Rensselaer
School of Engineering

Electrical, Computer, & Systems Engineering

Class of 2024
Advising Handbook

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Electrical Engineering

Electrical Engineering (EE) is a dynamic and broad field that applies physics and mathematics to the creative design, analysis, research, development, testing and monitoring of diverse systems and products in society today. From cell phones to smart cars, light emitting diodes to autonomous robots, power electronics to power systems, electrical engineering plays an essential role in advancing our multidisciplinary, technological society.

Key & Related Courses: Electric Circuits, Introduction to Electronics, Embedded Control, Computer Components and Operations, Signals and Systems, Engineering Probability, Microelectronics Technology, Fields & Waves I, and Electrical Energy Systems

Areas of Concentration: Microelectronics and Photonics; Electric Power and Energy; Communications and Network Science; Information and Decision Science; Computer Vision and Imaging; Control, Robotics, and Automation.

Employment and Career Opportunities: Electrical Engineering graduates with a bachelor's degree provide the backbone for a wide variety of technological fields. From designing sensors for the automotive industry to implementing circuits for defense companies, to creating imaging products in the medical field, electrical engineers enable scientific ideas in many areas of technology. According to Jobweb, a career development website for new college grads, electrical engineering is at the top of the engineering job demand curve at all degree levels, with a very clear lead over other engineering disciplines for M.S. and Ph.D. degrees. The U.S. Dept. of Labor also projects a 6% increase in employment through 2020. In addition, annual average job opportunities are highest for electrical and electronics engineers.

Typically, during the first year or two after a bachelor's degree, the young engineer would get to know the company's products, expectations, and procedures before selecting a technical niche. That niche may include, design, development, implementation, testing, and characterization of various technologies. On the job, hands on experience supplements theory learned in the classroom. For this reason, internships or co-ops before graduation increase chances of early success in this career path. Currently, our students are participating in co-ops with a variety of firms such as IBM, GE Energy, Cisco, Honda, Siemens, Intel, and Hasbro. For more information about co-ops or internships visit the Center for Career and Professional Development website at https://info.rpi.edu/career-development .

"A Bachelor of Science degree in engineering with a specialty in electrical engineering may also serve as a starting point for careers in many other fields, ranging from business to law, medicine, and politics, since the problem-solving skills acquired in an electrical engineering program provide an extraordinarily valuable asset. The same skills will equip you to assume leadership roles in your community and in professional circles outside the workplace" (*2001 IEEE, Inc.*). Management and electrical engineering is becoming a popular combination with a need for technical expertise in leadership. Decision making from a technical point of view is often sought and encouraged in electrical engineers whose aspirations are to lead. The finance industry has also become a primary employer of electrical engineers.

Undergraduate Research and Graduate School: Many electrical engineers eventually continue on to graduate school where they further develop their expertise with the goal of leading technology into new and exciting areas of application. Continuing education is needed for a career in research and development. In many cases, M.S. students pursue their degrees with financial assistance from their employers. EE students in doctoral programs can plan on full financial support which includes tuition and stipends, so such programs are essentially free. Participation in an undergraduate research project (URP) is an excellent way to learn about research and graduate studies.

Computer and Systems Engineering

Computer and Systems Engineering (CSE) is a dynamic field that creatively applies computers and mathematics to the design, analysis, research, development, testing and implementation of a wide range of systems and products. From secure wireless networks to medical imaging systems, autonomous mobile robots to face recognition security systems, aircraft control systems to mapping the world, distributed underwater pollution sensors to the next generation Internet, handheld games to drones, these systems are built by RPI computer engineers.

Key & Related Courses: Electric Circuits, Introduction to Electronics, Embedded Control, Computer Components and Operations, Signals and Systems, Engineering Probability, Computer Architecture, Networks, and Operating Systems, and Introduction to Algorithms.

Areas of Concentration: Machine Learning and Artificial Intelligence; Internet of Things; Automatic Control and Robotics; Communications and Information Processing; Computer Graphics & Applications; Computer Vision; Computer Hardware and VLSI Design; Computer Networks.

Employment and Career Opportunities: Computer and Systems Engineering graduates with a bachelor's degree provide the backbone for a wide variety of technological fields and enjoy broad freedoms in choosing the types of projects on which they want to work. In many cases, a computer engineer may decide to focus on building a tool or a product that meets a need they feel passionate about. For example, a computer engineer may develop a new algorithm and medical equipment to help loved ones or help to bring back the enjoyment of music to someone with profound hearing loss. According to Jobweb, a career development website for new college grads, computing and computer engineering are at the top of the engineering job demand curve at all degree levels, especially for M.S. and PhD degrees. Overall, career opportunities in computer engineering remain strong and are expected to grow by 9% by 2020.

Typically, during the first year or two after a bachelor's degree, the young engineer would get to know the company's products, expectations, and procedures before selecting a technical niche. That niche may include, design, development, implementation, testing, and characterization of various software and hardware technologies. On the job, hands on experience supplements theory learned in the classroom. Hence, internships or co-ops before graduation increase chances of early success in this career path. Currently, our students are participating in co-ops with a variety of companies such as IBM, GE Energy, Cisco, Intel, MIT/Lincoln Labs, and Google. For more information about co-ops or internships visit the Center for Career and Professional Development website at https://info.rpi.edu/career-development.

Management and computer engineering is becoming a popular combination with a need for technical expertise in leadership. Decision making from a technical point of view is often sought and encouraged in computer engineers whose aspirations are to lead. The finance industry has also become a key employer of CSE grads. Computer and Systems Engineers who go on to graduate school are looking to go beyond seeking solutions to immediate needs, and look to project and steer future technologies through discovery and innovation.

Undergraduate Research and Graduate School: In addition to the B.S. degree, the CSE program also offers M.S. and PhD degrees. The M.S. degree can be a terminal degree or used as preparation for PhD. Continuing education is needed for a career in research and development. In many cases, M.S. students pursue their degrees with financial assistance from their employers. CSE students in doctoral programs can plan on full financial support which includes tuition and stipends so such programs are essentially free. Participation in an undergraduate research project (URP) is an excellent way to learn about research and graduate studies.

Contact List for ECSE

Department Head:	John Wen (wenj@rpi.edu)	JEC 6052
Administrative Coordinator:	Gina Moore (gina@ecse.rpi.edu)	JEC 6049
Undergraduate Student Coordinator:	Rama Hamarneh (hamarr@rpi.edu)	JEC 6007
Administrative Assistant:	Priscilla Magilligan (pris@ecse.rpi.edu)	JEC 6009
Transfer Student Advisor:	Paul Schoch (schocp@rpi.edu)	J Bldg 4203
Graduate Student Coordinator:	Kelley Kritz (kritzk@rpi.edu)	JEC 6003
Class of 2024 Advisors		
	Derya Malak (malakd@rpi.edu)	JEC 6038
	Tianyi Chen (chent18@rpi.edu)	JEC 6036
	Michael Shur (shurm@rpi.edu)	CII 6023
	Ali Tajer (tajera@rpi.edu)	JEC 6040
Transfer Students	Paul Schoch (schocp@rpi.edu)	J Bldg 4203
Department Website:	https://ecse.rpi.edu	

Advising Responsibilities

Student's responsibilities

- To know their advisor's office hours, email address, and advising schedule.
- To make, and keep, appointments and prepare for registration advising by reviewing the templates, Class-Hour Schedule on SIS, and your Degree Works worksheet. Take with you a copy of your worksheet to the meeting.
- To formulate questions regarding curriculum, course selections, career options, etc. Take with you a list of questions.
- To be aware of their academic and personal needs and to seek assistance when needed. It's OK to ask your advisor for directions.
- To understand that the role of their advisor is to provide information and to advise you, but not to make decisions for you. Our goal is for every student to become an active participant in their education, not only while at Rensselaer but for their life time.

Advisor

- To be accessible to students throughout the year at posted office hours. If an advisor will be away from campus for an extended period of time, he or she should post the names and office locations of alternate advisors outside their offices, so that students will have other advising resources.
- To set aside designated times for registration advising and individual discussions.
- To be knowledgeable about current curriculum requirements, academic policies and procedures, referrals and resources on campus, and career opportunities in the major field.
- To guide students through academic programs that will complement their personal, educational, and professional interests.

The HUB

http://eng.rpi.edu/students/hub

The School of Engineering Advising Hub is the primary source of academic advising for all engineering students during their first two semesters at RPI. The Hub is located in the Ansell lounge on the third floor of the Jonsson Engineering Center (JEC) and is staffed by experienced advisors who will offer academic assistance for all engineering majors. Hub advisors assist students in establishing a foundation for academic success through student responsibility and planning. The Hub is a resource for all advising purposes including:

- Semester course planning
- Clear Student Advising Meeting (SAM) holds
- Major/minor declaration or changes
- Form approvals
- Registrar Protocol
- The Arch planning
- HASS and other course requirements

During their third semester students will transition to a faculty advisor specific to the student's major. The faculty advisor will then contribute to the student's academic success by offering valuable perspective on internships, research and job prospects in addition to graduation requirements.

The SoE First Year Advising Hub offers advising appointments every week day (no weekends or holidays) from 9am-noon and 1 to 4 pm. Until further notice, meetings will be held via WebEx video chat or by phone.

One-on-one meetings may be booked here: https://go.oncehub.com/SoEHub

ECSE Advising Tasks,
by Year
The Purposes for Meeting with Your Advisor

Time	Visions	Your Roadmap	People to Meet
Entering RPI		Adjust ECSE template/plan for AP credit	Members of the Student Orientation team
First Year	Choosing or changing a major	Exploring your plan and template	Getting to know your Hub Advisor
Second Year	Learning and deciding about Arch, URP's, Internships, Co-op's, and Study Abroad	Adjust plan for overloads, dropped or failed courses, Co-op, and Study Abroad.	Getting to know your faculty advisor and at least one faculty in major
Third Year	Planning 4th year, deciding about work and grad school	Adjust plan for co-op, overloads, dropped or failed courses.	Getting to know other faculty in major
Fourth Year	Creating a vision for career or grad school or both	Preparing applications for job and/or grad school	Asking faculty for recommendations

Academic Information and Regulations

The Institute requires a degree candidate to earn the last 30 credits in courses completed on this campus or through a program formally recognized by the Institute. Transfer courses are limited to two courses or eight credits counting toward the student's last 30 credits and require the approval of the director of the Advising and Learning Assistance Center.

Baccalaureate candidates must have passed all of the prescribed academic work and have satisfied the fee requirements. Candidates must also be in good academic and disciplinary standing. Undergraduate students on probation at the time of completion of course work may be required to meet certain stipulations for removal from probation. However, such requirements may be waived for those students whose cumulative GPAs satisfy the baccalaureate degree requirements. In general, a term's work with grades of not less than C will be required in programs arranged by the Committee on Academic Standing. The director of the Advising and Learning Assistance Center will state requirements to the students in writing.

Degree candidates must be registered during the semester in which they intend to graduate and must file a degree application with the registrar by the dates specified in the academic calendar. Students who previously applied for graduation but did not complete all their requirements on time must submit a new application specifying the new date of graduation.

Double Degrees

A student may become a candidate for a second baccalaureate degree when he or she has completed: (1) the equivalent of at least two terms (30 credit hours) of additional work beyond the requirements of a single degree, and (2) the courses in the department in which the student is registered and such other courses as are required for the second degree. From the ECSE department's perspective, students considering a Double Degree may want to consider a Co-terminal or traditional Master's degree, instead. The ability to obtain a graduate level degree by taking 30 credits beyond the Bachelor's degree should be seriously considered rather than taking 30 additional credits and conferring solely a Bachelor's degree.

Dual Majors

ECSE students sometimes pursue a dual major, usually in a field closely allied with ECSE. For example, CSE majors can add Computer Science as a CSE/CS dual major and EE majors can add Applied Physics to become EE/AppPhy dual majors. Other combinations of majors are also possible – consult the ECSE departmental website for more information. Before deciding on a dual major, meet with your advisor to learn more about it. Dual majors rarely have room in their schedules for Free Electives.

Minors

ECSE majors frequently complete a minor in a field of interest, other than engineering, by using Free Electives and/or the HASS Electives. A minor is a set of courses coherently based on subject, methodology, or other factors. Many departments offer one or more such minors; several of the minors are interdisciplinary. A student wishing to complete a minor should consult with the adviser for that minor before completing the second course in it (departmental secretaries have this information). Minors vary in their requirements from 15 to 21 credit hours. Courses for the minor may not be taken on a Pass/No Credit basis. No course which is required for a major can be used for a minor requirement. No course which is required for one minor can be used for another minor requirement.

HASS and Professional Development – Policies for Engineering Students

As part of their B.S. degree program, all Rensselaer undergraduates take a selection of HASS courses referred to as the HASS Core.
The HASS Core consists of:

- 24 credits distributed to afford students a breadth of perspective across the various disciplines (See footnotes 1 below).
  - A maximum of 12 credits at the 1000-level can be counted toward the HASS core.
  - A maximum of 8 AP or transfer credits can be counted toward the HASS core. (See footnotes 2, 3, and 5 below)
  - A maximum of 8 credits can be designated as P/NC.
- An approved 12-credit area of focus known as an Integrative Pathway, which is designed to add depth and coherence to the HASS Core, enhance students' majors, and optimize students' degree curriculum. Students can choose from a list of either disciplinary or interdisciplinary Pathways.
  - Courses counting toward the Pathway may not be designated as P/NC.
- One four-credit 4000-level course (See footnote 4 below)
- One HASS Communication Intensive course
  - Students should take their HASS Communication Intensive course during their first three semesters.
  - P/NC designation may not be used to satisfy this requirement.
- One HASS Inquiry course
  - Students should take an Inquiry course during their first year. These courses cultivate a deep appreciation of the ethical and moral imperatives that are the foundation of integrative knowledge that spans the humanities, arts, and social sciences. Students learn the habits of mind that illuminate contemporary global issues from a diversity of perspectives using an interdisciplinary, integrative, and collaborative approach. For a listing of HASS Inquiry courses go to: *https://info.rpi.edu/hass-inquiry*
- Breadth
  - Students should take at least one course from the humanities and one course from the social sciences.
  - Completion of a HASS Inquiry course (typically an IHSS course), in addition to the previously stated HASS Core requirements, satisfies the requirement.

Footnotes:

1. **Engineering majors must complete 20 credits** of HASS courses in addition to the credits earned associated with the three-course sequence of professional development (PD) courses entitled Professional Development-Group Dynamics (either ENGR 1010 or as part of ENGR 2050), Professional Development – Tech Issues and Solutions, and Professional Development-Leadership (ENGR 4010)**.**
2. **Transfer credit limit may be waived for transfer students if courses were taken at the previous institution, however, the limit for AP credits still applies.**
3. Students who transfer into Rensselaer can satisfy this through a three- or four-credit course at their prior institution or a four-credit course at Rensselaer.
4. Students enrolled at Rensselaer who wish to take a HASS course for credit at another accredited institution must obtain prior approval for the course from the HASS Associate Dean for Academic Affairs. Applicants must furnish a catalog description of the proposed course and syllabus, and a completed copy of Rensselaer's Transfer Credit Approval Form to the HASS Student Services Hub on the 4th floor of the Sage building or at **HASSInfo@rpi.edu.**

Humanities	Code	Social Sciences	Code
Arts	ARTS	Cognitive Science	COGS
Communication	COMM	Economics	ECON
Games and Simulation Arts & Sciences	GSAS	Games and Simulation Arts & Sciences	GSAS
Interdisciplinary Studies	IHSS	Interdisciplinary Studies	IHSS
Languages	LANG	Psychology	PSYC
Literature	LITR	Science and Technology Studies, Social Science	STSS
Philosophy	PHIL		
Science and Technology Studies, Humanities	STSH		
Writing	WRIT		

THE 2-CREDITS OF Professional Development-Tech Issues and Solutions SHALL BE SATISFIED AS FOLLOWS:
The named course STSS -4100 Professional Development-Tech Issues and Solutions, will satisfy this requirement.

A 4-credit alternate course at either a 2000 or 4000 level can be substituted for the 2-credit STSS -4100 Professional Development Tech Issues and Solutions course. A list of these alternate courses is available on the registrar website.

A course used to satisfy this requirement may not be taken on a Pass/No Credit basis.

In general, the alternate course will be split as follows:
– two credits allocated to satisfy Professional Development Tech Issues and Solutions
– the remaining credits allocated to free elective (or "Not Applied" to the degree if free elective credits have been completed)

With restrictions, the credits of an alternate that are not allocated to Professional Development Tech Issues and Solutions may be used to fulfill the 20-credits of HASS. These credits:
- **cannot** count toward the 4000 requirement,
- **cannot** count toward the Integrative Pathway requirement,

However,
- they can count toward the overall 20 credits of HASS,
- they can count toward the H and SS credit minimums,
- they can count toward the HASS "CI" requirement.

If a student transfers in a course that is in name and course number equivalent to a Professional Development Tech Issues and Solutions alternate, it counts as that named HASS course, but it does not transfer in its status as a Professional Development Tech Issues and Solutions alternate. The student would still be responsible for taking Professional Development Tech Issues and Solutions or an approved alternate at Rensselaer.

In the rare case that a student transfers in a course with Professional Development content nearly identical to that of STSS -4100 Professional Development Tech Issues and Solutions, they may furnish a syllabus of the transfer course and a completed copy of Rensselaer's Transfer Credit Approval form to the Associate Dean of Engineering to apply for approval. Note that some courses in the Study Abroad program automatically satisfy the P Professional Development Tech Issues and Solutions requirement, as indicated in the transfer equivalency guide.

The School of Humanities, Arts, and Social Sciences (HASS) Associate Dean of Academic Affairs is: **Brett Fajen** (fajenb@rpi.edu, Sage 4302)

The Assistant Registrar is: **Kim Herkert** (herkek@rpi.edu, Academy Hall 2713)

The Associate Dean of Engineering is: **Kurt Anderson** (anderk5@rpi.edu, JEC 3018)

The Arch

https://info.rpi.edu/the-arch

The Arch program is a unique approach for student development and growth that prepares students to meet the multifaceted challenges of the 21st century. The Arch will augment academic and experiential programs, and provide an even more robust-and transformative-educational experience for undergraduate students.

All undergraduate students will be required to participate in the Arch program in summer between sophomore and junior years. There is an exception process for athletes, ROTC, and a few other select cases.

The Arch is a restructuring of the Rensselaer academic calendar. It creates additional opportunities for experiential learning that complement curricular and co-curricular offerings at Rensselaer.

Rising juniors will attend a full summer semester, between their sophomore and junior years. Juniors then spend a semester away during either the fall or spring semester of their junior year, still only taking 8 semesters to graduate.

This will allow students to take advantage of the numerous experiential learning activities available off campus, including international travel, internships, co-ops, research opportunities, and engagement in community service projects.

Academic Semester Experience

YEAR	FALL	SPRING	SUMMER
Freshman	Required	Required	Optional
Sophomore	Required	Required	Required
Junior	*	*	Optional
Senior	Required	Required	Graduate

* option for an "away" semester

Electrical Engineering Curriculum Checklist

	First Year							
CSCI-1100	Computer Science I	4			ENGR-1200 OR ENGR-1400	Eng. Graphics & CAD [1] OR Eng. Communications [1]	1	
ECSE-1010	Intro. to ECSE [6]	4			ENGR-2350	Embedded Control	4	
MATH-1010	Calculus I	4			MATH-1020	Calculus II	4	
IHSS-####	Hum., Arts or Soc. Sci. Elective	4			PHYS-1100	Physics I	4	
						Science Elective	4	
	Second Year							
ECSE-2610	Computer Comp. & Operations	4			ECSE-2010	Electric Circuits [8]	4	
MATH-2400	Intro. to Differential Equations	4			ECSE-2500	Engineering Probability [8]	3	
PHYS-1200	Physics II	4			MATH-2010	Multivariable Calc & Matrix Algebra	4	
	Hum., Arts or Soc. Sci. Elective	4				Hum., Arts or Soc. Sci. Elective	4	
ARCH SEMESTER			**Third Year**		**Fall or Spring**			
ECSE-2110	Electrical Energy Systems	3			ECSE-2050	Intro. to Electronics [8]	4	
ENGR-2050	Introduction to Eng. Design	4			ECSE-2100	Fields and Waves I [8]	4	
STSS-4100	Prof Devt - Tech Issues & Solutions [1,3]	2			ECSE-2410	Signals and Systems [8]	3	
	Hum., Arts or Soc. Sci. Elective	4			ECSE-2900	ECSE Enrichment Seminar	1	
	Free Elective [2]	3-4				Math/Science Elective [7]	4	
	Fourth Year							
ECSE-2210	Microelectronics Tech. [8]	3				Free Elective [1,2]	3-4	
ECSE-4900	Multidisc. Capstone Design [1]	3				Free Elective [1,2]	3-4	
ENGR-4010	Prof Development - Leadership [1]	1				Free Elective (if needed) [2]	3-4	
	Lab Elective [1,4]	3				Restricted Elective [1,4,5]	3	
	Restricted Elective [1,4,5]	3				Hum., Arts or Soc. Sci. Elective	4	
	Technical Elective [1,4,5]	3-4						

1 May be taken either term.
2 The free electives must total to at least 12 credits.
3 This course will be fulfilled from a list published at the start of each semester. For a list of courses that satisfy the Professional Development – Technical Issues & Solution requirement refer to the link "Professional Development Courses" on the Registrar's "Academic Planning" web page. It should be completed before the capstone design course.
4 It is recommended that students use electives to form a concentration. See the ECSE Web page for concentration listings.
5 No more than one Independent Study course may be used to when satisfying the combined Technical and Restricted Elective requirements.
6 May be replaced with ENGR-1100 Introduction to Engineering Analysis
7 Students who wish to take ENGR-1600 Materials Science as their Math/Science Elective must take CHEM-1100.
8 Core courses that are the prerequisites for 4000-level courses, offered in Fall and Spring terms annually. Students should take the courses as soon as their prerequisites are met .**128 credits minimum**

RESTRICTED ELECTIVE
Any 3 or 4 credit hour course with the designation ECSE-4xxx or ECSE-6xxx.

TECHNICAL ELECTIVE
Any 3- or 4-credit-hour course in engineering, mathematics, or science at the 4000 level or higher.

LAB ELECTIVES
ECSE 4090 Mechatronics
ECSE-4130 Electric Power Eng. Lab
ECSE-4220 VLSI Design
ECSE-4760 Real-Time Cntrl & Comm.
ECSE-4770 Cptr H'ware Design
ECSE-4790 Microprocessor Systems
ENGR-4710 Adv. Manufacturing Lab I

SCIENCE ELECTIVE
CHEM-1100 Chemistry I
BIOL-1010/1015 Introduction to Biology + Lab
BIOL-2120 Cell and Molecular Bio.

MATH/SCIENCE ELECTIVE
A 4-credit-hour course (or a 3-credit-hour course with a 1-credit-hour laboratory) in Science (ASTR, BIOL, CHEM, ERTH, PHYS) or Mathematics (MATH, MATP). An independent Study course cannot be used to satisfy this requirement.

Computer and Systems Engineering Curriculum Checklist

	First Year						
CSCI-1100	Computer Science I	4		CSCI-1200	Data Structures	4	
ECSE-1010	Intro. to ECSE[7]	4		ECSE-2610	Cptr. Comp. & Operations	4	
ENGR-1200 OR ENGR-1400	Eng. Graphics & CAD[1] OR Eng. Communications[1]	1		MATH-1020	Calculus II	4	
MATH-1010	Calculus I	4		PHYS-1100	Physics I	4	
IHSS-####	Hum., Arts or Soc. Sci. Elective	4					
	Second Year						
CSCI-2200	Foundations of Comp. Science	4		CSCI-2300	Intro to Algorithms	4	
ENGR-2350	Embedded Control	4		ECSE-2010	Electric Circuits [8]	4	
MATH-2400	Intro. to Differential Equations	4			Science Elective	4	
PHYS-1200	Physics II	4			Hum., Arts or Soc. Sci. Elective	4	
	Arch Semester		**Third Year**		**Fall or Spring**		
ECSE-2660	Cptr Arch, Nets, & Op Sys	4		ECSE-2050	Intro. to Electronics [8]	4	
ENGR-2050	Intro. to Engineering Design	4		ECSE-2410	Signals & Systems [8]	3	
MATH-2010	Multivar Calc & Matrix Algebra	4		ECSE-2500	Engineering Probability [8]	3	
	Hum., Arts or Soc. Sci. Elective	4		ECSE-2900	Enrichment Seminar	1	
				STSS-4100	Prof Devt- Tech Issues & Solutions [1,3,4]	2	
					Hum., Arts or Soc. Sci. Elective	4	
	Fourth Year						
ENGR-4100	Prof Development - Leadership [1]	1		ECSE-4900	Multidisc. Capstone Design [1]	3	
	Computer Eng Elective[1,4]	3-4			Free Elective[2]	3-4	
	Restricted Elective[1,5,6]	3-4			Free Elective[2]	3-4	
	Restricted Elective[1,5,6]	3-4			Free Elective (if needed) [2]	3-4	
	Technical Elective[1,5,6]	3-4			Hum., Arts or Soc. Sci. Elective	4	
	Free Elective[2]	3-4					

1 May be taken either term.
2 The free electives must total at least 12 credits.
3 This course will be fulfilled from a list published at the start of each semester. For a list of courses that satisfy the Professional Development – Technical Issues & Solution requirement refer to the link "Professional Development Courses" on the Registrar's "Academic Planning" web page. It should be completed before the capstone design course.
4 May be taken in the third year.
5 It is recommended that students use electives to form a concentration. See the ECSE Web page for concentration listings.
6 No more than one Independent Study course may be used when satisfying the combined Technical and Restricted Elective requirements.
7 May be replaced with ENGR 1100 Introduction to Engineering Analysis.
8 Core courses that are the prerequisites for 4000-level courses, offered in Fall and Spring terms annually. Students should take the courses as soon as their prerequisites are met

RESTRICTED ELECTIVE
Any 3 or 4 credit hour course with the designation ECSE-4xxx or ECSE-6xxx.

TECHNICAL ELECTIVE
Any 3- or 4-credit-hour course in engineering, mathematics, or science at the 4000 level or higher.

COMPUTER ENGINEERING ELECTIVES
ECSE-4670 Computer Comm. Networks
ECSE-4770 Computer Hardware Design
CSCI-4380 Database Systems
ECSE-4750 Computer Graphics
ECSE-4790 Microprocessor Systems
CSCI-4440 Software Design & Doc

SCIENCE ELECTIVE
BIOL-1010/1015 Introduction to Biology +Lab
BIOL-2120 Intro to Cell and Molecular Biology
CHEM-1100 Chemistry I

Registration

When: Registration for the Spring semester generally occurs in early November. Registration for the Summer semester occurs the preceding Spring, usually in early March. Registration for the Fall semester occurs the preceding Spring, usually in early April. Exact dates are included in the Academic Calendar.

How: Use the Student Information System (SIS) to register for your courses.

Where: There are no assigned rooms for registration. You can register for your classes using any computer with Internet access.

Time tickets

As a student at Rensselaer, you are issued a "time ticket," which assigns to you a specific window of time during which you may register for the following semester. Your time ticket will be sent to your RPI email address 3 - 4 weeks before registration. In addition to making the registration assignment, this e-mail message notifies you of any existing '**holds**' which may prevent you from registering if you do not resolve them.

School of Engineering	
Freshman	0 - 30
Sophomore	31 - 60
Junior	61 - 95
Senior	96 - 128

Your registration time is assigned based on the number of credit hours you have **earned** as a student. The table to the right shows the range of earned credit hours associated with each class. Please note that classes which are still in progress or courses which have been graded as "incomplete" do *not* count towards earned credits.

Degree Works

Degree Works is a planning and advising tool, available only to undergraduate students, that allows you to track the progress you are making toward your Bachelor's Degree, develop plans of study, and estimate future GPAs. You can access Degree Works by logging in from the main menu of the Student Information System (SIS).

Registration FAQs

Q: What do I do if a class I want to register for is full?
A: Meet with the instructor of the course and request to be admitted to the course. If the class is a core/required course every effort will be made to accommodate the request. If this is an elective course you may be asked to take it in a subsequent semester. Note that for Core Engineering courses (ENGR prefix) there will be an electronic waitlist available at the time of registration which is capped at ten students per section.

Q: How do I add/drop a course?

A: You may use the Student Information System (SIS) to add or drop courses. Generally speaking, from the beginning of the semester, you will have **two weeks to add** courses and **eight weeks to drop** them. Please refer to the Academic Calendar for specific add and drop deadline dates. Meet with your advisor about the changes you want to make.

If you wish to petition to add or drop classes after the published deadline, you may do so using a Late Add/Drop Form. Please note that after getting the instructors signature (if required), the form must also be approved by the Advising and Learning Assistance Center.

Undergraduate Research Program (URP)

http://info.rpi.edu/undergraduate-research

Rensselaer has a very strong Undergraduate Research Program. This is a program that allows students to work in a professor's laboratory for credit or cash. On average, we have 30% of the class taking advantage of these opportunities during their Rensselaer career.

The program offers many advantages and the opportunity to:

- work on a project whose impact could be worldwide and can lead to patents and/or grants
- apply knowledge gained in the classroom to actual problems and research situations
- network with faculty beyond the classroom, opening the door to other opportunities
- gain critical leadership, team-building and critical thinking skills
- publish as an undergraduate
- receive course credit in a more dynamic way or supplement your income

How to find a project

Most URP projects are found through direct contact with the faculty member supervising the research. Most undergraduates find projects from faculty members from whom they have taken classes. A good place to start your search is to determine a faculty member with whom you may want to work on a project. Check the Research Areas page below to determine their field of research. If it sounds interesting, approach them about a possible URP project.

What if I have my own idea for a project?

You may work with a faculty member on an existing research project or on a project based on your own ideas. If you want to pursue your own project, find a faculty advisor who may be interested in your topic since you will be required to have a project advisor.

For credit or funding?

You can earn from one to four credit hours in a semester for your participation in the URP. The number of credit hours you earn is determined between you and your faculty sponsor. If you choose this option you and your faculty sponsor need to:

- Determine how many credit hours you will earn
- Decide exactly what is expected of you, such as your time commitment, the type of work to be submitted, etc.
- Agree on how your grade will be determined

Students may also participate in the URP for pay. URP funding typically comes from two sources:

- Your sponsoring faculty member or department, and/or
- The Office of Undergraduate Education

The faculty sponsor or department is responsible for the financial support of your research. In addition, the Office of Undergraduate Education provides a matching fund.

Most projects expect eight to twelve hours of work per week.

The URP application must be completed electronically and submitted to the departmental Administrative Assistant who:

- Checks the URP Application for completeness
- Fills out your payroll paperwork
- Forwards your application and payroll paperwork to the Office of Undergraduate Education for approval
- Will set up a schedule for reporting your hours. You must submit your hours to the Department Coordinator within the same payroll period that you worked. Please keep in mind that if you work and submit hours that exceed your funding allotment, you will not be paid for those hours. Pay checks are issued every other Friday

With whom can I work?

You can certainly work with any professor who agrees to have you as a part of the research team. However, you may have a more exciting experience if you are working in an area of interest to you. The following page has the research areas of our department listed as well as faculty names for each area. Note that some faculty are listed in more than one area.

You should talk to each of your course professors about their research and about you becoming a part of their team. Do not be shy. Ask about a position. If you do not ask, the answer will certainly be 'No'.

Research Areas

AI and Machine Learning

Tianyi Chen, Joe Chow, Qiang Ji, Agung Julius, Derya Malak, Santiago Paternain, Richard Radke, Ali Tajer, Luigi Vanfretti, Meng Wang, John Wen

Communications and Computer Networking

Hussein Abouzeid, Tianyi Chen, Mahmood Hameed, Mona Hella, Koushik Kar, Derya Malak, Ali Tajer, Luigi Vanfretti, Kyle Wilt

Computer Architecture and Hardware Systems

Hussein Abouzeid, Mahmood Hameed, James Lu, Tong Zhang

Control, Robotics, and Automation

Hussein Abouzeid, Joe Chow, Qiang Ji, Agung Julius, Junichi Kanai, Koushik Kar, Robert Karlicek, Russ Kraft, Santiago Paternain, Richard Radke, Paul Schoch, Jian Sun, Luigi Vanfretti, John Wen,

Electronics and Photonics:

Ishwara Bhat, Jeff Braunstein, Paul Chow, Partha Dutta, Mahmood Hameed, Mona Hella, Rena Huang, Robert Karlicek, James Lu, Shayla Sawyer, Paul Schoch, Fred Schubert, Michael Shur, Jian Sun

Image Sciences and Computer Vision

Randolph Franklin, Richard Radke, Qiang Ji, Meng Wang, Brisen Yazici

Power Electronics and Power Systems:

Hussein Abouzeid, Joe Chow, Jeff Braunstein, Paul Chow, Partha Dutta, Agung Julius, Koushik Kar, James Lu, Manoj Shah, Michael Shur, Jian Sun, Ali Tajer, Luigi Vanfretti, Meng Wang

International Study

International Study, or Semester Abroad as it is sometimes called, is coordinated by the Office of International Programs (OIP), located in 4103 Walker Lab. For general information about International Study visit the OIP web site:

http://info.rpi.edu/international-programs

ECSE students who choose to participate in International Study should do so during the Junior year (5th or 6th semester). This means that the decision to study abroad should be made during the 4th semester of study so that a plan for the entire junior year can be made with the guidance of the student's advisor. (For students with a substantial number of AP credits this may be the 3rd chronological semester.) Consultation Week in March is a good time to talk with your advisor about planning for International Study.

Students may also participate in a year-long fellowship program known as the Congress Bundestag Youth Exchange (CBYX) which offers the opportunity for intensive German language instruction, a semester of coursework at a German University, and a five-month internship placement in Germany. Participation in this program may delay graduation by a semester but the internship and language instruction will more than compensate for the delay.

Graduate School

The ECSE Department currently offers the MS, MEng, and PhD degrees in Electrical Engineering and in Computer and Systems Engineering. Students who wish to continue their studies beyond the B.S. degree should have a very good academic record and begin planning the application process in the 5th semester.

For more information about our graduate school, see the graduate school sections of the Institute catalog, as well as the ECSE Department web site. Also ask your advisor about grad school opportunities.

Students frequently think they cannot possibly afford graduate school. But the road to a PhD is essentially toll free. Most students are granted tuition waivers, in addition to receiving an assistantship stipend for living expenses. Students can graduate with a PhD without having added to their debt load.

If you are a very good student, consider applying to graduate school. It is easier to go directly from undergraduate studies to grad school than to wait for several years before enrolling.

Co-Terminal B.S.-M.S. Degrees: An Honors Program

ECSE students who have achieved exceptionally high grades in the first three years are invited to apply to the Co-Terminal Honors Program. The Co-Terminal Program allows Rensselaer undergraduates to complete their Bachelor's degree within eight semesters (ten for B. Arch students), while maintaining their Rensselaer financial aid for up to an additional two semesters of graduate study. Students can apply to most Master's Programs that Rensselaer offers, following the same curriculum as those who entered through the traditional route. Some applicants choose to pursue a Master's degree in the same academic discipline, while others take a more interdisciplinary approach, applying to a graduate program outside of their undergraduate department. Students must apply before the end of the first semester of their senior year, but it is strongly recommended that students begin talking with the undergraduate advisor by their sophomore or junior year.

For more information, pay a visit to the Graduate Admission administrator and pick up a Co-terminal information packet.

Useful Links

Advising and Learning Assistance Center http://info.rpi.edu/advising-learning-assistance/
When you need academic help or you're willing to help others

Career Development Center: https://info.rpi.edu/career-development
Looking for an internship, co-op, or career? This is the place.

Course Catalog: http://catalog.rpi.edu/
It's all here! Course descriptions, rules, and faculty names & interests.

ECSE Department: https://ecse.rpi.edu/
Department News & Information. Keep up to date with ECSE.

Grand Challenges – National Academy of Engineering:
http://www.engineeringchallenges.org/cms/8996.aspx
Exciting list of multidisciplinary challenges – just waiting for you.

Institute News & Links: http://rpinfo.rpi.edu/
Great home page with handy links. RPI calendar and news.

International Programs: http://info.rpi.edu/international-programs
Study abroad in Singapore or Denmark or Wales or ...?

IEEE – The RPI Student Branch: https://www.ecse.rpi.edu/~ieee/
Connect with students, researchers, and industry professionals in EE

Eta Kappa Nu (HKN) – https://www.ecse.rpi.edu/hkn/index.html
The international honor society for electrical engineers.

Ready...Set... Calculus! : http://calculus.math.rpi.edu/rsc/
Challenging set of problems that test your pre-calculus skills, for students at all levels.

Registrar Forms: http://srfs.rpi.edu/update.do?catcenterkey=29
Forms for all occasions: Changing majors, transferring credits, etc

Student Information System: http://sis.rpi.edu/
Jumping off page for registration & records, including Degree Works!

Frequently Asked ECSE Questions

Q: Do I have to repeat a required course in my major if I get a D in it?
A: No. A grade of D or D+ in any undergraduate course is considered passing.

Q: Can I take one of my Restricted or Technical Electives on a P/NC basis?
A: No. The P/NC option is only for Free Electives and up to two non-depth, non-Communication Intensive HASS courses.

Q: Can I undo a P grade?
A: Maybe. But you need to notify the Registrar's Office in writing by Friday of the 13th week of the semester in which you elected to use P/NC. However, once the P grade is on your transcript it is generally considered to be a permanent grade.

Q: I am a dual major and have two advisors. Do I need to meet with both of them before I can register for classes?
A: Yes. You will need to be cleared or 'SAM-ed' by each of your academic advisors before you can register.

Q: But my roommate is a dual major, too, and she only has one advisor. Why do I need two?
A: When the two majors, such as EE and CSE, are in the same department a single advisor can reasonably be expected to know both curricula. But with disparate majors, ECON and EE for example, it is best to have an advisor from each field of study.

Q: What if I am on co-op or study abroad when registration starts? How can I possibly meet with my advisor?
A: Electronic meetings are permitted under these circumstances. Send your advisor an email to alert him/her about your situation well before registration begins.

Q: I don't know who my advisor is. How can I find out?
A: You may check who your current adviser is by logging into SIS. Under the student menu, under Curriculum Information, click on "View my Adviser and Curriculum Information." Select the term you are looking for. Your advisor's name will be listed in the row titled Primary Adviser

Q: My Degree Works is messed up. I've heard that I won't be able to graduate. What do I do?
A: First, be assured that your graduation status is determined by at least two human beings. Degree Works is a tool to help plan and monitor academic progress. It does not decide who can graduate. Second, print a copy of your current report and, using a pencil/pen, tidy up the report and show the edited version to your advisor. If your advisor agrees with your redacting, he/she can email the Registrar's Office and have the changes made.

Q: I just began my senior year. How can I tell if I will graduate on time?
A: Meet with your advisor. He/she will help you assess your progress and plan for your last semester.

Q: Do I really have to take CompSci I (CSCI-1100)? I read the syllabus and I think I know it all already.
A: Some students do skip CompSci I and take the following course, Data Structures (CSCI-1200). However, you will have to replace the credits for CompSci I. For CSE majors and CSE/CS dual

majors the replacement course must be another CSCI course. For EE majors, the replacement can be any technical course (Science or Engineering).

Q: Can I use VLSI Design both as my Lab Elective and as a Restricted Elective?
A: No. One course can satisfy only one requirement.

Q: I want to take a course at a college near my home during the summer. How do I get it to transfer?
A: First, go to the RPI Transfer Course Guide
http://sis.rpi.edu/rss/yhwwkwags.P_Web_Artic_Guide. Then follow the given directions.

Q: I took Calculus I at another university but it is only 3 credits and RPI's Calc I is 4 credits. Do I have to make up one credit of calculus?
A: No. But you will have to complete the proper number of total math credits. This may mean choosing a 4-credit course to satisfy a 3-credit requirement later on. For transferred 3-credit HASS courses you will need to complete the credit requirements of the HASS Core.

Q: How many courses can I transfer into Rensselaer?
A: If you entered Rensselaer as a first year student, you may transfer up to 32 credits. AP credits are considered as transfer credits. Therefore, if you have 5 AP courses (20 credits) you may transfer an additional 12 credits to Rensselaer through summer study. You are further restricted to a maximum 8 transferred and AP credits of HASS.

Q: But I want to study abroad and I have 6 AP courses already. Does that mean I can only take 8 credits abroad?
A: No. Courses taken at affiliated institutions are considered as courses taken at Rensselaer. For a list of affiliated institutions go to the Office of International Programs
https://info.rpi.edu/international-programs