

# **NJIT**

**New Jersey Institute of Technology  
A Public Research University**

**Department of Electrical and Computer Engineering**

**Handbook for Graduate Students  
2000-2001**

**Available on the Web:  
<http://www.njit.edu/ECE/Publications/HANDBOOK.htm>**

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## **Introduction**

We are pleased to present out *Handbook for Graduate Students* for students enrolled in programs in the Department of Electrical and Computer Engineering (ECE). This document is a compilation of both Institute and ECE department regulations and procedures of particular interest to M.S. and Ph.D. students. Please note that the Institute's *Graduate Catalog* also contains information you will find helpful. Changes that may occur in ECE department procedures will be posted on the bulletin board near 200 ECEC. We expect to revise this handbook on an annual basis.

Graduate degrees offered by the Department of Electrical and Computer Engineering.

- MS in Electrical Engineering
- MS in Computer Engineering
- MS in Internet Engineering
- MS in Telecommunications (offered jointly with the Computer and Information Science department)
- Ph.D. in Electrical Engineering
- Ph.D. in Computer Engineering

## **II. ADMISSIONS**

The following sections contain special admission issues of concern to students in the Department of Electrical and Computer Engineering. Please consult the *Graduate Catalog* for other issues regarding admission.

### **1. GRE and TOEFL**

The Graduate Record Examination (GRE) General Section is required of all applicants to doctoral programs, all full-time applicants to master's programs, all applicants seeking financial support, and all applicants whose most recent degree was awarded from an institution outside of the United States.

The Test of English as a Foreign Language (TOEFL) is required for all international students applying to a graduate program, the score of which must be at least 550. Applicants with scores below 550 are not considered for admission.

### **2. Conditional Admission**

Conditional admission may be granted to applicants who do not have the appropriate academic background required for a particular degree program, but who have an academic record that meets NJIT's scholastic standards. Once granted conditional admission, students must complete conditional or bridge courses specified by the university within their first two semesters. Such courses may be at either the undergraduate or graduate level and are NOT counted as degree credits, although all graduate courses are calculated in the grade point average (GPA). Students must attain grades specified by the university and are not permitted to take more than 9 credits that count as graduate degree credits at NJIT before meeting the terms of conditional admission. Failure to meet these conditions may result in dismissal from the university.

### **3. Change of Major**

Students are admitted to one graduate degree program and not to the university as a whole. Students who wish to change majors must remain and take courses in the original program for a year and then file an application for the new program. There is no guarantee that the new application will be successful. Those on support may risk losing support from the original department and cancellation of a current award. International students and others who must be registered full-time will still be required to have a 12-credit registration.

### **4. Change of Degree Level**

Students who wish to change the level of the degree program in which they are enrolled must file an application for admission to the new degree level. There is no guarantee that the application will be

successful. Students who wish to drop down to a master's degree program from a doctoral program should be aware of the impact of this action on current and future financial support.



## **5. Non-Degree (Non-Matriculated) Students**

Non-matriculated students may be permitted to take a maximum of 9 graduate-level credits over three registration periods, except students seeking a graduate certificate. These students may take a maximum of 12 graduate-level credits over four registration periods. Students wishing to take credits beyond these limits must apply and be accepted to a degree program as a matriculated student. Academically qualified students who do not desire to enter degree programs may enroll for certain individual graduate courses. Such students must present transcripts of previous academic work or other appropriate evidence at each registration in order to indicate adequate preparation for the course work involved. If approved by the Associate Chair for Graduate Studies and by the Office of University Admissions, registration will be permitted if space is available. Permission to enroll as a non-matriculated student does not imply eventual admission to a degree program.

### **Graduate Certificate Programs**

NJIT offers clusters of courses in concentrated areas for students who wish to obtain a certificate of completion. In general, these require completion of 12 credits at the graduate level. Students in these programs are considered to be non-matriculated students for the duration of the certificate program.

Upon completion of the certificate program, the student may apply for admission to matriculated status. In the event that the petition is approved, some or all of the courses taken in the certificate may be applied toward satisfying the M.S. degree requirements. The courses must be applicable to the M.S., and the grade in each accepted course must be B or better.

### III. REGISTRATION AND OTHER ACADEMIC POLICIES

#### 1. Approval of Course of Study

Students are required to arrange a conference with their graduate advisor as soon as possible after notification of admission (international students should do so immediately after arrival in the United States) to formulate a course of study that meets the requirements of the particular degree program and reflects the interests and aspirations of the individual student. New students are required to obtain advisor approval for initial course registration.

#### 2. Continuous Registration Requirement

Once admitted to a degree program, students must be continuously registered each semester until they complete degree requirements. Students are not permitted to register for Maintaining Registration (MR) if their project, thesis or dissertation is unfinished without approval for a Leave of Absence by the Dean of Graduate Studies. Students who complete work for Master's Projects or Theses over several semesters receive a final grade (A, B, C) in the semester in which the work is completed and the final document is approved. The final grade of a completed doctoral dissertation is P. An interim grade of S or U is given for semesters other than the final semester.

#### 3. Transfer of Credits from Outside NJIT

Transfer credits are calculated by NJIT according to the total number of instructional minutes earned at the other institution. The equivalent instructional minutes of a maximum of 9 credits of graduate work, taken within seven years, from accredited U.S. educational institutions may be transferred and applied to degree requirements at NJIT. Credits from educational institutions outside the United States cannot be transferred. On a case by case basis, up to 9 credits may be waived for non-collegiate based instruction. The university does not grant transfer credit for work experience or other non-instructional activities. Credits are transferred only if the courses were taken for full academic credit, were never applied to any other degree, and a final grade of at least B was attained. In addition, the student's graduate advisor and the Office of Graduate Studies must agree that such courses directly relate to the student's program of study before they can be transferred.

Requests for transfer credit must be submitted on a form available from the Office of Graduate Studies, accompanied by course descriptions from the other educational institution. Students must also arrange for the other institution to send an official transcript to the Office of Graduate Studies at NJIT. Requests may be submitted and approved at any time but are not added to a student's record until matriculation is granted. Grades that are transferred will not be calculated in cumulative grade point averages.

#### 4. Enrollment Status

**Full-time Students:** Students registered for 12 credits or more throughout an entire semester are considered full-time. International students and students receiving financial awards must have full-time status each semester.

**Part-Time Students:** Students registered for fewer than 12 credits during a semester, unless certified as full-time by the Office of Graduate Studies.

## **5. Full-time Certification**

Graduate students must be registered for not less than 12 credits each semester in order to be accorded full-time status. The Office of Graduate Studies may certify certain students as full-time even if they are not registered for 12 credits, as follows:

- Students who have fewer than 12 credits remaining for completion of all degree requirements and are registered for all credits needed to complete the degree. This certification can only be given for one semester.
- Doctoral students preparing for qualifying examinations or research proposal presentations register for at least 9 credits. Course credit possibly includes 3 credits of pre-doctoral research.
- Doctoral candidates who have completed all course work, other degree and credit requirements, and who are registered in Dissertation Research and Seminar for at least 3 credits each semester.
- Students who originally registered for 12 credits but now have substantial extenuating circumstances requiring a reduction in course load. Normally this certification applies only in cases of medical or similar emergencies which incapacitate a student for a significant part of a semester. Improper course registration, failure to seek proper advisement, inadequate academic progress, or risk of earning a weak or failing grade are not extenuating circumstances.
- Students on a full-time cooperative education assignment and registered in the Co-op Work Experience or equivalent course. When students are in their final semester of study, they may be certified as full-time and approved for co-op. The Office of Graduate Studies should be consulted for limits on cooperative education, as it has an impact on full-time certification and allowable time to complete the degree.

Audited courses and withdrawn courses do not count toward full-time status; ESL (English as a Second Language) courses do count as one course.

## **6. Grade Point Average Calculation**

In order to obtain a graduate degree, candidates must have a cumulative grade point average of at least 3.0 in all graduate-level courses, exclusive of grades in Master's Project or Master's Thesis. All 500-level or higher courses are included in the cumulative grade point average, regardless of applicability to a specific degree. Only the initial grades for graduate courses that have been repeated once are excluded from GPA calculations. In addition, the cumulative grade point average for all courses counted for the degree, exclusive of Master's Project or Master's Thesis, must be 3.0 or better.

## **7. Expiration of Credit**

For all degrees, credits expire seven years after completion of the semester in which they are earned. Expired courses cannot be used to fulfill degree requirements and must be replaced by current credits. Degree requirements must be completed within seven consecutive years of original admission. Approved leaves of absence do not count against the seven-year limit for completion of the degree although the validity of individual courses may still expire during this time. Requests for waivers of the seven-year limit for extenuating circumstances, other than mere failure to register, are made to the Dean of Graduate Studies. The technical content and remaining currency of courses are considered in evaluating these requests.

## 8. Grades

The Registrar issues a grade report to each student at the end of each semester. Grade point averages are calculated for each semester and cumulatively for the entire graduate record. Undergraduate credits taken by graduate students are not counted. The following grades are used:

<u>Grade</u>	<u>GPA</u>	
A	4.0	Excellent
B+	3.5	Good
B	3.0	Acceptable
C+	2.5	Fair
C	2.0	Minimum Performance
F	0.0	Failure
I		Incomplete
W		Approved Withdrawal
AUD		Audited (No academic credit)
S or U		Satisfactory or Unsatisfactory (interim grades for thesis and dissertation and final grade for Co-op)
P		Passing for Doctoral Dissertation and Defense

## 9. Incomplete Grades

A grade of I (Incomplete) is given when courses cannot be completed because of special circumstances. Students on academic probation are not permitted incompletes without permission from the Office of Graduate Studies. Required course work may be finished at the discretion of the instructor, no later than the end of the subsequent semester. A letter grade must be assigned or a grade of “F” will be given. Students nominated for financial awards must have I grades resolved by the fourth week of the subsequent semester to allow a determination of their eligibility for the award. This grade cannot be changed. A grade of “I” cannot be given for thesis, project, dissertation, seminar, pre-doctoral research courses, or ESL courses.

## 10. Course Withdrawals

Withdrawal from graduate courses, without academic penalty, is permitted until the end of the ninth week of the semester. A notation of W on the student’s transcript signifies an approved withdrawal. Withdrawal forms may be obtained from the Office of the Registrar. Approved withdrawal takes effect when the Registrar receives the completed withdrawal form from the student within the designated nine-week period. A failing grade will be issued to students who do not notify the Registrar of withdrawal in this manner. Students who do not obtain an approved withdrawal are obligated to pay full tuition and fees. Any refunds for approved withdrawals follow the refund schedule established by the Registrar. Withdrawals that affect conditions for retention of financial awards or support, continued full-time status, academic probation, progress toward a degree, admission, ESL, or participation in special programs must be approved by the Office of Graduate Studies. After the ninth week of the semester, students may withdraw from a course only for extenuating circumstances with the approval of the Dean of Graduate Studies and by the graduate program advisor.

## **11. Auditing a Course**

Students who wish to audit a course must state their intention to do so at the time of registration. Change in auditing status is not permitted once a semester has begun. Students who audit are required to pay full tuition and fees for the course. Financial awards are not applicable to audited courses. Audited courses are not counted in determining full-time status. Students on probation are not permitted to audit.

## **12. Satisfactory and Unsatisfactory**

The grades S or U report progress in project, thesis, dissertation, and pre-doctoral research courses. These also can be final grades in seminar, co-op, teaching methods, and ESL courses. The grade of S is given for satisfactory progress and U is given for unsatisfactory progress. Students who fail to meet with their advisors will receive a U grade. Credits for courses in which U is received cannot count toward a degree.

## **13. Course Repetition**

Graduate students may request approval to repeat a course using a form available from the Office of Graduate Studies. The grade received in a repeated course is calculated in the cumulative grade point average, but the first grade still appears on the transcript. A maximum of two courses may be repeated in graduate studies. Students may not repeat a course without prior approval from the department and the Office of Graduate Studies. Students who receive an F in a course will be required to repeat that course. The Dean of Graduate Studies should be consulted if the course is no longer offered or not applicable to the student's current program.

## **14. Project, Thesis and Dissertation**

Theses and dissertations submitted for graduate degrees must follow a prescribed format. A manual outlining the university requirements for thesis and dissertation submission is available in NJIT's bookstore. The Office of Graduate Studies should be consulted for more information.

Letter grades (A, B, C) are given for satisfactory completion of Master's Project and Thesis requirements. Projects and theses must be submitted first, before a grade can be given. Theses and dissertations are submitted to the Office of Graduate Studies. Projects are submitted to the project graduate advisor. Semester and cumulative GPA calculations by the Registrar only include courses for which a letter grade is given. For the purpose of the GPA, the Registrar only calculates the grades for credits earned in the semester in which the project or thesis is completed. Letter grades cannot be given for an unfinished project or thesis, nor for work not submitted. A grade of P is given for satisfactory completion of a doctoral dissertation and defense. Receipt of two U grades for project, thesis, dissertation, or pre-doctoral research will result in a letter grade of F in place of the second U and dismissal from the program. Students may not register for project, thesis, or dissertation credits until they arrange for a department- or program-approved faculty advisor to supervise the work. Continued registration for additional thesis, project, or dissertation credits will be allowed as long as the advisor grades the work to show that there is satisfactory progress. Credits for which a U (unsatisfactory) grade is given are not counted as degree credits toward completion of the thesis, project, or dissertation.

Master's project or master's thesis registration must be at least 3 credits during a semester or summer session. Doctoral dissertation registration must be at least 6 credits during a semester, until the 36-credit requirement is reached, at which time 3-credit registrations are permitted. All students must have their

advisor's signature and section identification each time they register for project or thesis. Students must register for thesis, project, or dissertation work within the deadlines established by the Registrar. Doctoral dissertation registration may be 3 credits during a summer session. Maximum credit registration each semester is 12 credits for the doctoral dissertation, 6 credits for the master's thesis, and 3 credits for the master's project. Once a student has begun the master's project, the master's thesis, or the doctoral dissertation, he or she must register for these courses each semester until the project, thesis, or dissertation is completed. Unapproved interruptions in project, thesis or dissertation may be subject to billing for omitted credits. Students must be registered in project, thesis or dissertation in any semester or summer session in which completion is expected. A final grade is assigned by the advisor for thesis or dissertation when the Office of Graduate Studies confirms it has received all documents in final and approved form and all related bills have been paid.

Approval by the graduate program advisor and the Office of Graduate Studies must be obtained if the student wishes to interrupt the thesis, project, or dissertation for a semester or more. Students must maintain continuity of registration for theses and dissertations (implies registration for fall or spring, but not for summer). If a master's project is not completed after two semesters of registration, a final grade of F is given. Failure to complete a master's project by students who receive financial support may result in dismissal. No more than four semesters and two summers of registration for a master's thesis are permitted. Failure to complete a master's thesis within this period will result in a final grade of F, and may result in dismissal. No more than six years of registration for doctoral dissertation is permitted. Failure to complete a doctoral dissertation in this period will result in a final grade of F and dismissal from the program.

Students who require additional time to complete a project, thesis, or dissertation should appeal for an extension, in writing, to the graduate program advisor, the department, and the Office of Graduate Studies. If the appeal for an extension is denied, the student may appeal further in the following order: department chairperson, dean of the school or college, and finally to the Committee on Graduate Appeals. Appeals may be accompanied by any material that the student believes appropriate. Appeals to the Committee on Graduate Appeals should be directed to the Dean of Graduate Studies. All decisions of the Committee on Graduate Appeals are final.

## **15. Deadline Waiver**

Applications for January or May graduation for students whose master's thesis or doctoral dissertation is substantially complete, but who are unable to submit it in final form by the specified date, may request a deadline waiver from the Office of Graduate Studies before it is due. Students granted a waiver may be permitted until a date specified by the Office of Graduate Studies to submit the final copy of the work. Such students may then apply for the next scheduled graduation without having to pay for additional thesis or doctoral dissertation credits. Contact the Office of Graduate Studies for further information.

## **IV. MASTER OF SCIENCE IN ELECTRICAL ENGINEERING**

### **1. Admission Requirements**

Applicants are expected to have excellent undergraduate backgrounds in physics, mathematics (through differential equations and vector analysis), electrical networks and devices, electronics, analysis and design methods, transients, electromagnetic fields, and appropriate laboratory work in some of these areas.

Bridge Program~Students who have earned a Bachelor of Science in Engineering Technology (B.S.E.T.) degree, or who lack an appropriate background, must take the following courses, in addition to the degree requirements, to make up deficiencies. They must obtain a grade of B or better in each course. At the discretion of the department, students who have taken courses equivalent to these may have their bridge program requirements reduced accordingly.

EE 232-Circuits and Systems II  
EE 321-Random Signals and Noise  
EE 333-Circuits and Systems III  
EE 361-Electromagnetic Fields I  
EE 362-Electromagnetic Fields II  
EE 372-Electronic Circuits II  
EE 373-Electronic Circuits III

### **2. Degree Requirements**

Upon entering the program, students select an area of specialization supervised by an area coordinator. The master's program consists of 30 credits. Students should consult with the area coordinator or designee for their area of specialization before registering for courses to make sure they are meeting department requirements. Area coordinators or their designees must approve any additional courses that students wish to be counted towards their degrees. As a requirement for graduation, students must achieve a 3.0 cumulative GPA overall and in graduate-level courses not including the master's thesis or project.

### **3. Project, Thesis, Seminar**

Students who enter the electrical engineering master's program and who receive departmental or research-based awards must complete a master's thesis.

All master's students must register for two semesters of ECE 791 Graduate Seminar. Those with substantial professional experience may have this requirement waived. In order to receive passing credit, the student must attend at least five (5) seminars per semester, to be chosen from those sponsored by the areas, the ECE department, the Institute, or other outside seminars approved by the Seminar Supervisor. Please watch the bulletin board labeled *ECE 791 Graduate Seminar*, located in the hall leading to the ECE main office, for information on approved seminars.

Once a student registers for ECE 701 Master's Thesis, he or she must complete a thesis in two years.

Students who enter the program but who did not receive departmental or research-based awards, as well as entering part-time students, have three program options: 24 course credits and 6 credits of ECE 701 Master's Thesis or 27 course credits and 3 credits of ECE 700 Master's Project or 30 course credits not to include ECE 700 Master's Project or ECE 701 Master's Thesis.

## 4. Areas of Specialization

Entering full-time students must select an area of specialization during their first semester. Entering part-time students must select an area of specialization by the beginning of their third semester. Further specialization within each area is possible and encouraged. Students should contact the ECE Associate Chair for Graduate Studies for guidance.

### Area Members

#### Computer Systems

J.Savir (Area Coordinator), 209 ECE, 596-5681  
N. Ansari  
J. Carpinelli  
E. Hou  
C. Manikopoulos  
D. Misra  
S. Papavassiliou  
S. Rosenstark  
N. Uzun  
M. Zhou  
S. Ziaavras

#### Control Systems

A. Meyer (Area Coordinator), 307 ECEC, 596-3530  
T. Chang  
B. Friedland  
M. Kuo  
Y. Shi  
J. Strano  
M. Zhou

#### Communications and Signal Processing

A. Haimovich (Area Coordinator), 311 ECEC, 596-3534  
A. Akansu  
N. Ansari  
Y. Bar-Ness  
J. Frank  
H. Ge  
R. Haddad  
J. Klapper  
Y. Shi  
S. Tekinay

#### Energy Conversion and Power

E. Cohen (Area Coordinator), 323 ECEC, 596-3540  
W. Hubbi

#### Microwave and Lightwave Engineering

G. Whitman (Area Coordinator), 223 ECEC, 596-3232  
H. Grebel  
E. Niver

#### Solid-State Materials, Devices and Circuits

R. Cornely (Area Coordinator), 204 ECEC, 596-3537  
W. Carr  
H. Grebel  
D. Misra  
K. Sohn  
M. Sosnowski  
G. Thomas



## 5. Core Courses

Students are required to take 6 credits from the following list depending on area of specialization as noted:

- ECE 601-Linear Systems (all areas of specialization except Computer Systems)
- ECE 620-Electromagnetic Field Theory (Energy Conversion and Power; Microwave and Lightwave Engineering; Solid State Materials, Devices and Circuits)
- ECE 673-Random Signal Analysis I (Biomedical Systems, Communications and Signal Processing, Computer Systems, Control Systems)
- ECE 684-Advanced Microprocessor Systems (Computer Systems, Energy Conversion and Power)

## 6. 500-Level Courses

500-level courses in electrical engineering are not acceptable for credit toward a degree in electrical engineering. Only one 500-level course outside the department may be applied for credit toward a degree in electrical engineering.

## 7. Area Requirements

Note that students can choose electives outside of the lists below with advisor approval.

### Communications and Signal Processing

#### Communications Track

##### *Department Requirements:*

ECE 601-Linear Systems  
ECE 673-Random Signal Analysis I

##### *Area Requirements:*

ECE 642-Communication Systems I  
ECE 742-Communication Systems II

##### *Electrical Engineering Electives:*

ECE 640-Digital Signal Processing  
ECE 644-Intro. to Wireless & Personal Comm. Sys.  
ECE 646-Data Communications  
ECE 740-Advanced Digital Signal Processing  
ECE 746-Adaptive Array Proc. and Interference Canc.  
ECE 755-Advanced Topics in Digital Communication  
ECE 757-Wireless Communication  
ECE 759-Prin. of Phase Lock and Frequency Feedback  
ECE 776-Information Theory  
ECE 777-Statistical Decision Theory in Communications  
ECE 778-Algebraic Coding for Info. Transmission

#### DSP Track

##### *Department Requirements:*

ECE 601-Linear Systems  
ECE 673-Random Signal Analysis I

##### *Area Requirements:*

ECE 640-Digital Signal Processing  
ECE 740-Advanced Digital Signal Processing

##### *Electrical Engineering Electives:*

ECE 609-Artificial Neural Networks  
ECE 623-Fourier Optics  
ECE 642-Communication Systems I  
ECE 643-Digital Image Processing I  
ECE 684-Advanced Microprocessor Systems  
ECE 746-Adaptive Array Proc. & Int. Canc.  
ECE 747-Signal Decomposition Techniques  
ECE 749-Compression in Multimedia Engr.  
ECE 769-Stochastic Estimation and Control  
ECE 773-Random Signal Analysis II  
ECE 777-Stat.Decision Theory in Comm.  
ECE 778-Algebraic Coding for Info. Trans.

## **Computer Systems**

### Computer Networking Track

#### *Department Requirements:*

ECE 673-Random Signal Analysis I  
ECE 684-Advanced Microprocessor Systems

#### *Area Requirements:*

ECE 683-Computer Network Design and Analysis  
ECE 783-Computer Communication Networks

#### *Electrical Engineering Electives:*

ECE 605-Discrete Event Dynamic Systems  
ECE 639-Principles of Broadband ISDN and ATM  
ECE 642-Communication Systems I  
ECE 644-Intro. to Wireless & Personal Comm. Sysys.  
ECE 646-Data Communications  
ECE 650-Electronic Circuits  
ECE 677-Optimization Techniques  
ECE 681-Broadband Packet Switches  
ECE 742-Communications Systems II  
ECE 785-Parallel Processing Systems  
ECE 685-Network Interface Design

### Microprocessor Systems Track

#### *Department Requirements:*

ECE 601-Linear Sys. or ECE 673-Random Sig. Analysis I  
ECE 684-Advanced Microprocessor Systems

#### *Area Requirements:*

ECE 686-Instrumentation Systems and Microprocessors  
ECE 688-Microcontrollers in Instrumentation

#### *Electrical Engineering Electives:*

ECE 605-Discrete Event Dynamic Systems  
ECE 612-Computer Methods Applied to Power Systems  
ECE 640-Digital Signal Processing  
ECE 643-Digital Image Processing I  
ECE 650-Electronic Circuits  
ECE 660-Control Systems I  
ECE 664-Real-Time Computer Control Systems  
ECE 687-Design of Medical Instrumentation  
ECE 785-Parallel Process Systems

### VLSI Systems Design Track

#### *Department Requirements:*

ECE 673-Random Signal Analysis I  
ECE 684-Advanced Microprocessor Systems

#### *Area Requirements:*

ECE 658-VLSI Design I  
ECE 758-VLSI Design II

#### *Electrical Engineering Electives:*

ECE 605-Discrete Event Dynamic Systems  
ECE 650-Electronic Circuits  
ECE 657-Semiconductor Devices  
ECE 659-Fabric.Prin.Elec./Optoelec. Devices  
ECE 785-Parallel Processing Systems  
ECE 789-112-Design for Testability Principle

### Parallel Computer Systems Track

#### *Department Requirements:*

ECE 601-Lin.Sys. or ECE 673-Random Sig. Anal.  
ECE 684-Advanced Microprocessor Systems

#### *Area Requirements:*

ECE 689-Dig. Sys. Design for Machine Arith.  
ECE 690-Computer Systems Architecture

#### *Electrical Engineering Electives:*

ECE 605-Discrete Event Dynamic Systems  
ECE 640-Digital Signal Processing  
ECE 643-Digital Image Processing I  
ECE 650-Electronic Circuits  
ECE 785-Parallel Processing Systems

## **Control Systems**

### *Department Requirements:*

ECE 601-Linear Systems

ECE 673-Random Signal Analysis I

### *Area Requirements:*

ECE 660-Control Systems I

ECE 664-Real-Time Computer Control Systems

ECE 666-Control Systems II

### *Electrical Engineering Electives:*

ECE 661-Control System Components

ECE 677-Optimization Techniques

ECE 766-Stability Theory of Nonlinear Systems

ECE 768-Optimal Control Theory

ECE 769-Stochastic Estimation and Control

## **Energy Conversion and Power**

### *Department Requirements:*

ECE 601-Linear Systems

ECE 620-Electromagnetic Field Theory *or* ECE 673-Random Signal Analysis I  
*or* ECE 684-Advanced Microprocessor Systems

### *Area Requirements:*

ECE 610-Power System Steady-State Analysis

ECE 611-Transients in Power Systems

### *Electrical Engineering Electives:*

ECE 612-Computer Methods Applied to Power Systems

ECE 613-Protection of Power Systems

ECE 614-Dynamics of Electromechanical Energy Conversion

ECE 615-Advanced Electromechanical Energy Conversion I

ECE 616-Power Electronics

ECE 618-Power Systems Design of Alternative Energy Sources

ECE 710-Economic Control of Interconnected Power Systems

ECE 711-Power System Dynamics and Stability

## **Microwave and Lightwave Engineering**

### Antenna Track

#### *Department Requirements:*

ECE 601-Linear Sys. or ECE 673-Random Sig. Anal. I  
ECE 620-Electromagnetic Field Theory

#### *Area Requirements:*

ECE 622-Wave Propagation  
ECE 630-Microwave Electronic Systems  
ECE 632-Antenna Theory

#### *Electrical Engineering Electives:*

ECE 623-Fourier Optics  
ECE 625-Fiber and Integrated Optics  
ECE 626-Optoelectronics  
ECE 642-Communication Systems I  
ECE 657-Semiconductor Devices  
ECE 673-Random Signal Analysis I  
ECE 730-Theory of Guided Waves (suggested)

## **Solid-State Materials, Devices and Circuits**

### Circuits Track

#### *Department Requirements:*

ECE 601-Linear Systems  
ECE 684-Advanced Microprocessor Systems

#### *Area Requirements:*

ECE 648-Digital Microelectronics  
ECE 657-Semiconductor Devices  
ECE 658-VLSI Design I

#### *Electrical Engineering Electives:*

ECE 620-Electromagnetic Field Theory  
ECE 622-Wave Propagation  
ECE 625-Fiber and Integrated Optics  
ECE 650-Electronic Circuits  
ECE 660-Control Systems I  
ECE 677-Optimization Techniques  
ECE 768-Optimal Control Theory

### Fiber Optics Track

#### *Department Requirements:*

ECE601-Lin.Sys. or ECE673-Random Sig.Anal.  
ECE 620-Electromagnetic Field Theory

#### *Area Requirements:*

ECE 622-Wave Propagation  
ECE 626-Optoelectronics  
ECE 739-Laser Systems

#### *Electrical Engineering Electives:*

ECE 623-Fourier Optics  
ECE 624-Optical Engineering  
ECE 625-Fiber and Integrated Optics  
ECE 642-Communication Systems I  
ECE 657-Semiconductor Devices  
ECE 673-Random Signal Analysis I  
ECE 730-Theory of Guided Waves

### Devices Track

#### *Department Requirements:*

ECE 601-Linear Systems  
ECE 620-Electromagnetic Field Theory

#### *Area Requirements:*

ECE 657-Semiconductor Devices  
ECE 658-VLSI Design I  
ECE 659-Fabric.Prin. Elec./Optoelec. Devices

#### *Electrical Engineering Electives:*

ECE 623-Fourier Optics  
ECE 626-Optoelectronics  
ECE 630-Microwave Electronic Systems  
ECE 659-Fabric.Prin. Elec./Optoelec. Devices  
ECE 758-VLSI Design II  
Phys 761/787\*-Phys. of Sensors & Actuators  
MtSE 650-Physical Metallurgy  
MtSE 702-Characterization of Solids  
MtSE 765-Sci. and Technology of Thin Film

\*Co-listed as Phys 761-Solid-State Theory.

## **8. Independent Study**

For master's students, independent study courses, ECE 725, ECE 726, and ECE 727 will not count towards the master's degree course requirement, but ECE 725 can be used to satisfy the 12-credit full-time requirement. ECE 726 and ECE 727 cannot be used to satisfy the 12-credit full-time requirement.

## **9. Master's Thesis**

Before the end of the final term of thesis registration, a master's thesis committee, consisting of three (3) faculty members, will hear the student present his or her thesis in an open forum (thesis defense). At least two (2) members of the committee must be members of the ECE department. A typed version of the completed thesis should be available to the committee at least three (3) weeks before the oral defense is scheduled and an unbound copy of the thesis should be available in the Department Secretary's office (235 ECEC) three weeks before the defense. The final version is due in the library to meet graduation requirements by the date specified by the Office of Graduate Studies. Written notice of the presentation will be posted. Interested faculty and graduate students are invited to attend.

## V. MASTER OF SCIENCE IN COMPUTER ENGINEERING

### 1. Admission Requirements

Students are expected to have an undergraduate education in engineering or computer science. Students with baccalaureate degrees in areas other than computer engineering will be required to complete a bridge program. Those with undergraduate degrees in other fields should consult the Director of Computer Engineering for bridge requirements. Bridge courses do not count toward degree requirements.

### 2. Degree Requirements

Students must complete 30 credits—at least half of which are offered through the Department of Electrical and Computer Engineering—including the two-course sequence in at least one of the five areas of concentration. Students in all areas must take the two required core courses indicated below and complete either a master's project or thesis. As a requirement for graduation, students must achieve a 3.0 cumulative GPA, not including the master's thesis or project. The master's thesis or project grade must be B or higher.

Students who enter the computer engineering master's program and who receive departmental or research-based awards must complete a master's thesis.

All master's students must register for two semesters of ECE 791 Graduate Seminar. Those with substantial professional experience may have this requirement waived. In order to receive passing credit, the student must attend at least five (5) seminars per semester, to be chosen from those sponsored by the areas, the ECE department, the Institute, or other outside seminars approved by the Seminar Supervisor. Please watch the bulletin board labeled *ECE 791 Graduate Seminar*, located in the hall leading to the ECE main office, for information on approved seminars.

PLEASE NOTE THAT ECE 684 IS NOT AVAILABLE FOR MSCoE CREDIT.

### 3. Core

Required for all specializations are ECE 690-Computer Systems Architecture and CIS 610-Data Structures and Algorithms, *and* a project or thesis (3 credits of ECE 700-Master's Project or 6 credits of ECE 701-Master's Thesis).

## 4. Area Requirements

### Microprocessor-Based Systems

#### *Required:*

ECE 686-Instrumentation Systems and Microprocessors  
ECE 688-Microcontrollers in Instrumentation

#### *Electives (15 to 18 credits):*

ECE 605-Discrete Event Dynamic Systems  
ECE 612-Computer Methods Applied to Power Systems  
ECE 650-Electronic Circuits  
ECE 660-Control Systems I  
ECE 664-Real-Time Computer Control Systems  
ECE 666-Control Systems II  
ECE 783-Computer Communication Networks  
ECE 785-Parallel Processing Systems  
CIS 630-Operating System Design  
CIS 631-Data Management System Design  
CIS 635-Computer Programming Languages  
CIS 637-Real-Time Systems  
CIS 641-Formal Languages and Automata  
CIS 661-Systems Simulation  
CIS 662-Model Analysis and Simulation  
IE 605-Engineering Reliability

### Computer Networking

#### *Required:*

ECE 683-Computer Network Design and Analysis  
ECE 637-Introduction to Internet Engineering

#### *Electives (15 to 18 credits):*

ECE 605-Discrete Event Dynamic Systems  
ECE 639-Principles of Broadband ISDN and ATM  
ECE 642-Communication Systems I  
ECE 644-Intro. to Wireless and Personal Comm. Sys.  
ECE 673-Random Signal Analysis  
ECE 677-Optimization Techniques  
  
ECE 681-Broadband Packet Switches  
ECE 685-Network Interface Design  
ECE 742-Communication Systems II  
ECE 783-Computer Communication Networks  
CIS 630-Operating System Design  
CIS 631-Data Management System Design  
CIS 633-Distributed Systems  
CIS 637-Real-Time Systems  
CIS 652-Comp.Networks-Arch., Protocols and Standards  
CIS 654-Telecommunication Networks Performance Anal.  
CIS 665-Algorithmic Graph Theory

### Parallel Computing Systems

#### *Required:*

ECE 689-Dig. Sys. Design for Machine Arith.  
ECE 785-Parallel Processing Systems

#### *Electives (15 to 18 credits):*

ECE 605-Discrete Event Dynamic Systems  
ECE 609-Artificial Neural Networks  
ECE 640-Digital Signal Processing  
ECE 650-Electronic Circuits  
ECE 783-Computer Comm. Networks  
ECE 785-Parallel Processing Systems  
CIS 630-Operating System Design  
CIS 631-Data Management System Design  
CIS 633-Distributed Systems  
CIS 636-Compiling System Design  
CIS 637-Real-Time Systems  
CIS 665-Algorithmic Graph Theory  
CIS 668-Parallel Algorithms  
IE 623-Linear Programming

### VLSI System Design

#### *Required:*

ECE 658-VLSI Design I  
ECE 758-VLSI Design II

#### *Electives (15 to 18 credits):*

ECE 605-Discrete Event Dynamic Systems  
ECE 650-Electronic Circuits  
ECE 657-Semiconductor Devices  
ECE 659-Fabric.Prin. Elec./Optoelec. Devices  
ECE 783-Computer Comm. Networks  
ECE 789-112-Design for Testability  
Principles  
CIS 630-Operating System Design  
CIS 631-Data Management System Design  
CIS 641-Formal Languages and Automata  
CIS 665-Algorithmic Graph Theory  
IE 605-Engineering Reliability

IE 605-Engineering Reliability

### **Machine Vision Systems**

*Required:*

ECE 601-Linear Systems *and* ECE 643-Digital Image Processing I *or*  
CIS 659-Image Processing and Analysis *and* CIS 780-Computer Vision

*Electives (15 to 18 credits):*

ECE 605-Discrete Event Dynamic Systems  
ECE 609-Artificial Neural Networks  
ECE 640-Digital Signal Processing  
ECE 783-Computer Communication Networks  
ECE 785-Parallel Processing Systems  
CIS 630-Operating System Design  
CIS 631-Data Management System Design  
CIS 657-Prin. of Interactive Computer Graphics  
CIS 665-Algorithmic Graph Theory  
CIS 670-Artificial Intelligence  
CIS 672-Expert System Methods and Design  
CIS 759-Advanced Image Processing and Analysis  
IE 605-Engineering Reliability  
ME 628-Machine Vision Principles and Applications

Other courses may be used as electives with the permission of the Director of Computer Engineering.

### **5. Master's Thesis**

Before the end of the final term of thesis registration, a master's thesis committee, consisting of three (3) faculty members, will hear the student present his or her thesis in an open forum (thesis defense). At least two (2) members of the committee must be members of the ECE department. A typed version of the completed thesis should be available to the committee at least three (3) weeks before the oral defense is scheduled and an unbound copy of the thesis should be available in the Department Secretary's office (235 ECEC) three weeks before the defense. The final version is due in the library to meet graduation requirements by the date specified by the Office of Graduate Studies. Written notice of the presentation will be posted. Interested faculty and graduate students are invited to attend.

### **6. Research Opportunities**

Computer engineering faculty research areas include

Computer networking	Computer embedded control and intelligent automation
Multiprocessor system architecture	Robotics
Parallel and distributed processing	VLSI design and micro-engineering
Scheduling	Computer-aided instruction
Image processing	Fault-tolerant computing
Neural networks and genetic algorithms	Digital testability
Infrared imaging	Computer-aided design
Discrete event system models and tools	



## VI. MASTER OF SCIENCE IN INTERNET ENGINEERING

The objective of this program is to educate students in the field of internet engineering, with emphasis on computer internetworking and relevant applications.

### Admission Requirements

Applicants should have an undergraduate degree in Computer Engineering, Electrical Engineering or other relevant discipline from an accredited institution (or its equivalent). A minimum GPA of 3.0 on a 4.0 scale is required. These students should have taken Math 333 (Probability and Statistics), or EE321 (Random Signal and Noise), or another equivalent course; EE333 (Signals and Systems); and CIS 112 (Introduction to Computing or equivalent proficiency in C++ programming).

*Bridge Program* – The curriculum requires a basic knowledge of computer and communications fundamentals, such as signals and systems (EE 333), basic communication systems (EE 481), programming (CIS 112 or C++ programming), data structures and algorithms (CIS 505), and computer organization (CoE 251). The bridge courses are usually selected from this list, but some additional bridge courses, appropriate to each student's background, may be required.

### Degree Requirements

Candidates must complete a minimum of 30 credits, 9 in core courses and 21 in elective courses.

The required courses provide the basics of Internet Engineering. Electives are to be chosen from the available course pool to tailor the program to the student's professional needs and interests. This program utilizes graduate courses in Electrical and Computer Engineering, Computer and Information Science, Management Information Systems, and Management Programs at NJIT. They provide the necessary blend of education required for appropriate strength in Internet Engineering.

### Core Courses (9 Credits):

ECE 637	Introduction to Internet Engineering
ECE 682	Computer Network Design: An Internet Perspective
CIS 602	Java Programming

### Electives (21 Credits)<sup>†</sup>:

Select 15 credits if completing a master's thesis; 18 credits if completing a master's project; 21 credits if not completing either a master's project or a thesis.

ECE 673	Random Signal Analysis
ECE 683	Computer Network Design and Analysis
ECE 685	Computer Network Interface Design
ECE 638	Security & Network Management
ECE 639	Principles of Broadband ISDN and ATM
ECE 649	Compression in Multimedia Engineering
ECE 645	Wireless Networks

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<sup>†</sup> Other (new) courses related to Internet Engineering may be selected as electives with approval from the Graduate Advisor.

ECE 636	Computer Networking Laboratory
CIS 604	Client/Server Computing
Mgmt 620	Management of Technology
MIS 625	Internet for Managers
MIS 636	Telecommunications: Policies & Regulations
ECE 783	Computer Communication Networks
ECE 745	Wireless Internet
ECE 738	Communications Network Routing
ECE 788	Selected Topics in Internet Engineering

**Project, Thesis (optional)**

ECE 700	Master's Project in Internet Engineering (3 Credits)
ECE 701	Master's Thesis in Internet Engineering (6 Credits)

## VII. MASTER OF SCIENCE IN TELECOMMUNICATIONS

Offered by the Department of Electrical and Computer Engineering (ECE) and the Department of Computer and Information Science (CIS)

Graduate Advisors: ECE~Prof. Alex Haimovich, (973) 596-3534, e-mail haimovic@njit.edu  
CIS~Prof. Dennis Karvelas, (973) 596-2987, e-mail karvelas@njit.edu

### 1. Admission Requirements

Students can apply for admission to the program through either the Department of Electrical and Computer Engineering or the Department of Computer and Information Science. All applicants must submit scores on the Graduate Record Examinations (GRE) verbal, quantitative, and analytical aptitude tests. Applicants with undergraduate degrees in computer science, computer engineering or electrical engineering from an accredited institution are expected to have a GPA of at least 3.0. It is expected that these students have taken CIS 333, EE 321 and EE 333 (or their equivalents). Applicants having degrees in other fields will be considered for admission on an individual basis. These students will be required to complete a bridge program.

Bridge Program~The curriculum for the M.S. in Telecommunications requires a basic knowledge of computer fundamentals such as programming, data structures, computer architecture, signals and systems, and basic communication systems. Bridge courses do not count toward the degree. Completion of the preparatory courses with a 3.0 cumulative GPA or better is required for transfer to matriculated status. The bridge courses are selected from the following list depending on individual background.

EE 321-Random Signals and Noise\*

EE 333-Circuits and Systems III\*

EE 481-Communications Systems

CIS 251/EE 352/CoE 353-Computer Organization/Architecture/Microprocessors

CIS 332-Operating Systems

CIS 333-UNIX Operating Systems

CIS 505-C++ Data Structures

\* EE 321 and EE 333 may be substituted with ECE 501, Linear Systems and Random Signals.

### 2. Degree Requirements

Candidates must complete a minimum of 30 credit hours of course work, with a minimum overall average of 3.0. In addition, a minimum 3.0 GPA is required in the 5 core courses indicated below. Students with an exceptionally strong telecommunications background may be allowed to replace required courses with advanced electives. Permission of the Graduate Advisor from the Department of Electrical and Computer Engineering or the Department of Computer and Information Science is required.

All master's students must register for two semesters of ECE 791 Graduate Seminar. Those with substantial professional experience may have this requirement waived. In order to receive passing credit, the student must attend at least five (5) seminars per semester, to be chosen from those sponsored by the areas, the ECE department, the Institute, or other outside seminars approved by the Seminar Supervisor. Please watch the bulletin board labeled *ECE 791 Graduate Seminar*, located in the hall leading to the ECE main office, for information on approved seminars.

### 3. Core Courses (15 credit hours):

ECE 642-Communication Systems I

ECE 644-Introduction to Wireless and Personal Communications Systems

CIS 630-Advanced Operating System Design

CIS 651-Data Communications

CIS 652-Comp. Network-Arch. Protocol Standards *or* ECE 683 Comp. Network Design & Analysis

### 4. Elective Courses (15 credit hours):

ECE 638/CIS 696-Networks Management and Security

ECE 639/CIS 697-Principles of Broadband ISDN and ATM

ECE 646-Introduction to Data Communication

ECE 673-Random Signal Analysis I

ECE 685-Network Interface Design

ECE/CIS 700-Project in Telecomm. (3 cr.) *or* ECE/CIS 701-Thesis in Telecomm. (6 cr.)

ECE 742-Communication Systems II

ECE 755-Digital Communications

ECE 757-Wireless Communications

ECE 783-Computer Communication Networks

ECE 785-Parallel Processing Systems

CIS 604-Introduction to Client-Server Computing

CIS 631-Data Management System Design I

CIS 633-Distributed Systems

CIS 637-Real-Time Systems

CIS 650-Computer Architecture *or* ECE 690 Computer Systems Architecture

CIS 654-Telecommunication Networks Performance Analysis

CIS 656-Internetworking and Higher Layer Protocols

CIS 658-Multimedia Systems *or* ECE 649 Compression in Multimedia Engineering

CIS 665-Algorithmic Graph Theory

CIS 668-Parallel Algorithms

CIS 679-Management of Computer and Information Systems

CIS 752-Communication Protocol Synthesis and Analysis

MIS 635-Management of Telecommunications

MIS 636-Telecommunications: Policies and Regulation

### 5. Areas of Specialization

The following areas of specialization are suggested, but are not the limit of possibilities. They are given to provide a general framework for students.

**Management and Administration:** ECE 638/CIS 696-Networks Management and Security  
CIS 679-Management of Computer and Information Systems  
MIS 635-Management of Telecommunications  
MIS 636-Telecommunications: Policies and Regulation

**Communication Systems:** ECE 639/CIS 697-Principles of Broadband ISDN and ATM  
ECE 646-Introduction to Data Communication

ECE 649-Compression in Multimedia Engineering *or* CIS 658-Multimedia Systems  
ECE 673-Random Signal Analysis I  
ECE 685-Network Interface Design  
ECE 742-Communications Systems II  
ECE 755-Digital Communications  
ECE 757-Wireless Communications

**Networking:** ECE 638/CIS 696-Networks Management and Security  
ECE 639/CIS 697-Principles of Broadband ISDN and ATM  
ECE 673-Random Signal Analysis  
ECE 783-Computer Communication Networks  
CIS 604-Introduction to Client-Server Computing  
CIS 633-Distributed Systems  
CIS 637-Real-Time Systems  
CIS 650-Computer Architecture *or* ECE 690-Computer Sys. Architecture  
CIS 654-Telecommunication Networks Performance Analysis  
CIS 656-Internetworking and Higher Layer Protocols  
CIS 665-Algorithmic Graph Theory

**Information:** CIS 604-Introduction to Client-Server Computing  
CIS 631-Data Management Systems Design  
CIS 658-Multimedia Systems *or* ECE 649-Compression in Multimedia Engineering  
CIS 696/ECE 638-Networks Management and Security

Other ECE/CIS courses related to telecommunications may be selected as electives with written approval from the appropriate department Graduate Advisor.

## VIII. DOCTOR OF PHILOSOPHY IN ELECTRICAL ENGINEERING

During the first year of doctoral study, students should seek an academic faculty advisor in their area of concentration to advise on their program of study, including course registration and preparation for the qualifying examination. Students should also speak to area faculty to choose a research advisor and the research topic they will begin after passing the qualifying examination. The academic advisor and the research advisor could be the same person. Students can always visit the Doctoral Program Coordinator to discuss any issues regarding their program.

### 1. Degree Requirements

Requirements are determined in consultation with department advisors. Students holding a master's degree will require a minimum of 60 graduate credits beyond the master's degree. In addition to overall credit requirements, the program includes the following requirements.

- 24 credits of course work beyond the master's degree, at least 12 credits of which must be at the 700 level (excluding department core courses and other basic area courses) and none at the 500 level. ECE department core courses, ECE 601, ECE 620, ECE 673, and ECE 684, cannot be used to satisfy the 24-credit course requirement. In addition, the entry-level course in the student's major area cannot be used to satisfy the 24-credit course requirement. No more than two independent study courses may be used to satisfy this requirement. The entry-level courses for each area are as follows: Communications and Signal Processing-ECE 642 and ECE 640; Computer Systems-ECE 683 and ECE 690; Control Systems-ECE 660; Energy Conversion and Power-ECE 610; Microwave and Lightwave Engineering-ECE 622; Solid State Materials, Devices and Circuits-ECE 657.
- 36 credits of doctoral dissertation research. With department approval, well-qualified students may register for up to a maximum of 9 credits of ECE 792 Pre-Doctoral Research before completing the qualifying examination. A maximum of 6 credits of ECE 792 may be applied toward ECE 790.
- All doctoral students must register for six semesters of ECE 791 Graduate Seminar. Those with substantial professional experience may have this requirement waived. In order to receive passing credit, the student must attend at least five (5) seminars per semester, to be chosen from those sponsored by the areas, the ECE department, the Institute, or other outside seminars approved by the Seminar Supervisor. Please watch the bulletin board labeled *ECE 791 Graduate Seminar*, located in the hall leading to the ECE main office, for information on approved seminars.
- Students who wish to change majors may do so only once. If students receiving ECE department financial support wish to change majors, their applications for financial aid will be re-evaluated, at the time of switching, as if they were new applicants.

### B.S. to Ph.D. Program

Superior undergraduate students may apply to be admitted directly into the Ph.D. program. Such an accelerated program requires a minimum entrance GPA of 3.5, plus an interview with the ECE department Graduate Studies Committee. Students in this program must complete a total of 87 credits, consisting of 51 course credits and 36 dissertation research credits. At least 12 course credits must be at the 700 level.

## **2. Qualifying Examination**

Full-time students must take the qualifying exam for the first time within one year of beginning active study and must pass it completely by the next time it is offered. Part-time students must take the qualifying exam for the first time within three years of the beginning of active study and must pass it completely by the next time it is offered. For students admitted into the Ph.D. program at the B.S. level, the qualifying examination must be taken within one and one half years of admission and must be passed within two years. Students are only permitted to take the examination twice. The passage of the qualifying examinations is reported to the Office of Graduate Studies.

The doctoral qualifying examination currently consists of two portions: a major examination and a minor examination. Both parts must be taken at the same time. Major and minor areas are chosen from Communication Systems; Computer Systems; Control Systems; Energy Conversion and Power; Microwave and Lightwave Engineering; and Solid State Materials, Devices and Circuits. Information on previous examinations and study guides for the examinations are available from the ECE department Associate Chair for Graduate Studies and the Assistant to the Associate Chair for Graduate Studies.

## **3. Doctoral Candidacy**

Students become doctoral candidates when they pass the qualifying examination. Status as a doctoral candidate does not imply candidacy for the degree. Registration for doctoral research is permitted only to doctoral candidates. Doctoral students who are not yet doctoral candidates may register for pre-doctoral research.

## **4. Dissertation Committee**

A dissertation committee must be formed within twelve months after passing the qualifying examination. The dissertation committee must be approved by the ECE department Graduate Affairs Committee at the time of its formation and before the presentation of the research proposal. The dissertation committee chairperson typically is the doctoral candidate's program advisor, but other faculty may be selected, provided that they are from the ECE department. The committee consists of a minimum of five members, one of whom is external to the ECE department or to NJIT, and at least three of whom are members of the ECE department. The dissertation advisor must be a tenure-track or tenured faculty member at NJIT. If the dissertation advisor is an ECE department faculty member, then the chair of the student's dissertation committee may be any tenure-track or tenured faculty member in the ECE department at NJIT. If the dissertation advisor is not a member of the ECE department at NJIT, then the chair of the student's dissertation committee must be a tenured faculty member in the ECE department at NJIT. If the dissertation advisor is not an ECE department faculty member, there must be a co-advisor who is a tenure-track or tenured faculty member in the ECE department at NJIT.

## **5. Research Proposal**

Doctoral candidates must prepare a written research proposal for approval by their dissertation committee. The proposal must be presented after formation of the committee but within twelve months after passing the qualifying exam. The proposal should show that facilities are available to do the work. Research is expected to investigate or develop a unique contribution to science and technology. Research may be experimental, analytical, applied, or theoretical, provided it satisfies these criteria and is approved by the dissertation committee. The research proposal would normally include title and goal of the proposed dissertation; a detailed discussion of background material, including a literature search; a summary of work accomplished to date; a statement of how the residency requirement will be met; and a proposed time table for completion of research.

## **6. Residency**

Doctoral candidates must spend at least one academic year in full-time residence (defined as full-time registration for two consecutive semesters). This requirement is sometimes waived with the approval of the dissertation committee and the Office of Graduate Studies. Such waivers are granted when a candidate's dissertation research requires use of research facilities at an approved off-campus site.

## **7. Dissertation and Defense**

A dissertation should demonstrate original research that contributes to knowledge in the field. The dissertation should result in scholarly publication and must be defended in a publicly-announced oral defense. A typed version of the completed dissertation should be available to the committee at least three (3) weeks before the oral defense is scheduled and an unbound copy of the thesis should be available in the Department Secretary's office (235 ECEC) three weeks before the defense. Successful defense of the dissertation is determined by vote of the dissertation committee. All members of the committee must be present to hear the defense. In regard to format, the standard reference is the latest edition of the Estrin/Roche manual *Guidelines for Scientific and Professional Theses*. The Office of Graduate Studies policies on number of copies, deadlines, and submission of dissertation and abstracts are also to be followed. Every member of the dissertation committee must sign the approval page of the final dissertation document. Students cannot be certified by the ECE department for the doctoral degree until the student submits **at least one paper for publication in a peer-reviewed journal** deemed of acceptable quality by the dissertation advisor.

## **8. Grade Point Average**

In order to obtain the Doctor of Philosophy degree, candidates must achieve a cumulative grade point average of at least 3.0 in all graduate courses. The 3.0 minimum does not include the grade assigned for completion of the doctoral dissertation. Completion of the dissertation and its defense will be assigned a grade of P for "Passing." The P grade is for dissertation credits taken in the student's final semester.

## **9. ECE Department Financial Support for Doctoral Students**

Doctoral students who are receiving financial support (GA or TA) from the ECE department must adhere to the following policies.

At the completion of the first year of support, the student must submit a progress report to the ECE department Doctoral Studies Committee indicating progress in courses, research, and qualifying examinations. In addition, the student's dissertation advisor must write a request for continued financial support.

Support after the second year is contingent upon satisfying the requirements for qualifying exams, committee formation, and proposal presentation as defined on pages 26 and 27 of this document.

Support for the fourth year, which must be the last year for a TA or GA, will be granted if the student is assured to successfully graduate after this period.

Students who wish to apply for financial aid must be recommended by a faculty member who will submit a letter to the chair of the ECE Graduate Affairs Committee on behalf of the doctoral student. Preference is given to students who have passed the qualifying examination.



## **IX. DOCTOR OF PHILOSOPHY IN COMPUTER ENGINEERING**

This program is intended for superior students with master's or bachelor's degrees in computer engineering, computer science, electrical engineering, or other related fields, who wish to pursue advanced research in computer engineering. The program emphasizes the following areas:

(1) Microprocessor-based Systems, (2) Computer Networks, (3) Computer Architecture, (4) VLSI Systems Design, (5) Computer Vision, and (6) VLSI Testing and Fault Tolerance.

### **1. Admission Requirements**

Applicants are expected to have a master's degree in computer engineering, computer science, electrical engineering, or other related fields.

Superior undergraduate students may apply to be admitted directly into the Ph.D. program. Such an accelerated program requires a minimum entrance GPA of 3.5, plus an interview with the ECE department Graduate Affairs Committee.

Students must demonstrate superior academic background in engineering, mathematics, and physical science; skills in programming; and proficiency in major areas of computer engineering and science. A minimum master's GPA of 3.5 on a 4.0 scale, or equivalent, is required for admission. GRE scores must be submitted. Foreign students must also achieve a minimum TOEFL score of 550.

Students who lack an appropriate background will be required to take additional bridge courses that cannot be applied as degree credits.

### **2. Degree Requirements**

During the first year of doctoral study, students should seek an academic faculty advisor in their area of concentration to advise on their program of study, including course registration and preparation for the qualifying examination. Students should also speak to area faculty to choose a research advisor and the research topic they will begin after passing the qualifying examination. The academic advisor and the research advisor could be the same person. Students can always visit the Associate Chair for Graduate Studies to discuss any issues regarding their program.

A minimum of 60 degree credits beyond the master's degree or 90 credits beyond the bachelor's degree is required; 24 credits of course work beyond the master's degree, with at least 12 at the 700 level; and 36 credits of doctoral dissertation and research. ECE 684 cannot be used to satisfy the 24-credit course requirement.<sup>1</sup>

All doctoral students must register for six semesters of ECE 791 Graduate Seminar. Those with substantial professional experience may have this requirement waived. In order to receive passing credit, the student must attend at least five (5) seminars per semester, to be chosen from those sponsored by the areas, the ECE department, the Institute, or other outside seminars approved by the Seminar Supervisor. Please watch the bulletin board labeled *ECE 791 Graduate Seminar*, located in the hall leading to the ECE main office, for information on approved seminars.

Students must attain a minimum overall GPA of 3.0.

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<sup>1</sup> Note that ECE 684 is designed to enhance the student's skills in preparing for the qualifying examination. As such, it is not available for computer engineering doctoral program credit.

Students admitted into the program at the B.S. level must complete a total of 87 credits, consisting of 51 course credits and 36 dissertation research credits. At least 12 course credits must be at the 700 level.

If the 36 credits of dissertation research are completed before the dissertation is finished, candidates must register each semester for at least 3 credits of dissertation research until the dissertation is accepted.

Courses will be selected in consultation with the graduate advisor.

#### ECE 700-Level Courses

ECE 742-Communication Systems II  
ECE 758-VLSI Design II  
ECE 782-Built-in Self-Test for VLSI\*  
ECE 783-Computer Communication Networks  
ECE 785-Parallel Processing Systems  
ECE 786-Delay Testing\*  
ECE 789-Selected Topics in Design for Testability\*  
ECE 789-Image Processing II

#### CIS 700-Level Courses

CIS 780-Computer Vision  
CIS 750-Parallel Proc. Architecture & Programming

\* Currently being developed.

### **3. Qualifying Examination**

Full-time students must take the qualifying exam for the first time within one year of beginning active study and must pass it completely by the next time it is offered. Part-time students must take the qualifying exam for the first time within three years of the beginning of active study and must pass it completely by the next time it is offered. For students admitted into the Ph.D. program at the B.S. level, the qualifying exam must be taken within one and one-half years of admission and must be passed within two years. Students are only permitted to take the examination twice. The passage of the qualifying examinations is reported to the Office of Graduate Studies.

### **4. Doctoral Candidacy**

Students become doctoral candidates when they pass the qualifying examination. Status as a doctoral candidate does not imply candidacy for the degree. Registration for doctoral research is permitted only to doctoral candidates. Doctoral students who are not yet doctoral candidates may register for pre-doctoral research.

### **5. Dissertation Committee**

A dissertation committee must be formed within twelve months after passing the qualifying examination. The dissertation committee must be approved by the ECE department Graduate Affairs Committee at the time of its formation and before the presentation of the research proposal. The dissertation committee chairperson typically is the doctoral candidate's program advisor, but other faculty may be selected, provided that they are from the ECE department. The committee consists of a minimum of five members, one of whom is external to the ECE department or to NJIT, and at least three of whom are members of the ECE department. The dissertation advisor must be a tenure-track or tenured faculty member at NJIT. If the dissertation advisor is an ECE department faculty member, then the chair of the student's dissertation committee may be any tenure-track or tenured faculty member in the ECE department at NJIT. If the dissertation advisor is not a member of the ECE department at NJIT, then the chair of the student's dissertation committee must be a tenured faculty member in the ECE department at NJIT. If the

dissertation advisor is not an ECE department faculty member, there must be a co-advisor who is a tenure-track or tenured faculty member in the ECE department at NJIT.

## **6. Research Proposal**

Doctoral candidates must prepare a written research proposal for approval by their dissertation committee. The proposal must be presented after formation of the committee but within twelve months after passing the qualifying exam. The proposal should show that facilities are available to do the work. Research is expected to investigate or develop a unique contribution to science and technology. Research may be experimental, analytical, applied, or theoretical, provided it satisfies these criteria and is approved by the dissertation committee. The research proposal would normally include title and goal of the proposed dissertation; a detailed discussion of background material, including a literature search; a summary of work accomplished to date; a statement of how the residency requirement will be met; and a proposed time table for completion of research.

## **7. Residency**

Doctoral candidates must spend at least one academic year in full-time residence (defined as full-time registration for two consecutive semesters). This requirement is sometimes waived with the approval of the dissertation committee and the Office of Graduate Studies. Such waivers are granted when a candidate's dissertation research requires use of research facilities at an approved off-campus site.

## **8. Dissertation and Defense**

A dissertation should demonstrate original research that contributes to knowledge in the field. The dissertation should result in scholarly publication and must be defended in a publicly-announced oral defense. A typed version of the completed dissertation should be available to the committee at least three (3) weeks before the oral defense is scheduled and an unbound copy of the thesis should be available in the Department Secretary's office (235 ECEC) three weeks before the defense. Successful defense of the dissertation is determined by vote of the dissertation committee. All members of the committee must be present to hear the defense. In regard to format, the standard reference is the latest edition of the Estrin/Roche manual *Guidelines for Scientific and Professional Theses*. The Office of Graduate Studies policies on number of copies, deadlines, and submission of dissertation and abstracts are also to be followed. Every member of the dissertation committee must sign the approval page of the final dissertation document. Students cannot be certified by the ECE department for the doctoral degree until the student submits **at least one paper for publication in a peer-reviewed journal** deemed of acceptable quality by the dissertation advisor.

## **9. Grade Point Average**

In order to obtain the Doctor of Philosophy degree, candidates must achieve a cumulative grade point average of at least 3.0 in all graduate courses. The 3.0 minimum does not include the grade assigned for completion of the doctoral dissertation. Completion of the dissertation and its defense will be assigned a grade of P for "Passing." The P grade is for dissertation credits taken in the student's final semester.

## **10. ECE Department Financial Support for Doctoral Students**

Doctoral students who are receiving financial support (GA or TA) from the ECE department must adhere to the following policies.

At the completion of the first year of support, the student must submit a progress report to the ECE department Graduate Affairs Committee indicating progress in courses, research, and qualifying examinations. In addition, the student's dissertation advisor must write a request for continued financial support.

Support after the second year is contingent upon satisfying the requirements for qualifying exams, committee formation, and proposal presentation as defined on pages 30 and 31 of this document.

Support for the fourth year, which must be the last year for a TA or GA, will be granted if the student is assured to successfully graduate after this period.

Students who wish to apply for financial aid must be recommended by a faculty member who will submit a letter to the chair of the ECE Graduate Affairs committee on behalf of the doctoral student. Preference is given to students who have passed the qualifying examination.

## X. FACULTY RESEARCH AREAS/INTERESTS

- Ali N. Akansu**  
(Communications and Signal Processing) Signal and transform theories and applications in multimedia and digital communications, multimedia networks and internet engineering.
- Nirwan Ansari**  
(Communications and Signal Processing) Broadband and high speed networks, wireless ATM, distributed and adaptive detection in CDMA, computational intelligence, nonlinear signal processing.
- Yeheskel Bar-Ness**  
(Communications and Signal Processing) Adaptive signal processing, array processing and interference cancelers, fast adaptive algorithms, co-channel interference cancellation for mobile communication, coherent communication and phase locked loop application, source encoding for data compression.
- John Carpinelli**  
(Computer Systems) Interconnection networks, multiprocessor system design, computer architecture, educational computing, distance learning, collaborative filtering.
- Bill Carr**  
(Solid State) Micro-engineering, solid state device design and simulation, microelectronics processing and fabrication, VLSI design and circuit analysis, mems, sensors, micromachines, micro-actuators, smart sensors, microtransducers, BAA, CRDA.
- Timothy Chang**  
(Control Systems) Large-scale system theory, real-time computer control, distributed and resonant systems, control, robotics, and precision systems.
- Edwin Cohen**  
(Power) Maximum power import into an electric power network, load flow algorithms for radial power networks.
- Roy Cornely**  
(Solid State) Thin film materials and devices, design and fabrication of micro-sized 3-D structures for optoelectronic packaging and other applications, micromechanical photonic devices in silicon.
- Peter Engler**  
(Biomedical) Clinical applications of heart-rate variability, development of telemedicine, analysis of cell-membrane ion-channel currents.
- Joseph Frank**  
(Communications and Signal Processing) Spread-spectrum techniques, digital data transmission, detection and estimation, delta modulation, digital signal processing, digital filter design.
- Bernard Friedland**  
(Control Systems) Control theory, especially methods for control of linear and nonlinear systems with data sources of multiple types; applications to friction modeling, compensation, and traction control; rapid thermal processing; robotic vehicle navigation and control.
- Hongya Ge**  
(Communications and Signal Processing) Statistical and digital signal processing, detection theory, estimation theory, communications, numerical analysis, approximation theory.
- Haim Grebel** Integrated optical waveguides, optical devices and systems, laser processing of

(Microwave/Lightwave,  
Solid State)

semiconductor materials.

**Richard A. Haddad** QMF-wavelet filter realizations, properties, extensions, and implementation of Binomial Hermite filters for parallel processing; adaptive subband signal coding using variable tree structures; time-frequency localization and quantization effects in M-band structures; rank-order filters; special purpose adaptive subband filters; enhanced DCT algorithms.  
(Communications and  
Signal Processing)

**Alex Haimovich** Adaptive signal processing for interference rejection in wireless communications, signal processing for personal communications systems, smart antennas for cellular wireless systems, adaptive signal processing for radar.  
(Communications and  
Signal Processing)

**Edwin Hou** Genetic algorithms, infrared imaging, robotics, neural networks.  
(Computer Systems)

**Walid Hubbi** Power system analysis and power electronics.  
(Power)

**Jacob Klapper** Phase-locked loops, principles and applications; noise in FM systems.  
(Communications and  
Signal Processing)

**Marshall Kuo** Optimal control, differential games.  
(Control Systems)

**Raashid Malik** Computer vision, object recognition, pattern recognition, scene analysis, image processing.  
(Computer Systems)

**C.N. Manikopoulos** Neural networks, computer networks, computer vision.  
(Computer Systems)

**Andrew Meyer** Biomedical system dynamics, modeling and control, nonlinear control systems.  
(Control Systems,  
Biomedical)

**Durga Misra** VLSI design/processing, micro-engineering, integrated sensors, semiconductor devices.  
(Solid State,  
Computer Systems)

**Edip Niver** Wave propagation in homogeneous media, microwave device modeling and measurement, numerical methods, CAD of microwave components and systems, characterization in R/F optical systems.  
(Microwave/Lightwave)

**S. Papavassiliou** Computer and communication networks, especially wireless communications and high-speed networks, network design and management, TCP/IP and internetworking, mobile ad-hoc networks, resource allocation and management, computer network modeling and performance evaluation, optimization of stochastic systems.  
(Computer Systems)

- Stanley Reisman**  
(Biomedical) Biomedical systems modeling and signal processing in the endocrine, cardiovascular and nervous systems; rehabilitation engineering.
- Sol Rosenstark**  
(Computer Systems) Interconnection of high-speed digital circuits, feedback amplifiers.
- Jacob Savir**  
(Computer Systems) VLSI design for testability, test generation, fault simulation, computer-aided design, built-in self-test, data compression for test purposes, fault diagnosis, delay test.
- Yun-Qing Shi**  
(Communications and Signal Processing) Multidimensional systems and signal processing, computer vision image (sequence) processing, video coding, pattern recognition, infrared machine vision, applications in industrial automation and biomedical engineering.
- Kenneth Sohn**  
(Solid State) Superconductors/superconducting devices, solid-state devices.
- Marek Sosnowski**  
(Solid State) Materials and structures for micro-electronic and optoelectronic applications, thin film deposition, ion beam modification of materials.
- Joseph Strano**  
(Biomedical, Control Systems) Biomedical systems, simulation, instrumentation.
- Sirin Tekinay**  
(Communications and Signal Processing) Telecommunication networks; wireless and multimedia networks: RF environment modeling, wireless geolocation, teletraffic modeling, resource allocation, mobility management, information handling algorithms, capacity and performance analyses, queuing models, signaling, analysis of algorithms, database systems.
- Gary Thomas**  
(Solid State) Electronic materials and devices, and multimedia in educational systems.
- Gerald Whitman**  
(Microwave/Lightwave) Radiation, propagation and scattering of electromagnetic waves; specific applications include scattering from periodic and random rough surfaces; guidance and radiation from integrated dielectric structures; multiscattering in random media (vegetation) using transport theory; indoor radiowave propagation; transients in dispersive media; ray optics; quasi-optical resonators.
- MengChu Zhou**  
(Computer Systems, Control Systems) Discrete event systems, petri nets, computer networks, intelligent automation, computer-integrated manufacturing, multilifecycle engineering, embedded control, robotics, computational methods, flat-panel display.
- Sotirios Ziavras**  
(Computer Systems) Parallel processing architecture and algorithms, supercomputing and massively-parallel systems, image processing and computer vision, systems modeling and performance evaluation.

**STUDY PLAN FOR MASTER OF SCIENCE IN COMPUTER ENGINEERING**

USE OF THIS FORM: to be completed by the student and approved by the Director of Computer Engineering Programs.

NAME OF STUDENT: \_\_\_\_\_

LAST

FIRST

NJIT I.D. OR SOCIAL SECURITY #: \_\_\_\_\_

- AREA OF CONCENTRATION
- Microprocessor-based systems
  - Parallel computing systems
  - Computer networking
  - VLSI system design
  - Machine vision systems

Semester Admitted: \_\_\_\_\_

Revision #: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by: \_\_\_\_\_

	Course	Semester	Grade
<b>Required Courses</b>	<b>ECE 690</b>		
	<b>CIS 610</b>		
<hr/>			
<b>Project/thesis</b>	<b>ECE 70</b>		
<hr/>			
<b>Area Required Courses</b>			
<hr/>			
<b>Elective Courses</b>			
<hr/>			
<b>Required Bridge Courses</b>			
<hr/>			
<b>Non-degree Courses</b>			

STUDENT SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DIRECTOR OF COE PROGRAMS APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_



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## ECE M.S. THESIS DEFENSE REPORT

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USE OF THIS FORM: This form must be completed by the Thesis Committee Chair, approved by the ECE Associate Chair for Graduate Studies immediately after the defense, and submitted to the Office of Graduate Studies.

M.S. PROGRAM: \_\_\_\_\_

NAME OF M.S. STUDENT: \_\_\_\_\_  
LAST FIRST

NJIT I.D. OR SOCIAL SECURITY #: \_\_\_\_\_

FINAL TITLE OF THESIS: \_\_\_\_\_  
\_\_\_\_\_

DATE OF DEFENSE: \_\_\_\_\_

NAME, FACULTY RANK, DEPARTMENT/AFFILIATION OF THESIS COMMITTEE CHAIR:

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
NAME RANK DEPARTMENT/AFFILIATION SIGNATURE/DATE

NAME, FACULTY RANK, DEPARTMENT/AFFILIATION OF COMMITTEE MEMBERS:

NAME RANK DEPARTMENT/AFFILIATION SIGNATURE/DATE  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

RESULTS OF DEFENSE: PASS \_\_\_\_\_ FAIL \_\_\_\_\_

CONDITIONS/COMMENTS: \_\_\_\_\_

SIGNATURE OF THESIS COMMITTEE CHAIR: \_\_\_\_\_ DATE: \_\_\_\_\_

SIGNATURE OF ECE ASSOCIATE CHAIR FOR GRADUATE STUDIES: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY OFFICE OF GRADUATE STUDIES: \_\_\_\_\_ DATE: \_\_\_\_\_

## ECE Ph.D. DISSERTATION COMMITTEE APPOINTMENT REPORT

USE OF THIS FORM: This form is completed upon formation of the Ph.D. dissertation committee. It must be accompanied by a short abstract of the proposed dissertation. The committee must be formed within 12 months after passage of the qualifying examination. The policy for committee formation is described in the latest *ECE Handbook for Graduate Students*.

Ph.D. PROGRAM: \_\_\_\_\_

NAME OF DOCTORAL CANDIDATE: \_\_\_\_\_  
LAST FIRST

NJIT I.D. OR SOCIAL SECURITY #: \_\_\_\_\_

PRELIMINARY TITLE OF DISSERTATION: \_\_\_\_\_

NAME, FACULTY RANK, DEPARTMENT/AFFILIATION OF DISSERTATION COMMITTEE CHAIR:

_____	_____	_____	_____
NAME	RANK	DEPARTMENT/AFFILIATION	SIGNATURE/DATE

NAME, FACULTY RANK, DEPARTMENT/AFFILIATION OF COMMITTEE MEMBERS:

NAME	RANK	DEPARTMENT/AFFILIATION	SIGNATURE/DATE
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

DOCTORAL PROGRAMS COORDINATOR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DEPARTMENT CHAIR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY OFFICE OF GRADUATE STUDIES: \_\_\_\_\_ DATE: \_\_\_\_\_

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## ECE Ph.D. DISSERTATION *PROPOSAL* DEFENSE REPORT

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USE OF THIS FORM: This form must be completed by the Dissertation Advisor immediately after the proposal presentation, and it must be approved by the Doctoral Programs Coordinator before being submitted to the Office of Graduate Studies.

Ph.D. PROGRAM: \_\_\_\_\_

NAME OF DOCTORAL CANDIDATE: \_\_\_\_\_  
LAST FIRST

NJIT I.D. OR SOCIAL SECURITY #: \_\_\_\_\_

PROPOSED TITLE OF DISSERTATION: \_\_\_\_\_

DATE OF PROPOSAL DEFENSE: \_\_\_\_\_

DISSERTATION ADVISOR(S): \_\_\_\_\_

MEMBERS OF DISSERTATION COMMITTEE AT PROPOSAL DEFENSE:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

RESULTS OF DEFENSE: PASS \_\_\_\_\_ FAIL \_\_\_\_\_

CONDITIONS/COMMENTS: \_\_\_\_\_

DISSERTATION ADVISOR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DOCTORAL PROGRAMS COORDINATOR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DEPARTMENT CHAIR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY OFFICE OF GRADUATE STUDIES: \_\_\_\_\_ DATE: \_\_\_\_\_

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## ECE Ph.D. DISSERTATION DEFENSE REPORT

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USE OF THIS FORM: This form must be completed by either the Dissertation Committee Chair or the Doctoral Programs Coordinator immediately after the defense and submitted to the Office of Graduate Studies.

Ph.D. PROGRAM: \_\_\_\_\_

NAME OF DOCTORAL CANDIDATE: \_\_\_\_\_  
LAST FIRST

NJIT I.D. OR SOCIAL SECURITY #: \_\_\_\_\_

FINAL TITLE OF DISSERTATION: \_\_\_\_\_  
\_\_\_\_\_

DATE OF DEFENSE: \_\_\_\_\_

DISSERTATION ADVISOR(S): \_\_\_\_\_  
\_\_\_\_\_

MEMBERS OF DISSERTATION COMMITTEE AT DEFENSE:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RESULTS OF DEFENSE: PASS \_\_\_\_\_ FAIL \_\_\_\_\_

CONDITIONS/COMMENTS: \_\_\_\_\_

DISSERTATION ADVISOR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DOCTORAL PROGRAMS COORDINATOR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

DEPARTMENT CHAIR APPROVAL SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

RECEIVED BY OFFICE OF GRADUATE STUDIES: \_\_\_\_\_ DATE: \_\_\_\_\_