RENSSELAER POLYTECHNIC INSTITUTE
School of Engineering

UNDECIDED

ENGINEERING

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Biomedical Engineering

Biomedical engineering is a discipline that advances knowledge in engineering, biology and medicine, and improves human health through activities that integrate the engineering sciences with the biomedical sciences and clinical practice. In other words, biomedical engineering is a multidisciplinary field combining engineering, basic sciences and medicine.

Biomedical engineering produces a better understanding of

- How the body works.
- How the body becomes diseased.
- Ways to prevent/protect the body from disease.
- Novel mechanisms to reverse the disease process.
- Novel ways to repair diseased tissue.
- New devices to replace diseased tissue.

Biomedical Engineers develop devices and procedures that solve medical and health-related problems by combining their knowledge of biology and medicine with engineering principles and practices. Many do research, along with medical scientists, to develop and evaluate systems and products such as artificial organs, prostheses (artificial devices that replace missing body parts), instrumentation, medical information systems, and health management and care delivery systems. Biomedical engineers also may design devices used in various medical procedures, imaging systems such as magnetic resonance imaging (MRI), and devices for automating insulin injections or controlling body functions. Some specialties within biomedical engineering are biomaterials, biomechanics, medical imaging, rehabilitation engineering, and orthopedic engineering.

Biomedical Engineers are expected to have employment growth of 27% over the next decade, much faster than the average for all occupations. The aging of the population and a growing focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries.

The median salary for biomedical engineers, according to the US Department of Labor (http://www.bls.gov/ooh/architecture-and-engineering/home.htm), was $86,960 as of May 2012.

Contact List for Biomedical Engineering

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Graduate Program Director:	Guohao Dai (daig@rpi.edu)	CBIS 3123

Program Templates

a. Traditional BME Baccalaureate Program

First Year

Fall		Credit hours	Spring		Credit hours
ENGR 1100	Intro to Engineering Anal	4	ENGR 1300	Engineering Processes	1
CHEM 1100	Chemistry I	4	MATH 1020	Calculus II	4
MATH 1010	Calculus I	4	PHYS 1100	Physics I	4
	HASS Elective[1]	4	BIOL 2120	Intro to Cell & Mol Biology	4
ENGR 1200	Eng Graphics & CAD[6]	1		HASS Elective[1]	4

Second Year

Fall		Credit hours	Spring		Credit hours
CSCI 1190	Begin. Prog. for Engrs.	1	ENGR 2600	Mod. & Analysis of Uncertainty	3
PHYS 1200	Physics II	4	BMED 2100	Biomaterials Science and Eng	4
MATH 2400	Intro to Differential Eq	4	BMED 2540	Biomechanics	4
ENGR 2050	Intro to Eng Design	4	BMED 2300	Bioimaging and Bioinstrument	4
MATH 2010	Multi. Calc and Mat Alg.	4			

Third Year

Fall		Credit hours	Spring		Credit hours
BMED 4200	Modeling of Biomed Sys	4	BMED 4500	Advanced Systems Physiology	4
	Concentration I	4		Free Elective [4]	3
	HASS Elective[1]	4		Concentration II	4
	Free Elective [4]	3		HASS Elective[1]	4
				Professional Development II[2]	2

Fourth Year

Fall		Credit hours	Spring		Credit hours
BMED 4010	Bioeng Lab[3]	4	BMED 4600	BME Design[5]	3
BMED 4960	BME Prod. Dev & Com	3		Free Elective [4]	3
	Concentration III	3		Concentration V	3
	Concentration IV	3		HASS Elective[1]	4
	Free Elective [4]	3	ENGR 4010	Professional Development III	1

The minimum number of credit hours for the degree is 128

[1] Placement of humanities and social science electives can be varied with free electives. The courses counted as free electives must show a minimum of twelve (12) credit hours.

[2] Professional Development II will be fulfilled from a published list at the start of each semester and can be taken either semester. Professional Development III can be taken either semester of the senior year. Professional Development I is part of ENGR 2050.

[3] BMED 4010 may be taken in either Spring Year 3 or Fall Year 4.

[4] The minimum total credit hours of free electives is twelve (12), with no restrictions on the included number of 3 and 4 credit hour courses.

[5] Capstone writing-intensive course.

[6] ENGR 1400 may be taken as alternative to ENGR 1200. This course may be taken either semester.

Core BME Courses

BMED 2100	Biomaterials Science and Engineering	(4CR) (S2)
BMED 2300	Bioimaging and Bioinstrumentation	(4CR) (S2)
BMED 2540	Biomechanics	(4CR) (S2)
BMED 4010	BME Lab	(4CR) (S3 or F4)
BMED 4200	Modeling of Biomedical Systems	(4CR) (F3)
BMED 4260	BME Product Devel. & Commercialization	(3CR) (F4)
BMED 4500	Advanced Systems Physiology	(4CR) (S3)
BMED 4600	BME Design	(3CR) (S4)

Concentrations Courses

Each concentration includes three required courses and two to three elective courses, such that the total number of credit hours for a concentration is equal to or greater than 17. One of the elective courses needs to be concentration-specific while the other one has to be any 4000- or 6000-level BMED course. It is not possible to take the same course at the 4000- and 6000-level.

1) Biomaterials Concentration (3 required courses):

ENGR 1600	Materials Science for Engineers	(4 CR) (F, S)
ENGR 2250	Thermal and Fluids Engineering I	(4 CR) (F, S)
MTLE 2100	Structure of Engineering Materials	(4 CR) (S)

Plus an additional 5 or more credits hours from concentration electives.

2) Biomechanics Concentration (3 required courses):

BMED 4540	Biomechanics II	(3 CR) (F)
BMED 4580/6480	Biomedical Fluid Mechanics	(3 CR) (F)
ENGR 2250	Thermal and Fluids Engineering I	(4 CR) (F, S)

Plus an additional 7 or more credits hours from concentration electives.

3) Bioimaging/Instrumentation Concentration (3 required courses):

ECSE 2010	Electric Circuits	(4 CR) (F, S)
ECSE 2410	Signals and Systems	(4 CR) (F, S)
ENGR 2350	Embedded Control	(3 CR) (F, S)

Plus an additional 6 or more credits hours from concentration electives.

Premed BME Baccalaureate Program

First Year

Fall		Credit hours	Spring			Credit hours
ENGR	1100	Intro to Engineering Anal 4	ENGR	1300	Engineering Processes	1
CHEM	1100	Chemistry I 4	MATH	1020	Calculus II	4
MATH	1010	Calculus I 4	PHYS	1100	Physics I	4
BIOL	1010	Intro to Biology 4	BIOL	2120	Intro to Cell & Mol Biology	4
ENGR	1200	Eng Graphics & CAD[4] 1	CHEM	1200	Chemistry II	4

Second Year

Fall		Credit hours	Spring			Credit hours
CSCI	1190	Begin. Prog. for Engrs. 1	ENGR	2600	Mod. & Analysis of Uncertainty	3
PHYS	1200	Physics II 4	BMED	2100	Biomaterials Science and Eng	4
MATH	2400	Intro to Differential Eq 4	BMED	2540	Biomechanics	4
ENGR	2050	Intro to Eng Design 4	BMED	2300	Bioimaging and Bioinstrument	4
MATH	2010	Multi. Calc and Mat Alg. 4				

Third Year

Fall		Credit hours	Spring			Credit hours
BMED	4200	Modeling of Biomed Sys 4	BMED	4500	Advanced Systems Physiology	4
		Concentration I 4			Concentration II	4
PSYC	1200	General Psychology 4	STSS	1520	Sociology	4
CHEM	2250	Organic Chem I 3	CHEM	2260	Organic Chem II	3
					Prof. Development II[1]	2
			BCBP	4760	Molecular Biochemistry[5]	4

Fourth Year

Fall		Credit hours	Spring			Credit hours
BMED	4010	Bioeng Lab[2] 4	BMED	4600	BME Design[3]	3
BMED	4260	BME Prod. Dev & Com 3			Concentration V	3
		Concentration III 4			HASS Elective	4
		Concentration IV 3			HASS Elective	4
		HASS Elective 4	ENGR	4010	Professional Development III	1

The minimum number of credit hours for the degree is 130

[1] Professional Development II will be fulfilled from a published list at the start of each semester and can be taken either semester. Professional Development III can be taken either semester of the senior year. Professional Development I is part of ENGR 2050.
[2] BMED 4010 may be taken in either Spring Year 3 or Fall Year 4.
[3] Capstone writing-intensive course.
[4] ENGR 1400 may be taken as alternative to ENGR 1200. This course may be taken either semester.
[5] BCBP 4760 should be taken in the summer after the junior year and right before the MCAT.

Chemical & Biological Engineering

The major educational objective in the Howard P. Isermann Department of Chemical and Biological Engineering is to prepare students to enter their engineering practice dealing with chemical as well as physical processes to meet the challenges for the future. The curriculum, which builds on chemistry, biology, mathematics, basic sciences, and engineering science, culminates in professional applications in which theory is tempered by engineering art and economic principles. Through this curriculum, graduates are prepared equally well for professional practice or for advanced study.
Opportunities for creative and satisfying practice in chemical and biological engineering can be found in conception, design, control, or management of processes involving chemical and/or biochemical transformations. These processes range from the more conventional conversion of crude oil into petrochemicals and plastics, to the development of novel processes for the production of biopharmaceuticals, to the creation of lab on chip devices using nanomaterials. The chemical conversion of resources into new, more useful forms has been the traditional concern of chemical engineers. In recent years there has developed a critical concern with the depletion of resources, leading to increased efforts to conserve, recycle, and find alternatives. Concurrently with high-technology advances in biochemical and semiconductor processing, these developments pose challenges that fall on the chemical engineering profession.

An undergraduate degree that works! Our chemical engineering graduates are well prepared for advanced graduate study and for professional practice. The companies employing Rensselaer chemical engineering graduates during the past decade are:

Amgen (biopharmaceuticals),	BioGen-IDG (biopharmaceuticals),
Centocor (biopharmaceuticals),	ExxonMobil (oil and chemicals),
General Electric (plastics),	Human Genome Sciences (biopharmaceuticals),
IBM (semiconductors),	Intel (semiconductors),
Genzyme (pharmaceuticals)	Millipore (biopharmaceuticals),
Merck (pharmaceuticals),	Procter & Gamble (consumer products)
Regeneron (pharmaceuticals)	Sanofi (pharmaceuticals)

Diverse career choices exist not only in the chemical industry, but in virtually all processing industries, including agricultural, biotechnology, biomedical, chemical, food, nuclear, semiconductor processing, and environmental operations. By emphasizing basic principles, the program prepares its graduates for positions spanning the spectrum of activities from research and development, to process and project engineering, to production, or to technical marketing. Chemical engineering also provides an excellent background for entering medical school and law school.

Contact List for ChBE

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	B. Wayne Bequette (bequette@rpi.edu)	RI 129
	Joel Plawsky (Plawsky@rpi.edu)	RI 134
URP and Work Study Coordinator:	Sharon Sorell (sorels@rpi.edu)	RI 104
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Chemical and Biological Engineering
Curriculum Checklist Class of 2019

NAME: _____ E-mail: _____

Fall 2015					**Spring 2016**			
CHME-1010	Intro to Chemical Engineering [1]	1			BIOL-1010 & 1015	Intro to Biology & Laboratory	4	
CHEM-1110	Chemistry I with Advanced Lab	4			ENGR-1100	Intro to Engineering Analysis[2]	4	
MATH-1010	Calculus I	4			ENGR-1400 or 1200	Engineering Communications or Engineering Graphics/CAD	1	
PHYS-1100	Physics I [2]	4			MATH-1020	Calculus II	4	
	Hum., Arts or Soc. Sci. Elective	4				Hum., Arts or Soc. Sci. Elective	4	
Fall 2016					**Spring 2017**			
CHME-2010	Material, Energy, and Entropy Balances	4			**CHME-2020**	Energy, Entropy, and Equilibrium	4	
CHEM-2250	Organic Chemistry I	3			CHEM-2260	Organic Chemistry II	3	
CSCI-1190	Beginning C Programming for Engineers	1			ENGR-2600	Modeling and Analysis of Uncertainty	3	
MATH-2400	Intro to Differential Equations	4				Hum., Arts or Soc. Sci. Elective	4	
PHYS-1200	Physics II	4				Free Elective	4	
Fall 2017					**Spring 2018**			
CHME-4010	Transport Phenomena I	4			**CHME-4020**	Transport Phenomena II	4	
CHME-4030	Chemical Process Dynamics and Control	4			CHEM-4420	Microscopic Physical Chemistry	3	
CHEM-4530	Modern Techniques in Chemistry	4				Hum., Arts or Soc. Sci. Elective	4	
	Hum., Arts or Soc. Sci. Elective	4				Free Elective	4	
						Professional Development II[3]	2	
Fall 2018					**Spring 2019**			
CHME-4040	Chemical Engineering Separations	3			**CHME-4050**	Chemical Process Design	4	
CHME-4150	Chemical Engineering Lab I	3			**CHME-4160 or 4170**	Chemical Engineering Lab II or Bioprocessing Lab	3	
CHME-4500	Chemical Reactor Design	3			ENGR-4010	Professional Development III	1	
CHME	Chemical Engineering Elective	3			ENGR	Engineering Elective	4	
	Free Elective	4			CHEM	Chemistry Elective	3	

Electives	*The **chemistry elective** must be in advanced chemistry or advanced chemistry-related subject. This elective cannot be CHEM-4410 or CHEM-2440.* *The **chemical engineering elective** must be in chemical engineering or in an approved, advanced chemical engineering subject.* *The **engineering elective** cannot be a chemical engineering course; it must be at least 2000-level and contain 4 credits of engineering topics. This elective cannot be ENVE 2110 or ENGR 2250.* *The curriculum clearance officer, who maintains a list of appropriate courses, must approve selection of these three constrained electives. The three free electives are completely unconstrained.*	***Footnotes***	***[1]**May be replaced by "ENGR-1300 Engineering Processes"* ***[2]**May be taken in either order.* ***[3]**Choice of STSS-4840 or PSYC-4170.*

Objectives of the CBE Undergraduate Curriculum

Alumni of the Howard P. Isermann Department of Chemical and Biological Engineering will within five years of graduation be:

- Gainfully employed in a professional capacity and promoting the responsible application of technology to enhance the common good.
- Preparing for leadership roles in society by furthering their proficiency in engineering practice or by preparing for professional practice in related disciplines via further graduate or professional study.

Civil Engineering

Civil engineers are involved in providing the physical infrastructure that supports civilization, including shelter, transportation, water supply and waste disposal and/or recycling. Constructed facilities, their planning, analysis, design, construction, maintenance and operation, are the forte of civil engineering. Civil engineers use computational tools, engineered and natural materials, and human creativity to design, construct, and maintain the physical infrastructure, which supports the quality of life of the Earth's population.

For the individual who has a strong interest in innovative planning, design and construction, civil engineering offers far ranging opportunities for applying knowledge and creativity in making the world a better place to live.

Students in civil engineering study the common two year core curriculum in engineering, followed by core civil engineering courses in structural engineering, geotechnical engineering, transportation engineering, and environmental engineering. These courses are supplemented by elective concentrations in any one of the sub-areas listed above.

Contact List for CEE

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Administrative Staff:	Deb Roden rodend3@rpi.edu	JEC 4049
Graduate Admissions	Kim Boyce boycek@rpi.edu	JEC 4049

Civil Engineering Curriculum

FALL			FIRST YEAR	SPRING	
CHEM 1100	Chemistry I	4	CIVL 1100	Intro to Civil & Env. Eng.[3]	1
MATH 1010	Calculus I	4	MATH 1020	Calculus II	4
ENGR 1100	Intro. to Eng. Analysis	4	PHYS 1100	Physics I	4
CIVL 1200	Eng. Graphics for Civil Eng[1]	1		Basic Science Elective[2]	4
	Hum., Arts or Soc. Sci. El.	4		Hum., Arts or Soc. Sci. El.	4
			SECOND YEAR		
MATH 2400	Intro. to Differential Eqns.	4	ENGR 2090	Engineering Dynamics	4
PHYS 1200	Physics II	4	ENGR 2250	Thermal & Fluids Eng. I	4
ENGR 2050	Intro. to Eng. Design	4	ENGR 2530	Strength of Materials	4
	Hum., Arts or Soc. Sci. El.	4	CSCI 1190	Beginning C Prog. for Eng. [4]	1
				Hum., Arts or Soc. Sci El	4
			THIRD YEAR		
CIVL 2030	Intro to Transp. Eng.	4		CE Design Elective[5]	3
CIVL 2630	Intro to Geotech. Eng.	4	ENVE 4310	Applied Hydrology & Hydr.	4
CIVL 2670	Intro to Structural Eng.	4	ENGR 4760	Eng. Economics	3
ENVE 2110	Intro to Env. Eng.	4		Professional Develop. II[6]	2
				Free Elective	4
			FOURTH YEAR		
ENGR 2600	Model. & Analysis of Uncert	3	CIVL 4920	CE Capstone Design	3
	CE Design Elective[5]	3	ENGR 4010	Professional Devel. III[8]	1
	Free Elective	4		CE Tech. Elective[5]	3
	Math and Science Elective[7]	4		Free Elective	4
				Hum., Arts or Soc. Sci. El.	4

[1] CIVL 1200 may be replaced with ENGR 1200.
[2] Any 4-credit course in the School of Science with a prefix of ASTR, BIOL or ERTH.
[3] CIVL 1100 may be replaced with ENGR 1300.
[4] CSCI 1190 may be replaced with CSCI 1100.
[5] Text below lists the allowable courses.
[6] This course will be fulfilled from a list published at the start of each semester.
[7] Any 4-credit course in the School of Science with a prefix of ASTR, BCBP, BIOL, CHEM, ERTH, MATH or PHYS.
[8] Can be taken either semester of the senior year.

128 credits minimum

CE DESIGN ELECTIVES AND CONCENTRATIONS

Structural Engineering
CIVL 4070 Steel Design (Fall)
CIVL 4080 Concrete Design (Spring)

Geotechnical Engineering
CIVL 4010 Foundation Engineering (Fall)
CIVL 4140 Geoenvironmental Eng. (Fall)
CIVL 4150 Experimental Soil Mechanics (Spring)

Environmental Engineering
ENVE 4200 Solid and Hazardous Waste Eng. (Spring)
ENVE 4330 Introduction to Air Quality (Fall)
ENVE 4340 Physicochemical Processes in Env. Eng. (Spring)
ENVE 4350 Biological Processes in Env. Eng. (Fall)

Transportation Engineering
CIVL 4620 Mass Transit Systems (Spring)
CIVL 4640 Transp. Facility Design & Planning (Spring)
CIVL 4660 Traffic Engineering (Fall)
CIVL 4670 Highway Engineering (Spring)

CE TECHNICAL ELECTIVES

CIVL 2040 Professional Practice
CIVL 4240 Intro. to Finite Elements
CIVL 4270 Construction Management
CIVL 4440 Advanced Structural Analysis
Additional Courses

Additional Courses: With adviser approval, courses from related disciplines can also be taken. These include architecture, environmental engineering, earth and environmental sciences, mechanical engineering, chemical engineering, industrial engineering, and operations research. A representative list of such courses is as follows:

ENVE 4110 - Aqueous Geochemistry
ENVE 4310 - Applied Hydrology and Hydraulics
ERTH 2330 - Earth Materials
MATH 4800 - Numerical Computing Credit Hours: 4
ENVE 4200 - Solid and Hazardous Waste Engineering
ERTH 2120 - Structural Geology
ERTH 4710 - Groundwater Hydrology

Helpful Hints – CE Curriculum

Following the CE curriculum presented above will allow students to graduate with a BSCE Degree in 4 years. However, in the case of Co-op, Semester Abroad, Transfer, deviation from the template and graduating in four years is still possible. Listed below are helpful hints on which deviations from the standard template are possible and which should be avoided.

1. ENGR 2530 Strength of Materials is a prerequisite for both CIVL 2630, Intro. to Geotech and CIVL 2670, Intro. to Structures. Hence, ENGR 2530 should be taken no later than Spring/Sophomore year. If that is not possible, take ENGR 2530 in the summer before Fall/Junior year.

2. The four CEE Intro. courses – CIVL 2030, CIVL 2630, CIVL 2670 and ENVE 2110 – are only offered Fall semester. It is best to take these Fall semester of the Junior year. If taking all four Fall/Junior year is not possible, then take the Intro. courses in your specific area of interest and defer others (i.e., if you are interested in structural engineering, take CIVL 2670 Fall/Junior year and defer CIVL 2030 or ENVE 2110 to Fall/Senior year).

3. CIVL 4920, CE Capstone Design is only offered Spring semester. If you will be taking 4 ½ years to complete your degree, arrange your courses so that the Capstone pre-requisite (two design course sequence) is completed prior to Spring/Senior year.

4. Except for ENGR 2530, Strength of Materials, students can take most required ENGR courses, specifically ENGR 2090, 2250, 2600, 4760 whenever the prerequisite/corequisite is completed.

5. If you are planning to be away from campus for either the Co-op or Study Abroad program, the best time to pursue these programs is the Spring semester, Junior year.

Environmental Engineering

The Environmental Engineering program brings together dedicated people to study and work on the pressing environmental issues of our time. We prepare students for environmental careers in consulting engineering practice, private industry, national and international research laboratories, government agencies, and academia, as well as in many cross-disciplinary areas of engineering, science, and public policy. The department maintains close ties with people and organizations in all these career venues through an active research agenda and a vibrant alumni community. Student needs and career objectives are met through a well-crafted, rigorous, and interdisciplinary curriculum that stresses hands-on learning, grounding in fundamentals, and practical experience.

Our long-standing tradition of education in environmental problem solving at Rensselaer spans from the pioneering work on water analysis by William Pitt Mason in the later 1800's to the visionary environmental engineering ideas of Edward J. Kilcawley who introduced environmental engineering as an option in the mid-1940's and as a degree program in the mid-1950's. In addition to the Department of Civil and Environmental Engineering, there are faculty members at Rensselaer with teaching and research interests in environmental problem solving in the departments of Biology, Chemical Engineering, Chemistry, Earth and Environmental Sciences, and Applied Math.

Contact List for the CEE Department

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Administrative Staff:	Deb Roden rodend3@rpi.edu	JEC 4049
Graduate Admissions	Kim Boyce boycek@rpi.edu	JEC 4049

Environmental Engineering Curriculum

	FALL				SPRING	
			FIRST	YEAR		
	Hum., Arts or Soc. Sci. El.	4			Hum., Arts or Soc. Sci. El.	4
CHEM 1100	Chemistry I	4		CIVL 1100	Intro to Civil & Env. Eng.[3]	1
MATH 1010	Calculus I	4		MATH 1020	Calculus II	4
ENGR 1100	Intro. to Eng. Analysis	4		PHYS 1100	Physics I	4
CIVL 1200	Eng. Graphics for Civil Eng[1]	1			Science Elective[2]	4
			SECOND	YEAR		
MATH 2400	Intro. to Differential Eqns.	4		ENGR 2050	Intro to Eng. Design	4
PHYS 1200	Physics II	4		ENGR 2600	Modeling & Anal. of Uncert.	3
ENGR 2250	Thermal and Fluids Eng[4]	4		CSCI 1190	Beginning C Prog. for Eng.[5]	1
ENVE 2110	Intro to Env. Eng.	4			Science Elective[2]	4
					Hum., Arts or Soc. Sci El	4
			THIRD	YEAR		
	Free Elective I	4			Free Elective II	4
	Hum., Arts or Soc. Sci. El.	4		ENVE 4310	Applied Hydrology & Hydr.	4
	Professional Development[6]	2		ENVE 4320	Env. Chemodynamics	4
CHEM 2250	Organic Chemisty I	3		ENVE 4340	Physio. Processes in ENVE	4
ENVE 4330	Intro to Air Quality	4				
			FOURTH	YEAR		
	Multidisc. Eng. Elective[7]	3			Technical Elective II[8]	3
	Technical Elective[8]	3			Free Elective III	4
	Hum., Arts or Soc. Sci. El.	4		ENVE 4180	Env. Process Design	3
ENGR 4010	Prof. Development III	1		ERTH ####	Earth Science Elective [9]	4
ENVE 4350	Biol. Processes in ENVE	4				

1. CIVL 1200 may be replaced with ENGR 1200 or ENGR 1400.
2. Choose CHEM 1200 and either BIOL 1010 or another biology course chosen in consultation with adviser. Order does not matter.
3. CIVL 1100 may be replaced with ENGR 1300.
4. ENGR 2250 may be replaced by CHME 4010.
5. CSCI 1190 may be replaced with CSCI 1100 or CSCI 1010.
6. This course will be fulfilled from a list published at the start of each semester.
7. Multidisciplinary engineering elective: must be an engineering course, chosen in consultation with the adviser (see examples below).
8. Technical electives must be selected in consultation with the program adviser (e.g., ENVE 4110, ENVE 4200, ENVE 4240, and ENVE 496X). With adviser approval, courses from other disciplines may also be taken. These include Civil Engineering, Chemical Engineering, and Earth and Environmental Sciences (see examples below).
9. Earth Science Elective: must be an Earth Science course 2000 level or above. Choose from ERTH 2140, ERTH 2330, ERTH 4070, or ERTH 4500.

128 credits minimum

EE Multidisciplinary Engineering Electives

Core Engineering
ENGR 1600 Materials Science for Engineers (Spring & Fall)
ENGR 4760 Engineering Economics (Spring)
ENGR 2530 Strength of Materials (Spring & Fall)

Transportation Engineering
CIVL 2030 Intro. to Transportation Engineering (Fall)

Geotechnical Engineering
CIVL 2630 Intro. to Geotechnical Engineering (Fall)

Industrial and Systems Engineering
ISYE 4260 Human Performance Modeling and Support (Fall)

Mechanical, Aerospace and Nuclear Engineering
MANE 4010 Thermal and Fluids Engineering II (Spring and Fall)

EE TECHNICAL ELECTIVES

Environmental Engineering
ENVE 4200 Solid and Hazardous Waste Eng. (Spring)
ENVE 4240 Bench Scale Design (Fall)
ENVE 4110 Aqueous Geochemistry (Fall)
ENVE 496X Special Topics announced each semester

Civil Engineering
CIVL 2630 Intro. to Geotechnical Engineering (Fall)
CIVL 4150 Exp. Soil Mechanics (Spring)
CIVL 4140 Geoenvironmental Eng. (Fall)

Chemical Engineering
CHME 4030 Chemical Process Dynamics & Control (Fall)
CHME 4400 Chromatographic Separation Processes (Spring)

Earth and Environmental Sciences
ERTH 4540 Organic Geochemistry (Spring even-numbered years)
ERTH 4190 Env. Measurements (Fall odd-numbered years)
ERTH 4710 Groundwater Hydrology (Fall)

Helpful Hints – ENVE Curriculum

Following the ENVE curriculum template will allow students to graduate with a BS ENVE degree in 4 years. However, in the case of Co-op, Semester Abroad, and Transfer, deviation from the template and graduating in four years is still possible. Listed below are helpful hints for such cases.

1) ENGR 2250 Thermal and Fluids Engineering I is a prerequisite for several courses in the Junior year. It is also a corequisite for Intro to Environmental Engineering. Therefore, it should be taken in the Fall of Sophomore year.

2) There are two science electives in the Environmental Engineering curriculum. Students must choose Chemistry II (CHEM 1200) and a biology course; order does not matter. Courses that fulfill the biology requirement include BIOL 1010 - Introduction to Biology and BIOL 2120 - Introduction to Cell and Molecular Biology. Neither course has a prerequisite.

3) Students interested in environmental issues related to soils (landfill design, soil remediation) are encouraged to take CIVL 2630 Intro. to Geotechnical Engineering. It is only offered in the Fall semester. Note that ENGR 2530 Strength of Materials is a prerequisite for CIVL 2630.

4) ENVE 4180, Environmental Process Design, is a capstone design course offered only in the Spring semester. You should arrange your courses to complete ENVE design courses prior to taking ENVE 4180. These include ENVE 4330 Introduction to Air Quality, ENVE 4310 Applied Hydrology and Hydraulics, ENVE 4340 Physicochemical Processes, and ENVE 4350 Biological Processes.

5) If you are planning to be away from campus for either the Co-op or Study Abroad program, preferred semester for ENVE students is Fall- Junior year. CHEM 2250 Organic Chemistry I should be taken in your sophomore year or in the summer between the Sophomore and Junior year. The RPI equivalents of various courses offered by our overseas partners are listed on SIS. If you wish to take the course for which an equivalency has not been established, use the Transfer Credit form and supply the syllabus to the Department on campus that teaches the Rensselaer version.

Electrical Engineering

Electrical Engineering is a dynamic and broad field that applies physics and mathematics to the creative design, research, development, testing and maintenance of diverse products prevalent in society today. From cell phones to smart cars, Light Emitting Diodes to autonomous robots, nano to macro, electrical engineering continues to grow as an integral part of our multidisciplinary, technological society.

Computer & Systems Engineering

Computer and Systems Engineering is a dynamic field that creatively applies computers and mathematics to the design, development, testing, and implementation of a wide range of products. From secure wireless networks to medical imaging systems, from autonomous mobile robots to face recognition security systems, from aircraft control systems to mapping the world, from distributed underwater pollution sensors to the next generation Internet, from handheld games to MP3 players, these systems are built by RPI computer engineers.

Contact List for ECSE

Department Head:	Michael Wozny (woznym@rpi.edu)	JEC 6052
Administrative Assistant:	Priscilla Magilligan (pris@ecse.rpi.edu)	JEC 6012
Administrative Coordinator:	Gina Moore (gina@ecse.rpi.edu)	JEC 6049
Advising Coordinator:	David Nichols (nichols@ecse.rpi.edu	JEC 6046
Transfer Student Advisor	David Nichols (nichols@ecse.rpi.edu	JEC 6046
Graduate Admissions:	Ronnie Rowe (rower@rpi.edu)	JEC 6012
Class of 2019 Advisors	Alhussein Abouzeid (Abouzeid@ecse.rpi.edu)	JEC 6038
	Rena Huang (huangz3@rpi.edu)	CII 6207
	John McDonald (mcdonald@ecse.rpi.edu)	CII 6123
	Michael Shur (shurm@rpi.edu)	CII 6015
	Ali Tajer (tajer@ecse.rpi.edu)	JEC 6006
	Ken Vastola (Vastola@ecse.rpi.edu)	JEC 6024

Electrical Engineering Curriculum Checklist

Class of 2019

Name: _____ E-mail: _____

CSCI-1100	Computer Science I	4		ENGR-1200 OR ENGR-1400	Eng. Graphics & CAD[1] OR Eng. Communications[1]	1	
MATH-1010	Calculus I	4			Science Elective[5]	4	
ENGR-1100	Intro. to Eng. Analysis	4		MATH-1020	Calculus II	4	
	Hum., Arts or Soc. Sci. El.	4		PHYS-1100	Physics I	4	
					Hum., Arts or Soc. Sci. El.	4	
MATH-2400	Intro. to Differential Eqns.	4		ENGR-2350	Embedded Control	4	
PHYS-1200	Physics II	4		ECSE-2010	Electric Circuits	4	
	Multidisciplinary Elective[1]	4		ECSE-2610	Cptr. Comp. & Operations	4	
	Hum., Arts or Soc. Sci. El.	4		MATH-2010	Multivar Calc & Matrix Alg	4	
ENGR-2050	Intro. to Eng. Design	4		ECSE-2900	ECSE Enrichment Seminar	1	
ECSE-2050	Intro. to Electronics	4		ECSE-2100	Fields & Waves I	4	
ECSE-2410	Signals & Systems	3		ECSE-2210	Microelectronics Tech.	3	
ECSE-2500	Engineering Probability	3		ECSE-2110	Electrical Energy Systems	3	
	Professional Devel. II[1,3]	2			Free Elective[2]	3-4	
ENGR-4010	Professional Devel. III[1]	1			Restricted Elective[1,4,6]	3	
	Design Elective[1]	3			Restricted Elective[1,4,6]	3	
	Lab Elective[1,4]	3-4			Free Elective[1,2]	3-4	
	Technical Elective[1,4,6]	3-4			Free Elective (if needed)[2]	3-4	
	Free Elective[1,2]	3-4			Hum., Arts or Soc. Sci. El.	4	
	Hum., Arts or Soc. Sci. El.	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.
4 It is recommended that students use electives to form a concentration. See the ECSE Web page for concentration listings.
5 Students who wish to take ENGR 1600 as their Multidisciplinary Elective must take CHEM 1100.
6 No more than one Independent Study course may be used when satisfying the combined Technical and Restricted Elective requirements.

129 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.

MULTIDISCIPLINARY ELECTIVES
ENGR-1600 Materials Science for Eng.
ENGR-2090 Engineering Dynamics
ENGR-2250 Thermal & Fluids Eng. I
ENGR-2530 Strength of Materials

LAB ELECTIVES
ENGR-4710 Adv. Manufacturing Lab I
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

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

DESIGN ELECTIVES
MANE-4220 Inventor's Studio (F, S)
ECSE-4900 ECSE Design (F, S)

Computer and Systems Engineering Curriculum Checklist

Class of 2019

Name: _____ E-mail: _____

CSCI-1100	Computer Science I	4			CSCI-1200	Data Structures	4	
ENGR-1100	Intro. to Eng Analysis	4			MATH-1020	Calculus II	4	
ENGR-1200 OR ENGR-1400	Eng. Graphics & CAD[1] OR Eng. Communications[1]	1				Science Elective	4	
MATH-1010	Calculus I	4				Hum., Arts or Soc. Sci. El.	4	
	Hum., Arts or Soc. Sci. El.	4						
CSCI-2200	Foundations of Comp. Sci.	4			CSCI-2300	Intro to Algorithms	4	
ECSE-2610	Cptr. Comp. & Operations	4			ECSE-2660	Cptr Arch, Nets, & Op Sys	4	
ENGR-2350	Embedded Control	4			MATH-2400	Intro. to Differential Eqns	4	
PHYS-1100	Physics I	4			PHYS-1200	Physics II	4	
ECSE-2010	Electric Circuits	4			ECSE-2050	Intro. to Electronics	4	
ECSE-2900	Enrichment Seminar	1			ECSE-2410	Signals & Systems	3	
ENGR-2050	Intro. to Eng. Design	4			ECSE-2500	Engineering Probability	3	
MATH-2010	Multivar Calc & Matrix Alg.	4				Free Elective[2]	3-4	
	Hum., Arts or Soc. Sci. El.	4				Hum., Arts or Soc. Sci. El.	4	
ENGR-4010	Professional Devel. III[1]	1				Professional Devel. II[1,3,4]	2	
	Technical Elective[1,5,6]	3-4				Restricted Elective[1,5,6]	3-4	
	Restricted Elective[1,5,6]	3-4				Design Elective[1]	3	
	Computer Eng Elective[4]	3-4				Free Elective[1,2]	3-4	
	Free Elective[1,2]	3-4				Hum., Arts or Soc. Sci. El.	4	
						Free Elective (if needed) [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.
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.

130 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.

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

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

DESIGN ELECTIVES
ECSE-4900 ECSE Design (F, S)
MANE-4220 Inventor's Studio (F, S)

Industrial and Management Engineering

The most distinctive aspect of IME is the flexibility it offers. Whether it's shortening a rollercoaster waiting line, streamlining an operating room procedure, distributing products worldwide, or manufacturing superior automobiles, all these challenges share the common goal of saving money and increasing efficiencies which is a core focus of this discipline. Industrial engineering encompasses service industries as well as manufacturing, with IMEs employed in entertainment industries, shipping and logistics businesses, and health care organizations. The integration of people, materials, capital, equipment, and energy into productive systems is the IME's main concern. An IME may be involved in scheduling crews and flights at an airline, planning production at a manufacturing plant, designing automation solutions in a distribution warehouse, or building information systems to support organizational decision making.

As companies adopt management philosophies of continuous productivity and quality improvement to survive in the increasingly competitive world market, the need for IME's is growing. IME's are the only engineering professionals trained specifically to be productivity and quality improvement specialists. Many practitioners say that an IME education offers the best of both worlds: a combination of engineering and business education. This is why many industrial engineers end up being promoted into senior management positions.

IMEs make processes better through:

- More efficient and more profitable business practices
- Better customer service and product quality
- Making work safer, faster, easier, and more rewarding
- Helping companies produce more products quickly
- Making the world safer through better designed products and processes
- Reducing costs associated with new technologies

The U.S. Bureau of Labor Statistics [BLS] has described a typical IME's function as follows:

Industrial engineers determine the most effective ways for an organization to use the basic factors of production-people, machines, materials, information, and energy-to make or process a product. They are the bridge between management and operations. They are more concerned with increasing productivity through the management of people, methods of business organization, and technology than are engineers in other specialties, who generally work more with products or processes.

Contact List for IME

Department Head:	John Wen (wenj@rpi.edu)	CII 5015
Administrative Staff:	Mary Wagner wagnem@rpi.edu	CII 5015

Industrial & Management Engineering Curriculum Checklist

Fall Semester				Spring Semester			
		FIRST		**YEAR**			
CHEM-1100	Chemistry I[1]	4		ENGR-1200	Engineering Graphics & CAD[2]	1	
ENGR-1100	Intro to Eng Analysis	4		MATH-1020	Calculus II	4	
ENGR-1300	Engineering Processes[2]	1		PHYS-1100	Physics I	4	
MATH-1010	Calculus I	4			Computer Science Elective[3]	4	
	Hum. or Soc. Sci. Elective	4			Hum. or Soc. Sci. Elective	4	
		SECOND		**YEAR**			
ENGR 2050	Intro to Engineering Design	4		ENGR 2600	Modeling & Analysis of Uncertainty	3	
PHYS 1200	Physics II	4		ISYE-2210	Prod & Ops Mgt & Cost Acctg. [5]	4	
MATH 2400	Intro. to Differential Equations	4		MATH-2010	Multivariable Calc & Mat Algebra	4	
	Hum., Arts or Soc. Sci. Elective	4			Science Elective[4]	4	
		THIRD		**YEAR**			
ISYE-4140	Statistical Analysis	4		ISYE-4250	Discrete Event Simulation	4	
ISYE-4600	Operations Research Methods	4			Technical Elective[7]	3	
	Technical Elective[7]	3			Technical Elective[7]	3	
	Professional Development II[6]	2			Free Elective I	4	
	Hum., Arts or Soc. Sci. Elective	4			Hum., Arts or Soc. Sci. Elective	4	
		FOURTH		**YEAR**			
ISYE-4530	Information Systems[1]	4		ISYE-4270	IME Design	3	
ENGR-4760	Eng. Economics	3		ISYE-4210	Design & Anal of Supply Chains	3	
	Technical Elective[7]	3		ENGR-4010	Professional Development III	4	
	Free Elective I1	4			Technical Elective[7]	3	
					Free Elective I1I	4	

1. *This course is only offered in the fall semester.*
2. *For these two courses, order does not matter. ENGR 1300 may be replaced with ISYE 1100 Introduction to Industrial and Systems Engineering. ENGR 1200 may be replaced with ENGR 1400 Engineering Communications.*
3. *IME majors must take CSCI 1010 Introduction to Computer Programming or CSCI 1100 Computer Science I for the Computer Science Elective.*
4. *IME majors may select any 4-credit course with the designation ASTR, BCBP, BIOL, CHEM, ERTH, MATH, or PHYS to satisfy the science elective requirement.*
5. *This course is only offered in the spring semester.*
6. *This course can be fulfilled by taking a 2-credit course from a list of courses published at the start of each semester.*
7. *IME majors must select five courses from the following list of technical electives. The selected courses must include a minimum of three ISYE numbered courses and at least two courses from among: ISYE 4200, ISYE 4230, ISYE 4240, ISYE 4250 and ISYE 4280:*

   ENGR 1600 Materials Science for Engineers
   ENGR 2090 Engineering Dynamics
   ENGR 2250 Thermal and Fluids Engineering I
   ENGR 2300 Electronic Instrumentation
   ENGR 2350 Embedded Control
   ENGR 2530 Strength of Materials
   ENGR 2710 General Manufacturing Processes
   ENGR 4710 Advanced Manufacturing Laboratory I
   ENGR 4720 Advanced Manufacturing Laboratory II
   ISYE 4200 Design and Analysis of Work Systems
   ISYE 4230 Quality Control
   ISYE 4240 Engineering Project Management

ISYE 4250 Facilities Design & Industrial Logistics
ISYE 4280 Decision Focused Systems Engineering

Other approved technical elective options:
ISYE 4220 Optimization Algorithms and Applications
ISYE 4260 Human Performance Modeling and Support
ISYE 4300 - Complex Systems Models for Industrial and Systems Engineering
ISYE 4310 - Ethics of Modeling for Industrial and System Engineering
ISYE 4320 Theory of Scheduling
ISYE-4330 Design of Experiments
ISYE 4760 Mathematical Statistics
ISYE 4810 Computational Intelligence

Special undergraduate sections or regular graduate sections of 6000-level ISYE courses can also serve as technical electives except for ISYE 6600, ISYE 6610 and ISYE 6620.

Materials Science & Engineering

Materials Science and Engineering is an interdisciplinary branch of engineering that investigates the performance and properties of materials through manipulation of matter at the atomic and molecular length scales. This discipline has helped to define the technological sophistication of human history as discoveries of new materials enable new technologies that help to improve our day-to-day lives. This rich tradition of discovery continues to this day through our research in metals, semiconductors, ceramics, polymers, composites, biomaterials, materials for energy, and nanomaterials.

As a materials engineer you will help to discover and synthesize materials for applications across all industries. The materials that surround us and help us to live healthy lives, work safely, and travel are products of our ability to manipulate matter at the atomic scale.

At the core of our discipline we understand and leverage the interrelationship between material structure, processing, properties and performance. Understanding this relationship allows a materials engineer to design and synthesize new materials for new and improved applications.

Contact List for MSE

Department Head:	Pawel Keblinski (keblip@rpi.edu)	MRC 102
Administrative Coordinator:	Meeli Chew Leith (leithm@rpi.edu)	MRC 103
Undergraduate Advising:	Liping Huang (huangL5@rpi.edu)	MRC 202
	Dan Lewis (lewisd2@rpi.edu)	MRC 110
	Rahmi Ozisik (ozisik@rpi.edu)	MRC 205
	Yunfeng Shi (shiy2@rpi.edu)	MRC 114
Department Coordinator (for URP)	Nancy Beatty (beattn@rpi.edu)	MRC 140
Graduate Admissions:	Liping Huang (huangL5@rpi.edu)	MRC 202
Graduate Advising	Minoru Tomozawa (tomozm@rpi.edu)	MRC 109B

Fall Semester				Spring Semester			
		FIRST		**YEAR**			
CHEM 1100	Chemistry I	4		MATH 1020	Calculus II	4	
MATH 1010	Calculus I	4		PHYS 1100	Physics I	4	
ENGR 1100	Intro. to Engineering Analysis	4		ENGR 1600	Materials Science for Engs[1]	4	
MTLE 1200	Intro to Materials Science[2]	1			Hum., Arts or Soc. Sci. Elective	4	
	Hum., Arts or Soc. Sci. Elective	4					
		SECOND		**YEAR**			
ENGR 1200	Engineering Graphics & CAD[3]	1		MTLE 2100	Structure of Engineering Materials	4	
ENGR 2250	Thermal and Fluids Eng. I	4		ENGR 2050	Intro to Engineering Design	4	
PHYS 1200	Physics II	4		CSCI 1190	Beginning C Progrmg for Engs	1	
MATH 2400	Intro. to Differential Equations	4			Science Elective	4	
	Hum., Arts or Soc. Sci. Elective	4			Hum., Arts or Soc. Sci. Elective	4	
		THIRD		**YEAR**			
MTLE 4100	Thermodynamics of Materials	4		MTLE 4150	Kinetics in Materials Sys.	4	
MTLE 4200	Electrical & Optical Prop of Mtls	4		MTLE 4250	Mechanical Props of Materials	4	
ENGR 2600	Modeling & Analysis of Uncertainty	3		MTLE 4910	Materials Selection	3	
	Professional Development II[4]	2			Restricted Elective[1]	4	
	Hum., Arts or Soc. Sci. Elective	4					
		FOURTH		**YEAR**			
MTLE 4400	Materials Synthesis & Processes	4		MTLE 4500	Computational Materials Design	3	
ENGR 4010	Professional Development III	1		MTLE 4920	Multidisciplinary Capstone Design[1]	3	
	Materials Elective I[1]	3			Free Elective III	4	
	Free Elective I	4			Materials Elective II	3	
	Free Elective II[1]	4					

128 credits minimum

RESTRICTED ELECTIVES

ECSE 2010 - Electric Circuits 4 credit hours (Fall & Spring)
ENGR 2090 - Engineering Dynamics 4 credit hours (Fall & Spring)
ENGR 2300 - Electronic Instrumentation 4 credit hours (Fall & Spring)
ENGR 2350 - Embedded Control 4 credit hours (Fall & Spring)
ENGR 2530 - Strength of Materials 4 credit hours (Fall & Spring)
BMED 2540 - Biomechanics[5] 4 credit hours (Fall)

MATERIALS ELECTIVES

MTLE 4030 - Glass Science Credit Hours: 3
MTLE 4310 - Corrosion Credit Hours: 3
MTLE 4440 – Thin Films Credit Hours: 3
MTLE 4470 – Processing of Biomaterials Credit Hours: 3
MTLE 4960 - Topics in Materials Engineering Credit Hours: 3
MTLE 4050 - Introduction to Polymers Credit Hours: 3
MTLE 4430 – Fundamentals Alloy Systems Credit Hours: 3
MTLE 4460 – Materials for Energy Credit Hours: 3
MTLE 4520 – Materials Extreme Cond. Credits: 3

Note: The courses in the Materials Electives list may be substituted with any MTLE 4000- or 6000-level course. In order to take a 6000-level course, students may be required to obtain formal approval from the Office of Graduate Education, as specified in the course catalog. The free electives must total at least 12 credits.

1. This course can be taken in either semester.
2. May be replaced by ENGR 1300 or another engineering exploration course.
3. May be replaced by ENGR 1400.
4. This course will be fulfilled from a list published at the start of each semester.
5. This restricted elective option is available to dual MTLE/BMED majors only.

Aeronautical/Aerospace Engineering

Today's aeronautical engineers not only develop airplanes and rockets, they design high-speed trains and submarines, hydrofoils and wind turbines. Rensselaer graduates have helped to develop the engines that propel jumbo jets, the lunar lander for the Apollo spacecraft, and the Rover for the Mars Exploration Mission.

At Rensselaer, you'll begin with core engineering, basic science, computing, and the fundamentals of flight. These will prepare you for further studies of fixed-wing and rotary-wing aircraft, lightweight structures, propulsion, and space vehicle design. Our programs place emphasis on research, design, development, and operation of flight vehicles for aeronautical and space applications. In their senior year, undergraduates may focus on fixed-wing aircraft, rotary-wing aircraft, or spacecraft design, though none of these choices precludes employment or graduate work in any other focus area. Our graduates choose careers in industry or government laboratories, doing research in anything from high-speed aerodynamics or high-temperature strength of jet engine blades, to the sale of aircraft and aircraft components.

Mechanical Engineering

Mechanical engineers design, develop, manufacture, sell, and maintain machinery. Air conditioning and heating systems, automobiles, jets, power plants, spacecraft, and oil drilling equipment all bear the imprint of the mechanical engineer.

As an undergraduate, you'll follow the core engineering curriculum in your first two years, gaining a solid grounding in mathematics, physics, and chemistry, as well as taking introductory courses in computing and mechanical engineering. You can then opt for technical electives in aeronautics, applied mechanics/mechanics of materials, design, manufacturing, energy systems, or space technology.

Many mechanical engineering graduates assume positions of management, while others prefer a career along technical lines

Nuclear Engineering

Nuclear engineering focuses on methods, devices, and systems to get benefits from the peaceful use of nuclear energy and radiation. At Rensselaer, you'll begin with fundamentals in chemistry, physics, and mathematics, core engineering, computing, and Nuclear Phenomena for Engineering Applications. These will prepare you for further studies in nuclear energy production, energy systems, health physics, and radiation technology.

Areas of research pursued at Rensselaer include reactor engineering, thermal-hydraulics, health and medical physics, dosimetry, radiation transport, neutron scattering, and x-ray production.

Careers in nuclear engineering include electricity production, food safety, medical diagnostics and treatment, space and underwater propulsion applications, and non-destructive testing for industry.

A note about the MANE Office of Undergraduate Student Services:

Located in JEC 2012 you will find the MANE Office of Undergraduate Student Services. This office was established by the MANE department to assist undergraduates as they navigate through their four years at Rensselaer. Here you will find all necessary Registrar's Office forms and advice to help you complete them; assistance with Registration issues; help with curriculum and course selection; and even some candy to help you through your day.

Contact List for MANE

MANE Department Offices

Department Head	Suvranu De	des@rpi.edu	JEC 2049
Senior Administrative Coordinator	Colleen Bonesteel	carroc@rpi.edu	JEC 2049
Administrative Specialist	Hollis McEvilly	mcevih@rpi.edu	JEC 2049

Undergraduate Student Resources

Director of Undergraduate Student Services	Thomas Haley	haleyt2@rpi.edu	JEC 2049
Sr. Student Services Administrator	Marie Dieffenbach	dieffm@rpi.edu	JEC 2012
Administrative Specialist	Karen Phelan	phelak@rpi.edu	JEC 2012
Undergraduate Degree Clearance Officer (AE & ME)	Catalin Picu	cpicu@scorec.rpi.edu	JEC 2049*
Undergraduate Degree Clearance Officer (NE)	Bimal Malaviya	malavb@rpi.edu	JEC 5050

Graduate Student Resources

Associate Department Head for Graduate Studies	Yoav Peles	pelesy@rpi.edu	JEC 2002
Sr. Student Services Administrator	Kathryn Tomlin	tomlik2@rpi.edu	JEC 2049
Administrative Specialist	Susan Miller	milles7@rpi.edu	JEC 2002

Aeronautical Engineering

Minimum credit hour requirements for the Bachelor's Degree in Aeronautical Engineering: 128

FIRST YEAR					
	FALL	Credits		SPRING	Credits
CHEM-1100	Chemistry I	4	ENGR-1300	Engineering Processes	1
ENGR-1100	Introduction to Engineering Analysis	4	MANE-2060	Fundamentals of Flight	3
ENGR-1200	Engineering Graphics & CAD [1]	1	MATH-1020	Calculus II	4
MATH-1010	Calculus I	4	PHYS-1100	Physics I	4
HASS	Hum. or Soc. Sci. Elective	4	HASS	Hum. or Soc. Sci. Elective	4
		17			16
SECOND YEAR					
	FALL	Credits		SPRING	Credits
ENGR-2530	Strength of Materials	4	ENGR-2050	Introduction to Engineering Design	4
MATH-2400	Introduction to Differential Equations	4	ENGR-2090	Engineering Dynamics	4
PHYS-1200	Physics II	4	ENGR-2250	Thermal and Fluids Engineering I	4
HASS	Hum. or Soc. Sci. Elective	4	CSCI- 1190	Beginning Programming for Engineers	1
			MATH-2010	Multivariable Calculus and Matrix Algebra	4
		16			17
THIRD YEAR [2]					
	FALL	Credits		SPRING	Credits
MANE-4060	Aerospace Structures and Materials	4	ENGR-2600	Modeling and Analysis of Uncertainty	3
MANE-4070	Aerodynamics I	3	MANE-4050	Modeling & Control of Dynamic Systems	4
MATH-4800	Numerical Computing	4	MANE-4900	Aeroelasticity and Structural Vibration	3
HASS	Hum. or Soc. Sci. Elective	4	MANE-4920	Aerospace Structures and Controls Lab	2
			HASS	Hum. or Soc. Sci. Elective	4
		15			16
FOURTH YEAR					
	FALL	Credits		SPRING	Credits
ENGR-4010	Professional Development III	1		Capstone Design Elective [5]	3
MANE-4080	Propulsion Systems	4		Free Elective	4
MANE-4800	Boundary Layers and Heat Transfer	3		Free Elective	4
MANE-4910	Fluid Dynamics Lab	2		Free Elective	4
	Flight Mechanics Elective [3]	4			
	Professional Development II [4]	2			
		16			15

1. Choice of: ENGR-1200 Engineering Graphics & CAD or ENGR-1400 Engineering Communication.
2. AE students should start planning for their Flight Mechanics/Capstone track during third year. Those on the Space Flight track must take MANE-4100 Spaceflight Mechanics during spring semester of third year to assure timely graduation. In such cases, MANE 4050 or ENGR 2600 can be delayed until spring semester of fourth year.
3. Choice of: MANE-4090 Flight Mechanics, MANE-4200 Rotorcraft Performance, Stability & Control, or MANE-4100 Spaceflight Mechanics (as noted, the latter must be taken in spring semester of third year to assure timely graduation).
4. For a list of courses that satisfy the PD II requirement refer to the link "Courses which satisfy the PD II requirement" on the SIS home page.
5. Choice of: MANE-4230 Air Vehicle Design, MANE-4850 Space Vehicle Design, or MANE-4860 Intro to Helicopter Design (students on the Space Flight track take MANE 4850 in fall of fourth year).

Mechanical Engineering

Minimum credit hour requirements for the Bachelor's Degree in Mechanical Engineering: 129

FIRST YEAR					
	FALL	Credits		SPRING	Credits
ENGR-1100	Introduction to Engineering Analysis	4	ENGR-1300	Engineering Processes	1
ENGR-1200	Engineering Graphics & CAD [1]	1	ENGR-1600	Materials Science for Engineers	4
CHEM-1100	Chemistry I	4	MATH-1020	Calculus II	4
MATH-1010	Calculus I	4	PHYS-1100	Physics I	4
HASS	Hum. or Soc. Sci. Elective	4	HASS	Hum. or Soc. Sci. Elective	4
SECOND YEAR					
	FALL	Credits		SPRING	Credits
ENGR-2530	Strength of Materials	4	ENGR-2050	Introduction to Engineering Design	4
MATH-2400	Introduction to Differential Equations	4	ENGR-2090	Engineering Dynamics	4
PHYS-1200	Physics II	4	ENGR-2250	Thermal and Fluids Engineering I	4
HASS	Hum. or Soc. Sci. Elective	4	CSCI- 1190	Beginning Programming for Engineers	1
			MATH-2010	Multivariate Calculus & Matrix Algebra	4
THIRD YEAR			FOURTH YEAR		
		Credits			Credits
ENGR-2350	Embedded Control	4	ENGR-4010	Professional Development III	1
ENGR-2300	Electronic Instrumentation	4	MANE-4260	Design of Mechanical Eng. Systems	3
ENGR-2600	Modeling and Analysis of Uncertainty	3		Science Elective [4]	3
MANE-4010 MANE-4020	Thermal and Fluids Core Module [2] Thermal and Fluids Engineering II (TFE II) Thermal and Fluids Lab (concurrent or after TFE II)	4 2	MANE-4xxx	Technical Elective I [5]	3
MANE-4030 MANE-4040	Mechanical Systems Core Module [2] Elements of Mechanical Design (EMD) Mechanical Systems Lab (concurrent or after EMD)	4 2	MANE-4xxx	Technical Elective II [5]	3
MANE-4050	Modeling and Control of Dynamic Systems	4	HASS	Hum. or Soc. Sci. Elective	4
HASS	Hum. or Soc. Sci. Elective	4		Free Elective	4
	Professional Development II [3]	2		Free Elective	4
				Free Elective	4

[1] Choice of: ENGR-1200 Engineering Graphics & CAD or ENGR-1400 Engineering Communication.

[2] The laboratory component of each Core Module (MANE-4020/-4040) must be taken concurrent with or after the theoretical component (MANE-4010/-4030). The laboratory courses have lecture components to review the theory, so there is no disadvantage to taking the laboratory in any later semester.

[3] For a list of courses that satisfy the PD II requirement, refer to the link "Courses which satisfy PD II requirement" on the SIS home page.

[4] The Science Elective may be selected from any 2000-level or above course in the School of Science with an ASTR, BCBP, BIOL, CHEM, ERTH, MATH, or PHYS prefix. An independent study course may not be used to satisfy this requirement. The Science Elective may not be taken on a Pass/No Credit basis.

[5] The Technical Electives shall be two upper level (4000 or above) MANE courses. An independent study course may not be used to satisfy this requirement. The Technical Electives may not be taken on a Pass/No Credit basis.

ME students are encouraged to use their technical electives, science elective, and possibly free electives to develop a mechanical engineering concentration (e.g., in applied mechanics, energy systems, manufacturing and design, mechatronics, aerospace systems, nuclear systems, etc.) they can market themselves with.

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Nuclear Engineering

Minimum credit hour requirements for the Bachelor's Degree in Nuclear Engineering: 130

FIRST YEAR					
	FALL	Credits		SPRING	Credits
ENGR-1100	Introduction to Engineering Analysis	4	ENGR-1200	Engineering Graphics & CAD	1
CHEM-1100	Chemistry I	4	ENGR-1600	Materials Science for Engineers	4
MANE-1961	Introduction to Nuclear Engineering [1]	1	MATH-1020	Calculus II	4
MATH-1010	Calculus I	4	PHYS-1100	Physics I	4
HASS	Hum. or Soc. Sci. Elective	4	HASS	Hum. or Soc. Sci. Elective	4
		17			17
SECOND YEAR					
	FALL	Credits		SPRING	Credits
MATH-2400	Introduction to Differential Equations	4	CSCI- 1190	Beginning Programming for Engineers	1
PHYS-1200	Physics II	4	ENGR-2050	Introduction to Engineering Design	4
HASS	Hum. or Soc. Sci. Elective	4	MANE-2830	Nuclear Phenomena for Eng. Applications	4
	Free Elective I	4	MATH-2010	Multivariable Calculus and Matrix Algebra	4
			HASS	Hum. or Soc. Sci. Elective	4
		16			17
THIRD YEAR					
	FALL	Credits		SPRING	Credits
ENGR-2250	Thermal and Fluids Engineering I	4	ENGR-2600	Modeling and Analysis of Uncertainty	3
MANE-4350	Nuclear Instrumentation & Measurement	3	MANE-4400	Nuclear Power Systems Engineering	4
MANE-2400	Fundamentals of Nuclear Engineering	4	MANE-4470	Radiological Engineering	3
HASS	Hum. or Soc. Sci. Elective	4	MANE-4480	Physics of Nuclear Reactors	4
				Professional Development II [2]	2
		15			16
FOURTH YEAR					
	FALL	Credits		SPRING	Credits
MANE-4050	Modeling & Control of Dynamic Systems	4	MANE-4390	NE Senior Design Project II	2
MANE-4370	Nuclear Engineering Lab	4	MANE-4440	Critical Reactor Laboratory	3
MANE 4380	NE Senior Design Project I	1		Technical Elective [4]	3
ENGR-4010	Professional Development III	1		Restricted Elective II [3]	3
	Restricted Elective I [3]	3		Free Elective III	4
	Free Elective II	4			
		17			15

[1] Other 1-credit Engineering Exploration courses, such as ENGR-1300 Engineering Processes, may be substituted.

[2] For a list of courses that satisfy the PD II requirement, refer to the link "Courses which satisfy PD II requirement" on the SIS home page.

[3] Restricted Electives focus on a student's technical interests or area of specialization within the Nuclear Engineering field. Restricted electives are MANE 4000-level or higher courses related to Nuclear Engineering that are taken for 3 credits or more. If you have questions regarding whether a specific course satisfies your Restricted Elective requirements, please consult with your advisor. Restricted Electives may not be taken on a Pass/No Credit basis.

[4] The Technical Elective can be any 2000-level or higher School of Engineering or School of Science course taken for 3 credits or more. Technical Electives may not be taken on a Pass/No Credit basis.

Foundational Mathematics, Science, and Core Engineering Science Courses for Engineering Majors

All engineering majors require math and science courses and in some cases those courses act as pre-requisites for other courses within the major. Those courses vary from one major to the next with the exceptions of Calculus I and II, Introduction to Differential Equations, and Physics I and II which all majors require. All Engineering majors require Introduction to Engineering Analysis.

Below is a breakdown (by major) of the required math, science, and core engineering courses.

					CEE			ECSE			MANE				
Credits	Dept	#	Name	BME	CivE	EnvE	ChBE	EE	CSE	IME	Aero	Mech	Nucl	MatE
4	BIOL	1010	Introduction to Biology			o_1	√	o_2	o_2					
4	BIOL	2120	Introduction to Cell and Molecular Biology	√				o_2	o_2					
4	CHEM	1100	Chemistry I	√	√	√	√a	o_2	o_2	√	√	√	√	√
4	CHEM	1200	Chemistry II			√								
4	CSCI	1010	Introduction to Computer Programming							o_3				
4	CSCI	1100	Computer Science I		o_4			√	√	o_3				
1	CSCI	1190	Beginning Programming for Engineers	√, o_4	o_4	√, o_4	√, o_4				√, o_4	√, o_4	√, o_4	√, o_4
4	CSCI	1200	Data Structures						√					
4	ENGR	1100	Introduction to Engineering Analysis	√	√	√	√	√	√	√	√	√	√	√
1	ENGR	1200	Engineering Graphics & CAD or 1 ENGR-1400 Engineering Communication	√	o_5	o_5	√	√	√	√	√*	√*	√	√
1	ENGR	1300	Engineering Processes	√	o_6	o_6	o_6			o_6	√	√	o_6	o_6
4	ENGR	1600	Materials Science for Engineers			o_7		o_7		o_7		√	√	√
4	ENGR	2050	Introduction to Engineering Design (with Professional Development I)	√	√	√		√	√	√	√	√	√	√
4	ENGR	2090	Engineering Dynamics		√		o_7	o_7		o_7	√	√		o_7
4	ENGR	2250	Thermal and Fluids Engineering I		√	√		o_7		o_7	√	√	√	√
4	ENGR	2300	Electronic Instrumentation				o_7			o_7		√		o_7
4	ENGR	2350	Embedded Control				o_7	√	√	o_7		√		o_7
4	ENGR	2530	Strength of Materials		√	o_7	o_7	o_7		o_7	√	√		o_7
3	ENGR	2600	Modeling and Analysis of Uncertainty	√	√	√	√			√	√	√	√	√
4	ENGR	2710	General Manufacturing Processes				o_7			o_7				
1	ENGR	4010	Professional Development III	√	√	√	√	√	√	√	√	√	√	√
4	ENGR	4760	Engineering Economics		√	o_7	o_7			√				
4	MATH	1010	Calculus I	√	√	√	√	√	√	√	√	√	√	√
4	MATH	1020	Calculus II	√	√	√	√	√	√	√	√	√	√	√
4	MATH	2010	Multivariate Calculus and Matrix Algebra	√				√	√	√	√	√	√	
4	MATH	2400	Introduction to Differential Equations	√	√	√	√	√	√	√	√	√	√	√
4	PHYS	1100	Physics I	√	√	√	√	√	√	√	√	√	√	√
4	PHYS	1200	Physics II	√	√	√	√	√	√	√	√	√	√	√
			Math and Science Elective		**4 (1)**					**4 (1)**		**3-4 (2)**		**4 (1)**

Legend

√ - named required course for major
√a - Chem I is with Advanced Lab
√* - ENGR-1200 Engineering Graphics & CAD is preferred

o_j : (j=1, 7) optional/elective course(s) with rules specific to indicated program. Please see specific rule defined below for details.
o_1 : BIOL 1010 or other Biology course chose is consultation with advisor is required.
o_2 : BIOL 1010, BIOL 2120 or CHME 1100 may be used to satisfy the ELEC and CSYS majors as their "Science Elective"
o_3 : IME students must take either CSCI 1010 or CSCI 1100 to satisfy their computer science elective
o_4 : CSCI 1190 may be replaced with CSCI 1100
o_5 : CIVL 1200 is preferred, but ENGR 1200 and ENGR 1400 will satisfy this requirement
o_6 : ENGR 1300 may be replaced with 1-credit Introduction to engineering discipline course (e.g. CIVL 1100, CHME 1010, ISYE 1100, MTLE 1200)
o_7 : Multidiciplinary technical elective

(#) - credits (level) of ASTR, BCBP, BIOL, CHEM, ERTH, MATH or PHYS

H&SS and PD II – Policies for Engineering Students

Engineering students at Rensselaer are required to successfully complete

- 20 credits of H&SS (Humanities and Social Sciences)
- 2 credits of PD II (Professional Development II)

as well as

- 1 credit of PD I (typically as part of ENGR-2050 Introduction to Engineering Design, or alternatively as ENGR-1010 Professional Development I if ENGR-2050 transferred in as less than a 4 credit course)
- 1 credit of ENGR-4010 PD III

for a total of 24 credits to fulfill the H&SS Core requirement.

ENGINEERING STUDENTS SHALL DISTRIBUTE THE 20 CREDITS OF H&SS AS FOLLOWS.

≥ 8 credits of H (ARTS, COMM, IHSS, LANG, LITR, PHIL, STSH, WRIT)
≥ 8 credits of SS (COGS, ECON, IHSS, PSYC, STSS)
≥ 4 credits at the 4000+ level

≤ 3 courses at the 1000 level (but note depth sequence restriction, below)
≤ 4 credits from 1-credit courses (e.g., music ensembles)
≤ 6 credits as pass/no-credit (but note depth sequence and CI restrictions, below)
≤ 2 courses (8 credits maximum) as transfer courses (including AP courses)

a depth sequence of two courses, each of ≥ 4 credits, from the same area code (ARTS, COMM, etc., but not including IHSS) where a minimum of one course (≥ 4 credits) is at an advanced level (2000+), and no courses are taken on a Pass/No Credit basis. STSS and STSH count as the same area code.

In addition, students are required to take at least one HASS course that is "CI" (Communications Intensive – a list of these courses is available from a link on the SIS home page, and here: http://srfs.rpi.edu/update.do?artcenterkey=208&setappvar=page(1)). This course may not be taken on a Pass/No Credit basis. This CI course is not required to be part of the 24 credits of H&SS Core; that is, it may instead be an HASS CI course taken as a free elective

Enrolled Rensselaer students wishing to take an H&SS course for credit at another accredited institution must obtain prior approval for the course from the HASS Manager of Student Services. Applicants must furnish a catalog description of the proposed course and a completed copy of Rensselaer's Transfer Credit Approval form to the HASS Manager of Student Services to apply for approval.

Cross-listed STSS/STSH courses can be switched (between H and SS) after the course is taken by making a request to the Assistant Registrar.

THE 2-CREDITS OF PD II SHALL BE SATISFIED AS FOLLOWS.

Either of the 2-credit courses, PSYC-4170 or STSS-4840, will satisfy the PD II requirement. **At some future time these will transition to a single 2-credit IHSS-4xxx course that will satisfy the PD II requirement.** Only **one** of these 2-credit PD II courses can be taken for credit.

A 4-credit PD II alternate course at any level (1000-4000) can be substituted for the 2-credit course. A list of these PD II alternate courses is available from a link on the SIS home page, and here: http://registrar.rpi.edu/update.do?artcenterkey=325.

A course used to satisfy the PD II requirement may **not** be taken on a Pass/No Credit basis.

In general, the PD II alternate course will be split as follows:

- two credits allocated to satisfy PD II
- 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 a PD II alternate that are not allocated to PD II may be used to fulfill the 20-credits of H&SS. These credits:

- **cannot** count toward the 4000 requirement,
- **cannot** count toward the depth requirement,
- **cannot** increase the number of 1000 level credits past 12.

However,

- they can count toward the overall 20 credits of H&SS,
- they can count toward the H and SS 8-credit minimums,
- they can count toward the H&SS "CI" requirement.

If a student transfers in a course that is in name and course number equivalent to a PD II alternate it counts as that named HASS course, but it does **not** transfer in its status as a PD II alternate. The student would still be responsible for taking PD II or a PD II alternate at Rensselaer.

In the rare case that a student transfers in a course with Professional Development II content nearly identical to that in either PSYC-4170 or STSS-4840 (the 2-credit PD II courses), they may furnish a catalog description 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 PD II requirement, as indicated in the transfer equivalency guide.

The School of Humanities, Arts, and Social Sciences (HASS)Associate Dean of Academic Affairs is:
Mike Kalsher (kalshm@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

Need an Extra Credit?

Q: What if I'm short 1-2 credits in H&SS?
A: Use a 4-credit PD II alternate, with 2 credits to PD II, 1-2 credits to H&SS as needed, and any remaining credits to free elective (or "Not Applied" if you have filled all of your free elective credits)

Q: What if I'm short 1-2 credits in Free Electives?
A: Use a 4-credit PD II alternate, with 2 credits to PD II and 2 credits to free elective

Q: Am I really free to choose my free electives?
A: Almost, but not quite – there are restrictions for "free" electives. To count as a free elective, one credit classes must be either
– from the School of Engineering, or
– graded classes (though you can take these on a Pass/No Credit basis),
and
– ROTC courses (USAF, USAR, USNA) must not total more than six credits
One credit classes that are graded Satisfactory / Unsatisfactory (S/U) that are not in the School of Engineering may **not** be used as free electives. For example, PHYS-1010 A Passion for Physics is a 1-credit S/U course that will not count as a free elective.

Options for 1 credit free electives
- independent study (1 credit ≈ 3 hours/week ⇒ ~ 45 hours of work)
- undergraduate research project (when taken for credit)
- School of Engineering courses, such as
  - CHME-1010 Introduction to Chemical Engineering
  - CIVL-1100 Introduction to Civil and Environmental Engineering
  - CIVL-1960 / ENVE-1960 AutoCAD CIVL 3D
  - ENGR-1300 Engineering Processes (if not required for your major)
  - ENGR-4200 Fortran Programming
  - ISYE-1100 Introduction to Industrial and Systems Engineering
  - MANE-1100 Introduction to Nuclear Engineering
  - MANE-2961 Mechatronics Hardware and Software
  - MTLE-1200 Introduction to Materials Engineering
- School of Science courses
  - ISCI-4510 Origins of Life Seminar (requires Junior standing or higher)
- HASS courses
  - ARTS-2300 Rensselaer Orchestra
  - ARTS-2310 Rensselaer Concert Choir
  - ARTS-2320 Percussion Ensemble
  - ARTS-2330 Jazz Ensemble
  - ARTS-2960 Ensemble Congeros
- ROTC courses (USAF, USAR, USNA, up to six credits maximum)
- most one-credit topics courses (see http://srfs.rpi.edu/update.do?artcenterkey=305)

Responsibilities

"We are at the very beginning of time for the human race. It is not unreasonable that we grapple with problems. But there are tens of thousands of years in the future. Our responsibility is to do what we can, learn what we can, improve the solutions, and pass them on." **Richard Feynman (1918 - 1988)**

Student's responsibilities

- To know their advisor's office hours and advising schedule.
- To make an appointment and prepare for registration advising by reviewing the Catalog, Class-Hour Schedule, and Curriculum Advising & Program Planning (CAPP).
- To formulate questions regarding curriculum, course selections, career options, etc.
- To be aware of their academic and personal needs and to seek assistance when needed.
- To understand that the role of their advisor is to advise them, not to make decisions for them. Each student needs to realize that it's his or her education at stake, and that, with advisement, *they* are ultimately responsible for making any final decisions.

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

The SoE Student Services HUB is a great place for freshmen and sophomore engineering students to find answers to their most pressing academic and career related questions. The HUB is located in the Ansell Lounge on the third floor in the Jonsson Engineering Center (JEC). The HUB is comprised of experience faculty and staff members who specialize in many of the different engineering majors. The HUB is open weekdays during the academic year during the following hours:

Monday-Thursday 10:00-4:00, Friday 10:00-1:00

HUB personnel have been trained to answer questions regarding all engineering majors, including required courses, prerequisites, different concentrations, optimal time for co-ops and internships, traveling abroad, etc. We especially encourage undeclared engineering students to utilize The Hub as a resource while they decide what major to pursue. Each personnel member will have access to students' CAPP reports and will be able to supply the student with the best advice, or refer them to a more knowledgeable source. HUB personnel will not be able to sign Student-Advisor Meeting (Sam) requirements for students. Their job is to supplement, not replace, the student's appointed academic advisor.

Bachelor's Degree

The bachelor's degree is awarded to students who have pursued successfully, as evaluated by the faculty, a plan of study that encompasses several disciplines. Each plan of study has at least two objectives: first, to reach a pre-professional standing or fundamental mastery in a selected discipline; second, to develop some grounding in knowledge found in liberally educated persons, an appreciation of technology and science, and an openness to ongoing learning.
General requirements:
• The number of courses and credit hours is prescribed by each curriculum. Minimum requirements are **128 credits for engineering**.
• The minimum grade point average (GPA) is **2.0**.
• To receive a baccalaureate degree, a student must have been admitted to the curriculum corresponding to the degree, must have satisfied the curriculum requirements, and must be enrolled in that curriculum at the time the degree is granted.
• The course content in physical, life, and engineering sciences must total a minimum of **24 credit hours**. For information on additional requirements, see the School of Science section of the course catalog.
• The course content in humanities and social sciences must total a minimum of **24 credit hours**, including at least **eight credit hours** in the humanities and **eight credit hours** in the social sciences. For information on additional requirements, see the School of Humanities, Arts, and Social Sciences section of the course catalog.
• Every student is required to take at least **two** communication-intensive courses. At least one of these must be in the students' major and at least one of the courses must be taught in the School of Humanities, Arts, and Social Sciences. Courses used to fill the communication-intensive requirement may not be taken as Pass/No Credit.
• The minimum course concentration in the area of the selected discipline is prescribed by each curriculum but **cannot be less than 30 credit hours**.
• At least **24 credit hours are to be elective**, of which no less than **12 credit hours** are unrestricted electives.
• The student must be registered full-time for a minimum of four semesters. Two semesters of part-time study at Rensselaer will be considered equivalent to one semester of full-time study. In addition, the student must complete a minimum of **64 credit hours** at Rensselaer, all of which will be applied to the baccalaureate degree. If a transfer student elects to study abroad or enroll in the co-op program, no more than 12 such credits may apply to the 64 needed for the bachelor's degree. The student's Plan of Study at Rensselaer must include at least **16 credits** of courses above the 1000 level in the major field, or in an approved concentration.

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 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.

Dual Majors

Undergraduate students who fulfill all the degree requirements for two curricula and who have met the conditions below will have completed a dual major. They will receive one diploma noting both majors.
(1) The student must designate a first-named and second-named major in writing at least one semester prior to graduation, and have the appropriate department(s) approve this designation prior to filing the dual major form with the registrar.
(2) Each student will be assigned an adviser in each department who will monitor progress towards degrees in that department.
(3) The degree clearance officer in the department will certify that the student has met the degree requirements in that department.
(4) The 24- credit-hour mathematics/science requirement and the 24-credit-hour humanities and social sciences requirement will satisfy the Institute requirements for both majors.

Minors

Within the distributional requirements described, the student may elect any courses that meet his or her personal or professional needs. Courses can be chosen to form a minor-that is, a set of courses coherent 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.

Pass/No Credit

The purpose of the Pass/No Credit option is to allow you to take courses outside of your normal curriculum or minor program which you might otherwise not consider taking because of grade considerations. Please note that the Pass/No Credit option is not available to graduate students or nonmatriculated students.

Submission procedures and deadlines
If you wish to take a course with the Pass/No Credit designation, you must file an approved Pass/No Credit Form, with the Registrar's before deadline date specified in the academic calendar. Similarly, if you have elected to take a course on this basis, you must choose to drop the Pass/No Credit designation by filing a Remove Pass/No Credit Designation Form by the same deadline. Please refer to Rensselaer's academic calendar for specific dates by which you must add or remove Pass/No Credit designations.

Undergraduate students may elect to take courses on a Pass or No Credit basis, for which the grade is either “P” (Pass) or “NC” (Fail). In general:

•You may take no more than 12 credit hours of courses designated as Pass/No Credit courses, and no more than six credits of these may be Humanities and Social Sciences courses used to satisfy the requirements of the undergraduate courses in these fields. You cannot use a pass/no credit course in the H&SS depth requirement.
•You may not use the Pass/No Credit designation for any courses, which you have previously failed, or for any courses which are specifically required by name or which are required to be chosen from a list of named courses in your curriculum or minor.
•You may not take any courses at the 6000 level on a Pass/No Credit basis.
•Communication Intensive courses cannot be taken as Pass/No Credit. (Effective for students who enter Fall 2010 or later)

Registration

When: Registration for the Spring semester generally occurs in early November. 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 here at Rensselaer, you are issued a "time ticket," which assigns you a specific window of time during which you may register for the next semester. Your time ticket will be sent to your RPI email address, 2 - 3 weeks before registration. Your registration time is assigned based on the number of credit hours you have earned as a student. Please note that classes which are still in progress or courses which have been graded as "incomplete" do not count towards earned credits, nor do transferred courses and Advanced Placement (AP) credit. The table to the right shows the range of earned credit hours associated with each class.

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

You should receive your time ticket via e-mail approximately four weeks prior to the scheduled registration period. 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.

CAPP reports

Your Curriculum Advising and Program Planning (CAPP) report is a planning and advising tool -- available only to undergraduate students -- that allows you to track the progress you're making toward your Bachelor's Degree. You can access your CAPP report via the main menu of the Student Information System (SIS). Please note that the Registrar temporarily suspends the nightly CAPP report updates during registration and while grades are being processed, due to the large volume of transactions which are already being posted to the student records system during these times. After registration or grades posting has been completed, all students' reports will be updated; this will take approximately four days and will begin with seniors, followed by juniors, sophomores, and freshmen.

FAQs for registration

What do I do if a class I want to register for is full?
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. In the case of Biomedical Engineering classes, you may also see the advising coordinator for the department in room JEC 7048. 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.

How do I add/drop a course?
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.
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 the instructor's signature (if required), the form must also be approved by the Advising and Learning Assistance Center.

Undergraduate Research Program (URP)

Rensselaer's Undergraduate Research Program (URP) provides real-world, hands-on research experience for students like you. Through this unique program, you have the opportunity to work directly with a faculty member on a bonafide research project.

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
- interact with some of the most informed and learned professors in the world
- 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
- establish industry connections that could lead to a co-op or future employment
- distinguish yourself from your peers
- publish as an undergraduate
- receive course credit in a more dynamic way or supplement your income

http://undergrad.rpi.edu/update.do?catcenterkey=77

URP application: http://undergrad.rpi.edu/update.do?artcenterkey=117

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

Some examples of projects students have been involved in include:

- Study of Spinal Sclerosis
- Mechanical Loading of the Lumbar Spine
- Schwann Cell Migration
- Cell Based Cancer Research
- Soft Tissue Engineering
- Vascular Regulation

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 their website to investigate their field of research. If it sounds interesting, approach them about a possible URP project

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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, funding or the experience?

You can earn from one to four credit hours per semester for your participation in the URP. The number of credit hours you earn is negotiable between you and your faculty sponsor. If you choose this option you and your 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
- In the past, students who have participated in the URP for pay have earned up to $3,000 per semester. The majority of participants earn $400 per semester.

URP funding comes from two sources:

- Your sponsoring faculty member or department
- 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 pays URP participants a maximum of $400 per semester in the form of matching funds.

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

The URP application should be submitted to the Department Coordinator, 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

Applying for the Experience

No deadline specified. You would have the opportunity to apply to gain the experience of working on a research project.

Frequently Asked Questions

Who do I contact for information regarding RPI concerns?
General Links:
Advising and Learning Assistance Center: http://alac.rpi.edu/setup.do
Bursar Office: http://finance.rpi.edu/update.do?catcenterkey=33
Career Development Center: http://www.rpi.edu/dept/cdc/
Co-Op / Internships: http://www.rpi.edu/dept/cdc/students/experience/coop/index.html
Course Catalog: http://www.rpi.edu/academics/catalog/
Financial Aid/Workstudy: http://www.rpi.edu/dept/admissions/aid/index.html
International Programs: http://undergrad.rpi.edu/update.do?catcenterkey=81
Registrar Forms: http://srfs.rpi.edu/update.do?catcenterkey=29
Student Handbook: http://www.rpi.edu/dept/doso/resources/judicial/docs/2014-2016RPIHandbookofStudentRightsandResponsibilitiesAUGUST2014.pdf
Student Information System: http://sis.rpi.edu/

Where can I find information on jobs for engineering majors?
The US Department of Labor (http://www.bls.gov/oes/current/oes_nat.htm#17-0000) provides information on the various fields of engineering and statistics concerning salary and job outlooks.

By when does a student need to choose the major?
Students have two semesters in which to declare a major and still be able to graduate in four years.

How do I change my major?
It is important to meet not just with your current advisor but also with the advisor in your prospective department. He or she will help you determine what requirements you will need to meet and whether they involve additional courses or credit hours. The Undergraduate Change of Major/Change of Status form must be completed and signed by the Associate Dean in JEC 3018.

What help is there available to make an informed choice of major?
The Advising & Learning Assistance Center (ALAC) has set up a one credit Freshman seminar to help students make a decision about a major. As part of this seminar interest tests are given and reviewed with each student individually. Faculty and students from all of the schools are available during the seminar to meet with students.

What major should I take?
There are many factors involved in deciding a major but the most important one is what interests you. The Advising & Learning Assistance Center can help with this process. Meeting with the advisors in the departments that interest you is a good step as well as taking introductory courses to familiarize yourself with the various fields of study within the schools.

What classes should I take?
First year classes are generally specified by the curriculum of the school you are enrolled in.
For students enrolled in the School of Engineering this includes completing core courses as well as the required courses determined by the institute. Once you have declared a major your advisor will work with you on which courses to take. For those students who have not declared a major several departments offer one credit introductory courses that provide students with the basics of that particular field.

Can I substitute a different class for a required course?
Substitutions must be approved by the Degree Clearance Officer (DCO) within the department and written notification is sent to the Registrar's Office. You should meet with your advisor and/or the DCO to determine which substitutions are most commonly approved.

Can a program requirement be waived?
Waivers must be approved by the Degree Clearance Officer. Your advisor may recommend that a requirement be waived, but this may not be possible if accreditation issues are involved.

Can I repeat a course?
Yes, if you repeat the identical course as an undergraduate at Rensselaer, both grades will appear on your student record and transcript. However, keep in mind that:

- The grade received in the repeated course is always the one used in computing your GPA. Note! If a student repeats a course that they previously passed, and fails the course, the failure takes precedence and the student has not completed the course requirements for graduation purposes.
- The course credit will count only once.
- Independent Study courses, courses taken on a P/NC basis, or courses taken at another institution cannot be used to replace the original course grade.
- Repeating a course for which a "WI" grade was originally received will not replace that grade in determining the GPA.

The recalculation of GPAs to account for repeated courses occurs at the end of the semester after all grades for all students have been processed.

How do undergraduates get involved in research? Can they? Do they all?
The best way to get involved in a research project is to approach instructors in classes you have or are taking. Visit their web sites and see what research they are working on to see if it interests you. Even if you can not find a project that interests you in your major field, you will find that faculty in all the Institute's schools conduct research and may need undergraduate researchers to assist them.

How do I get an internship?
Internships and Cooperative Education (Co-Op) are both managed by the Career Development Center. An important first step is to officially register in the co-op program. You will then have access to JobLink, the CDC's on-line recruiting system, where you can link to employers who are looking for co-op students, and read about those whose requirements you meet.

When should a co-op be taken?
Many courses in the some majors are offered only once a year and some courses have to be taken in sequence. Therefore, students going to Co-op require a careful planning. Probably the best time for students to go to Co-op would be the third year, either fall or spring.

Can freshmen have cars on-campus?
Parking is hard to find, and freshmen are not allowed to purchase Rensselaer parking passes. If you do choose to bring your car, you must park it on the street, which may be difficult. For more information, see http://www.rpi.edu/dept/parking/.

Will I have time for extracurricular activities?
Absolutely. Just do not overdo it by signing up for everything at once—academics come first. Extracurricular are a great place to meet people and relieve stress, so do not miss out.

Can I change my adviser?
Yes, go to the Associate Dean's Office in JEC 3018 to request a change.