



**New Jersey Institute of Technology**

**Helen & John C. Hartmann Department  
of Electrical and Computer Engineering**

**HANDBOOK FOR UNDERGRADUATE STUDENTS**

**September 2019**

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## I. INTRODUCTION

We are pleased to present our *Handbook for Undergraduate Students*. This document is a compilation of both Institute and ECE department regulations and procedures of particular interest to BSEE and BSCoE students. Please note that the Institute's *Undergraduate Catalog* also contains information you will find helpful.

The Department of Electrical and Computer Engineering offers bachelor degrees in electrical engineering and computer engineering.

## II. ADMINISTRATION

### Chair:

Dr. Leonid Tsybeskov, 207 ECE Center, (973) 596-6594, [tsybeskov@njit.edu](mailto:tsybeskov@njit.edu)

### Associate Chair for Graduate Studies:

Dr. Durgamadhab Misra, 339 ECE Center, (973) 596-5739, [dmisra@njit.edu](mailto:dmisra@njit.edu)

### Associate Chair for Undergraduate Studies:

Dr. Marek Sosnowski, 237 ECE Center, (973) 596-8464, [sosnowski@njit.edu](mailto:sosnowski@njit.edu)

### Student Advisor and Curriculum Coordinator:

Ms. Ryoko Mathes, 235 ECE Center, (973) 596-5457, [mathes@njit.edu](mailto:mathes@njit.edu)

### Other Staff Who May Be of Assistance:

Ms. Barbara Faltz, Administrative Assistant II, 200 ECE Center, (973) 596-3510, [faltz@njit.edu](mailto:faltz@njit.edu)

Mrs. Tanita Evans, Principal Clerk, 200 ECE Center (973) 596-3512, [tanita.evans@njit.edu](mailto:tanita.evans@njit.edu)

Dr. Byron Chen 221 ECE Center, (973) 596-3545, [byron.h.chen@njit.edu](mailto:byron.h.chen@njit.edu)

Joan Mahon, Assistant to the Chair for Administration, 233 ECE Center, (973) 596-3524, [mahon@njit.edu](mailto:mahon@njit.edu)

Ms. Teri Bass, Administrative Assistant, 227 ECE Center, (973) 596-3513, [bass@njit.edu](mailto:bass@njit.edu)

### Other Helpful Directory Information:

Career Development Services, Fenster Hall, (973) 596-3100

Student Financial Aid Services, Student Services Mall, (973) 596-3480, [finaid@njit.edu](mailto:finaid@njit.edu)

Office of the Dean of Students, 255 Campus Center, (973) 596-3470 or 3466, [doss@njit.edu](mailto:doss@njit.edu)

Office for First Year Students, 280 Campus Center, (973) 596-2981, [firstyearstudents@njit.edu](mailto:firstyearstudents@njit.edu)

Office for International Students and Faculty, Rm 140 Fenster Hall, (973) 596-2451,

[international.students@njit.edu](mailto:international.students@njit.edu)

Office of the Registrar, Student Services Mall, (973) 596-3236, [office.of.registrar@njit.edu](mailto:office.of.registrar@njit.edu)

### III. FACULTY DIRECTORY

Name	Office	Telephone	Email
Ali Abdi	303 ECEC	596-5621	<a href="mailto:abdi@njit.edu">abdi@njit.edu</a>
Ali Akansu	317 ECEC	596-5650	<a href="mailto:kansu#@njit.edu">kansu#@njit.edu</a>
Nirwan Ansari	343 ECEC	596-3670	<a href="mailto:nirwan.ansari@njit.edu">nirwan.ansari@njit.edu</a>
John Carpinelli	315 ECEC	596-3536	<a href="mailto:carpinelli@njit.edu">carpinelli@njit.edu</a>
Atam Dhawan	345 ECEC	596-5442	<a href="mailto:atam.p.dhawan@njit.edu">atam.p.dhawan@njit.edu</a>
Mohammed Feknous	311 ECEC	596-6460	<a href="mailto:mohammed.feknous@njit.edu">mohammed.feknous@njit.edu</a>
Bernard Friedland	351 ECEC	596-3509	<a href="mailto:bf@njit.edu">bf@njit.edu</a>
Hongya Ge	333 ECEC	642-4990	<a href="mailto:ge@njit.edu">ge@njit.edu</a>
Haim Grebel	325 MICRO	596-3533	<a href="mailto:haim.grebel@njit.edu">haim.grebel@njit.edu</a>
Alexander Haimovich	321 ECEC	596-3534	<a href="mailto:haimovic@njit.edu">haimovic@njit.edu</a>
Edwin Hou	357 ECEC	596-3521	<a href="mailto:hou@njit.edu">hou@njit.edu</a>
Walid Hubbi	329 ECEC	596-3518	<a href="mailto:hubbi@njit.edu">hubbi@njit.edu</a>
Moshe Kam	331 ECEC	596-3521	<a href="mailto:moshe.kam@njit.edu">moshe.kam@njit.edu</a>
Abdallah Khreishah	349 ECEC	596-3528	<a href="mailto:abdallah.khreishah@njit.edu">abdallah.khreishah@njit.edu</a>
Joerg Kliewer	213 ECEC	596-3519	<a href="mailto:jkliewer@njit.edu">jkliewer@njit.edu</a>
Dong-Kyun Ko	215 ECEC	596-3515	<a href="mailto:dong.kyun.ko@njit.edu">dong.kyun.ko@njit.edu</a>
Serhiy Levkov	203 ECEC	642-7676	<a href="mailto:levkov@njit.edu">levkov@njit.edu</a>
Qing Liu	345 ECEC	596-3526	<a href="mailto:qliu@njit.edu">qliu@njit.edu</a>
Xuan Liu	317 ECEC	596-5693	<a href="mailto:xliu@njit.edu">xliu@njit.edu</a>
Oksana Manzhura	205 ECEC	596-35-4	<a href="mailto:oksana.manzhura@njit.edu">oksana.manzhura@njit.edu</a>
Durgamadhab Misra	339 ECEC	596-5739	<a href="mailto:dmisra@njit.edu">dmisra@njit.edu</a>
Hieu Nguyen	309 ECEC	596-3534	<a href="mailto:Hieu.p.nguyen@njit.edu">Hieu.p.nguyen@njit.edu</a>
Edip Niver	406 MICRO	596-3542	<a href="mailto:niver@njit.edu">niver@njit.edu</a>
Ratna Raj	347 ECEC	596-8289	<a href="mailto:Ratna.raj@njit.edu">Ratna.raj@njit.edu</a>
Bipin Rajendran	337 ECEC	596-3516	<a href="mailto:Bipin.rajendran@njit.edu">Bipin.rajendran@njit.edu</a>
Roberto Rojas-Cessa	323 ECEC	596-3508	<a href="mailto:rojasces@njit.edu">rojasces@njit.edu</a>
Jacob Savir	209 ECEC	596-5681	<a href="mailto:savir@njit.edu">savir@njit.edu</a>
Oswaldo Simeone	211 ECEC	495-5710	<a href="mailto:osvaldo.simeone@njit.edu">osvaldo.simeone@njit.edu</a>
Marek Sosnowski	237 ECEC	596-3541	<a href="mailto:sosnowski@njit.edu">sosnowski@njit.edu</a>
Leonid Tsybeskov	207 ECEC	596-6594	<a href="mailto:leonid.tsybeskov@njit.edu">leonid.tsybeskov@njit.edu</a>
Cong Wang	313 ECEC	596-5744	<a href="mailto:cong.wang@njit.edu">cong.wang@njit.edu</a>
Gerald Whitman	405 MICRO	596-3232	<a href="mailto:whitman@njit.edu">whitman@njit.edu</a>
Mengchu Zhou	349 ECEC	596-6282	<a href="mailto:zhou@njit.edu">zhou@njit.edu</a>
Sotirios Ziafras	353 ECEC	596-5651	<a href="mailto:ziafras@njit.edu">ziafras@njit.edu</a>

#### ECE Study Lounge

Located on the first floor of Faculty Hall, Room 104, the ECE Study Lounge offers a quiet environment for students to study, read a book or magazine, or just spend their time along with their fellow ECE students.

#### IV. ADVISEMENT AND REGISTRATION PROCEDURES

The Student Advisor and the Associate Chair for Undergraduate Studies are the advisors to all undergraduate students. Freshmen and Sophomores are advised by the student adviser, Ms. Ryoko Mathes. The Associate Chair for Undergraduate Studies advises Juniors and Seniors on their tracks and elective courses, approves ECE transfer credits from other institutions and is responsible for certifying EE and CoE students for graduation. For the purpose of ECE advising, Sophomores are students who take 200 level ECE courses; Juniors take 300 level ECE courses and Seniors 400 level courses, regardless of the total number of acquired credits.

Registration begins late in the Fall semester for the next Spring semester and in the Spring for the next Summer and Fall. Students who have a registration hold need to have it removed before registering online. To have the hold removed; Freshmen and Sophomores make appointments with the ECE adviser Ms. Ryoko Mathes by link: <https://mathesnajtece.youcanbook.me/>

Juniors and Seniors make appointment with the Associate Chair via link:

<https://www.google.com/calendar/selfsched?sstoken=UUU4TWdES0NScW9DfGRIZmF1bHR8ZGIwYTEXNjdmNGVjMjQ2Y2JhN2YzYjNmY2YzOWQzNmE> or by e-mail.

Juniors and Seniors who have high GPA and are on track to graduation may have their holds removed before registration starts without seeing the adviser. If this is your case and you know which courses to take, go ahead and register but you can always contact or meet the adviser if you have questions.

Be prepared for an advising appointment. Write down a tentative list of courses you plan to take using Student Study Plan form at the end of this handbook. A useful tool in planning your course schedule is the Academic Checklist of your program. It lists all required courses (from ECE and other departments), semester by semester, and lets you see at a glance which courses you still need to take to graduate. You can find the checklists at the end of this handbook and on ECE department website. Keep the checklist updated and verify your record with your NJIT transcript on Highlander Pipeline. Make sure that you have taken the prerequisites for the courses you will register for. See the prerequisite listing in Section VII of this Handbook.

*DegreeWorks* is also useful but it is only advisory, not an official record. It may not account properly for senior, especially technical elective, courses.

Students who have difficulty coming to the office and are in good academic standing may request removing the registration hold by email, sending the filled Student Study Plan form in an attachment. List courses you want to take but with the maximum total number of credits based on your GPA in the table below.

**Include your major and student ID in all correspondence with the department.**

After your hold is removed or necessary permits obtained, register for courses online through the NJIT self-registration system.

#### **Course Load and Your GPA**

Your grade point average (GPA) is an important indicator of your overall academic performance, and it will be considered by your prospective employer or a graduate program admission officer. While students are understandably concerned with the time it takes to graduate, they often make a

mistake by overloading their schedule and registering for more courses than they can successfully complete. This trading quality for quantity often does not pay. GPA lower than 2.0, even for courses taken in one semester, automatically changes student academic status from good standing to Warning. If the academic performance does not improve, Probation and Suspension follows. **A student can be only one time in any of these states during studies at NJIT.** One cannot even graduate with a GPA below 2.0, and if you want to be a successful professional, your score should not be anywhere near that number. Admission to graduate school requires a GPA of at least 3.0.

The following guide shows the relationship between your cumulative GPA and the maximum number of credits that we recommend you should register for in a given semester.

GPA	Number of Credits
2.0*	12**
2.5	15
3.0	19***

- \* A lower GPA leads to a warning, followed by a probation, and academic suspension
- \*\* Minimum credits for full time status
- \*\*\* Maximum number of credits allowed per semester

### Prerequisites

Prerequisites of a course are other courses that must be completed before registering for the course. For example, Physics 2 (Phys 122) and Calculus 2 (Math 112) are the prerequisites for all ECE courses (except ECE 101), and must be completed before registration for any ECE course. Prerequisite requirements are strictly enforced. See the list of the prerequisites of ECE courses at the end of this handbook. Students who are enrolled in prerequisite courses in a given semester are allowed to register for the follow-up courses in the following semester, assuming that they pass the prerequisite courses. Students must withdraw from a course if they fail even one of its prerequisites. **Note that an Incomplete in a prerequisite course means that the prerequisite condition was not satisfied.** The registrar checks course rosters at the start of every semester and removes from them the students without prerequisites. Permits for registering without prerequisites are given only in special cases for reasons such as a delay in posting the grade of a completed prerequisite or delay in obtaining a transcript from another college. The permits also require the course instructor approval.

### Repeating a Course

A course for which a student received an F grade must be repeated. Be diligent and work hard to pass the course on the second try if this happens to you. A new grade will substitute the F, which will not be counted in the calculation of your GPA but only once. The university policy states that a student can enroll in any course no more than four times, **counting withdrawals.** Attempting

four times and not passing a course required in the program results in removing the student from the degree program. If you cannot cope with the course material, it is better to withdraw than to fail but do not take withdrawing decision lightly.

### **Closed Courses**

It is best to register early as some courses are in demand and fill up quickly. If the courses you want to take are closed, put your name on the waiting list through the Highlander Pipeline. Presence of students on the waiting list may lead to increasing the registration limit and reopening the course. Note however that this may not be possible with laboratories where the number of available places is limited by the equipment availability.

Not all courses may be offered every semester; some may only be offered in the fall semester, others in the spring. This applies especially to upper level courses. Consider this in planning your schedule, especially in the senior year.

### **Concentration Tracks and Technical Electives**

Senior students are allowed to choose different concentration areas (tracks) in electrical engineering and in computer engineering. Tracks consist of the track specific lecture courses and track laboratories. There is some flexibility in choosing track courses including mixing courses from different tracks. Besides track courses, senior students take technical elective courses, which must be 300 or 400 level ECE courses or advisor approved upper level engineering, science or mathematics courses. It is your responsibility to make certain that the elective courses you are taking meet the elective requirements. More information on tracks and technical electives is included in section

### **Senior Design Project**

All ECE students must take ECE 414 the semester before registering for Senior Project ECE 416 or ECE 417. Students who are registering for ECE 417 must have approval of their project advisor. ECE 414 and ECE 416/417 should be taken in the last two semesters of your studies. See more information on Senior Design Projects in included in Section VII.

### **Graduate Courses**

As undergraduates, you can take graduate courses only with the approval of the ECE Associate Chair for Undergraduate Studies and the graduate adviser. A standard condition for approval is GPA of at least 2.8. "Approval form for Undergraduate Student to Register for a Graduate Course" form is available on the registrar website. See also information on BS/MS program in this handbook.

## **Transfer Credits**

Transfer credits for courses completed at other schools that are equivalent to those offered by NJIT are awarded at the time of admission. A minimum grade of C must be earned in the course in order to receive the transfer credits. All transfer credits must be documented by an official transcript issued by the school where the course was completed. Courses completed at New Jersey community colleges are routinely transferred by the admission office but the ultimate decision on accepting the transfer belongs to the department that offers the equivalent course at NJIT. This is especially relevant to transfers from schools other than community colleges in the state, out of state universities, and schools outside US. Students who have attended foreign institutions of higher education must also submit an evaluation of their work made by World Educational Services Inc. or another approved service. Further information regarding evaluations may be obtained from the Registrar's office.

Students who want to have a course evaluated by the ECE department should present: (1) the course syllabus, or at least a detailed course description, and (2) a copy of the transcript with the grade and the academic semester when the course was completed. Since Physics 2 (Phys 122) and Calculus 2 (Math 112) are the prerequisites for all ECE courses, these prerequisite must be transferred before requesting transfer of ECE courses.

Once a student is admitted, he or she is expected to complete the remaining courses required for graduation at NJIT. Permission for taking courses at other institutions is granted only in special cases and must be approved prior to enrolling in them. Taking a course elsewhere without prior approval may result in not being able to have it transferred.

To be eligible for graduation, students transferring to NJIT must complete in residence at NJIT at least 33 credits in upper division courses approved by the department of their major study. The grades of other schools for transfer courses are not included in the calculation of the NJIT GPA.



## **V. UNDERGRADUATE PROGRAM IN THE ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT**

### **Undergraduate Program Educational Objectives**

1. Graduates will succeed in electric or computer engineering or other diverse fields that require analytical and/or professional skills.
2. Graduates will pursue professional development, including continuing or advanced education, relevant to their career plans.
3. Graduates will contribute to their fields or professionals and society.

### **Bachelor of Science Degrees offered in the Electrical and Computer Engineering Department**

The curriculum at NJIT provides a broad education in mathematics, the natural sciences, humanities and social sciences. Upon this foundation is built a depth of understanding in engineering fields. The program seeks to produce engineers who can think analytically and creatively, work effectively, and communicate clearly with others.

The Electrical and Computer Engineering Department offers two majors: Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Computer Engineering (BSCoE).

### **What is Electrical Engineering?**

Electrical Engineering is a diversified and challenging profession concerned with the design, development, fabrication and control of the electrical devices upon which our technological society so largely depends. Electrical engineers utilize their knowledge of devices and systems design in a multitude of areas. These include: integrated circuits, computers, environmental and biomedical instrumentation, energy conversion, power generation and distribution, control systems, microprocessors, and communication devices and systems.

Electrical Engineering graduates with a BSEE have a range of career possibilities. They may enter into industry, professional practice or may pursue advanced studies in electrical engineering or related fields. Electrical Engineering is also a useful basis for further study in a different field such as law, medicine or business.

## What is Computer Engineering?

Computer Engineering professionals develop, design, and test computer systems. They understand both computer hardware and software and possess enough engineering breadth to skillfully apply the basic modeling techniques representing the computing process to analyze application tradeoffs, and design computers for a variety of applications. Economics and inherent flexibility have led to the widespread use of computer engineering in all areas of technology, science, business, and medicine. The career potential for graduates with this knowledge has been strong for many years.

## Comparison of the BSEE and BSCoE Programs

The curricula leading to the two degrees are almost the same in the Freshman and Sophomore years (with the exception of one course in the sophomore year). The two programs diversify in the Junior year. Further diversification occurs in the curricula of each major as students choose different concentration areas (tracks) in electrical engineering and in computer engineering.

**Electrical Engineering Tracks.** In the senior year, students emphasize an area of interest by selecting from a range of electives (lectures and a laboratory) in the tracks listed below in alphabetical order:

*Computer Systems:* Students in the EE major may elect an in-depth study of computer system organization and computer system design. Students study Central Processor Unit (CPU) design, control unit design, memory organization and I/O processing.

*Controls:* The mechanism of feedback pervades nature, science, and technology. The curriculum in Controls teaches how engineers can use the feedback mechanism to design systems for controlling a variety of dynamic processes, used in the operation of systems ranging from spacecraft, aircraft, and automobiles to heating, ventilation, and air conditioning systems.

*Electronic, Microwave, and Photonic Devices:* This area concentrates on electronic and photonic devices and technologies. It covers modeling and design tools for semiconductor electronic and photonic devices, including transistors, lasers, solar cells, as well as VLSI circuits. Radio frequency (RF), microwave, and lightwave devices and systems are also included.

*Power Systems:* The Power Systems track includes the study of the economic generation and stable transmission of electrical energy to consumers.

*Telecommunications and Networking :* The information revolution is built on an infrastructure of communications and computer networks. The Telecommunications and Networking track focuses on the analysis and design of wireless & wireline systems for information delivery. A variety of courses are available in topics such as optical communications networks and wireless communications.

**Computer Engineering Tracks.** In the senior year, students emphasize an area of interest by selecting a technical track. Two technical tracks are currently available:

*Computer Communications:* The Computer Communications track provides students with a working knowledge of digital data communications and computer network design. Particular emphasis is put on its physical and data link layers, the devices which make computer networks a reality, and methods for predicting network performance.

*Advanced Computer Systems:* The emphasis in this track is on the architectural characteristics of advanced computer systems and the techniques for their design and analysis. The topics include computer system design, design advances in computer architecture, and simulation of computer systems.

## **Laboratory Facilities**

Laboratory experience is a very important part of a student's education. The ECE department at NJIT emphasizes hands-on and design experience as well as communication skills in its undergraduate curriculum. For all ECE laboratories detailed manuals are provided. Students are required to obtain laboratory kits available at the NJIT bookstore.

The EE undergraduate laboratory experience is concentrated in four laboratory core courses: ECE 291, ECE 392, ECE 395 (and ECE 494 in *Computer Systems* track), and a Technical Track Laboratory.

The CoE undergraduate laboratory experience is concentrated in four laboratory core courses: ECE 291, ECE 394, ECE 395, ECE 495 and a Technical Track Laboratory.

## **Senior Design Project**

During the senior year, all students are called upon to integrate and direct their knowledge and experience toward a senior project. Successful completion of the project can be challenging but also a very satisfying and exciting experience. It can be also a great item on the resume. Companies have hired our graduates based on their Senior Design Project work.

The project work is structured as a two semester course, which should be taken in the last two semesters of study for the degree to capitalize on the knowledge and experience gained in all prior courses. Students are expected to form project teams of two or three members. The teams often include CoE and EE students, and sometimes students from other departments, especially in interdisciplinary projects. The teams are given the opportunity to select a topic and develop a project plan. They submit a formal project proposal for approval in the first semester of the project work (ECE 414). They complete the work on the project in the following semester under supervision of an instructor in a class with other teams (ECE 416), or under supervision of an individual adviser (ECE 417). The project must be completed and presented for review, and a final written report must be submitted and approved. More information on the Senior Design Project can be found on the ECE Department website. [http://ece.njit.edu/students/Senior\\_Project\\_Documentation.php](http://ece.njit.edu/students/Senior_Project_Documentation.php)

## **Beyond the BS degree**

For students who wish to continue their studies in electrical engineering or in computer engineering beyond the BS degree, the Department of Electrical and Computer Engineering offers a variety of areas of

specialization at the MS and Ph.D. levels. Many graduate courses are offered in the evening to meet the needs of part-time students. See also description of BS-MS program in the next chapter of this handbook.

## **VI. SPECIAL PROGRAMS AND SOCIETIES**

### **BS/MS**

The BS/MS Program permits qualified NJIT undergraduate students (3.0 minimum GPA) to earn credits toward a graduate degree. Students with GPA of at least 3.0 but below 3.5 can take six (6) credits of graduate course work while student with GPA above 3.5 can take nine (9) credits of graduate course work that may be counted towards both the bachelor and master's degree at NJIT. The graduate courses can count as technical electives and in some cases they can replace the required courses in the program curriculum. See the academic adviser for details.

BS/MS students are encouraged to pursue graduate study immediately following the completion of the bachelor's degree. However, courses can be applied to the graduate degree up to two (2) years after completing the bachelor's degree.

A new BS/PhD program was introduced recently, which allows for up to four (4) graduate courses count for the BS degree.

For further information, please see <http://www.njit.edu/graduatestudies/program-options/bs-ms/index.php>

### **The Minors in the ECE Department**

In addition to major BS degrees, students in the ECE department or other departments can obtain a minor BS degree by passing the following courses:

**EE Minor for CoE** (15 credits): ECE 333, ECE 341, ECE 361, ECE 372, ECE 374

**EE Minor for other** (16 credits): ECE 231, ECE 232, ECE 271, ECE 291, two from ECE 333, ECE 341, ECE 361, ECE 372, ECE 374

**CoE Minor for EE** (13 credits): CS 114, CS 332, ECE 353, ECE 394, ECE 495

**CoE Minor for other** (17 credits): ECE 231, ECE 251, or CS 251, ECE 252, ECE 291, ECE 353, ECE 394, ECE 495.

## **Professional and Honor Societies**

There are very active student technical/honor societies in the department: the Institute of Electrical and Electronics Engineers (IEEE) Student Chapter-North Jersey Section; Eta Kappa Nu-Gamma Chapter, the electrical engineering honor society; and Tau Beta Pi, an engineering honor society.

### IEEE (Faculty advisor: Mr. Mohammed Feknous)

The IEEE has more than 300,000 members world-wide, encompassing all aspects of electrical technology from electron device physics to super computer networks.

Recent activities of this student branch include: the organization of a student leadership conference; the offering of a tutorial session for students in need of extra help; feedback sessions where students meet with the ECE chairperson and associates to voice their complaints and concerns as well as to offer support for the department's efforts; organization of a workshop on programmable logic devices; and arranging on-site company visits. Frequently they conduct a student professional activities conference to discuss workplace issues. The IEEE student chapter office is located in 104B Faculty Memorial Hall.

### Eta Kappa Nu (Faculty advisor: Mr. Mohammed Feknous)

Membership in this honor society is eagerly sought by students in electrical engineering. With the assistance of the faculty advisor, the chapter is actively engaged in promoting the professional advancement of students. Outside speakers are invited to address the students on technical as well as ethical issues. Eta Kappa Nu has a tutoring program for all ECE students and arranges visits to companies. Eta Kappa Nu honor society is located in 303 Faculty Memorial Hall.

### Tau Beta Pi (Faculty advisor: Mr. Mohammed Feknous)

Tau Beta Pi is an honor society founded in 1885 to recognize engineering students of superior scholarship and outstanding character, as well as engineers of eminent achievement. Beyond distinguished scholarship, members must also have exemplary character. Tau Beta Pi honor society is located in 323 Faculty Memorial Hall.

## VII. COMPUTER ENGINEERING AND ELECTRICAL ENGINEERING CURRICULA

### COE PROGRAM FOUR YEAR PLAN OF STUDY

#### FIRST YEAR

##### First Semester

Course ID	Title	Credits
CHEM 125	General Chemistry I	3
FED 101	Fundamentals of Engineering Design	2
HUM 101	English Composition: Writing, Speaking, Thinking I	3
MATH 111	Calculus I	4
PHYS 111	Physics I	3
PHYS 111A	Physics I Laboratory	1
FRSH SEM	Freshman Seminar	0
	Term Credits	16

##### Second Semester

Course ID	Title	Credits
CS 115	Intro. to CS I in C++	3
MATH 112	Calculus II	4
Phys 122	Electricity and Magnetism for ECE Applications	3
PHYS 121A	Physics II Laboratory	1
ECE 101	Introduction to Electrical and Computer Engineering	0
HUM 102	English Composition: Writing, Speaking, Thinking II	3
	Term Credits	14

#### SECOND YEAR

##### First Semester

Course ID	Title	Credits
CS 116	Intro. to Computer Science II/C++	3
ECE 231	Circuits and Systems I	3
ECE 251	Digital Design	3
MATH 222	Differential Equations	4
GER 200 <sup>1,2</sup>	A 200-level course with the prefix COM, ENG, HIST, HUM, LIT, PHIL, STS, or THTR	3
	Term Credits	16

### Second Semester

Course ID	Title	Credits
<a href="#">ECE 232</a>	Circuits and Systems II	3
<a href="#">ECE 252</a>	Microprocessors	3
<a href="#">ECE 271</a>	Electronic Circuits I	3
<a href="#">ECE 291</a>	Electrical Engineering Laboratory I	1
<a href="#">Math 213</a>	Calculus III B	4
	Term Credits	14

### THIRD YEAR

#### First Semester

Course ID	Title	Credits
<a href="#">CS 280</a>	Programming Language Concepts	3
<a href="#">ECE 368</a>	Signal Transmission	3
<a href="#">ECE 395</a>	Microprocessor Laboratory	2
<a href="#">MATH 326</a>	Discrete Analysis for Computer Engineers	3
<a href="#">MATH 333</a>	Probability and Statistics	3
	Term Credits	14

#### Second Semester

Course ID	Title	Credits
<a href="#">CS 332</a>	Principles of Operating Systems	3
<a href="#">MATH 340</a> <a href="#">or MATH 337</a>	Applied Numerical Methods or Linear Algebra	3
<a href="#">ECE 353</a>	Computer Organization and Architecture	3
<a href="#">PHIL 334</a>	Engineering Ethics and Technological Practice 2	3
<a href="#">ECE 394</a>	Digital Systems Lab	1
Economics or Management	Select from Econ 201, Econ 265, Econ 266, MGMT 390, and IE 492	3
	Term Credits	16

## FOURTH YEAR

### First Semester

Course ID	Title	Credits
<a href="#">ECE 414</a>	Electrical and Computer Engineering Project I	1
<a href="#">ECE 495</a>	Computer Engineering Design Lab	3
COE Track Elective I		3
COE Track Elective II ECE Technical Elective		3
ECE Technical Elective		3
GER 300 level <sup>2</sup>	300-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR	3
Term Credits		16

### Second Semester

Course ID	Title	Credits
<a href="#">ECE 416</a> or <a href="#">ECE 417</a>	Electrical and Computer Engineering Project II or Independent Study Project II	3
COE Track Elective III		3
COE Track Laboratory		2
ECE Technical Elective		3
GER Senior Seminar 400 level course in Humanities, History or Social Sciences		3
Term Credits		14

**Total Degree Credits**

**120**

<sup>1</sup> Fulfills prerequisite requirements for 300 level GER

<sup>2</sup> Students may also take approved courses at Rutgers-Newark to fulfill this requirement.

Note: The sequence of track courses and track laboratories depends on prerequisites and may be different from the one shown above for different tracks.



## Computer Engineering Tracks

The computer Engineering technical tracks are designed to provide in-depth study in a specialty area. Students at the fourth year of the curriculum must choose one of the available tracks. Courses are listed below. Students may take alternative courses but must see their academic advisor for approval.

Computer Engineering Tracks - Select one of the following:

### 1. Advanced Computer Systems Track

Course ID	Title	Credits
<a href="#">ECE 451</a>	Advanced Computer Architecture	3
<a href="#">ECE 452</a>	Advanced Computer Architecture II	3
<a href="#">ECE 453</a> or <a href="#">IS 461</a>	Introduction to Discrete Event Systems Systems Simulation	3
<a href="#">ECE 459</a>	Advanced Computer Systems Design Lab	2

### 2. Computer Communications Track

Course ID	Title	Credits
<a href="#">ECE 421</a>	Digital Data Communications	3
<a href="#">ECE 422</a>	Computer Communications Networks	3
<a href="#">ECE 425</a>	Wireless Communication Systems	3
<a href="#">ECE 429</a>	Computer Communications Lab*	2

- Students interested in general telecommunication rather than in networking may take ECE 489 instead of ECE 429. ECE 421 is the prerequisite for ECE 489 while ECE 422 is the prerequisite for ECE 429.

## TECHNICAL ELECTIVES

In addition to the track courses, COE students take two ECE technical elective courses. The ECE technical elective must be a 300 or 400 level ECE course or advisor approved upper level engineering, science or mathematics course. An excellent choice is an ECE course from a different COE track. Elective courses from other programs can count for the minor in that program. Elective courses from other departments cannot cover the same material as ECE courses taken by the student. For example some CS courses may cover similar material as other courses in the COE program and are not allowed as electives. Courses from the Engineering Technology Department are generally not approved as ECE electives.

**NOTE: Degree Works may not account properly for technical electives but it will not affect your path to graduation.**

## EE PROGRAM FOUR YEAR PLAN OF STUDY

### FIRST YEAR

#### First Semester

Course ID	Title	Credits
<a href="#">CHEM 125</a>	General Chemistry I	3
<a href="#">FED 101</a>	Fundamentals of Engineering Design	2
<a href="#">HUM 101</a>	English Composition: Writing, Speaking, Thinking I	3
<a href="#">MATH 111</a>	Calculus I	4
<a href="#">PHYS 111</a>	Physics I	3
<a href="#">PHYS 111A</a>	Physics I Laboratory	1
<a href="#">FRSH SEM</a>	Freshman Seminar	0
	Term Credits	16

#### Second Semester

Course ID	Title	Credits
<a href="#">CS 115</a>	Intro. to CS I in C++	3
<a href="#">MATH 112</a>	Calculus II	4
Phys 122	Electricity and Magnetism for ECE Applications	3
<a href="#">PHYS 121A</a>	Physics II Laboratory	1
<a href="#">ECE 101</a>	Introduction to Electrical and Computer Engineering	0
<a href="#">HUM 102</a>	English Composition: Writing, Speaking, Thinking II	3
	Term Credits	14

### SECOND YEAR

#### First Semester

Course ID	Title	Credits
<a href="#">ECE 231</a>	Circuits and Systems I	3
<a href="#">ECE 251</a>	Digital Design	3
<a href="#">MATH 222</a>	Differential Equations	4
GER 200 <sup>1,2</sup>	A 200-level course with the prefix COM, ENG, HIST, HUM, LIT, PHIL, STS, or THTR	3
<a href="#">Phys 234</a>	Physics III	3
	Term Credits	16

#### Second Semester

Course ID	Title	Credits
<a href="#">ECE 232</a>	Circuits and Systems II	3
<a href="#">ECE 252</a>	Microprocessors	3
<a href="#">ECE 271</a>	Electronic Circuits I	3
<a href="#">ECE 291</a>	Electrical Engineering Laboratory I	1
<a href="#">Math 213</a>	Calculus III B	4
	Term Credits	14

**THIRD YEAR****First Semester**

Course ID	Title	Credits
<a href="#">ECE 333</a>	Signals and Systems	3
<a href="#">ECE 361</a>	Electromagnetic Fields I	3
<a href="#">ECE372</a>	Electronic Circuits II	3
<a href="#">ECE 392</a>	Electrical Engineering Lab II	2
<a href="#">ECE 395</a>	Microprocessor Laboratory	2
Economics or Management	Select from Econ 201, Econ 265, Econ 266, MGMT 390, and IE 492	3
	Term Credits	16

**Second Semester**

Course ID	Title	Credits
<a href="#">ECE 321</a>	Random Signals and Noise	3
<a href="#">ECE 362</a>	Electromagnetic Fields II	3
<a href="#">ECE 374</a>	Electronic Device	3
<a href="#">ECE 341</a>	Energy Conversion	3
<a href="#">PHIL 334</a>	Engineering Ethics and Technological Practice 2	3
	Term Credits	15

**FOURTH YEAR****First Semester**

Course ID	Title	Credits
<a href="#">ECE 414</a>	Electrical and Computer Engineering Project I	1
<a href="#">ECE 494</a>	Electrical Engineering Lab III	2
	EE Track Elective I	3
	EE Track Elective II	3
	ECE Technical Elective	3
GER 300 level <sup>2</sup>	300-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR	3
	Term Credits	15

**Second Semester**

<a href="#">ECE 416</a> or <a href="#">ECE 417</a>	Electrical and Computer Engineering Project II or Independent Study Project II	3
	EE Track Laboratory	2
	GER Senior Seminar 400 level course in Humanities, History or Social Sciences	3
	ECE Technical Elective	3
	ECE Technical Elective	3
	Term Credits	14

**Total Degree Credits****120**

<sup>1</sup> Fulfills prerequisite requirements for 300 level GER

<sup>2</sup> Students may also take approved courses at Rutgers-Newark to fulfill this requirement.

*Note: The sequence of track courses and track laboratories depends on prerequisites and may be different from the one shown above for different tracks.*

## Electrical Engineering Tracks

Students should select one track. Courses are listed below. In some cases, students may substitute a course in the selected track with another course not listed in the track, with the academic advisor approval.

### Electrical Engineering Tracks - Course List

#### 1. Control Systems Track

Course ID	Title	Credits
<a href="#">ECE 431</a>	Introduction to Feedback Control Systems *	3
<a href="#">ECE 432</a>	Control Systems Elective	3
<a href="#">ECE 439</a>	Control Systems Laboratory	2

#### 2. Electronic, Microwave and Photonic Devices Track

Course ID	Title	Credits
<a href="#">ECE 461 or ECE 463</a>	Microwave and Integrated Optics or Optoelectronics	3
<a href="#">ECE 462</a>	RF/Fiber Optics Systems Elective **	3
<a href="#">ECE 469</a>	RF/Microwave and Fiber Optics Systems Laboratory	2

#### 3. Power Track

Course ID	Title	Credits
<a href="#">ECE 442</a>	Power Systems **	3
<a href="#">ECE 443</a>	Renewable Energy Systems	3
<a href="#">ECE 449</a>	Power Systems Laboratory	2

#### 4. Telecommunications & Networking Track

##### A – with telecommunication lab

Course ID	Title	Credits
<a href="#">ECE 421</a>	Digital Communications Systems *	3
<a href="#">ECE 425</a>	Wireless Communication Systems	3
<a href="#">ECE 489</a>	Communications Systems Laboratory	2

### B – with networking lab

Course ID	Title	Credits
<a href="#">ECE 421</a>	Digital Communications Systems *	3
<a href="#">ECE 422</a>	Computer Communication Networks *	3
<a href="#">ECE 429</a>	Computer Communications Lab	2

Students may choose either version A or B of the track. Note that ECE 421 is a prerequisite for ECE 489 lab and ECE 422 is a prerequisite for ECE 429 lab.

### 5. Computer Systems Track

Course ID	Title	Credits
<a href="#">ECE 353</a>	Computer Organization and Architecture	3
<a href="#">ECE 451</a>	Advanced Computer Architecture	3
<a href="#">ECE 495</a>	Computer Engineering Design Lab	2

*Note: ECE 495 lab has ECE 394 prerequisite. Selecting this track requires 1 lab additional credit.*

\*Prerequisite for track lab

\*\*Co-requisite for track lab

### TECHNICAL ELCTIVES

In addition to the track courses, EE students take three ECE technical elective courses. The ECE Elective must be a **300 or 400 level ECE course** or an advisor approved upper level **engineering, science or mathematics** course. An excellent choice is an ECE course from a different COE track. Technical elective courses chosen from another program can count for the minor in that program. Elective courses cannot cover the same material as ECE courses taken by the student. For example, Math 333 is not allowed as an elective since the required course, ECE 321, covers similar topics. Note, however, that ECE 321 can replace Math 333 prerequisite for the math courses that require it but does not count itself for the math minor. ECE 368 is not an allowed elective in the EE program which has required courses covering its contents. Courses from the Engineering Technology Department are generally not approved as ECE electives.

**NOTE: Degree Works may not account properly for technical electives but it will not affect your path to graduation.**

## COE AND EE PROGRAM FIVE-YEAR PLAN OF STUDY

In addition to the standard 4 – year BS-COE and BS - EE curricula, ECE department offers 5 - year programs, which include Cooperative Education as an integral part of the curriculum integrating real world work experience and learning with the student's academic experience. It gives employers the opportunity to assist in the student's development and supplement their workforce with emerging talent, while enhancing the student's potential for employment at graduation.

A cooperative education program is offered to all ECE students with GPA  $\geq 2.7$  by the end of their second year of studies. It includes two assignments of 25 weeks each and must be completed using a two cycle fixed schedule.

### COE and EE 5 year Study Plan with COOP\*

SEMESTER	4-YEAR PLAN	A	B
1	FRESHMAN 1	FRESHMAN 1	FRESHMAN 1
2	FRESHMAN 2	FRESHMAN 2	FRESHMAN 2
3	SOPHOMORE 1	SOPHOMORE 1	SOPHOMORE 1
4	SOPHOMORE 2	SOPHOMORE 2	SOPHOMORE 2
YEAR 2 SUMMER		COOP 1	
5	JUNIOR 1	COOP 1	JUNIOR 1
6	JUNIOR 2	JUNIOR 1	COOP 1
YEAR 3 SUMMER		COOP 2	COOP 1
7	SENIOR 1	COOP 2	JUNIOR 2
8	SENIOR 2	JUNIOR 2	COOP 2
YEAR 4 SUMMER			COOP 2
9		SENIOR 1	SENIOR 1
10		SENIOR 2	SENIOR 2

\* ENGR 210 ( 1 credit) required before starting COOP

An ECE student desiring to participate in the program should choose a co-op cycle and meet with the ECE Undergraduate Student Advisor Mrs. Ryoko Mathes at mathes@njit.edu regarding the co-op schedule, program requirements and a choice of the qualified employer. The list of qualified employers and other important information can be obtained from the NJIT Career Development Services (CDS). After acceptance as a cooperative program employee by a university-approved employer, a student can formally enter the program. The student registers in ENGE 310 (COOP 1 or ENGR 410 (COOP 2). Each course is 12 credits not counted towards degree but provides full time student status. After finishing the program, a student receives the regular engineering degree (BS EE/CoE) and a certificate indicating completion of the cooperative education program with industry.

## VIII. ELECTRICAL AND COMPUTER ENGINEERING PREREQUISITES AND CO-REQUISITES

Course (credits)	Title	Prerequisites	Co-requisites
ECE 101 (0)	Intro.to Electrical and Computer Engineering	None	
ECE 231 (3)	Circuits and Systems I	PHYS 122, MATH 112 or MATH 133	
ECE 232 (3)	Circuits and Systems II	ECE 231	MATH 222
ECE 251 (3)	Digital Design	PHYS 122	
ECE 252 (3)	Microprocessor	ECE 251	
ECE 271 (3)	Electronics I	ECE 231 (with a C grade minimum)	ECE 232
ECE 291 (1)	Electrical Engineering Lab. I	ECE 231, HSS 101	ECE 232
ECE 310 (0)	Co-op Work Experience I	ADVISOR'S PERMISSION, SOPHOMORE YEAR	
ECE 321 (3)	Random Signal and Noise	ECE 232,	ECE 333
ECE 333 (3)	Signals and Systems	ECE 232, MATH 222	
ECE 341 (3)	Energy Conversion	ECE 231	
ECE 353 (3)	Computer Architecture and	ECE 252	
ECE 354 (2)	Digital Test	ECE 251, MATH 333	
ECE 361 (3)	Electromagnetic Fields I	ECE 231, MATH 213, MATH 222	
ECE 362 (3)	Electromagnetic Fields II	ECE 361	
ECE 368 (2)	Signal Transmission*	ECE 232, ECE 251	
ECE 372 (3)	Electronics II	ECE 232, ECE 271	
ECE 374 (3)	Electronic Devices I	ECE 271	
ECE 392 (2)	Electrical Engineering Lab. II	ECE 271, ECE 291	ECE 372
ECE 394 (1)	Digital System Lab.	ECE 251, ECE 271, ECE 291	
ECE 395 (2)	Microprocessor Lab.	ECE 252, ECE 291	
ECE 410 (3)	Co-op Work Experience II	CO-OP ADVISOR'S PERMISSION, ECE 310	
ECE 414 (1)	ECE Project I To be taken in the semester preceding the last semester before graduation	EE: ECE 321, ECE 341, ECE 372, ECE 392, ECE 395 CoE: ECE353, ECE 368, ECE 394, ECE 395	
ECE 416 (3)	ECE Project II	ECE 414	
ECE 417 (3)	Independent Study ECE Project II	INSTRUCTOR'S PERMISSION and ECE 414	
ECE 418 (3)	Independent Study	ADVISOR'S PERMISSION	
ECE 421 (3)	Digital Data Communications	ECE 232, MATH 333 OR ECE 321	
ECE 422 (3)	Computer Communication Networks	ECE 321 OR MATH 333	
ECE 423 (3)	Data Communication Network	ECE 421 OR ECE 481	
ECE 424 (3)	Optical Communication Networks	ECE 232 and either ECE 321 OR MATH 333	
ECE 425 (3)	Wireless Communication Systems	ECE 421 OR ECE 481	
ECE 429 (2)	Computer Communication Lab.	ECE 422	
ECE 431 (3)	Systems and Virtual Instrumentation	ECE 333	
ECE 432 (3)	Control Systems Elective	ECE 431	
ECE 435 (3)	Medical Imaging Instrumentation & Data Acquisition Systems	ECE 231, ECE 252, ECE 333	
ECE 436 (3)	Bio Control Systems	ECE 431	
ECE 439 (2)	Control Systems Lab.	ECE 431	ECE 432

<b>Course (credits)</b>	<b>Title</b>	<b>Prerequisites</b>	<b>Co-requisites</b>
ECE 441 (3)	Power Electronics	ECE 372	
ECE 442 (3)	Power Systems Elective	ECE 341	
ECE 443 (3)	Renewal Energy Systems	ECE 231, 271	
ECE 449 (2)	Power Systems Lab.	ECE 494	ECE 442
ECE 451 (3)	Advanced Computer Architecture I	ECE 353	
ECE 452 (3)	Advanced Computer Architecture II	ECE 451	
ECE 453 (3)	Introduction to Discrete Event	ECE 251 or CIS251, MATH 333 OR ECE 321	
ECE 456 (3)	Computer Systems Elective	ECE 252, ECE 395	
ECE 457 (3)	Digital Image Processing	ECE 333	
ECE 459 (2)	Computer System Design Lab.	ECE 451, ECE 495	ECE 452
ECE 461 (3)	Microwave and Integrated Optics	ECE 362	
ECE 462 (3)	RF/Fiber Optics Systems Elective	ECE 362	
ECE 463 (3)	Optoelectronics	ECE 374	
ECE 469 (2)	RF/Fiber Optics Systems Lab.		ECE 462
ECE 475 (3)	VLSI Circuits	ECE 372	
ECE 481 (3)	Communications Systems	ECE 321	
ECE 482 (3)	Communications Systems Elective	ECE 421	
ECE 489 (2)	Communications Systems Lab.	ECE 421	
ECE 494 (2)	Electrical Engineering Lab. III	ECE 341, ECE 374, ECE 392	ECE 341 or 374
ECE 495 (3)	Computer Engineering Design Lab.	ECE 353, ECE 394	
ECE 498 (3)	Special Topics in Electrical and Computer Engineering	Depends on the course topic	



## IX. ACADEMIC CHECKLISTS

### BS CoE Academic Checklist

Freshman 1st Semester	Semester	Grade	Freshman 2nd Semester	Semester	Grade
(3) Chem 125			(3) CS 115		
(2) FED 101 <sup>a</sup>			(0) ECE 101 <sup>b</sup>		
(3) HUM 101			(3) HUM 102		
(4) Math 111			(4) Math 112		
(3) Phys 111			(3) Phys 122		
(1) Phys 111A			(1) Phys 121A		
(0) Freshman Seminar <sup>b</sup>					
<b>16 credits</b>			<b>14 credits</b>		

Sophomore 1st Semester	Semester	Grade	Sophomore 2nd Semester	Semester	Grade
(3) CS 116			(3) ECE 232		
(3) ECE 231			(3) ECE 252		
(3) ECE 251			(3) ECE 271		
(3) GER 200 level <sup>c</sup>			(1) ECE 291		
(4) Math 222			(4) Math 213		
<b>16 credits</b>			<b>14 credits</b>		

Junior 1st Semester	Semester	Grade	Junior 2nd Semester	Semester	Grade
(3) ECE 368			(3) ECE 353		
(2) ECE 395			(1) ECE 394		
			(3) CS 332		
(3) CS 280			(3) Math 337/Math 340		
(3) Math 333			(3) MGMT/ IE 492/ Econ <sup>d</sup>		
(3) Math 326			(3) Phil 334		
<b>14 credits</b>			<b>16 credits</b>		

Senior 1st Semester	Semester	Grade	Senior 2nd Semester	Semester	Grade
(1) ECE 414			(3) ECE 416/417		
(3) ECE 495			(2) Track Lab <sup>e</sup>		
(3) Track 1			(3) Track 3 <sup>e</sup>		
(3) Track 2 <sup>e</sup>			(3) Senior Seminar		
(3) GER 300 level <sup>f</sup>			(3) Technical Elective <sup>g</sup>		
(3) Technical Elective					
<b>16 credits</b>			<b>14 credits</b>		

**Total 120 credits**

a. Maybe substituted for transfer students

b. Waived for transfer students

d. Select from MGMT 390, Econ 201, Econ 265, Econ 266, and IE 492

c. Must be a 200-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR

e. The order of track courses depends on prerequisites in the track

f. Must be a 300-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR

g. Humanities or History Seminar

**BS EE Academic Checklist**

<b>Freshman 1st Semester</b>	<b>Semester</b>	<b>Grade</b>	<b>Freshman 2nd Semester</b>	<b>Semester</b>	<b>Grade</b>
(3) Chem 125			(3) CS 115		
(2) FED 101 <sup>a</sup>			(0) ECE 101 <sup>b</sup>		
(3) HUM 101			(3) HUM 102		
(4) Math 111			(4) Math 112		
(3) Phys 111			(3) Phys 122		
(1) Phys 111A			(1) Phys 121A		
(0) Freshman Seminar <sup>b</sup>					

**16 credits**

**14 credits**

<b>Sophomore 1st Semester</b>	<b>Semester</b>	<b>Grade</b>	<b>Sophomore 2nd Semester</b>	<b>Semester</b>	<b>Grade</b>
(3) ECE 231			(3) ECE 232		
(3) ECE 251			(3) ECE 252		
(3) GER 200 level <sup>c</sup>			(3) ECE 271		
(4) Math 222			(1) ECE 291		
(3) Phys 234			(4) Math 213		

**16 credits**

**14 credits**

<b>Junior 1st Semester</b>	<b>Semester</b>	<b>Grade</b>	<b>Junior 2nd Semester</b>	<b>Semester</b>	<b>Grade</b>
(3) ECE 333			(3) ECE 321		
(3) ECE 361			(3) ECE 362		
(3) ECE 372			(3) ECE 374		
(2) ECE 395			(3) ECE 341		
(2) ECE 392			(3) Phil 334		
(3) MGMT/ IE 492/ Econ <sup>d</sup>					

**16 credits**

**15 credits**

<b>Senior 1st Semester</b>	<b>Semester</b>	<b>Grade</b>	<b>Senior 2nd Semester</b>	<b>Semester</b>	<b>Grade</b>
(2) ECE 494			(3) ECE 416/417		
(1) ECE 414			(2) Track Lab <sup>e</sup>		
(3) Track 1 <sup>e</sup>			(3) Technical Elective		
(3) Track 2 <sup>e</sup>			(3) Technical Elective		
(3) Technical Elective			(3) Senior Seminar <sup>g</sup>		
(3) GER 300 level <sup>f</sup>					

**15 credits**

**14 credits**

**Total 120 credits**

a. Maybe substituted for transfer students

b. Waived for transfer students

d. Select from MGMT 390, Econ 201, Econ 265, Econ 266, and IE 492

c. Must be a 200-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR

e. The order of track courses depends on prerequisites in the track

f. Must be a 300-level course with the prefix COM, ENG, HIST, HUM,LIT,PHIL, STS, or THTR

g. Humanities or History Seminar

**X. STUDENT STUDY PLAN**

PROGRAM: COE \_\_\_\_ EE \_\_\_\_

*Bring this form when you come to the ECE office to meet you adviser. Fill also the course checklist with grades obtained so far.*

**Current Semester Courses:**

**Any Summer courses?**

Course	Credits	Expected Grade

**Next Semester** \_\_\_\_\_

**Following Semester** \_\_\_\_\_

Course	Credits

Course	Credits

Other courses remaining to graduation: \_\_\_\_\_  
(for Seniors only)

Expected graduation (semester) \_\_\_\_\_ GPA \_\_\_\_\_

Student name \_\_\_\_\_ ID # \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_