE(CSC)	570			X	COMPUTER NETWORKS	NTWK F/S
ECE(CSC)	573			X	INTERNETWORK PROTOCOLS AND ARCHITECTURE	NTWK F/S
ECE(CSC)	574			X	NETWORK SECURITY	NTWK F/S
ECE(CSC)	575			X	INTRODUCTION TO WIRELESS NETWORKING	NTWK S
ECE(CSC)	576			X	CONNECTION-ORIENTED NETWORKS	NTWK F/S
ECE	579			X	INTRO TO COMPUTER PERFORMANCE MODELLING	NTWK F/S
ECE	582		X		WIRELESS COMMUNICATION SYSTEMS	COMM F
ECE	600		X	X	ORIENTATION COURSE- REQ'D OF ALL INCOMING STUDENTS	VARIABLE F
ECE	705			X	MEMORY SYSTEMS	COMP ARC
ECE	706			X	ADVANCED PARALLEL COMPUTER ARCHITEC	COMP ARC S
ECE	712		X		INTEGRATED CIRCUIT DESIGN FOR WIRELESS COMMUNICATION	MW CKTS/ APP ELMG S
ECE(MAE)	717		X		MULTIVA LIN SYSTEMS THEORY	SEE FOOTNOTE
ECE	718		X		COMPUTER-AIDED CIRCUIT ANALYSIS	CIRCUITS S
ECE	719		X		MICROWAVE CIRCUIT DESIGN	MW CKTS/ APP ELMG F
ECE	721			X	ADVANCED MICROARCHITECTURE	COMP ARC F-O
ECE	722		X		ELECTRONIC PROPERTIES OF SOLID STATE MATERIALS	NEP F
ECE	723		X		OPTICAL PROPERTIES OF SEMICONDUCTORS	NEP S-0
ECE	724		X		ELECTRONIC PROPERTIES OF SOLID STATE DEVICES	NEP S
ECE	725		X		QUANTUM ENGINEERING	NEP S
ECE	726		X		ADVANCED FEEDBACK CONTROL	ROBOMECH CON INSTR V
ECE PY)	727		X		SEMICONDUCTOR THIN FILM TECHNOLOGY	NEP
ECE	729		X		GROWTH OF THIN FILMS FROM THE VAPOR PHASE	NEP S-A
ECE	733		X		DIGITAL ELECTRONICS	CIRCUITS S
ECE	734		X		POWER MANAGEMENT INTEGRATED CIRCUITS	PWR ELEC/ PWR SYS F
ECE	736		X		POWER SYSTEM STABILITY AND CONTROL	PWR ELEC/ PWR SYS F
ECE	737		X		MICROWAVE DEV. CHARACTER. TECHNIQUES	MW CKTS/ APP ELMG F
ECE	739		X		INTEGRATED CKT TECHNOLOGY FABRICATION LAB.	NEP S
ECE	742		X		ARTIFICIAL NEURAL NETWORKS	SIG PROC COMPINTEL S
ECE	743			X	HIGH PERFORMANCE MULTICOMPUTER ARCHITECTURE	COMP ARC F
ECE	745			X	ASIC VERIFICATION	VLSI SYS F

APPENDIX A (revised 6/10)						
ECE	746			X	HIGH PERFORMANCE VLSI DESIGN	VLSI SYS
ECE	747			X	DIGITAL SIGNAL PROCESSING ARCHITECTURE	COMP ARC S
ECE	751		X		DETECTION AND ESTIMATION THEORY	COMM S
ECE	752		X		INFORMATION THEORY	COMM S-0
ECE	753		X		COMPUTER ANAL. OF LARGE SCALE POWER SYSTEMS	PWR ELEC/ PWR SYS S-E
ECE	755		X		ADVANCED ROBOTICS	ROBOMECH CON INSTR F
ECE	756		X		ADVANCED MECHATRONICS	ROBOMECH CON INSTR S
ECE	759		X		PATTERN RECOGNITION	SIG PROC COMPINTEL S-E
ECE	761			X	DESIGN AUTOMATION FOR VLSI	VLSI SYS S
ECE	762		X		ADVANCED DIGITAL COMMUNICATIONS SYSTEMS	COMM F
ECE	763		X		COMPUTER VISION	SIG PROC COMPINTEL F
ECE	764		X		DIGITAL IMAGE PROCESSING	SIG PROC COMPINTEL F
ECE	765			X	FAULT TOLERANT COMPUTING	SIG PROC COMPINTEL S
ECE	766		X		WIRELESS COMMUNICATIONS: SIGNAL PROCESSING PRINCIPLES	COMM S
ECE	767		X		ERROR-CONTROL CODING	COMM S-E
ECE(CSC)	773			X	ADVANCED TOPICS IN INTERNET PROTOCOLS	NTWK S
ECE(CSC)	774			X	ADVANCED NETWORK SECURITY	NTWK S
ECE(CSC)	775			X	ADVANCED WIRELESS NETWORKS	NTWK F
ECE(CSC)	776			X	DESIGN & PERFORMANCE EVALUATION OF NTWK SYS & SVCS	NTWK S
ECE(CSC)	777			X	TELECOMMUNICATIONS NETWORK DESIGN	NTWK F
ECE	778		X		OPTICAL FIBER COMMUNICATIONS	NTWK F
ECE(CSC)	779			X	ADVANCED COMPUTER PERFORMANCE MODELING	NTWK F
ECE	781		X	X	SPECIAL STUDIES IN ECE GIVEN AS NEED ARISES	VARIABLE V
ECE	782		X	X	SPECIAL STUDIES IN ECE GIVEN AS NEED ARISES	VARIABLE V
ECE	785			X	ADVANCED COMPUTER DESIGN	COMP ARC F
ECE	786			X	ADVANCED COMPUTER ARCHITECTURE	COMP ARC S
ECE	791		X	X	SPECIAL TOPICS IN ECE (DEPENDS ON TOPIC)	VARIABLE V
ECE	792		X	X	SPECIAL TOPICS IN ECE (DEPENDS ON TOPIC)	VARIABLE V
ECE	633		X	X	INDIVIDUAL TOPICS IN ECE—only 1 S/U course allowed (MS Level) exception with 695 for thesis students	VARIABLE V
ECE	634		X	X	INDIVIDUAL STUDIES IN ECE —only 1S/U course allowed (MS Level) exception with 695 for thesis students	VARIABLE V
ECE	833		X	X	INDIVIDUAL TOPICS IN ECE (PhD Level)	VARIABLE V
ECE	834		X	X	INDIVIDUAL STUDIES IN ECE (PhD Level)	VARIABLE V
FOOTNOTE					Course is not associated with any specific specialty area and cannot be used to satisfy the breadth requirement for a degree.	

APPENDIX B

A table of the graded coursework for several common situations for obtaining the PhD degree is given below.

ECE PHD Graded Course Requirements (Proposed)					
	Direct from BS	NCSU-MS non-thesis 30 hrs ECE courses	NCSU-MS non-thesis 21 hrs ECE courses, 9 hrs outside ECE	NCSU-MS thesis 21 hrs ECE courses, 9 hrs thesis, special topic	Non-NCSU MS in ECE 18 hours credit
Total Minimum Graded Hours in PhD after last degree	42	12	12-18 (depends on 9 hours)	18	18
Minimum Graded ECE hours at NCSU after last degree	36	6	15	12	12
Graded Graduate level hours outside major area at NCSU	9	9	9	9	9 *
*Courses in three ECE specialty areas at NCSU with B+ or better	Yes	Can count those during NCSU MS	Can count those during NCSU MS	Can count those during NCSU MS	Must take at NCSU

- *Students with MS degrees from other universities in subjects other than ECE may count their MS courses toward this requirement.

However, these students are required to take appropriate courses to satisfy ECE graduate admission requirements and pass the courses, as described above, in three specialty areas.

- Courses taken outside of ECE at other U.S. universities require approval of the Director of Graduate Programs. Detailed documentation of course content is required.

APPENDIX C

ECE Milestones

(See University deadlines in the Graduate Handbook)

<http://www.ncsu.edu/grad/handbook/index.php>)

Required Forms/Actions*	When Required	Who Initiates	Comments
Complete, official transcripts from universities and colleges attended, including degrees and dates awarded.	Before the beginning of the first semester of enrollment	Student is responsible for providing official transcripts to the Graduate School.	You cannot graduate without an official transcript on file with the NCSU Graduate School.
Signed Patent Agreement	Before the end of the first semester of enrollment	Initiated by student and submitted to ECE Department . DGP approves & sends to Grad School.	Form is available via http://www.ncsu.edu/grad/faculty-and-staff/forms-list.html
Plan of Work (PhD and MS)	By the end of the second semester of enrollment (or the semester in which you complete 18 hours) for MS and end of 4 th for PhD.	Student is responsible for submission of plan in MyPackPortal. DGP is responsible for assuring the plan meets ECE requirements.	Samples for Plans of Work for the various degree programs are available via the ECE Graduate Plans of Work web page.
Request for appointment of advisory committee for MS Thesis or PhD	With Plan of Work In MyPackPortal.	Student must find an advisor (chair of committee). Committee is checked by DGP and submitted to the NCSU Graduate School.	Check rules for committees in ECE Graduate Student Handbook.
Modification of Plan of Work (all students)	Via MyPackPortal . Contact ECE Grad Office to re-set plan in SIS. No later than four (4) weeks into the semester in which you plan to graduate.	DGP is responsible for assuring the plan meets ECE requirements. Student is responsible for assuring that plan of work matches transcript.	If no plan has been filed and approved at all levels, you cannot be cleared and may not graduate that semester. Late filing may delay graduation.
Graduation Clearance for master's (non-thesis) program only—a self check.	No later than the fourth (4 th) week of the semester in which the student plans to graduate (7 working days after the first day of SS I for summer grads) BEFORE APPLY TO GRADUATE	Initiated by the student. Student ensures POW matches transcript; if not, submit new POW.	Graduation Clearance Checklist for ECE Non-thesis MS is available on ECE Graduate Forms web page.

Apply to Graduate Non-thesis MS students	By the end of the fourth (4 th) week of classes of the semester in which the student plans to graduate.	Initiated by student in MyPackPortal.	If you cannot graduate due to any circumstances please inform the ECE Grad Office to WITHDRAW your Application to Graduate.
Request to Schedule the Master's Oral Examination (master's thesis students only)	Submit to ECE Grad Office 15 days before exam date. The ECE Grad Office must submit to the NCSU Graduate School at least 10 working days before the examination is scheduled. POW must already be approved.	Initiated by student and submitted to the Graduate School by the DGP. Student must also apply to graduate at the same time via MyPackPortal.	Form to Schedule Master Thesis Exam is available in "Exams" category via ECE Graduate Forms web page. Recommend student Apply to Graduate when the defense is scheduled.
Request to Schedule the Preliminary Oral Examination (doctoral students only)	After Qualifying Review has been completed, but no later than four months <i>prior to</i> Final Oral Exam. Request must be submitted to ECE Grad Office 15 working days prior to exam date. The ECE Office must submit the request to the NCSU Graduate School at least 10 working days prior to proposed exam date (see right).	Initiated by student and submitted to the Graduate School by the ECE Grad Office. The Graduate School responds in 5 working days if a GSR has already been assigned. If not, the Graduate School may take up to 10 working days to respond.	Form to Schedule Doctoral Prelim Exam is available in "Exams" category via ECE Graduate Forms web page.
ETD (Electronic Thesis and Dissertation) MS	MS students should begin the ETD process <u>no later than the end of the first year.</u>	Initiated by the MS student	Recommend student attend ETD Workshop given by Graduate School
ETD (Electronic Thesis and Dissertation) PhD	Doctoral students should begin the ETD process <u>no later than</u> when the Prelim Exam is passed.	Initiated by the doctoral student	Recommend student attend ETD Workshop given by Graduate School
Request to Schedule the Final Oral Examination (doctoral students only)	Request must be submitted to ECE Grad Office 15 working days prior to exam date. The ECE Office submits the request to Graduate School at least 10 working days prior to proposed exam date (see right), and no earlier than 4 calendar months after successful completion of preliminary exam.	Initiated by student and submitted to the Graduate School by the ECE Grad Office. The Graduate School responds in 5 working days if a GSR has already been assigned. If not, the Graduate School may take up to 10 working days to respond.	Form Request to Schedule Doctoral Final is available in "Exams" category via ECE Graduate forms web page. Recommend student Apply to Graduate when the FINAL defense is scheduled.

Exam Grade Reports for ALL Scheduled Exams (MS Thesis, Prelim for PhD and Final for PhD)	Immediately after oral examination is completed.	Chair of Student's Committee must submit form to ECE Grad Office with signatures of all committee members. ECE Grad Office must submit to the Graduate School within 5 working days of exam.	
Submission of thesis or dissertation to Graduate School.	Once the final oral exam is an unconditional pass , the student should immediately submit their electronic ETD to the online system no later 24 hours after the exam (but before the deadline, whichever is earlier.)	Initiated by student. Student has two (2) ETD Thesis Review Deadlines to meet. The Thesis Editor reviews the ETD once for each student. Thus, each student is to submit a PDF ETD file to the Thesis Editor two times only: First file and final, error-free file.	The submission should occur well in advance. The end-of-semester times are very crowded. The first ETD submission is for the thesis review and the second ETD submission is to have the final, error-free file accepted by the Graduate School.

APPENDIX D

Requirements for Full-Time/Part-Time Registration

Full-time/Part-time Status of Graduate Students NC State uses a uniform Schedule of Full-time/Half-time Status of Graduate Students. These definitions apply to **ALL** graduate students.

- **1. Fall and Spring Semesters**

CLASSIFICATION	FULL TIME	HALF TIME
Non-Thesis Master's	Non-Thesis Master's Registration for nine (9) or more credit hours per Fall or Spring semester, or a minimum of three (3) hours per semester during the semester in which the student is completing the last course(s) required to complete the degree. Students who have completed ¹ all credit hour requirements for their degree must register for three (3) hours of XXX 689 (Non-Thesis Master Continuous Registration - Full Time Registration). Students may register for this course a maximum of one semester.	Registration for 3-8 credit hours per Fall or Spring semester, or one (1) hour of XXX 688 (Non-Thesis Master's Continuous Registration-Half Time Registration) for students who have completed ² all credit hour requirements for their degree.
Thesis Master's	Registration for nine (9) or more credit hours per Fall or Spring semester, or a minimum of three (3) hours per semester during the semester in which the student is completing the last course(s) required to complete the degree. For thesis students, this could include XXX 695. Students who have completed ³ all credit hour requirements (including research credits) for their degree except for completing their research and/or writing and defending the thesis should register for	Registration for 3-8 credit hours per Fall or Spring semester, or one (1) hour of XXX 699 (Master's Thesis Preparation) for students who have completed ⁴ all credit hour requirements (including research credits) for their degree and are completing their research and/or writing and defending the thesis.

	three (3) hours of XXX 699 (Master's Thesis Preparation) each semester until graduation.	
Doctoral	Registration for nine (9) or more credit hours per Fall or Spring semester until the student completes all credit hour requirements for the degree, including research credits, and the oral preliminary examination, or three (3) hours per semester of XXX 899 (Doctoral Dissertation Preparation) for students who have completed ⁵ all credit hour requirements for their degree (including research credits and the oral preliminary examination) except for completing their research and/or writing and defending the dissertation.	Registration for 3-8 credit hours per Fall or Spring semester, or one (1) credit of XXX 899 for students who have completed ⁶ all credit hour requirements for their degree (including research credits and the oral preliminary examination) except for completing their research and/or writing and defending the dissertation.

- ¹Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 689 and be considered full time.
- ²Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 699 and be considered full time.
- ³Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 688 and be considered half time.
- ⁴Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 699 and be considered half time.
- ⁵Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 899 and be considered full time.
- ⁶Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 899 and be considered half time.
- **2. Summer Sessions**