This handbook provides general guidelines for ECE M.S./Ph.D. students. All degree plans and graduate student matters must conform to the Rice University General Announcements and the ECE course plan, and be approved by the ECE Graduate Committee. In addition, it is the student’s responsibility to become familiar with the contents of this handbook and to comply with all regulations, policies, procedures and deadlines, including the university honor code.
TABLE OF CONTENTS:

I. ABOUT THE M.S./PH.D. IN ECE
   Honor Code

II. ADMINISTRATION/GENERAL INFORMATION
   Your Department Partners
   Mail
   ESTHER
   Student Health Services
   International Student Information
   Graduate Studies Form Library
   Employment
   Stipend/Summer Support
   Vacation/Time Off
   GSA Information

III. GENERAL ANNOUNCEMENTS

IV. M.S./Ph.D. TIMELINE
   Year 1
   Year 2
   Year 3-8

V. ACADEMICS
   Master of Science (M.S.)/Doctorate of Philosophy (Ph.D.) in ECE
   ECE Areas of Study
   Academic and Research Advisors
   M.S./Ph.D. Degree Plan
   ELEC 699 Seminar
   Ph.D. Qualifier – ELEC 599
   Candidacy
   Changing Research Groups, Advisors, or Departments
   ESTHER
   Guidelines for Independent Study
   Grades, Department Duties, Academic Status

VI. IMPORTANT LINKS AND DATES
   Links
   Dates
   Help Available

VII. DEPARTMENT DIRECTORY
I. ABOUT THE M.S./PH.D. IN ECE

Welcome to the Rice University Department of Electrical and Computer Engineering! Your admission to Rice is the latest milestone in an exemplary academic career. At Rice, researchers and faculty members at the forefront of their fields will guide you. You will be taught to think creatively, be a part of a network of knowledge, and redefine your own limits.

The Ph.D. program prepares students for research careers in academia and industry. Students admitted to the Ph.D. program with a bachelor’s degree are required to complete 90 hours of credit (typically 42 hours of coursework and 48 hours of research).

Honor Code
All incoming Rice students agree to abide by the Rice University honor system. The honor system, one of the oldest and proudest traditions at Rice, is administered by the Honor Council, whose student members are elected each year by the student body. Adopted by a student vote in 1916, the honor system has remained essentially the same since that time but for changes in the procedures and membership of the Honor Council.

Students take all written examinations and complete any specifically designated assignments under the honor system. By committing themselves to the honor system, all students accept responsibility for assuring the integrity of the examinations and assignments conducted under it. More information can be found at ga.rice.edu.

II. ADMINISTRATION

Your Department Partners
ECE graduate students are welcome to ask for assistance when it is needed. Administrative staff and the Engineering Graduate Program staff are all available to answer questions. A directory can be found in Section VII.

In addition, each incoming Ph.D. student will be assigned two seasoned ECE graduate students, one in the student’s primary area of research and one from another area. Mentors will assist first-year students in academic matters, including preparation for ELEC 599, and
social interaction with members of ECE and other interdisciplinary departments. Mentor/mentee social events will be planned over the course of the first year by the Student Mentor Committee.

**Mail**
ECE graduate student mailboxes can be found in Abercrombie Room A239. FedEx and UPS Packages are received in Abercrombie A204.

**ESTHER**
ESTHER is the web application for students, faculty and staff. Students will use this application to register for classes and retrieve certain data such as grades and account information. Using ESTHER, students can: update contact information; register, add and drop courses; access final grades; view holds on accounts, etc. See registrar.rice.edu/students/esther_FAQs/ for information about how to use ESTHER.

**Student Health Services**
Student Health Insurance: Rice University requires all degree-seeking students to have health insurance. Students electing to enroll in the Rice Student Health Plan may opt to be billed annually or semi-annually. Contact the Cashier’s Office (713-348-4946) for payment options. You must complete an insurance waiver form to forego the Rice health plan.

Health Data Form (HDF): All new graduate students are required to submit a properly completed HDF to Student Health. All students under the age of 22 years, regardless of classification, must provide documentation of vaccination against meningococcal disease. See health.rice.edu for more information.

International Student Health Information: All Rice-sponsored F-1 and J-1 international students must enroll in either 1) Aetna (Rice’s Student Health Insurance Plan) or 2) SAS (Rice’s Approved Alternate Health Insurance Plan for Internationals). Visit oiss.rice.edu/studenthealth/ for more information.

**International Student Information**
International Student Newsletters can be found at http://oiss.rice.edu/news/ and more information is in Section VII of this handbook.

See oiss.rice.edu/ for details on international student internships with
regard to Optional Practical Training (OPT) and Curricular Practical Training (CPT).

**Graduate Studies Form Library**

Graduate Studies keeps a very useful library of commonly needed forms for everything from leaves of absence to candidacy petition to thesis submission. Visit: graduate.rice.edu/forms for more information. Specific forms include:

**Enrollment**
- Leave of Absence
- Short Term Medical and Parental Leave
- Withdrawal

**Candidacy**
- Candidacy Petition Instructions
- Candidacy Petitions
- Request for Extension of time to Candidacy

**Thesis Defense**
- Thesis Defense Instructions
- Webform to Announce Defense as required by General Announcements

**Announcements**
- Request for Extension of Time to Defense

**Thesis Submission**
- Thesis Submission Instructions
- Master’s & Doctoral UMI Agreement Forms

**Degree Conferral**
- Registrar’s Application for Degree
- Petition for a Non-Thesis Master’s
- Petition for an Automatic Master’s
- Graduation Checklists

**Commencement**

**Employment**

Students receiving a stipend may accept employment only with the approval of their home academic department. Students working for more than 20 hours per week are not normally eligible for full-time status. See the ECE Graduate Program Administrator for details. International students must obtain the appropriate work authorization from OISS before starting to work. If you work even one day before or after your authorization, you must leave the U.S. or face deportation. See oiss.rice.edu/studentwork/ for additional information.
**Stipend/Summer Support**
All enrolled full-time Ph.D. students are supported with full tuition and a stipend.

All first-year Ph.D. students are supported by fellowships. Thereafter, students in good standing will be supported as Research Assistants by their M.S./Ph.D. advisors. Compensation is calculated and paid semi-monthly from August 16 to December 31 and from January 1 to May 15.

Many Ph.D. students obtain fellowships in addition to what is provided by Rice. See graduate.rice.edu/funding for more information.

Summer Support - Students should discuss their summer plans well in advance with their advisors. In order to be paid by Rice for the summer, students must register for at least 6 hours of ELEC 800. Students planning a summer internship off-campus, with advisor’s approval, must inform the Lead Financial Analyst and Graduate Program Administrator by May 1 in order to complete the financial arrangements required.

**Vacation/Time Off**
Graduate students often receive financial support in the form of graduate stipend and tuition waivers. The termination of financial support to a graduate student, while not equivalent to dismissal, is a serious action that could deprive students of their financial ability to continue graduate studies.
Active participation in required academic activities (for example, laboratory work in certain science and engineering programs) is a basic condition for continued financial support. Students who are absent from such required activities for a contiguous two weeks without permission and without mitigating circumstances may be subject to termination of financial support. Such absences may be taken as an indication that inadequate academic progress is being made. Thus, if absences have to occur, they must be pre-arranged with the student’s supervisor, except for medical and family emergencies, in which case timely notification is required. Graduate advisors and programs should be aware of unexplained student absences and must provide immediate written warnings when students are not present and carrying out required academic activities for more than one week.
**Departmental Responsibilities**
In most research degree programs, students must undertake a limited amount of teaching or perform other services as part of their training. Assigned duties should not entail more than 10 hours per week, averaged over the semester, or extend over more than eight semesters. ECE students are required to complete 6 semesters of grading as part of their coursework.

**Graduate Student Association**
The Graduate Student Association (GSA) is comprised of degree-seeking graduate students at Rice University. The GSA mission is to enrich the graduate student experience and to represent, support, and promote graduate student interests and values. Visit gsa.rice.edu to learn more.

**III. GENERAL ANNOUNCEMENTS**

Rice University Publishes its “General Announcements” each year. These are the official rules of the university and include the honor code that every student agrees to abide by, as well as forms and research information. They can be found at ga.rice.edu. Two sections of this are of particular importance to graduate students in ECE. The first section, titled “Graduate Students,” outlines the basic rules and expectations for all graduate students at Rice University. The second section of importance is the department-specific information. This information covers the degree requirements for the M.S./Ph.D. This section is reproduced below:

**Graduate Degree Programs**
*The ECE department offers two graduate degree programs. The Doctor of Philosophy (Ph.D.) program prepares students for a research career in academia or industry. The Ph.D. program consists of formal courses and original research conducted under the guidance of a faculty advisor, leading to a dissertation. Students in the Ph.D. program complete a Master of Science (M.S.) degree as part of their program; the ECE department does not admit students for a terminal M.S. degree.*

**Degree Requirements for M.S./Ph.D. in Electrical Engineering**
*Students are admitted to the Ph.D. program only in the fall semester. ECE Ph.D. students move through the program in stages, starting as first-year student, advancing to M.S. candidate, Ph.D. qualified student, and*
Ph.D. candidate; each advancement requires the approval of the ECE graduate committee. Students entering with previous graduate work may follow a hybrid program developed in consultation with the faculty and the graduate committee. The first academic year concentrates on foundation coursework and developing a research area. Each student must successfully complete a project, ELEC 599, in his or her chosen area of research in lieu of an oral or written qualifying exam. In addition to enabling the faculty to evaluate the student’s research potential, the project encourages timely completion of the M.S. degree. The student must complete a master’s thesis and successfully defend it in an oral examination. Students who have already acquired a master’s degree elsewhere must also complete the ELEC 599 project, after which acceptance of their previous master’s degree will be determined by the Graduate Committee.

A candidate for the Ph.D. degree must demonstrate independent, original research in electrical and computer engineering. After successful completion of all coursework, a student is eligible for Ph.D. candidacy. The student then engages in full-time research, culminating in presentation of the Ph.D. research proposal and then the completion and public defense of the Ph.D. dissertation.

IV. M.S./PH.D. TIMELINE

Year 1
The first academic year concentrates on foundation coursework followed by focus on a research area. The year consists of a minimum of 18 hours of coursework, which includes 6 hours of ELEC 599 - a research presentation, developed under the guidance of a faculty advisor and committee that qualifies the student for continuation in the Ph.D. program. A minimum of 9 hours of core coursework is required in semester 1. Any variance to this plan requires a written petition to and approval from the ECE Graduate Committee.

ELEC 599 is taken in the second semester of the first year, along with 3 hours of core coursework. A spring midterm progress evaluation will be conducted with the advisor to ensure the student’s project is on track. More on ELEC 599 can be found in Section V – Ph.D. Qualifier.

Year 2 and Thesis Defense
Early in the third semester, the student must develop a Ph.D. course plan (see Section V – Degree Plan) approved by their advisor and
co-signed by a member of the ECE Graduate Committee. It is then submitted to the Graduate Program Administrator for the student’s file. Course plans may be revised, reapproved and resubmitted at any time over the course of the degree program.

M.S. degrees are expected to be obtained by the end of the 4th semester (second year, and no later than the end of the 8th semester). Once the student has completed the requisite hours, established a committee, performed research, written a thesis and is ready to defend, the student must submit the Petition for Approval of M.S. Candidacy to the Graduate Program Administrator. The student will schedule their oral presentations with their committees.

Years 3-8
In Year 3 and beyond, the student will perform his/her additional coursework and ELEC 800 totaling at least 30 hours for the M.S. and 90 for the Ph.D. All Rice graduate students must petition for Ph.D. candidacy before the start of the 9th semester (fifth year). Ph.D. degrees are expected to be obtained by the end of the 10th semester (fifth year) and no later than the end of the 16th semester (eighth year). See graduate.rice.edu/boundaries for time boundaries.

V. ACADEMICS

Master of Science (M.S.) Degree
The M.S. degree is offered only as a precursor to the Ph.D. degree. It requires at least 30 semester hours of credit beyond the bachelor’s degree (typically 24 hours of course credit which includes ELEC 599, and 6 hours of ELEC 800 research credit). Twenty-four of the 30 required hours must be completed at Rice; therefore, no more than 6 hours may be transferred from a previous M.S. degree in the case of a denied previous master’s degree. Your previous master’s degree will be denied if you switch subfields.

The M.S. program requires original research work reported in a thesis and a public oral presentation, evaluated by a master’s thesis committee consisting of a thesis advisor and at least two other faculty members.

Barring a written exemption from the Graduate Committee, the M.S. must be completed within 3 years of entering the M.S./Ph.D. program.
Previous Master’s (Non-Rice)
Students admitted with an approved previous M.S. degree are required to complete a minimum 18 hours of course credit in addition to ELEC 800, and 48 hours of research credit. Previous M.S. degrees are approved or denied upon completion of ELEC 599 in the first year. Twenty-four of the 30 required hours must be completed at Rice; therefore, no more than 6 hours may be transferred from a previous M.S. degree in the case of a denied previous master’s degree. Your previous master’s degree will be denied if you change subfields. Denied previous M.S. degrees require the student to obtain a Rice ECE M.S. degree before continuing on to the Ph.D. degree.

Visit bit.ly/1zmWph4 for specifics.

Doctor of Philosophy (Ph.D.) Program
The Rice University Department of Electrical and Computer Engineering (ECE) offers a graduate program leading to the Doctor of Philosophy (Ph.D.). The Department does not offer a stand-alone thesis Master of Science degree; students admitted to our Ph.D. program with a bachelor’s degree are required to earn the M.S. within the program before proceeding to the Ph.D.

The Ph.D. program is full-time only, with a minimum of 9 credit hours per semester. Ph.D. students are required to fulfill 6 semesters of grading as a part of the degree requirements. Students must maintain continuous program involvement and enrollment unless granted an official leave of absence.

Courses must be 400 level and above, except for mathematics (300 and above), and 15 hours must be at the 500 level or above, as stated on the course plan of study. Each student is also required to complete 6 semesters of grading as part of their coursework and the seminar class, ELEC 699.

A 3.0 GPA (B) must be maintained in major and minor coursework. Only courses in which a grade of B- or above is achieved will be counted towards the M.S./Ph.D degrees. Students whose GPA falls below a 2.33 will be placed on academic probation by the university. Students whose GPA falls below a 3.0 will be placed on academic probation by the ECE Department. Visit ga.rice.edu for more information from General Announcements.
Barring a written exemption from the Graduate Committee, the Ph.D from B.S. must be completed within 6 years of entering the M.S./Ph.D. program, and the Ph.D. from previous M.S. within 4 years.

**ELEC 699 Seminar**
The ELEC 699 Seminar Course is intended to foster development of breadth among all graduates at all phases of study in ECE. The requirement is registered attendance at 3 ECE sponsored or co-sponsored seminars per semester. All M.S./Ph.D. students are required to take and earn an “S” (Satisfactory) in ELEC 699 as a part of his/her degree requirements for each semester in residence. Details of seminars are emailed to all department personnel on a regular-basis and are posted on the ECE website at ece.rice.edu. Seminars hosted or co-hosted by a student’s thesis advisor cannot be counted towards the student’s 3 seminars. Departmental attendance sheets will be provided at all seminars for the first 10 minutes. It is your responsibility to sign-in at the beginning of the seminar. If for some reason there is no sign-in sheet available, students will be responsible for emailing the Graduate Program Administrator within 24 hours of attendance in order to receive credit.

**Ph.D. Qualifier – ELEC 599**
(http://www.ece.rice.edu/academics/graduate/599calendar/)
ELEC 599 serves two purposes: It allows students to begin research early in the Ph.D. program. Projects selected often serve as catalysts for publications and thesis work. It serves as the ECE Ph.D. qualifier by demonstrating one's ability to perform independent research.

Students must pass ELEC 599 to remain in the Ph.D. program (a passing grade for ELEC 599 is indicated by a grade of A- or higher). At the end of the fall semester of the first year, students select a research project and an advisor. Early in the spring semester students submit project abstracts and timelines, followed by the selection of two project committee members in addition to the advisor. At least two committee members must have their primary appointment in ECE as assistant, associate, or full professors. Other committee members may be adjunct faculty selected from ECE as well as faculty from ECE-related interdisciplinary departments. A spring midterm progress evaluation will be conducted with the advisor to ensure the student’s project is on track. Any problems will be referred to the ECE Graduate Committee for intervention.
In April, the ECE Graduate Program Administrator will schedule oral presentations for all ELEC 599 students. Presentations are limited to 20 minutes with a maximum of 20 slides, and questions by committee are limited to 5 minutes. The written project reports must be submitted to committees and the ECE Graduate Program Administrator by mid-April. Reports are limited to 10 pages and should be formatted in 11 pt. font and according to the LaTeX or MS Word templates given in the IEEE transaction style. Visit bit.ly/1qg7vC0 for guidelines.

It is the student’s responsibility to follow up with all committee members prior to the scheduled presentation to confirm all logistics of the ELEC 599 qualifier. Following presentations, project committees will meet to provide written evaluations, which are then submitted to the ECE Graduate Committee for final evaluation and grade.

The ELEC 599 grade is based on:
1. overall performance on the project;
2. motivation and enthusiasm for graduate work;
3. quality of written presentation;
4. quality of oral presentation;
5. quality of research; and
6. prospects for Ph.D. success.

Visit ece.rice.edu/academics/graduate/599calendar/ for specifics.

The Graduate Committee meets to determine final ELEC 599 grades, after which individual evaluation letters will be provided to students. At this meeting, the Committee will also determine whether or not previous Master’s degrees will be accepted, which will also be noted in evaluation letters.

Students who do not pass ELEC 599 will not be permitted to continue in the M.S/Ph.D. program and financial support will end on May 15. However, graduate student status may be retained without financial support until August 15. Students may petition the ECE Graduate Committee to retake ELEC 599 or apply their accumulated course credit toward the professional master’s degree (M.E.E.), requiring a total of 30 hours. Both options require the approval of the ECE Graduate Committee and Office of Graduate and Postdoctoral Studies (GPS). See the information below from the Rice General Announcements for more details on the transfer process:
Admission into a professional program is granted separately from admission into a research or thesis program. Students who wish to change from a thesis program to a professional degree program must petition their department in writing. Upon recommendation of the department and approval by the dean’s office, the request is sent to the Office of Graduate and Postdoctoral Studies for consideration and final approval. If approved, students who received tuition waivers while enrolled in the thesis program will be expected to repay the tuition before their professional degrees are awarded. Professional degree programs terminate when the degree is awarded. Students who wish to continue graduate study after completing a professional program must apply for admission into a research program.

Academic Advisors
Each incoming Ph.D. student is initially assigned an academic advisor, usually a member of the ECE Graduate Committee, to help with course selection and other initial academic concerns. Final course selection does not need to be completed until after the start of classes. During the first year, Ph.D. students will select a research advisor, who will then take over the student’s advising. Usually the research advisor will be derived from the ELEC 599 research project undertaken in the second semester. Upon passing ELEC 599 at the end of the first year, the advisor will begin providing stipend support for the graduate student.

Candidacy and Defense

M.S. Candidacy
The Petition for Approval of M.S. Candidacy form is submitted to the ECE Graduate Program Administrator along with a copy of his/her course plan. The Department Chair’s signature is required on the petition, which is then submitted along with the transcript and course plan to the Office of Graduate and Postdoctoral Studies (GPS) for approval.

M.S. Defense
One week prior to defending, the student must submit the following information to GPS, the Rice Events Calendar (events.rice.edu/rgs), and the ECE department listservs: defense date, time, location, title and abstract, as well as the names, titles and departments of committee members. See graduate.rice.edu/thesis for more information.

The M.S. student receives an initialed Approval of Candidacy form from
GPS, which is signed by members of the student’s committee upon passing the M.S. defense. This form is copied to the student’s file and submitted to GPS. The student has six months from the date of defense to submit his/her signed thesis to GPS, at which time the student becomes a Master’s Degree Candidate.

Additionally, if a student plans to defend and submit a thesis for the next degree conferral, students must file their applications for approval of M.S. candidacy with GPS before November 1 for mid-year conferral and before March 1 for May conferral. In addition, the defense must be completed and the thesis submitted prior to the deadline found on the registrar’s calendar.

Ph.D. Candidacy
In order to petition for Ph.D. degree candidacy, a student must have completed 45 semester hours of advanced studies as approved by the Department and achieved at least a 3.0 (B) in each of these courses, successfully completed ELEC 599, and earned a Master of Science degree from Rice University, or have an equivalent Master of Science degree, as decided by the ECE Graduate Committee. See graduate.rice.edu/candidacy for more information.

The Petition for Approval of Ph.D. Candidacy form is then submitted to the ECE Graduate Program Administrator along with a current transcript and a copy of his/her course plan before the start of the 9th semester (fifth year). The Department Chair’s signature is required on the petition, which is then submitted along with the transcript and course plan to GPS for approval.

Ph.D. Thesis Proposal
After a student petitions for candidacy, but before defending his/her thesis, the student must present a thesis proposal. This is done after a research direction has been decided upon and after preliminary results are achieved, but with enough time remaining to include any redirections recommended by committee members. This usually occurs over 1 year before the Ph.D. Defense. The ECE Graduate Program Administrator will generate a form letter for the student’s committee members to sign in approval of the thesis proposal following the presentation. The student may only defend his/her thesis after successfully presenting the thesis proposal and upon approval of the committee members.
One week prior to presentation of thesis proposal, the student must submit the following information to the ECE Graduate Program Administrator and ECE Department listservs: proposal date, time, location, title and abstract, as well as the names, titles and departments of committee members.

**Ph.D. Defense**
Two weeks prior to defending, the student must submit the following information to GPS, the Rice Events Calendar (events.rice.edu/rgs), and the ECE department listservs: defense date, time, location, title and abstract, as well as the names, titles and departments of committee members. Visit graduate.rice.edu/thesis for more information.

The Ph.D. student then receives an initialed Approval of Candidacy form that is signed by the student’s committee members upon passing the Ph.D. defense. This form is copied to the student’s file and submitted to the Office of GPS. The student has 6 months to submit a signed thesis to GPS, at which time the student becomes a Doctoral Degree Candidate.

Additionally, if a student plans to defend and submit a thesis for the next degree conferral, students must file their applications for approval of Ph.D. candidacy in the Office of Graduate and Postdoctoral Studies before November 1 for mid-year conferral and before March 1 for May conferral. In addition, the defense must be completed and the thesis submitted prior to the deadline found on the registrar’s calendar.

**Changing Departments**
Rice recognizes research interests may change after a student enters a graduate program. If a student feels his/her interests and talents could be better served working with a different advisor or in another research group or department, a change can be accommodated. Although each case is unique, following are guidelines for making an advisor/group/department change:

1. Discuss issues with current advisor. Often an adjustment of research topic may resolve the problem.
2. If issues are insurmountable, speak with faculty members whose research interests are more in line with the student’s and who have the funding for support.
3. When an alternate faculty member agrees to replace the current advisor, obtain permission from the Chair of ECE Graduate Committee and proceed to the ECE Graduate Program Administrator, who will process the documentation required for the exchange.

**ECE Areas of Study**
The ECE Department has four interdisciplinary areas of study that the M.S./Ph.D. student can choose from:

*Computer Engineering:*
The Computer Engineering group at Rice University has a long track record of innovative research in physical modeling and characterization, VLSI signal processing, computer architecture, computer-aided design, and storage and network systems. Spanning the spectrum of computing from low-power personal devices to large-scale parallel information systems, networked computing solves a myriad of technology challenges. Future computing technologies, including the on-chip integration of systems and networks, will move us beyond current methods in silicon.

*Neuroengineering:*
Neuroengineering is the analysis and control of the nervous system in order to enhance and restore neuronal function. At Rice, we develop technologies to understand, repair, replace, enhance, or treat the diseases of the nervous system. We also design, construct and study devices that interface with living neural tissue.

In addition to the ongoing neuroengineering research efforts in individual laboratories across campus, the university has established the Rice Center for Neuroengineering (RCNE). The center’s goal is to integrate state-of-the-art research and technologies developed by individual research teams into broader research efforts to interrogate and understand neural systems. The mission of the RCNE is to apply engineering principals to neuroscience in a way that advances both the science and technology related to neural systems. RCNE is uniquely positioned as a leader in neuroengineering thanks to the broad, interdisciplinary research performed in conjunction with the world’s largest medical center (Texas Medical Center), steps away from the Rice University campus. Current neuroengineering research in ECE includes: Nanotechnology for measuring and manipulating neural cells and circuits; Optogenetic and photonic neural interface technology;
Computational microscopy and functional neural imaging; Neural recordings in behaving animals; Cutting-edge tools and algorithms for systems neurobiology; Information theory and signal processing methods for neuroengineering; Closed-loop neuromodulation and real-time deep brain stimulation; Theoretical and computational neuroscience.

**Photonics, Electronics and Nano-devices:**
The focus of this program is the improved understanding of electronic, photonic, and plasmonic materials, optical physics, the interaction of light and matter, along with the application of that knowledge to develop innovative devices and technologies. The specific areas of interest cover a broad range: Nanophotonics and plasmonics, optical nanosensor and nano-actuator development, studies of new materials, in particular nanomaterials and magnetically active materials; imaging and image processing, including multispectral imaging and terahertz imaging; ultrafast spectroscopy and dynamics; laser applications in remote and point sensing, especially for trace gas detection; nanometer-scale characterization of surfaces, molecules, and devices; organic semiconductor devices; single-molecule transistors; techniques for optical communications; and optical interactions with random, nanoengineered, and periodic media; and applications of Nanoshells in biomedicine.

**Systems: Communications, Control, Networks and Signal Processing:**
The understanding of how to analyze and restructure signals is applied to a wide range of areas, including image and video analysis, representation, and compression; wavelets and multi-scale methods; statistical signal processing, pattern recognition, and learning theory; distributed signal processing and sensor networks; communication systems; and computational neuroscience. Emergent applications include high-performance, scalable and widely deployed wireless Internet and expanding “broad-band” services for residences and public spaces.

**Degree Plan**
Coursework is based on the student’s degree plan. The degree plan requirements for the M.S. portion of the program must include:
At least 30 credit hours beyond the B.S., including 18 hours of core and breadth courses (6 courses), 6 hours of research credit (ELEC 800), and 6 hours of ELEC 599, the Ph.D. qualifier. ELEC 699 is required for each
semester in residence.

The degree plan requirements for the Ph.D. portion of the program must include:
60 hours of credit beyond the Rice M.S., including 12 additional course credits (4 courses). The remaining credits can include research credits, seminars, or other courses. ELEC 699 is required for each semester in residence.

Students may be eligible to transfer up to 3 hours of credit from another university. Rice undergraduates entering the M.S./Ph.D. program may transfer course credit not applied to their undergraduate degrees, with the approval of the ECE Graduate Committee and Office of the Registrar.

**ESTHER**
Students must register for courses using ESTHER. ESTHER is the web application for students, faculty and staff. Students will use this application to register for classes and retrieve certain data such as grades and account information. For information about how to use ESTHER see section II or: registrar.rice.edu/students/esther_FAQs/

**Grades, Department Duties, Academic Status**

*Grades*—According to university guidelines, students must achieve at least a B- (2.67) grade point average (GPA) in courses counted toward the graduate degree. The ECE Department requires a B (3.0) GPA and adds the requirement that only courses in which a grade of B- or above is earned will count towards the graduate degree. To compute GPA, the credits attempted in semester hours for each course and the points for the grade earned (from A+ = 4.33 to F = 0.00) are multiplied, then the products (one for each course) are added together, and the sum is divided by the total credits attempted.

*Pass/Fail*—No courses counted towards the degree plan may be taken pass/fail.

*Satisfactory/Unsatisfactory*—In the ECE Department, the faculty assign a grade of “S” or “U”. ELEC 800, Research and Thesis, is such a course. Students should be aware that while a grade of “S” or “U” does not affect their GPA, no credit is awarded if a grade of “U” is received. Courses with a grade of “S” will count towards total credits earned.
Incompletes—Instructors report this designation to the Office of the Registrar when a student fails to complete a course because of verified illness or other circumstances beyond the student’s control that occur during the semester. For an incomplete received in the fall semester, students must complete the work by the end of the fourth week of the spring semester or an earlier date as defined by the instructor, and instructors must submit a revised grade by the end of the fifth week. For an incomplete received in the spring semester, students must complete the work before the start of the fall semester or an earlier date as defined by the instructor, and instructors must submit a revised grade by the end of the first week.

Audit—The grade designation of “AUD” is used for people auditing a course, and specifically when the auditing student has met the audit requirements of the course. A grade designation of “NC” is given to students who do not meet the audit requirements. Requests to audit a class or to change from audit to credit or vice versa must be done by the end of the second week of the semester.

VI. IMPORTANT LINKS AND DATES

Links
Academic Calendar: registrar.rice.edu
Award Opportunities: engineering.rice.edu/gradopps
Counseling Center: rcc.rice.edu
Course Catalog: courses.rice.edu
Forms: registrar.rice.edu/online_forms
General Announcements: ga.rice.edu
Good Practices in Graduate Education: graduate.rice.edu/goodpractices
Graduate and Postdoctoral Studies (GPS) Office: graduate.rice.edu
Guidelines for Dismissal/Petition: bit.ly/RUdismiss
Honor System and Code of Student Conduct: ga.rice.edu
International Student Information: oiss.rice.edu
International Student Forms: oiss.rice.edu/forms/
Recreation Center: recreation.rice.edu
Registration: graduate.rice.edu/registration
Research and Scholarly Activities: ga.rice.edu/GR_students/
Wellness: wellness.rice.edu

Dates
Refer to the Registrar’s Office at registrar.rice.edu for all academic calendar information.

Help Available
When you or a friend is in need of help, there are many resources available to you on the Rice campus:

Graduate Program Director & Administrator
Dr. Michael Orchard & Graduate Administrator Carrie Toffoletto are available to help students with academic and personal needs. Their contact information can be found in Section VII.

Student Health Services: health.rice.edu
The Rice Student Health Services provides preventive and outpatient clinical care for the students of Rice University. Student Health is located on-campus and is dedicated to meeting the unique needs of undergraduate and graduate students.

Rice Wellness Center: wellbeing.rice.edu
The Student Wellbeing Office supports student development and success and is also a good first point of contact for students who want to talk to someone about solutions to their wellbeing concerns. They can provide advice and practical support to help you resolve personal challenges, such as conflicts with friends, difficulty making decisions, struggling with your identity, and academic concerns or problems that
are more serious in nature.

Rice Counseling Center: wellbeing.rice.edu/rcc/
The Rice Counseling Center is designed to complement the university's academic mission by assisting students' personal and educational development through a variety of psychological and psychiatric services. The goal of these efforts is to help students develop effective problem-solving and decision-making capabilities in order to make satisfying life choices, and maximize their capacity for continued emotional growth.

Graduate and Postdoctoral Studies (GPS) office:
For questions concerning the graduate program as a whole, contact Sherry Vanderslice, Graduate Student Affairs Project Manager, at sdvl@rice.edu or 713-348-2154.
VII. DEPARTMENT DIRECTORY

STAFF DIRECTORY

Carrie Toffoletto
Department Administrator
Graduate Program Administrator
713-348-5081
collo@rice.edu

Abercrombie A204

Trey Menchaca
Staff Assistant
713-348-3568
am22@rice.edu

Abercrombie A204

Additional information such as a full listing of all staff and their responsibilities can be found at ece.rice.edu/people/staff.aspx
Behnaam Aazhang  
J.S. Abercrombie Professor, Electrical and Computer Engineering  
aaz@rice.edu  
ece.rice.edu/aaz.aspx  
Research Summary: Communication theory, information theory, and their applications to wireless communication with a focus on the interplay of communication systems and networks; including network coding, user cooperation, spectrum sharing, and opportunistic access. Signal processing, information processing, and their applications to neuroengineering with a focus on the real-time closed-loop stabilization of neuronal systems to mitigate disorders such as epilepsy, Parkinson, tremors, depression, and obesity.

Athansios C. Antoulas  
Professor, Electrical and Computer Engineering  
aca@rice.edu  
ece.rice.edu/antoulas.aspx  
ece.rice.edu/~aca  
Research Summary: Large-scale dynamical systems, approximation, computation, linear algebra.

Aydin Babakhani  
Assistant Professor, Electrical and Computer Engineering  
ab28@rice.edu  
ece.rice.edu/~ab28  
Research Summary: Analysis, design, and testing of integrated circuits and antennas, with applications in high-speed wireless communication, radar, medical imaging, and bio-sensing.

Richard G. Baraniuk  
Victor E. Cameron Professor of Engineering  
richb@rice.edu  
ece.rice.edu/baraniuk.aspx  
cnx.org  
Research Summary: Multiscale, computational signal and image processing; open access, collaborative scholarly publication.
Joseph R. Cavallaro
Professor, Electrical and Computer Engineering & Computer Science
cavallar@rice.edu
ece.rice.edu/cavallaro.aspx
cmc.rice.edu
Research Summary: VLSI signal processing, wireless communication systems architectures, VLSI systems design and prototyping.

John W. Clark, Jr.
Professor, Electrical and Computer Engineering & Bioengineering
jwc@rice.edu
ece.rice.edu/clark.aspx
ece.rice.edu/~jwc
Research Summary: Electrophysiology (neural, cardiac); mathematical modeling of biological systems; signal processing methods applied to biological systems; nonlinear system dynamics; electromagnetic field theory.

Gene Frantz
Professor in the Practice, Electrical & Computer Engineering (Signal Processing)
genef@rice.edu
ece.rice.edu/genefrantz.aspx
Focus Summary: Entrepreneurship, intrepreneurship.

Naomi J. Halas
Stanley C. Moore Professor, Electrical & Computer Engineering
Professor of Biomedical Engineering, Chemistry, Physics and Astronomy
halas@rice.edu
ece.rice.edu/halas.aspx
halas.rice.edu
Research Summary: Nanoengineering, plasmonics, and nanophotonics.
Kevin Kelly
Associate Professor, Electrical and Computer Engineering
kkelly@rice.edu
ece.rice.edu/kelly.aspx
ece.rice.edu/~kkelly
Research Summary: Electronic materials, microscopy, manotechnology, compressed sensing.

Caleb Kemere
Assistant Professor, Electrical and Computer Engineering
caleb.kemere@rice.edu
ece.rice.edu/kemere.aspx
nel.rice.edu
neuroengineering.rice.edu
Research Summary: Building interfaces with memory and cognitive processes; model-based signal processing; low-power embedded systems.

Edward W. Knightly
Chair, Electrical and Computer Engineering
Professor, Electrical and Computer Engineering & Computer Science
knightly@rice.edu
ece.rice.edu/knightly.aspx
networks.rice.edu
Research Summary: Wireless networks, urban-scale testbeds, clean-slate design, diverse spectrum access, multi-antenna systems, hardware platforms, high-performance protocol design, security, and performance evaluation.

Junichiro Kono
Professor, Electrical and Computer Engineering, Physics & Astronomy
kono@rice.edu
ece.rice.edu/kono.aspx
ece.rice.edu/~irlabs
Research Summary: Optical THz processes in semiconductor nanostructures and devices.
Farinaz Koushanfar
Associate Professor, Electrical and Computer Engineering
farinaz@rice.edu
ece.rice.edu/koushanfar.aspx
aceslab.org
Research Summary: Sensor networks, low power embedded systems, optimization and statistics.

Daniel Mittleman
Professor, Electrical and Computer Engineering & Bioengineering
Faculty Interim Director, Smalley Institute for Nanoscale & Technology
daniel@rice.edu
ece.rice.edu/mittleman.aspx
ece.rice.edu/~daniel
Research Summary: Far-infrared spectroscopy of materials using broadband sub-picosecond pulses of terahertz radiation.

Michael T. Orchard
Professor, Electrical & Computer Engineering
orchard@rice.edu
ece.rice.edu/orchard.aspx
ece.rice.edu/ece/faculty/Orchard.html
Research Summary: Image and video modeling and compression.

Xaq Pitkow
Assistant Professor, Electrical and Computer Engineering
Assistant Professor, Computational Neuroscience, Baylor College of Medicine
xaq.pitkow@rice.edu
ece.rice.edu/pitkow.aspx
neuro.bcm.edu/pitkowlab
neuroengineering.rice.edu
Research Summary: Distributed neural representations, algorithms for statistical inference, models of the natural environment, and computation by nonlinear recurrent networks.
Jacob T. Robinson  
Assistant Professor, Electrical and Computer Engineering & Bioengineering  
jacob.t.robinson@rice.edu  
ece.rice.edu/robinson.aspx  
robinsonlab.com  
neuroengineering.rice.edu  

Research Summary: Nanotechnology to measure and manipulate neural activity.

Ashutosh Sabharwal  
Professor, Electrical and Computer Engineering  
ashu@rice.edu  
ece.rice.edu/sabharwal.aspx  
cmc.rice.edu/warp  

Research Summary: Wireless networks, information theory, multiple antenna systems, coding and computation.

Ray Simar  
Professor in the Practice, Electrical and Computer Engineering & Computer Science  
(Digital Signal Processing Architecture)  
ray.simar@rice.edu  
ece.rice.edu/simar.aspx  

Research Summary: Digital signal processors, design methodology and programming tools.

Isabell Thomann  
Assistant Professor, Electrical and Computer Engineering  
it6@rice.edu  
ece.rice.edu/thomann.aspx  
thomanni.rice.edu  

Research Summary: Energy, photocatalysis, ultrafast spectroscopy and nanophotonics.
Frank K. Tittel  
J.S. Abercrombie Professor, Electrical and Computer Engineering  
Professor, Bioengineering  
fkt@rice.edu  
ece.rice.edu/tittel.aspx  
lasersci.rice.edu  
*Research Summary:* Quantum electronic devices, laser spectroscopy, nonlinear optics, and laser-materials, interactions with applications in medicine and microelectronics.

Peter J. Varman  
Professor, Electrical and Computer Engineering & Computer Science  
pjv@rice.edu  
ece.rice.edu/varman.aspx  
ece.rice.edu/~pjv  
*Research Summary:* Storage and memory systems; virtualization and resource management; datacenter architecture; cloud computing.

Ashok Veeraraghavan  
Assistant Professor, Electrical and Computer Engineering  
vashok@rice.edu  
ece.rice.edu/veeraraghavan.aspx  
ece.rice.edu/~av21  
*Research Summary:* Computational imaging, computer vision and robotics.

Gary Woods  
Professor in the Practice, Electrical and Computer Engineering & Computer Science  
(Computer Technology)  
gary.woods@rice.edu  
ece.rice.edu/garywoods.aspx  
*Research Summary:* Optical probing and debugging of advanced integrated circuits.
Lin Zhong
Associate Professor, Electrical and Computer Engineering
lzhong@rice.edu
ece.rice.edu/lzhong.aspx
ruf.rice.edu/~mobile
Research Summary: Mobile & embedded system design, design automation of digital systems.

More information on all faculty members can be found at ece.rice.edu, including biographies and current research projects.