



Rensselaer

School of Engineering

Mechanical,  
Aerospace, & Nuclear  
Engineering

Class of 2022

Advising Handbook

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## DEPARTMENT OF MECHANICAL, AEROSPACE AND NUCLEAR ENGINEERING (MANE)

The Department of Mechanical, Aerospace and Nuclear Engineering (MANE), is part of Rensselaer's School of Engineering (SOE). MANE offers three collaborative but distinct undergraduate programs leading to a Bachelor of Science degree: Mechanical Engineering (ME), Aerospace Engineering (AE), and Nuclear Engineering (NE).

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## CAREERS IN ENGINEERING

### Comparing Majors

Data on the career opportunities associated with each field of engineering can be obtained from the U.S. Department of Labor's Bureau of Labor Statistics web site: [www.bls.gov/ooh/Architecture-and-Engineering](http://www.bls.gov/ooh/Architecture-and-Engineering). The site provides information on the various fields of engineering and statistics concerning salary and an estimate of future job growth. Each field includes details on the work that each type of engineer does, the work environment, educational preparation, salary range, similar occupations, key characteristics of workers and occupations and contacts for more information.

### Careers in 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 will 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. (And head coach of an NFL football team.)

### Aeronautical/Aerospace Engineering at a Glance

Aeronautical engineers work on things like:

- Airplanes and helicopters
- Submarines and hydrofoils
- Rockets, lunar landers, Mars rovers
- Engines, high-speed trains and wind turbines

Aeronautical/Aerospace engineering disciplines include:

- Fixed-wing aircraft, rotary-wing aircraft
- Propulsion, spacecraft
- Light-weight structures and adaptive/smart structures
- Fluid mechanics and heat transfer
- High-performance computing

Graduates typically choose industry or government laboratory careers doing things like:

- High-speed aerodynamics
- High-temperature strength of jet engine blades
- Sale of aircraft and aircraft components

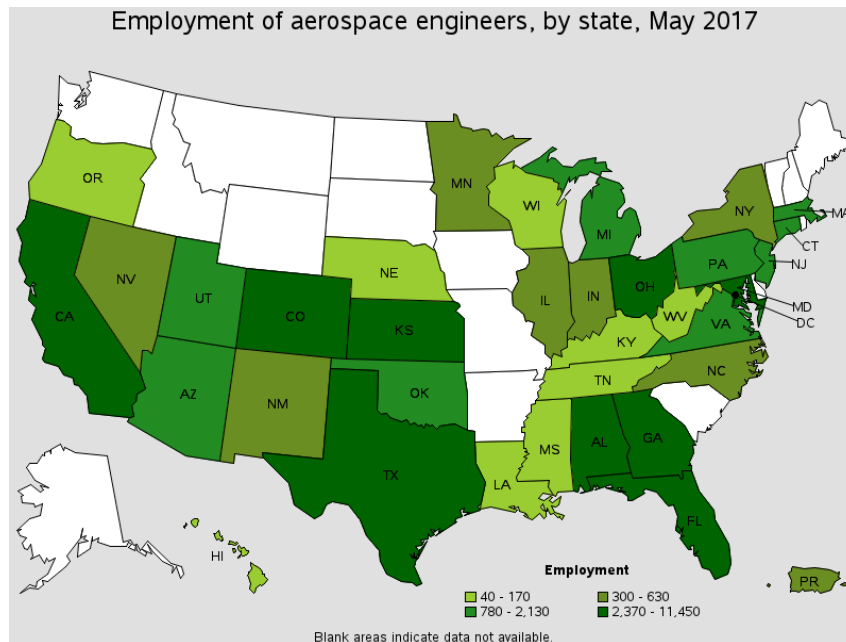
Graduates typically work for employers like:

Bell Helicopter  
Boeing  
Bombardier  
B. F. Goodrich  
Cessna  
General Electric

Gulfstream  
Honeywell  
JPL  
Lockheed-Martin  
NASA  
Northrop-Grumman

Orbital Sciences  
Pratt and Whitney  
Raytheon  
Rolls-Royce  
Sikorsky

Geographic profile for this occupation:



## Careers in 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, control systems, energy systems, manufacturing and design, or space technology. Many mechanical engineering graduates assume positions of management, while others prefer a career along technical lines.

## Mechanical Engineering at a Glance

Mechanical engineers work on things like:

- Automobiles, airplanes, and spacecraft
- Power plants and oil rigs
- Air conditioning and heating systems
- Designing mechanisms and analyzing machine dynamics



## Nuclear Engineering at a Glance

Nuclear engineers work on things like:

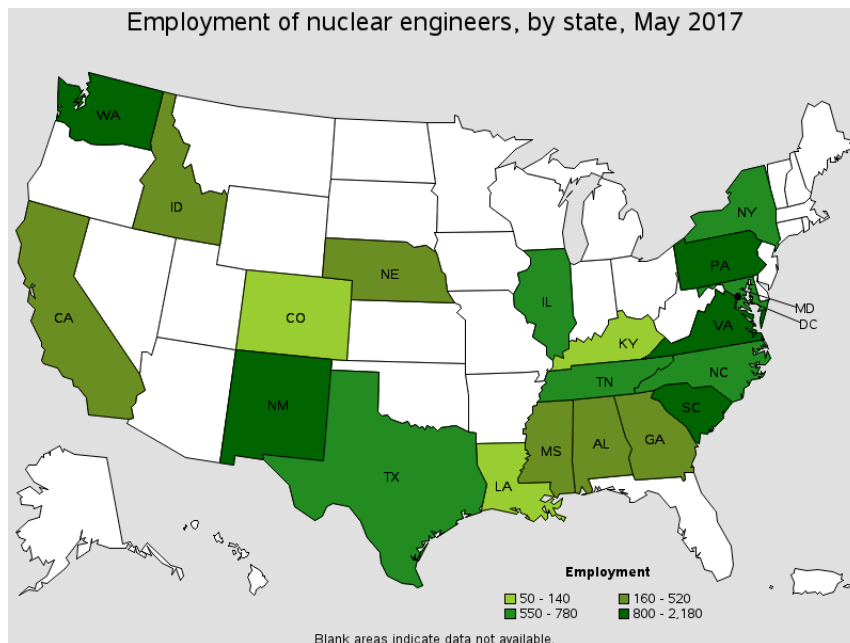
- Nuclear reactor engineering
- Health and medical physics
- Thermal-hydraulics
- Dosimetry
- Radiation transport
- X-ray production
- Neutron scattering

Nuclear engineering disciplines include:

- Nuclear energy production
- Health and medical physics
- Nuclear systems engineering
- Radiation technology

Graduates choose careers in:

- Electricity production
- Medical diagnostics and treatment
- Space and underwater propulsion
- Food safety
- Non-destructive testing for industry
- Mineral resource and geological exploration
- Carbon dating
- Art authentication





## THE ARCH

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

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

Students in the Class of 2022 will be required to participate in the Arch program in summer 2020. There is an [exception process](#) for athletes, ROTC, and a few other select cases.

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

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

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

### Academic Semester Experience

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

\* option for an "away" semester

## BACHELOR OF SCIENCE IN AERONAUTICAL ENGINEERING

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

FIRST YEAR					
	FALL (17 credits)	Credits		SPRING (17 credits)	Credits
ENGR-1100	Introduction to Engineering Analysis <sup>1</sup>	4	CHEM-1100	Chemistry I <sup>1</sup>	4
ENGR-1200	Engineering Graphics & CAD <sup>1,2</sup>	1	MANE-1060	Fundamentals of Flight <sup>4</sup>	1
MATH-1010	Calculus I	4	MATH-1020	Calculus II	4
PHYS-1100	Physics I	4	PHYS-1200	Physics II	4
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4
SECOND YEAR					
	FALL (16 credits)	Credits		SPRING (17 credits)	Credits
ENGR-1300	Engineering Processes <sup>1</sup>	1	ENGR-2600	Modeling and Analysis of Uncertainty <sup>1,6</sup>	3
ENGR-2530	Strength of Materials <sup>1</sup>	4	MANE-2110	Numerical Methods & Programming	3
MANE-2710	Thermodynamics <sup>1</sup>	3	MANE-2720	Fluid Mechanics	3
MATH-2400	Introduction to Differential Equations <sup>1</sup>	4	MATH-2010	Multivariable Calculus and Matrix Algebra	4
	SoE Engineering Design Elective <sup>1,5,6</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4
THIRD YEAR <sup>9</sup>					
	ARCH (16 credits)	Credits		FALL OR SPRING (16 credits) <sup>9</sup>	Credits
ENGR-2090	Engineering Dynamics <sup>4</sup>	4	MANE-4500	Modeling & Control of Dynamic Systems <sup>6</sup>	3
MANE-4060	Aerospace Structures and Materials	4	MANE-4900	Aeroelasticity and Structural Vibration	3
MANE-4070	Aerodynamics I	4	MANE-4910	Fluid Dynamics Laboratory <sup>8</sup>	2
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4	MANE-4920	Aerospace Structures and Controls Lab <sup>8</sup>	2
			STSS-4###	Professional Development II <sup>1,6,7</sup>	2
				Free Elective I <sup>6,9</sup>	4
FOURTH YEAR					
	FALL (16 credits)	Credits		SPRING (15 credits)	Credits
MANE-4080	Propulsion Systems	3	ENGR-4010	Professional Development III <sup>1</sup>	1
MANE-4510	Control Systems Laboratory <sup>1,8</sup>	2	MANE-4###	Capstone Design Elective <sup>9,12</sup>	3
MANE-4###	Computation Intensive Elective <sup>1,10</sup>	3	MANE-4###	Aerospace Technical Elective <sup>1,13</sup>	3
MANE-4###	Flight Mechanics Elective <sup>9,11</sup>	4		Free Elective III <sup>1</sup>	4
	Free Elective II <sup>1</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4

<sup>1</sup> These required courses may be taken in any order in the academic year shown (or in a previous year) given the pre-requisites are met.

<sup>2</sup> Choice of ENGR-1200 Engineering Graphics & CAD, ENGR-1400 Engineering Communication, or CIVL-1200 Engineering Graphics for Civil Engineers; EG&CAD is preferred for Aerospace Engineers.

<sup>3</sup> The five HASS Electives may be taken in any semester; it is recommended to schedule one in each of the first two semesters and at least one in the Arch summer term.

<sup>4</sup> Any 1 credit engineering exploration elective (e.g., "Introduction to [major]") may be substituted.

<sup>5</sup> Choice of ENGR-2050 Introduction to Engineering Design or MANE-2220 Inventor's Studio 1; both have Professional Development I embedded in them.

<sup>6</sup> These courses may be taken in the Arch Summer semester (if the summer schedule permits).

<sup>7</sup> 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.

<sup>8</sup> These three laboratory courses may be taken any semester in the junior or senior year, provided all prerequisites have been completed.

<sup>9</sup> Aeronautical Engineering students should start planning for their Flight Mechanics/Capstone track prior to the Arch summer. Those on the Space Flight track must take MANE-4100 Spaceflight Mechanics during spring semester of third year (in place of the free elective) to assure timely graduation.

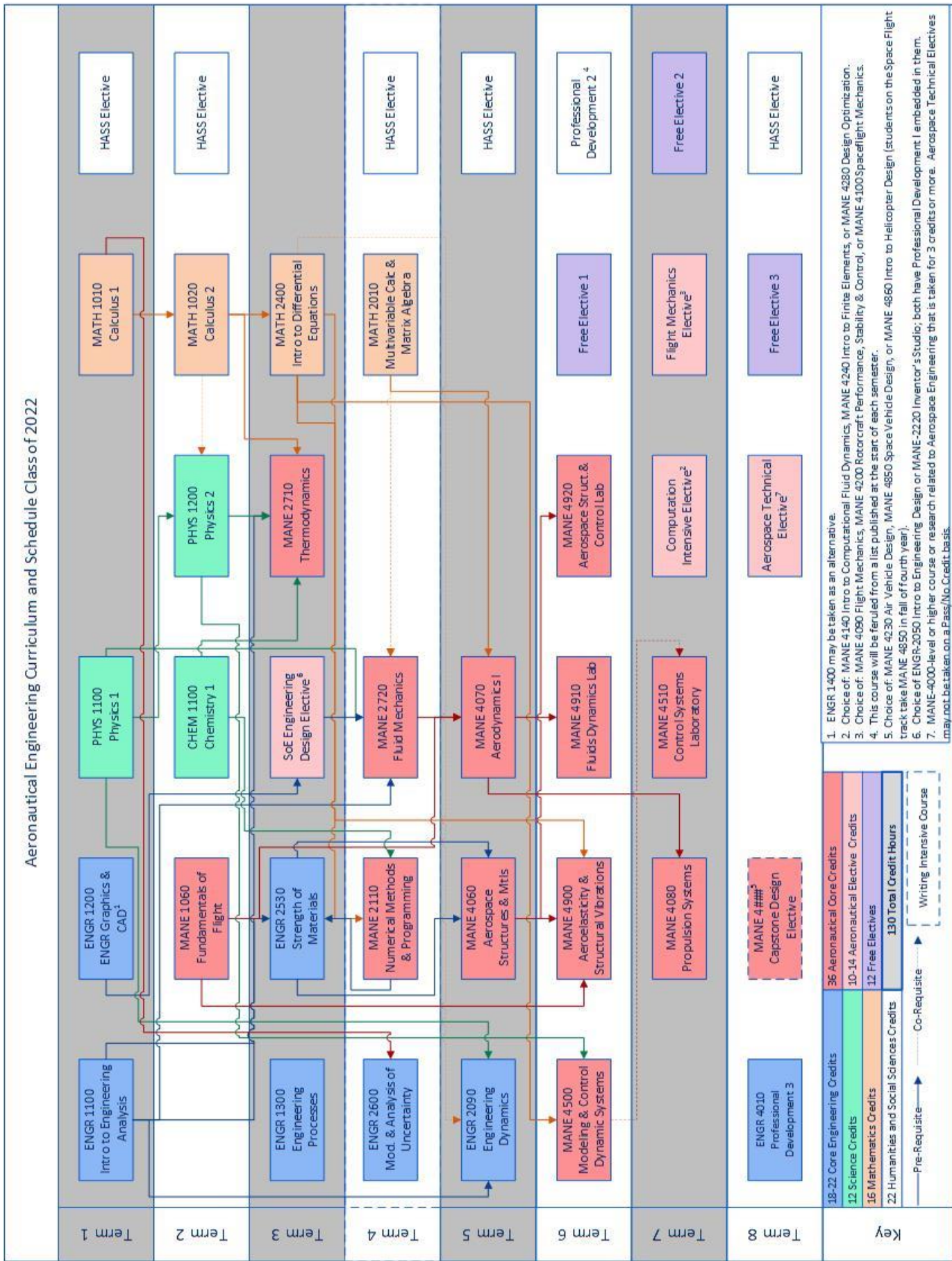
<sup>10</sup> Choice of MANE-4140 Intro to Computational Fluid Dynamics, MANE-4240 Intro to Finite Elements, or MANE-4280 Design Optimization.

<sup>11</sup> Choice of MANE-4090 Flight Mechanics, MANE-4200 Rotorcraft Performance, Stability, and Control, or MANE-4100 Spaceflight Mechanics (as noted, the latter must be taken in spring semester of third year to assure timely graduation).

<sup>12</sup> Choice of MANE-4230 Air Vehicle Design, MANE-4850 Space Vehicle Design, or MANE-4860 Introduction to Helicopter Design (students on the Space Flight track take MANE-4850 in fall of fourth year).

<sup>13</sup> Aerospace Technical Elective: The Aerospace Technical Elective is a MANE-4000-level or higher course or research related to Aerospace Engineering that is taken for 3 credits or more. Aerospace Technical Electives may not be taken on a Pass/No Credit basis.

# Aeronautical Engineering Curriculum and Schedule Class of 2022



1. ENGR 1400 may be taken as an alternative.
2. Choice of: MANE 4140 Intro to Computational Fluid Dynamics, MANE 4240 Intro to Finite Elements, or MANE 4280 Design Optimization.
3. Choice of: MANE 4080 Flight Mechanics, MANE 4200 Rotorcraft Performance, Stability & Control, or MANE 4100 Spaceflight Mechanics.
4. This course will be fulfilled from a list published at the start of each semester.
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).
6. Choice of ENGR-2050 Intro to Engineering Design or MANE-2220 Inventor's Studio; both have Professional Development I embedded in them.
7. MANE-4000-level or higher course or research related to Aerospace Engineering that is taken for 3 credits or more. Aerospace Technical Electives may not be taken on a Pass/No Credit basis.

## **Aeronautical Engineering Course Prerequisite Chart**

### **First Year Fall semester**

ENGR-1100	Introduction to Engineering Analysis No prerequisites
ENGR-1200	Engineering Graphics & CAD (or ENGR-1400 Engineering Communication) No prerequisite
MATH-1010	Calculus I No prerequisites
PHYS-1100	Physics I No prerequisites

### **First Year Spring semester**

CHEM-1100	Chemistry I No prerequisites
MANE-1060	Fundamentals of Flight No prerequisites
MATH-1020	Calculus II MATH-1010 Calculus I
PHYS-1200	Physics II PHYS-1100 Physics I

### **Second Year Fall semester**

ENGR-1300	Engineering Processes No prerequisite
ENGR-2530	Strength of Materials ENGR-1100 Introduction to Engineering Analysis
MANE-2710	Thermodynamics CHEM-1100 Chemistry I, ENGR-1100 Introduction to Engineering Analysis, MATH-1020 Calculus II*, PHYS-1200 Physics II*
MATH-2400	Introduction to Differential Equations MATH-1020 Calculus II*

### **Second Year Spring semester**

ENGR-2600	Modeling and Analysis of Uncertainty MATH-1010 Calculus I
MANE-2110	Numerical Methods and Programming CHEM-1100 Chemistry I, MATH-2400 Introduction to Differential Equations*
MANE-2720	Fluid Mechanics ENGR-1100 Introduction to Engineering Analysis, PHYS-1100 Physics I, MATH-2010/11 Multivariable Calculus* (co-requisite), MATH-2400 Introduction to Differential Equations* (co- requisite)
MATH-2010	Multivariable Calculus and Matrix Algebra MATH-1020 Calculus II*

### **Third Year Summer semester**

ENGR-2090	Engineering Dynamics ENGR-1100 Introduction to Engineering Analysis, PHYS-1100 Physics, MATH-2400 Introduction to Differential Equations* (co-requisite)
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- MANE-4060 Aerospace Structures and Materials  
ENGR-2530 Strength of Materials\*
- MANE-4070 Aerodynamics I  
ENGR-2250 Thermal and Fluids Engineering I\* OR MANE-2720 Fluid Mechanics\*, MANE-1060 Fundamentals of Flight

### **Third Year Fall or Spring semester**

- MANE-4500 Modeling and Control of Dynamics Systems  
MATH-2400 Introduction to Differential Equations\*, PHYS-1200 Physics II\*
- MANE-4900 Aeroelasticity and Structural Vibration  
MATH-2400 Introduction to Differential Equations\*, MANE-1060 Fundamentals of Flight, MANE-4060 Aerospace Structures and Materials\*
- MANE-4910 Fluid Dynamics Laboratory  
MANE-4070 Aerodynamics I\*
- MANE-4920 Aerospace Structures and Control Laboratory  
MANE-4060 Aerospace Structures and Materials\*

Professional Development II- A list of courses that satisfy the PDII requirement, can be found on SIS:

### **Fourth Year Fall semester**

- MANE-4080 Propulsion Systems  
MANE-2710 Thermodynamics\* AND MANE 2720 Fluid Mechanics\* OR MANE-4070 Aerodynamics I\* OR MANE-4010 Thermal and Fluids Engineering II\* OR MANE-4400 Nuclear Power Systems\*
- MANE-4510 Control Systems Laboratory  
MANE 4500 Modeling and Control of Dynamic Systems \* (co-requisite)

### **Fourth Year Spring semester**

- ENGR-4010 Professional Development III  
Student must have senior standing

### **Computation Electives**

- MANE-4140 Introduction to Computational Fluid Dynamics  
MANE-2110 Numerical Methods and Programming\*, MANE-2720 Fluid Mechanics\*
- MANE-4240 Introduction to Finite Elements  
ENGR-2530 Strength of Materials\* OR MANE-2720 Fluid Mechanics\*, MANE 2110 Numerical Methods and Programming\*
- MANE-4280 Design Optimization  
MANE 2110 Numerical Methods and Programming\*, MATH 2010 Multivariable Calculus and Matrix Algebra\*

### **Flight Mechanics Electives**

- MANE-4090 Flight Mechanics  
MANE-4500 Modeling and Control of Dynamic Systems\*, MANE-4070 Aerodynamics I\*
- MANE-4200 Rotorcraft Performance, Stability & Control  
MANE-4070 Aerodynamics I\*
- MANE-4100 Spaceflight Mechanics  
ENGR-2090 Engineering Dynamics\*, MATH-2400 Introduction to Differential Equations\*

### **Capstone Design Electives**

- MANE-4230 Air Vehicle Design  
MANE-4060 Aerospace Structures and Materials\*, MANE-4090 Flight Mechanics\*
- MANE-4850 Space Vehicle Design

Any Flight Mechanics Elective\*  
MANE-4860 Introduction to Helicopter Design  
MANE-4200 Rotorcraft Performance, Stability and Control\*

\*This course also has prerequisite requirements.

The Aerospace Technical Elective may have prerequisites; check the course catalog.

HASS courses and free electives may have prerequisites; check the course catalog.

## Additional Guidance for Building an Aeronautical Engineering Curriculum

- MANE's industrial advisors recommend students acquire more than the minimum communication skills required at Rensselaer. Thus, a *technical communication* course is recommended as a HASS elective. Examples include:

WRIT-1110 Writing for Classroom and Career

WRIT-4410 Research Writing

COMM-4420 *Foundations of HCI Usability*

COMM-4470 *Information Design*

COMM-4520 *Information Architecture*

Courses with related technical communication content include:

COMM-1510 Introduction to Communication Theory

COMM-2610 Introduction to Visual Communication

COMM-4460 Visual Design: Theory and Application

WRIT-2110 Rhetoric and Writing

WRIT-4160 Writing about Science

Please note that these courses are not offered every semester and there are not enough seats to accommodate all of the students who may wish to take them. Please do not stress out if you are unable to register for one of these courses. This recommendation is a suggestion, not a requirement. If you do take additional Communication Intensive courses, be sure to include those skills on your resume.

- Aerospace Engineers are more likely to use CAD skills in industry, so ENGR-1200 EG&CAD is recommended over ENGR-1400 Engineering Communication or CIVL-1200 Engineering Graphics for Civil Engineers, though any one of these is acceptable.
- Select a Computation Intensive Elective based on your interests and strengths. Finite Element methods (FEM) are primarily for structural analysis, though they are applied to fluid problems as well. Computational Fluid Dynamics (CFD) is focused on fluid systems analysis. Design Optimization methods are mathematical techniques used extensively in industry, and especially in the aerospace industry.
- Most aerospace companies are not concerned with which mechanics/capstone sequence you take as an undergraduate. It is for you to choose what path you are most passionate about and where your strengths are. Plan carefully, as the fixed-wing and rotorcraft paths are fall-spring, while the space path is spring-fall.

Eligible students who intend to become co-terminal students should begin to identify a graduate co-terminal advisor in the Junior year resident semester, and begin the application process at the beginning of their senior year.

- To reduce the course load in your graduate year, try to front-load at least one course applicable to your master's degree in your senior year. Many graduate courses are offered only every other year, so plan ahead for what courses to take in your senior and co-terminal years.
- Prior to registering for senior year courses, consult with your co-terminal master's advisor on the best use of the Aerospace Technical Elective in preparing for your graduate studies.
- Consider being resident for a summer to make progress on your master's thesis/project (though not taking any credits)

# BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

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

FIRST YEAR					
	FALL (17 credits)	Credits		SPRING (17 credits)	Credits
CHEM-1100	Chemistry I	4	ENGR-1300	Engineering Processes <sup>1</sup>	1
ENGR-1100	Introduction to Engineering Analysis <sup>1</sup>	4	ENGR-1600	Materials Science	4
ENGR-1200	Engineering Graphics and CAD <sup>1,2</sup>	1	MATH-1020	Calculus II	4
MATH-1010	Calculus I	4	PHYS-1100	Physics I <sup>1</sup>	4
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4
SECOND YEAR					
	FALL SEMESTER (17 credits)	Credits		SPRING (15 credits)	Credits
ENGR-2530	Strength of Materials <sup>1</sup>	4	ENGR-2300	Electronic Instrumentation <sup>6</sup>	4
MANE-2710	Thermodynamics <sup>1</sup>	3	MANE-2110	Numerical Methods and Programming	3
MATH-2400	Introduction to Differential Equations <sup>1</sup>	4	MATH-2010	Multivariable Calc & Matrix Algebra <sup>1,6</sup>	4
PHYS-1200	Physics II	4		SoE Engineering Design Elective <sup>1,5,6</sup>	4
STSS-4###	Professional Development II <sup>1,4</sup>	2			
THIRD YEAR					
	SUMMER (15 credits)	Credits		FALL OR SPRING (17 credits)	Credits
ENGR-2090	Engineering Dynamics	4	ENGR-2600	Modeling and Analysis of Uncertainty <sup>6</sup>	3
MANE-2720	Fluid Mechanics I	3	MANE-4020	Thermal and Fluids Lab <sup>7</sup>	2
MANE-4030	Elements of Mechanical Design	4	MANE-4040	Mechanical Systems Lab <sup>7</sup>	2
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4	MANE-4500	Modeling & Control of Dynamic Systems	3
			MANE-4730	Heat Transfer	3
				Free Elective I <sup>6</sup>	4
FOURTH YEAR					
	FALL SEMESTER (16 credits)	Credits		SPRING SEMESTER (15 credits)	Credits
MANE-4510	Control Systems Laboratory <sup>7</sup>	2	ENGR-4010	Professional Development III <sup>1,7</sup>	1
MANE-4###	Computational Elective <sup>1,9</sup>	3	MANE-4260	Multidisciplinary Capstone Design <sup>1,8</sup>	3
MANE-4###	Technical Elective <sup>1,9</sup>	3	####-4###	SoE Technical Elective <sup>1,9</sup>	3
	Free Elective II	4		Free Elective III	4
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4

1 These required courses may be taken in any order in the academic year shown (or in a previous year) given the pre-requisites are met.

2 Choice of ENGR-1200 Engineering Graphics & CAD, ENGR-1400 Engineering Communication, or CIVL-1200 Engineering Graphics for Civil Engineers; EG&CAD is preferred for Mechanical Engineers.

3 The five HASS Electives may be taken in any semester; it is recommended to schedule one in each of the first two semesters and one in the Summer Arch.

4 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. It must be completed before the capstone design course.

5 Choose from ENGR-2050 Introduction to Engineering Design and MANE-2220 Inventor's Studio I; both have Professional Development I embedded in them.

6 These courses may be taken in the Arch Summer semester (if the summer schedule permits).

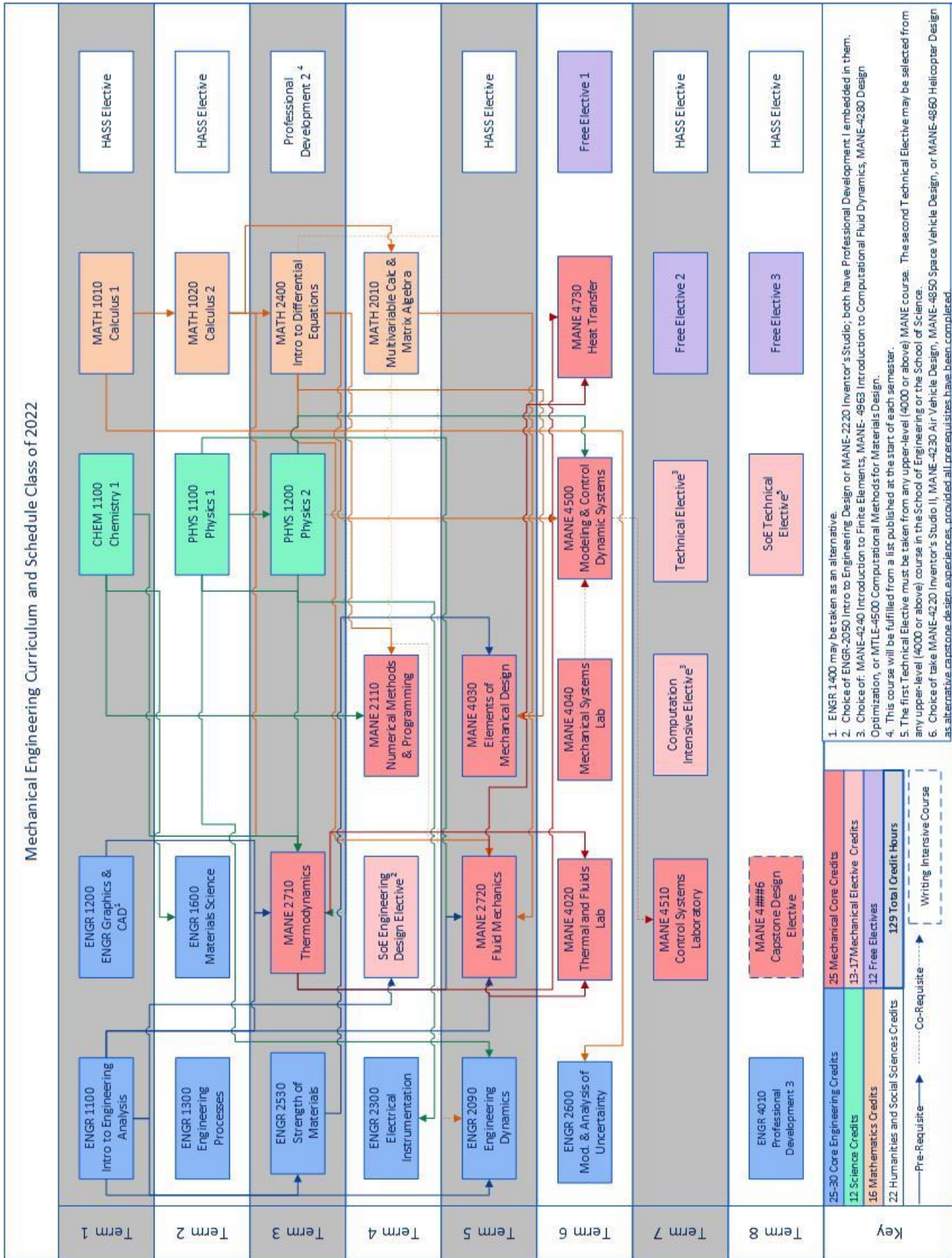
7 These laboratory courses may be taken any semester in the junior or senior year, provided all prerequisites have been completed.

8 Mechanical Engineering students may alternatively take MANE-4220 Inventor's Studio II, MANE-4230 Air Vehicle Design, MANE-4850 Space Vehicle Design, or MANE-4860 Helicopter Design as alternative capstone design experiences, provided all prerequisites have been completed.

9 Computation and Technical Electives The Computation Elective must be chosen from the following list of courses: MANE-4240 Introduction to Finite Elements, MANE- 4963 Introduction to Computational Fluid Dynamics, MANE-4280 Design Optimization, or MTL-4500 Computational Methods for Materials Design. The first Technical Elective must be taken from any upper-level (4000 or above) MANE course. The second Technical Elective may be selected from any upper-level (4000 or above) course in the School of Engineering or the School of Science. An independent study course, such as a design project or an undergraduate research project in the School of Engineering or the School of Science may also be used to satisfy this requirement. Computational and Technical Electives may not be taken on a Pass/No Credit basis.



## Mechanical Engineering Curriculum and Schedule Class of 2022



## Mechanical Engineering Course Prerequisite Chart

### **First Year Fall semester**

- CHEM-1100 Chemistry I  
No prerequisite
- ENGR-1100 Intro to Engineering Analysis  
No prerequisite
- ENGR-1200 Engineering Graphics & CAD (or ENGR-1400 Engineering Communication)  
No prerequisite
- MATH-1010 Calculus I  
No prerequisite

### **First Year Spring semester**

- ENGR-1300 Engineering Processes  
No prerequisite
- ENGR-1600 Materials Science  
CHEM-1100 Chemistry I
- MATH-1020 Calculus II  
MATH-1010 Calculus I
- PHYS-1100 Physics I  
No prerequisite

### **Second Year Fall semester**

- ENGR-2530 Strength of Materials  
ENGR-1100 Introduction to Engineering Analysis
- MANE-2710 Thermodynamics  
CHEM-1100 Chemistry I, ENGR-1100 Introduction to Engineering Analysis, MATH-1020 Calculus II\*, PHYS-1100 Physics I
- MATH-2400 Introduction to Differential Equations  
MATH-1020 Calculus II\*
- PHYS-1200 Physics II  
PHYS-1100 Physics I

Professional Development II- A list of courses that satisfy the PDII requirement, can be found on SIS:

### **Second Year Spring semester**

- ENGR-2300 Electronic Instrumentation  
PHYS-1200 Physics II\*
- MANE-2110 Numerical Methods and Programming  
CHEM-1100 Chemistry I, MATH-2400 Introduction to Differential Equations\*
- MATH -2010 Multivariable Calculus and Matrix Algebra  
MATH-1020 Calculus II\*

### **Third Year Summer semester**

- ENGR-2090 Engineering Dynamics  
ENGR-1100 Intro to Engineering Analysis, PHYS-1100 Physics I, MATH-2400 Intro to Differential Equations\* is a co-requisite
- MANE-2710 Fluid Mechanics  
ENGR-1100 Introduction to Engineering Analysis, MATH-2010/11 Multivariable Calculus\*,  
MATH-2400 Intro to Differential Equations\*, PHYS-1100 Physics I

MANE-4030 Elements of Mechanical Design  
MATH-2400 Introduction to Differential Equations\*, ENGR-2530 Strength of Materials\*

### **Third Year Fall or Spring semester**

ENGR-2600 Modeling and Analysis of Uncertainty  
MATH-1010 Calculus I

MANE-4020 Thermal and Fluids Engineering Laboratory  
MANE-2710 Thermodynamics\*, MANE-2720 Fluid Mechanics\*

MANE-4040 Mechanical Systems Lab  
(must be taken after or concurrent with MANE-4030 Elements of Mechanical Design\*)

MANE-4500 Modeling and Control of Dynamic Systems  
MATH-2400 Introduction to Differential Equations\*, PHYS-1200 Physics II\*

MANE-4730 Heat Transfer  
MANE-2710 Thermodynamics\*, MANE-2720 Fluid Mechanics\*

### **Fourth Year**

ENGR-4010 Professional Development III  
Student must have senior standing

MANE-4260 Design of Mechanical Engineering Systems  
Student must have senior standing

MANE-4510 Control Systems Laboratory  
(must be taken after or concurrent with MANE-4500 Modeling and Control of Dynamic Systems\*)

### **Computation Electives**

MANE-4140 Introduction to Computational Fluid Dynamics  
MANE-2110 Numerical Methods and Programming\*, MANE-2720 Fluid Mechanics\*

MANE-4240 Introduction to Finite Elements  
ENGR-2530 Strength of Materials\* OR MANE-2720 Fluid Mechanics\*, MANE 2110 Numerical Methods and Programming\*

MANE-4280 Design Optimization  
MANE 2110 Numerical Methods and Programming\*, MATH 2010 Multivariable Calculus and Matrix Algebra\*

MTLE-4500 Computational Methods for Materials Design  
MANE 2110 Numerical Methods and Programming\*  
Junior Standing

### **Capstone Design Electives**

MANE-4220 Inventor's Studio II  
ENGR-2050 Introduction to Engineering Design OR MANE-2220 Inventor's Studio I

MANE-4230 Air Vehicle Design  
MANE-4060 Aerospace Structures and Materials\*, MANE-4090 Flight Mechanics\*

MANE-4260 Multidisciplinary Capstone Design  
ENGR-2050 Introduction to Engineering Design OR MANE-2220 Inventor's Studio I  
Senior Standing

MANE-4850 Space Vehicle Design  
Any Flight Mechanics Elective\*

MANE-4860 Introduction to Helicopter Design  
MANE-4200 Rotorcraft Performance, Stability and Control\*

\*This course also has prerequisite requirements.  
The Technical Electives may have prerequisites; check the course catalog.  
HASS courses and free electives may have prerequisites; check the course catalog.

## Additional Guidance for Building a Mechanical Engineering Curriculum

- MANE's industrial advisors recommend students acquire more than the minimum communication skills required at Rensselaer. Thus, a *technical communication* course is recommended as a HASS elective. Examples include:

WRIT-1110 Writing for Classroom and Career  
WRIT-4410 Research Writing  
COMM-2961 Technical Writing in Print and Digital Media  
COMM-4420 Foundations of HCI Usability  
COMM-4470 Information Design  
COMM-4520 Information Architecture

Courses with related technical communication content include:

COMM-1510 Introduction to Communication Theory  
COMM-2610 Introduction to Visual Communication  
COMM-4460 Visual Design: Theory and Application  
WRIT-2110 Rhetoric and Writing  
WRIT-4160 Writing about Science

Please note that these courses are not offered every semester and there are not enough seats to accommodate all of the students who may wish to take them. Please do not stress out if you are unable to register for one of these courses: this recommendation is a suggestion, not a requirement. If you do take additional Communication Intensive courses, be sure to include those skills on your resume.

- Mechanical Engineers are more likely to use CAD skills in industry, so ENGR-1200 EG&CAD is recommended over ENGR-1400 Engineering Communication or CIVL-1200 Engineering Graphics for Civil Engineers, though any one of these is acceptable.
- Select a Computation Intensive Elective based on your interests and strengths. Finite Element methods (FEM) are primarily for structural analysis, though they are applied to fluid problems as well. Computational Fluid Dynamics (CFD) is focused on fluid systems analysis. Design Optimization methods are mathematical techniques used extensively in industry, and especially in the aerospace industry.
- Most companies are not concerned with which Capstone Design experience you take as an undergraduate. It is for you to choose what path you are most passionate about and where your strengths are.

Eligible students who intend to become co-terminal students should begin to identify a graduate co-terminal advisor in the Junior year resident semester, and begin the application process at the beginning of their senior year.

- To reduce the course load in your graduate year, try to front-load at least one course applicable to your master's degree in your senior year. Many graduate courses are offered only every other year, so plan ahead for what courses to take in your senior and co-terminal years.
- Prior to registering for senior year courses, consult with your co-terminal master's advisor on the best use of the Technical Electives in preparing for your graduate studies.
- Consider being resident for a summer to make progress on your master's thesis/project (though not taking any credits)

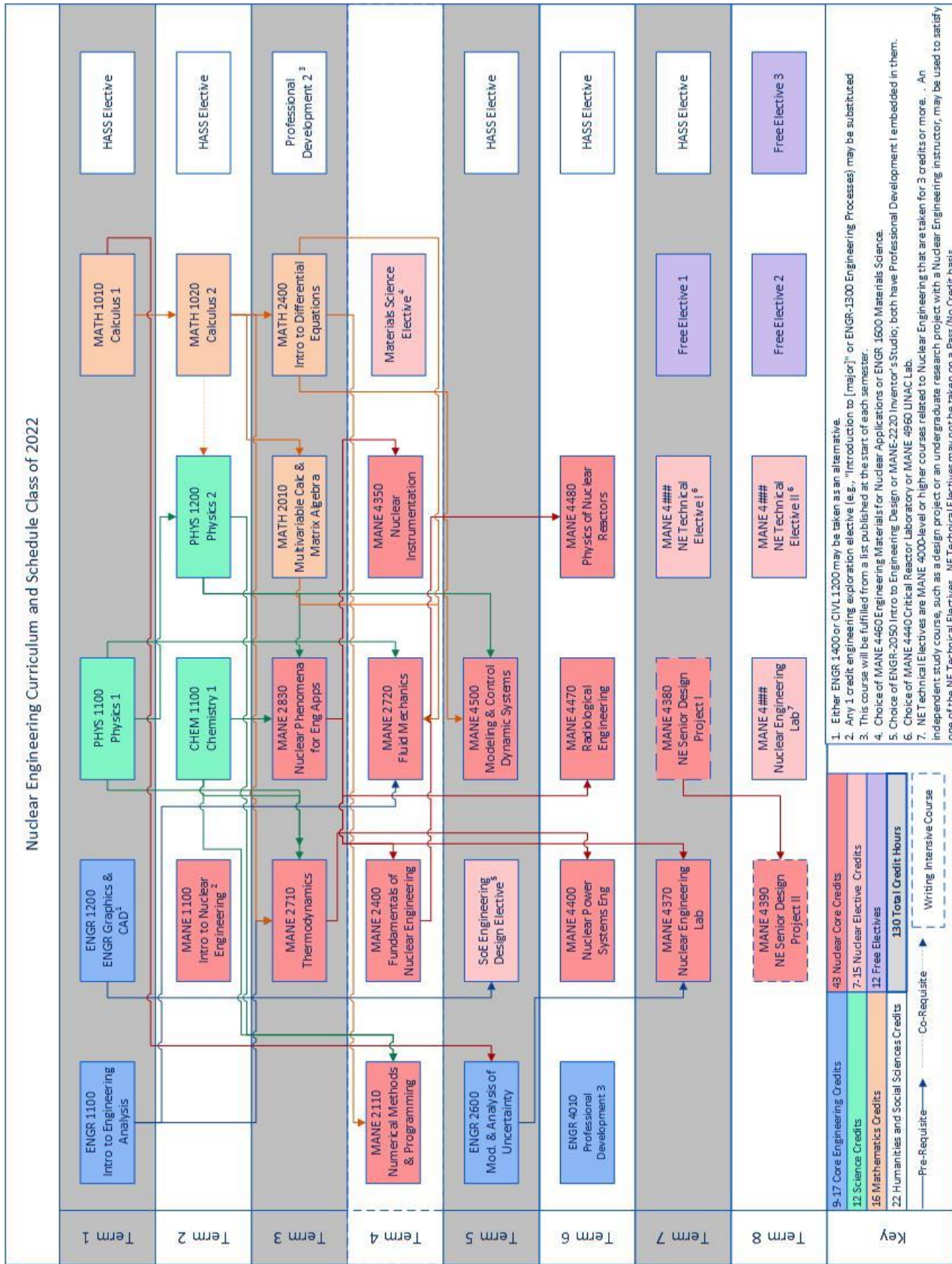
# BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING

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

FIRST YEAR					
FALL (17 credits)		Credits	SPRING (17 credits)		Credits
ENGR-1100	Introduction to Engineering Analysis <sup>1</sup>	4	CHEM-1100	Chemistry I	4
ENGR-1200	Engineering Graphics & CAD <sup>1,2</sup>	1	MANE-1100	Introduction to Nuclear Engineering <sup>4</sup>	1
MATH-1010	Calculus I	4	MATH-1020	Calculus II	4
PHYS-1100	Physics I	4	PHYS-1200	Physics II	4
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4		Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4
SECOND YEAR					
FALL (17 credits)		Credits	SPRING (17 credits)		Credits
MANE-2710	Thermodynamics <sup>1</sup>	3	MANE-2110	Numerical Methods & Programming <sup>1</sup>	3
MANE-2830	Nuclear Phenomena for Eng. Apps	4	MANE-2400	Fundamentals of Nuclear Engineering	4
MATH-2010	Multivariable Calc & Matrix Algebra <sup>1,5</sup>	4	MANE-2720	Fluid Mechanics <sup>1</sup>	3
MATH-2400	Introduction to Differential Equations <sup>1</sup>	4	MANE-4350	Nuclear Instrumentation & Measurement	3
STSS-4###	Professional Development II <sup>1,5,6</sup>	2		Materials Science Elective <sup>1,5,7</sup>	4
THIRD YEAR					
SUMMER (14 credits)		Credits	FALL (16 credits)		Credits
ENGR-2600	Modeling and Analysis of Uncertainty	3	ENGR-4010	Professional Development III <sup>5,9</sup>	1
MANE-4500	Modeling & Control of Dynamic Systems	3	MANE-4400	Nuclear Power Systems Engineering	4
	Engineering Design Elective <sup>8</sup>	4	MANE-4470	Radiological Engineering	3
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4	MANE-4480	Physics of Nuclear Reactors	4
			HASS	Hum., Arts or Soc. Sci. Elective	4
FOURTH YEAR					
FALL (17 credits)		Credits	SPRING (16 credits)		Credits
MANE-4380	NE Senior Design Project I	1	MANE-4390	NEEP Senior Design Project II	2
MANE-4370	Nuclear Engineering Lab	4	MANE-4###	NE Technical Elective II <sup>1,11</sup>	3
MANE-4###	NE Technical Elective I <sup>1,11</sup>	4	MANE-4###	Nuclear Engineering Lab II <sup>10</sup>	3
	Free Elective I <sup>1</sup>	4		Free Elective II <sup>1</sup>	4
	Hum., Arts or Soc. Sci. Elective <sup>3</sup>	4		Free Elective III <sup>1</sup>	4

1. These required courses may be taken in any order in the academic year shown (or in a previous year) given the pre-requisites are met.
2. Choice of ENGR-1200 Engineering Graphics & CAD, ENGR-1400 Engineering Communication, or CIVL-1200 Engineering Graphics for Civil Engineers.
3. The five HASS Electives may be taken in any semester; it is recommended to schedule one in each of the first two semesters and one in the Arch Summer
4. Any 1 credit engineering exploration elective (e.g., "Introduction to [major]" or ENGR-1300 Engineering Processes) may be substituted.
5. These courses may be taken in the Arch Summer semester (if the summer schedule permits).
6. 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.
7. Choose from MANE-4460 Engineering Materials for Nuclear Applications or ENGR-1600 Materials Science.
8. Choose from MANE-2220 Inventor's Studio I or ENGR-2050 Introduction to Engineering Design; both have Professional Development I embedded in them.
9. Students restricted from Arch (e.g., ROTC, certain athletes) will delay PD III until senior year, after the Professional Development I content in the Engineering Design Elective.
10. Choose from MANE-4440 Critical Reactor Lab or MANE-4960 LINAC Lab.
11. NE Technical Electives are MANE 4000-level or higher courses related to Nuclear Engineering that are taken for 3 credits or more. The NE Technical Electives allow you to focus on your technical interest or area of specialization within the Nuclear Engineering field. If you have questions regarding whether a specific course satisfies your NE Technical Elective requirements, please consult with your academic advisor. An independent study course, such as a design project or an undergraduate research project with a Nuclear Engineering instructor, may be used to satisfy one of the NE Technical Electives. NE Technical Electives may not be taken on a Pass/No Credit basis.

## Nuclear Engineering Curriculum and Schedule Class of 2022



## Nuclear Engineering Course Prerequisites

### **First Year Fall semester**

- ENGR-1100 Introduction to Engineering Analysis  
No prerequisite
- ENGR-1200 Engineering Graphics and CAD (or ENGR-1400 Engineering Communication)  
No prerequisite
- MATH-1010 Calculus I  
No prerequisite
- PHYS-1100 Physics I  
(MATH-1010 Calculus I is a co-requisite)

### **First Year Spring semester**

- CHEM-1100 Chemistry I  
No prerequisite
- MANE-1100 Introduction to Nuclear Engineering (or any 1-credit Engineering Exploration)  
No prerequisite
- MATH-1020 Calculus II  
MATH-1010 Calculus I
- PHYS-1200 Physics II  
PHYS-1100 Physics I

### **Second Year Fall semester**

- MANE-2710 Thermodynamics  
CHEM 1100 Chemistry 1, ENGR 1100 Intro to Engineering Analysis, MATH-1020 Calculus II\*,  
PHYS-1100 Physics I
- MANE-2830 Nuclear Phenomena for Engineering Applications  
PHYS-1100 Physics I, CHEM-1100 Chemistry I  
(MATH-2400 Introduction to Differential Equations\* is recommended but not required)  
(PHYS-1200 Physics II\* is recommended but not required)
- MATH-2010 Multivariable Calculus and Matrix Algebra  
MATH-1020 Calculus II\*
- MATH-2400 Introduction to Differential Equations  
MATH-1020 Calculus II\*

Professional Development II- A list of courses that satisfy the PDII requirement, can be found on SIS:

### **Second Year Spring semester**

- MANE-2110 Numerical Methods and Programming for Engineers  
CHEM-1100 Chemistry I, MATH-2400 Introduction to Differential Equations\*,  
PHYS-1200 Physics II\*
- MANE-2720 Fluid Mechanics  
ENGR-1100 Intro to Engineering Analysis, PHYS I Physics I, MATH 2010/11 Multivariable  
Calculus and Matrix Algebra\*, MATH-2400 Introduction to Differential Equations\*
- MANE-2400 Fundamentals of Nuclear Engineering  
MANE-2830 Nuclear Phenomena for Engineering Applications\*
- MANE-4350 Nuclear Instrumentation and Measurement  
MANE-2830 Nuclear Phenomena for Engineering Applications\*
- Materials Science Elective\*

### **Third Year Arch semester**

ENGR-2600 Modeling and Analysis of Uncertainty

MATH-1010 Calculus I

Engineering Design Elective\*

MANE-4500 Modeling and Control of Dynamic Systems

MATH-2400 Introduction to Differential Equations\*,

PHYS-1200 Physics II\*

### **Third Year Fall semester**

ENGR-4010 Professional Development III

No prerequisite

MANE-4400 Nuclear Power Systems Engineering

ENGR-2250 Thermal and Fluids Engineering\* OR MANE-2710 Thermodynamics\*

MANE-4470 Radiological Engineering

MANE-2830 Nuclear Phenomena for Engineering Applications\*

(MANE-4350 Nuclear Instrumentation and Measurement\* is recommended but not required)

MANE-4480 Physics of Nuclear Reactors

MANE-2400 Fundamentals of Nuclear Engineering\*

### **Fourth Year Fall semester**

MANE-4370 Nuclear Engineering Lab

ENGR-2600 Modeling and Analysis of Uncertainty\*, MANE-2830 Nuclear Phenomena for Engineering Applications\*

MANE-4380 NE Senior Design Project I

Prerequisite: permission of instructor

### **Fourth Year Spring semester**

MANE-4390 NE Senior Design Project II

MANE-4380 NEEP Senior Design Project I\*

\*This course also has prerequisite requirements.

The Technical Electives may have prerequisites; check the course catalog.

HASS courses and free electives may have prerequisites; check the course catalog



## Additional Guidance for Building a Nuclear Engineering Curriculum

- MANE's industrial advisors recommend students acquire more than the minimum communication skills required at Rensselaer. Thus, a *technical communication* course is recommended as a HASS elective. Examples include:
  - WRIT-1110 Writing for Classroom and Career
  - WRIT-4410 *Research Writing*
  - COMM-4420 *Foundations of HCI Usability*

Courses with related technical communication content include:

- COMM-1510 *Introduction to Communication Theory*
- COMM-2610 *Introduction to Visual Communication*
- COMM-4460 *Visual Design: Theory and Application*
- WRIT-2110 *Rhetoric and Writing*
- WRIT-4160 *Writing about Science*

Please note that these courses are not offered every semester and there are not enough seats to accommodate all of the students who may wish to take them. Please do not stress out if you are unable to register for one of these courses: this recommendation is a suggestion, not a requirement. If you do take additional Communication Intensive courses, be sure to include those skills on your resume.

Eligible students who intend to become co-terminal students should begin to identify a graduate co-terminal advisor in the Junior year resident semester, and begin the application process at the beginning of their senior year.

- To reduce the course load in your graduate year, try to front-load at least one course applicable to your master's degree in your senior year. Many graduate courses are offered only every other year, so plan ahead for what courses to take in your senior and co-terminal years.
- Prior to registering for senior year courses, consult with your co-terminal master's advisor on the best use of the Technical Electives in preparing for your graduate studies.
- Consider being resident for a summer to make progress on your master's thesis/project (though not taking any credits)

## HASS AND PD II – POLICIES FOR ENGINEERING STUDENTS

Engineering students at Rensselaer are required to successfully complete

- 20 credits of HASS (Humanities, Arts, 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 HASS Core requirement.

**Engineering Students shall distribute the 20 credits of HASS as follows.**

- A minimum of 8 credits of Humanities/Arts (see table below)
- A minimum of 8 credits of Social Science (see table below)
- At least 4 credits must be 4000+ level
- No more than 3 courses at the 1000 level (but note depth sequence and CI restriction below)
- No more than 4 credits can come from 1 credit courses (e.g. music ensemble)
- No more than 2 courses (8 credits total) can be from transfer courses (including AP/IB and study abroad classes)
- No more than 8 credits can be from Pass/No credit courses (note depth sequence and CI restriction below)

<b>Humanities:</b>	<b>Social Science:</b>
<b>ARTS</b> (Arts, Music)	<b>COGS</b> (Cognitive Science)
<b>COMM</b> (Communication & Media)	<b>ECON</b> (Economics)
<b>LANG</b> (Language)	<b>PSYC</b> (Psychology)
<b>LITR</b> (Literature)	<b>STSS</b> (Anthropology)
<b>PHIL</b> (Philosophy)	<b>STSS</b> (Sociology)
<b>STSH</b> (History)	<b>STSS</b> (Science & Technology)
<b>STSH</b> (Science & Technology)	
<b>WRIT</b> (Writing)	
<b>IHASS</b> (Interdisciplinary HASS)	<b>IHASS</b> (Interdisciplinary HASS)

A depth sequence of two courses, each of  $\geq 4$  credits, from the same area code (ARTS, COGS, etc., but not including IHSS) where a minimum of one course ( $\geq 4$  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). 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 HASS Core; that is, it may instead be an HASS CI course taken as a free elective

Enrolled Rensselaer students wishing to take a HASS course for credit at another institution must obtain prior approval for the course from the HASS Manager of Student Services or HASS Associate Dean. Applicants must furnish a syllabus for the proposed course (a catalog description is sometimes sufficient, but not always), and a completed copy of Rensselaer’s Transfer Credit Approval form 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.

Through careful planning and course selection, students may fulfill more than one requirement with a single course. For example, a 4000 level CI course can cover both the CI requirement and the 4000 level requirement. Another example is a 4000 level course that can satisfy the depth requirement as long as it shares the same prefix as another course at a lower level. However, even though a single course may be used to fulfill more than one requirement, Engineering students **MUST STILL** have 20 credits of HASS overall.

## **The 2-credits of PD II shall be satisfied as follows:**

The 2 credit course STSS -496# (number to be assigned each semester) specifically titled PD2 Tech Issues and Solutions, will satisfy the PD II requirement.

A 4-credit PD II alternate course at any level (2000-4000) 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 HASS. These credits:

- **cannot** count toward the 4000 requirement,
- **cannot** count toward the depth requirement,

However,

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

If a student transfers in a course that is in name and course number equivalent to a 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 of STSS -496# (number to be assigned each semester) course specifically titled PD2 Tech Issues and Solutions, they may furnish a syllabus of the transfer course and a completed copy of Rensselaer’s Transfer Credit Approval form to the Associate Dean of Engineering to apply for approval. Note that some courses in the Study Abroad program automatically satisfy the 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:** There are some nominal 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),
- 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  $\approx$  3 hours/week  $\Rightarrow$   $\sim$  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-1200 Engineering Graphics for Civil Engineers
  - ENGR-1300 Engineering Processes (if not required for your major)
  - ENGR-1700 Intro to Better World Engineering
  - ISYE-1100 Introduction to Industrial and Systems Engineering
  - MANE-1100 Introduction to Nuclear Engineering
  - MANE-1090 Introduction to Mechanics 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-2360 Roots of Africa Music Ensemble
- ROTC courses (USAF, USAR, USNA, up to six credits maximum)
- most one-credit topics courses (see <http://srf.s.rpi.edu/update.do?artcenterkey=305>)

<b>Checklist for HASS Core Requirements</b>		
	<b>Yes</b>	<b>No</b>
<b>Distribution Requirement</b>		
<b>Have you completed the Humanities distribution requirement?</b> (Minimum of 8 credits in courses with a Humanities and/or IHSS departmental prefix) <b>NOTE:</b> PD2 or alternative PD2 cannot be used		
<b>Have you completed the Social Sciences distribution requirement?</b> (Minimum of 8 credits in courses with a Social Science and/or IHSS departmental prefix) <b>NOTE:</b> PD2 or alternative PD2 cannot be used		
<b>Depth Requirement</b>		
<b>Have you completed two 4-credit HASS courses with the same departmental prefix, one of which is above the 1000 level?</b> Example COMM 1510 and COMM 2210 <b>NOTE:</b> Pass/No credit is not allowed Can be two courses at the 2000 level.		
<b>Communication Intensive (CI) Requirement</b>		
<b>Have you completed at least one HASS course designated as CI?</b> Courses designated as CI are listed online at <a href="https://sis/rpi.edu">https://sis/rpi.edu</a> <b>NOTE:</b> Transfer credit and Pass/No Credit are not typically allowed.		
<b>4000 Level Requirement</b>		
<b>Have you completed at least one 4 credit HASS course at the 4000 level?</b>		
<b>Restrictions: Are you meeting....</b>		
<b>A maximum of three 1000 level courses may be applied to the HASS Core</b>		
<b>A maximum of eight transfer/AP/IB credits may be counted towards the HASS core</b>		
<b>A maximum of two courses may be taken Pass/No Credit</b>		
<b>Have you completed a total of 24 credits of HASS courses?</b> <b>NOTE:</b> Engineering is 22 and Architecture is 20		
<b>If you have answered all of the questions with “Yes”, then you have met the HASS Core Requirements</b>		

## FRIENDLY ADVICE

The courses at Rensselaer are generally more intense and faster paced and expect a much higher level of problem solving than some students have been prepared for. **The primary responsibility for learning has shifted to you.**

When we say “problem solving”, we are in part referring to test questions. We refer to three types.

- The one you see coming: It’s very similar to homework problems you’ve been assigned, just with a few minor changes.
- The one you still see coming, but from a different direction: If the homework asked you  $2+2=?$ , the test may ask  $4-2=?$ .
- The one you’ll never see coming: It is a question like nothing you’ve seen before, and that’s the point. All that you’ve learned in the course has prepared you for the question, but the question itself is still completely new. What is being measured is: do you understand the material well enough that you understand how to apply it to completely new situations. That’s one of the skills that differentiates an engineer from Rensselaer. And there are companies that rely on it when they hire. First year classes don’t do this as much, but starting with sophomore classes like Thermal and Fluids Engineering I you must be prepared. **You must continuously learn how to learn.**

Try hard to not overload the number of credits needed in your last year: you will want time to look for a job that you will enjoy and that will value and reward you for your skills. Utilize your advisor, they are here to ensure that you have the best, well-rounded college experience possible.

And please take good care of yourself. **Eat right, get plenty of exercise, and get enough sleep.**

## EMAIL ETIQUETTE

In today’s world, email plays a major role in communication with faculty and staff at RPI. Remember email is a reflection of who you are. If your email is disorganized and filled with mistakes, your recipient will likely think of you as disorganized and careless. Below are some tips to create effective emails:

- Be sure to begin all emails with a greeting like Dear Professor Smith, or Ms. Crandall.
- DO NOT WRITE YOUR EMAILS IN CAPITALS, they present an ANGRY tone.
- Introduce yourself. Don’t assume that your recipient remembers meeting you, offer a reminder of who you are.
- Include the message thread so your recipient can read the history of the conversation without having to search their inbox.
- Keep your correspondence short. Clearly state the intentions of your email in a sentence or two.
- Avoid replying with a one word response. Be sure to reread the original email to make sure you have answered all questions.
- Avoid personal attacks on email.
- Reply in a reasonable amount of time. Responding within 24 hours is preferable considering students are expected to check their email daily.
- Reply all should only be used when you HAVE to include everyone in your reply.
- Always, always, always reread your email before clicking “send”.

# ENGINEERING PROGRAM REQUIREMENTS

## Bachelor's Degree Requirements and Academic Policies

In addition to understanding the requirements of your academic major, you'll want to familiarize yourself with the Bachelor's degree requirements and the academic policies that apply to Rensselaer Undergraduates. That information can be found in the section of the online course catalog titled "Academic Information and Regulations" here: [catalog.rpi.edu](http://catalog.rpi.edu).

## The Advising Process

### The HUB

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

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

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

The Advising Hub will offer academic support to students through the end of the fall semester of their sophomore year. At that time, students will transition to a faculty advisor specific to the student's major. The faculty advisor will then contribute to the student's academic success by offering valuable perspective on internships, research and job prospects in addition to graduation requirements.

The Advising Hub hours are Monday, Tuesday, Thursday, and Friday 9am-4pm, by appointment.

Walk-in Wednesdays offer 20 minute meetings with no appointment necessary.

## Academic Advisors

Beginning with the fourth semester, each undergraduate student is assigned an academic advisor who is a faculty member in the MANE department. You should meet with your advisor once per semester to review and approve your course schedule before registration. But there are many more reasons to establish a good relationship with your academic advisor! Advisors can clarify degree requirements, help you develop an educational plan to serve your career goals, recommend specific courses, and refer you to sources of additional help on campus, such as career information, study skills, time management, and research opportunities.

Establishing an informal student-faculty contact can enhance the quality of your undergraduate experience, so it's very important that you get to know your advisor. Course offerings and curriculum requirements

sometimes change, so it's very important that you meet with your advisor on a regular basis to discuss any possible changes to your undergraduate plan of study and to stay on track for your degree. What's more, regular contact with your advisor can help provide a good source for recommendations later in your career.

### **MANE Office of Undergraduate Student Services**

In addition to your academic advisor, the MANE Office of Undergraduate Student Services can assist you with many advisement and registration-related tasks. Our office provides all necessary Registrar forms and can help you complete them. We provide assistance with Registration issues; help with curriculum and course selection. If, after using this booklet, you still have questions or concerns or just want to know more about how we can help you, stop by JEC 2012 to say hello.

### **Student Advisor Meeting (SAM) Holds**

Students are required to meet with their faculty advisor at least once per year. If you do not meet with your advisor once per year, a Student Advisor Meeting (SAM) hold will be placed on your account and you will be prevented from registering. To resolve this situation, contact your academic advisor immediately. \

### **Registrar's Holds**

Please contact MANE Student Services if you have a Registrar's hold, a financial hold, or some other hold and need to take certain MANE courses in order to graduate on time. We need to make sure we save you a slot in those classes. This is especially true for the laboratory courses, where enrollment is more limited.

### **Degree Works**

Your Degree Works worksheet 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 Degree Works via the main menu of the [Student Information System \(SIS\)](#).

### **Additional Advising Resources**

Advising and Learning Assistance Center: [alac.rpi.edu](http://alac.rpi.edu)

Center for Career and Professional Development: [www.rpi.edu/dept/cdc](http://www.rpi.edu/dept/cdc)

Course Catalog: [www.rpi.edu/academics/catalog](http://www.rpi.edu/academics/catalog)

International Programs: <https://info.rpi.edu/international-programs>

Registrar Forms: [srfs.rpi.edu/update.do](http://srfs.rpi.edu/update.do)



## **COURSE REGISTRATION**

### **When to Register**

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. A few weeks before registration begins, you will receive an email with a “time ticket” that explains when you should register for your courses. Time tickets are explained in detail below.

### **How to Register**

Use the Student Information System (SIS) to register for your courses. You can find details about each course in the online course catalog: [catalog.rpi.edu](http://catalog.rpi.edu).

### **Where to Register**

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

### **Registration Time Tickets**

Each semester you are issued a "time ticket," which designates 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 a few weeks before registration. This e-mail message also notifies you of any issues, including a SAM hold, which may prevent you from registering. If there is any kind of registration hold on your account, you will need to resolve the issue before registering for courses.

Your registration time is assigned based on your class standing, which is determined by the number of credit hours you have earned (see below). Classes that are still in progress, courses that have been graded as "incomplete," transferred courses and Advanced Placement (AP) credits do not count toward earned credits.

### **School of Engineering Class Standing by Credit Hours Earned**

Freshman: 0 – 30 credits  
Sophomore: 31 – 60 credits  
Junior: 61 – 95 credits  
Senior 96 – 128 credits

### **If a Course You Need is Full**

The MANE department staff does its best to anticipate the number of seats needed for each course. However, high demand and classroom size restrictions sometimes result in a course being closed. Students are NOT prevented from graduating on time due to closed sections of courses! We use a wait list system to ensure fairness, and we prioritize those students who need a course to graduate on time. If you are unable to register for a course because it is full, please contact the appropriate staff member to be put on the waiting list. For CORE Engineering courses (course prefix ENGR), an online wait list is utilized. For MANE courses, stop by the Office of Undergraduate Student Services in JEC 2012. Please include your name, RIN, CRN, course number, section number, and course name for the courses you want to be put on the wait list for. For courses with multiple sections, list your preferred sections in descending order of preference. If you need to drop a course to make room for a course you hope to add, you must indicate that in your email.

## ADDITIONAL DEGREE OPTIONS

### Academic Minors

Minors are NOT available in either Mechanical Engineering or Aeronautical Engineering. Students interested in a minor in Nuclear Engineering may choose a minor focused on either Reactor Engineering or Medical Applications of Radiation Technology. For detailed information on Nuclear Engineering minors, please contact Professor Bimal Malaviya, Degree Clearance Officer for Nuclear Engineering.

### Double Degrees

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

### Dual Majors

Dual major programs lead to a single baccalaureate degree embracing two fields. There are several special programs that can be completed in eight semesters. Undergraduate students who fulfill all the degree requirements for two curricula and who have met the conditions below will receive one diploma noting both majors.

- Dual major students may be assigned an adviser in each department who will monitor progress towards degrees in that department. In some cases only one advisor is assigned (e.g., when both majors are within the same department, such as Mechanical and Aeronautical Engineering).
- The degree clearance officer in the department will certify that the student has met the degree requirements in that department.
- The 24- credit-hour mathematics/science requirement and the 24-credit-hour Humanities and Social Sciences (HASS) requirement will satisfy the Institute requirements for both majors.

The MANE Department currently has guidance for the following dual majors:

- Aeronautical Engineering and Mechanical Engineering
- Mechanical Engineering and Electrical Engineering
- Mechanical Engineering and Nuclear Engineering
- Mechanical Engineering and Design, Innovation, and Society
- Mechanical Engineering and Management
- Nuclear Engineering and Applied Physics
- Nuclear Engineering and Environmental Engineering

Please note that these are not the only possible dual degree combinations; these are simply the dual degrees for which we have already developed templates. If you wish to pursue a different dual major, you should first consult with your MANE academic advisor. If the second major is through another department, you will also need to consult an advisor in that department. Ideally, dual degree advisement should be completed during the first year to maximize the possibility of completing the dual degree in the minimum number of semesters.

## MORE WAYS TO ENHANCE YOUR UNDERGRADUATE STUDIES

There are many ways to enhance your academic, career and social options during your four years on campus. Here are some of them.

### International Programs: Study Abroad

The Study Abroad opportunity available at Rensselaer is an excellent experience for both professional and personal growth, and the department fully supports students wishing to take advantage of this wonderful opportunity. Information on the various Study Abroad programs, application materials, and Frequently Asked Questions are available through the Office for International Programs. More information can be found here: <https://info.rpi.edu/international-programs>. Professor Catalin Picu ([cpicu@scorec.rpi.edu](mailto:cpicu@scorec.rpi.edu)) is the Study Abroad contact for the MANE Department.

When considering Study Abroad options, planning is required to minimize the impact on the graduation plans of the participant. In most situations, the time away does not delay graduation. Depending on your AP and transfer credit amounts, your choice of major, dual major or co-terminal plans, and in consultation with your academic advisor, you may choose to study abroad either in your sophomore year or junior year.

For MANE-specific course equivalents, please check the “Transfer Equivalency Catalog” listing, which can be found on the Log In page of the Student Information System (SIS): [sis.rpi.edu](http://sis.rpi.edu).

- Students are encouraged to choose from this list of pre-approved courses. If you are considering coursework that does not appear on the pre-approved list, please provide the course description from the university abroad and if possible a syllabus for that course. A prior approval form has to be completed and signed by the International Adviser of the Department. The forms are available on the Registrar’s website or from the MANE Office of Undergraduate Student Services in JEC 2012.
- In addition, students may transfer courses that will be used as Free Electives or Humanities and Social Sciences courses. Students are encouraged to take abroad Humanities and Social Science (HASS) courses or free electives which are above the 1000 level here at RPI. Courses that the host university considers to be junior level or senior level courses can usually be transferred in to RPI.

Note: the system at RPI is based on 4 credit hour courses while many foreign universities rely on 3 credit courses so one can wind up one credit short per course. Therefore, you may wind up taking two courses to fill the credit hour requirement for one course at RPI with the extra credits going to “Free Elective” as a split course on the Degree Works worksheet. Additional HASS credits may also come from 4-credit PD II alternate courses (two credits to PD II, one or two to HASS, and any remaining to free electives); however, these credits must satisfy the requirements for HASS courses (e.g., if a 1000-level PD II alternate is taken but you have already taken the maximum number of 1000-level courses/credits, then these credits cannot count toward HASS requirements). In all cases, prior approval of transfer credit is encouraged and from a student perspective, this prior approval is the “guarantee” they should have that coursework taken abroad will count towards their graduation requirements at RPI.

### Undergraduate Research Project (URP)

Rensselaer's Undergraduate Research Program (URP) provides practical, hands-on research experience. Through this unique program, you have the opportunity to work directly with a faculty member on their research project. It’s a great resume-builder! Here’s how to find a URP opportunity:

- 1) Find a professor whose research interests you. You can start by checking out the faculty and research pages of the MANE department’s website: [mane.rpi.edu](http://mane.rpi.edu)

Some faculty members have their own homepages with more detail about their work. Do your homework and familiarize yourself with their research before you approach them.

- 2) Once you have picked someone you would like to work with, go to see them during their office hours or email them to make an appointment.
- 3) When you meet with the professor, think of it as a job interview! Bring your resume and your transcript and be prepared to talk about why you're interested in their research and how your interests and experience can contribute to the project.
- 4) Once a faculty member agrees to have you work with them, the MANE Student Services Office in JEC 2012 to complete the URP paperwork.
- 5) URPs can be done for pay or for credit. Additional information about the program and downloadable application forms may be found on the Office of Undergraduate Education web site:  
<https://info.rpi.edu/undergraduate-research>

## Research

MANE offers a wide range of disciplines that are flexible to accommodate individual interests. Research interests include:

### Mechanics and Materials

*Research areas:* Acoustics, Multi-body dynamics; Fatigue and fracture processes; Friction and wear; Biomechanics; Plasticity; Composites; Microelectric materials; Materials under extreme loading conditions; Irradiation hardening; Nanomechanics of materials; Multiscale computational methods.

*Participating faculty:* Kurt Anderson, Terry Blanchet, Suvranu De, Nikhil Koratkar, Jie Lian, Emily Liu, Antoinette Maniatty, Catalin Picu, Henry Scarton, Mark Shepherd, John Tichy, Daniel Walczyk, and Lucy Zhang.

### Thermal and Fluids Engineering

*Research areas:* Energy efficiency and sustainability; Advanced microfluidics for thermal management; System level thermal management, heat conduction and solid-state thermoelectric energy conversion in nanostructured materials; Nanoscale thermal metrology; Interfacial heat transfer; Convection and phase-change in microchannels; Structured surfaces for enhanced heat transfer; Nanostructured thermal interface materials; Thermal energy storage materials; Heat generation and dissipation in radio frequency heated magnetic nanoparticles; Microsystems for energy harvesting; Plasmonic nanoparticles spectrally coupled with luminescent solar concentrators; Loop heat pipes; and Combustion.

*Participating faculty:* Theo Borca-Tasciuc, Diana Andra Borca-Tasciuc, Amir Hirsu, Jie Lian, Matthew Oehlschlaeger, Zvi Rusak, Henry Scarton, Richard Smith, Lucy Zhang, and Wei Zhou.

### Design and Manufacturing

*Research areas:* Design methodology in general and mechanical engineering design techniques in particular; Tribology; Metrology; Rapid prototyping; Flexible manufacturing; Micro/nano-scale manufacturing (subtractive and additive techniques); Process modeling; Material design for manufacturing; Sustainable manufacturing; Fiber-composite processing; Fuel-cell manufacturing; Bio-medical manufacturing; New manufacturing techniques; Operation of manufacturing facilities; CAD/CAM; Diagnostic and controls.

*Participating faculty:* Terry Blanchet, Antoinette Maniatty, Sandipan Mishra, Johnson Samuel, Daniel Walczyk, and John Wen.

### Dynamics and Controls

*Research areas:* Adaptive and Smart Optics Systems; Intelligent Building Systems; Control of Micro/Nano-scale Manufacturing; Learning Control Systems; Nonlinear, Robust and Adaptive Control, Human-in-the-loop Control Design.

*Participating faculty:* Kurt Anderson, Mamadou Diagne, Fotis Kopsaftopoulos, Sandipan Mishra, and John Wen.

### Fluid Dynamics/Aerodynamics

*Research areas:* Experimental, Numerical, and Theoretical fluid mechanics; Advanced Aerodynamic Flow Control techniques, Passive and Active; Aerodynamics of low, moderate, and high Reynolds number flows; Manned and unmanned aerial vehicle aerodynamics; Acoustics and vibrations; Compressible flows; Wind energy, Biofluids; Interfacial Hydrodynamics.

*Participating faculty:* Michael Amitay, Jason Hicken, Amir Hirsa, Zvi Rusak, Onkar Sahni, Henry Scarton, John Tichy, and Lucy Zhang.

### Advanced Structures/Materials

*Research areas:* Active structures, morphing structures, cellular structures, structures with integrated damping capability, energy absorption capability; Advanced materials including piezoelectric materials, shape memory alloys and polymers, electrorheological and magnetorheological fluids, nano-materials; Advanced composites, bio-composites; Advanced structural analysis methods, nonlinear aeroelasticity, nonlinear multi-body dynamics; and Computational structural dynamics.

*Participating faculty:* Farhan Gandhi, Prabhat Hajela, Jason Hicken, Fotis Kopsaftopoulos, Nikhil Koratkar, Emily Liu, and Daniel Walczyk.

### Optimization

*Research areas:* Multidisciplinary design optimization; Aerodynamic shape optimization; Trajectory optimization; Optimization under uncertainty; Inverse problems and model reduction.

*Participating faculty:* Prabhat Hajela, Jason Hicken, and Onkar Sahni.

### Space

*Research areas:* Spacecraft trajectory control optimization; Spacecraft relative motion optimization; Alternative ways to optimize propellant consumption relying on atmospheric differential drag; Large flexible spacecraft dynamics and control; Space vehicle control; Fluid dynamics in microgravity; Thermal management in microgravity.

*Participating faculty:* Kurt Anderson, John Christian, and Amir Hirsa.

### Combustion/Propulsion

*Research areas:* Fuel chemistry; Optical diagnostics; Solid propellants; Spray combustion; Nano-energetics; Swirl-stabilized combustion; Transonic combustion.

*Participating faculty:* Matthew Oehlschlaeger and Zvi Rusak.

### Nuclear Power Systems

*Research areas:* Novel reactor design concepts; Nuclear safety/risk analysis/emergency preparedness; Nuclear thermal hydraulics; Fuel cycle (spent fuel storage, geological repository, re-processing); Fuel design and performance; Nuclear data instrumentation and detector development; Computational methods (neutronics analysis, multi-physics, and multi-scale modeling); Nuclear fusion and energy policy.

*Participating faculty:* Yaron Danon, Wei Ji, Hyun Kang, Emily Liu, Jie Lian, Michael Podowski, Bimal Malaviya, and George Xu.

### Applied Radiation Technologies

*Research areas:* Accelerator physics; Neutron, x-ray, and light scattering physics and experiments; Radiation detection and measurement; Novel radiation sources, Nuclear cross-section data measurement and analysis; Nuclear non-proliferation.

*Participating faculty:* Yaron Danon, Wei Ji, Emily Liu, and George Xu.

### Radiation Protection, Medical and Industrial Uses of Radiation

*Brief description:* Radiation dosimetry; Imaging and radiotherapy of cancer; Medical isotope production; Non-destructive testing (civil engineering materials, oil exploration)

*Participating faculty:* Yaron Danon, Wei Ji, and George Xu.

### Nuclear Materials

*Brief description:* Radiation interaction and radiation effects; Advanced nuclear fuels and structural materials; Aging management; Materials for nuclear waste management; Nanostructured materials for nuclear applications.

*Participating faculty:* Jie Lian and Emily Liu.

## **Cross-Cutting Research Areas**

### Energy Science and Engineering

*Brief description:* This cross-cutting research theme is centered around clear common interests in energy efficiency, energy storage, energy harvesting, and thermal controls. It builds on the strong expertise in fundamental thermal sciences and engineering across multiscales, thermal metrology, nanostructured materials, electrochemical energy storage, and microsystem fabrication technologies.

*Participating faculty:* Theo Borca-Tasciuc, Diana Andra Borca-Tasciuc, Jason Hicken, Wei Ji, Nikhil Koratkar, Jie Lian, Emily Liu, Matthew Oehlschlaeger, Michael Podowski, Zvi Rusak, Onkar Sahni, Mark Shepherd, Richard Smith, John Tichy, and Lucy Zhang.

### Materials, Materials Processing and Controls

*Brief description:* MANE faculty are engaged in high impact interdisciplinary research in materials, manufacturing and controls as well as research that effectively links the three disciplines to come up with system level solutions to important technological problems. The research interests of the faculty includes materials for energy, nano-materials, nano composites, nanoscale heat transfer, thermoelectrics, nano-mechanics, fiber-reinforced composites, additive manufacturing, non-linear controls, micro-machining, spaceflight control, tribology, non-linear dynamics, nuclear materials, bio-materials, smart materials, adaptive structures, and computational nano and bio mechanics.

*Participating faculty:* Kurt Anderson, Terry Blanchet, Diana Andra Borca-Tasciuc, Theo Borca-Tasciuc, Suvranu De, Farhan Gandhi, Jason Hicken, Amir Hirsa, Nikhil Koratkar, Jie Lian, Antoinette Maniatty, Sandipan Mishra, Catalin Picu, Johnson Samuel, Mark Shepherd, Daniel Walczyk, and John Wen.

### Human Health and Safety

*Brief description:* This cross-cutting research theme is centered around common interests in biomechanics, virtual surgery, radiation dosimetry, medical robotics, biomechanical imaging, experimental nano-bio-science, and biotechnology.

*Participating faculty:* Diana Andra Borca-Tasciuc, Suvranu De, Amir Hirsa, Antoinette Maniatty, Sandipan Mishra, Emily Liu, John Tichy, George Xu, and Lucy Zhang.

## **Five Year Co-terminal Degree Program**

One of the best ways to increase the value of your undergraduate program study is through the MANE co-terminal degree program. Graduate degrees have become more essential in the workplace, and the five-year co-terminal program allows you to earn your Bachelor's degree *and* your Master's degree in only five years. Degrees can be earned in the same or in different academic disciplines, and financial assistance is available for all five years. And there's no GRE requirement!

In addition to offering increased academic and professional options when you graduate, a Master's program can serve as an introduction to the type of academic research undertaken by doctoral students. If you're not sure whether academic research is the right path for you, a Master's program is a great way to test the waters.

For more information about the MANE co-terminal program, contact Beth Ann Macey in the Graduate Student Services Office in JEC 2002. Beth Ann can be reached at 276-2031 or [maceyb2@rpi.edu](mailto:maceyb2@rpi.edu).

## **Center for Career and Professional Development**

The Center for Career and Professional Development (CCPD) can assist with everything from creating a résumé and polishing job interview skills to researching career options and identifying potential employers. The CCPD offers a comprehensive program of career and professional development activities, co-op, internship, and full-time job search activities to both undergraduate and graduate students. Visit their web site for more information: [www.rpi.edu/dept/cdc](http://www.rpi.edu/dept/cdc)

## **Professional & Student Organizations**

### **Alpha Nu Sigma**

The objective of the Alpha Nu Sigma Society is to recognize high scholarship, integrity, and potential achievement in applied nuclear science and nuclear engineering among outstanding students by means of membership in the Society.

### **American Nuclear Society (ANS)**

The American Nuclear Society is a not-for-profit, international organization dedicated to promoting the advancement of nuclear science, engineering, and technology. ANS serves its members in their efforts to develop and safely apply nuclear science and technology for public benefit through knowledge exchange, professional development, and enhanced public understanding. ANS consists of over 10,000 members worldwide, including more than 1,000 students. Our chapter consists of approximately 30 active members and is governed by a four-member executive board. Our mission is to provide services to students that will foster personal and career development in a friendly environment.

### **American Society of Aeronautics and Astronautics (AIAA)**

AIAA currently has over 190 active student branches, including 12 foreign student branches, with a total active membership of over 5,000 students worldwide. Your student branch is your base of operations in AIAA during your college years, and it's an open door to professional activities, recognition, and contacts that would otherwise be unavailable to students.

### **American Society of Mechanical Engineers (ASME)**

ASME is a society for all engineers that provides opportunities to grow as an engineer and as a professional. Through conferences, competitions and meetings/tours, ASME is a way to explore the many fields of engineering and stay up to date on what is happening across the world. ASME is not strictly for mechanical engineers, but for anyone majoring in any field of engineering.

### **Design Build Fly Team (DBF)**

Design/Build/Fly (DBF) is an international aircraft design competition in which student teams from universities across the world design, build, and fly a remote controlled aircraft. Each year the American Institute for Aeronautics and Astronautics (AIAA) presents a new design challenge requiring a completely new aircraft to be created. The competition is sponsored by the AIAA, Cessna Aircraft and Raytheon Missile Systems and is focused on the development of unmanned aerial vehicles. RPI's team functions as an extra-curricular activity that typically meets twice per week in the design phase and as often as possible during the

build and test phases. RPI DBF made its first appearance at the 2006-2007 competition and in the 2012-2013 competition they placed Third, beating out MIT by .53 points.

### **Engineers for a Sustainable World (ESW – RPI) ([www.eswusa.org](http://www.eswusa.org))**

We are dedicated to combining the knowledge, skills, and experience of the RPI community to engineer solutions to social, environmental, and economic problems, both domestic and foreign, in the most sustainable way possible. We in Engineers for a Sustainable World endeavor to design solutions that will bring benefit over a great length of time, considering technological, social, and environmental limitations as they interrelate. We are not restricted to environmental projects, and we welcome all interested people, engineers or not.

### **Hybrid Car**

An outgrowth of the Formula SAE Program, the Formula Hybrid Program emphasizes drive train innovation and fuel efficiency in a high performance green technology application.

### **MANE Student Advisory Council (SAC)**

Established to pull student influence into the MANE Departments official business, the MANE Student Advisory Council better the student experience by facilitating seminars, bringing in guest lecturers, and participating in various administrative tasks. In the past, public forum events, faculty hiring, and seminar series have been provided to the campus community by the Council. For more information on the MANE Student Advisory Council, visit <http://mane.rpi.edu/graduate/student-resource>

### **Pi Tau Sigma**

Pi Tau Sigma, the international mechanical engineering honor society, was founded in March 1915 to recognize outstanding students who display both distinguished scholarship in technical fields and exemplary character. Pi Tau Sigma is highly regarded within industry and the academic world, and has grown to include 150 chapters in universities across the country. The Rensselaer Phi chapter was chartered in 1940, and is currently working towards hosting programs targeted towards freshmen and sophomores concerning research opportunities, as well as mentoring. Please visit our website at [pts.union.rpi.edu](http://pts.union.rpi.edu) for more information.

### **Rensselaer Aeronautical Federation (RAF)**

The purpose of the RAF is to promote interest in aviation and aviation safety within the Rensselaer community, to encourage safe and economical flying, and to increase flight proficiency of the membership.

### **Sigma Gamma Tau**

Sigma Gamma Tau is the honor society for Aerospace Engineering. It seeks to identify and recognize achievement and excellence in the Aerospace field. Sigma Gamma Tau's collegiate chapters elect annually to membership those students, alumni, and professionals who, by conscientious attention to their studies or professional duties, uphold this high standard for the betterment of their profession.

### **Society of Auto Engineers (SAE)**

The Rensselaer Formula SAE Team is a dynamic group of individuals representing a broad array of academic disciplines who collaborate to conceive, design, and fabricate a high performance formula style racecar. The Team was formed in 1991 and participated in competition for the first time in 1992. Since then, we have continued to place competitively, usually in the top third.



### **Society of Women Engineers (SWE)**

The Society of Women Engineers is an international society designed to encourage and support women in the pursuit of professional career in the engineering and technologic fields, through corporate interaction, community outreach, and social events, both on the local and national levels.

### **Rensselaer Electric Vehicle (REV)**

Rensselaer Electric Vehicle is a student organization for the design of electric vehicles at Rensselaer Polytechnic Institute. The team, formerly known as the RPI Solar Car Racing Team, has competed in the Shell Eco-marathon since 2011.

## FREQUENTLY ASKED QUESTIONS

### **If I haven't declared a major already, is there help available to assist me in the process of choosing one?**

The [Advising & Learning Center](#) (ALAC) has set up a one credit freshman seminar to help students make a decision about a major. During the seminar, students participate in interest tests, and results are reviewed with each student individually. Faculty from all of the schools offered at the Institute are available to meet with the seminar participants to answer any questions.

### **How do I change my major?**

It is important to meet with a representative from your prospective department prior to making that decision. 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 also be completed and submitted to the staff in the Core Engineering Office in JEC 3018. They will sign as the Curriculum Coordinator.

### **What classes should I take?**

First year classes are generally determined by the curriculum 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.

### **Should I declare a minor?**

Minors are NOT available in either Mechanical Engineering or Aeronautical Engineering. Students interested in a minor in Nuclear Engineering may choose a minor focused on either Reactor Engineering or Medical Applications of Radiation Technology. For detailed information on Nuclear Engineering minors, please contact the MANE Office of Undergraduate Student Services. Minors range in their requirements from 16 to 20 credit hours, with most having 16 credit hours. The Minor Approval form must be completed and signed by your advisor and by the minor department.

### **Can I take a graduate level course as one of my free electives?**

Yes, you may take a graduate course as one of your free electives and in Mechanical or Nuclear Engineering, may be used as a technical elective or a restricted elective. An [Approval](#) form must be completed and submitted to the Dean of Graduate Education before the second week of classes. Check with your advisor first about the appropriateness of the graduate level course.

### **Can I substitute a different class for a required course?**

Substitutions for required courses are permitted only with the approval of the heads of the departments concerned and the dean of the school or designated representative. All approved substitutions must have written notice filed with the registrar.

### **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.

### **How do undergraduates get involved in research? Can they? Do they?**

The best way to get involved in a research project is to approach instructors of your classes. Visit their web sites and see what research they are working on to see if it interests you. Even if you cannot find a project that interests you in your major field, you will find that faculty in all of 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 Center for Career and Professional Development (CCPD). An important first step is to visit the CCPD and discuss your intentions with a counselor. CCPD can also give you access to JobLink, the on-line recruiting system where you can link to employers who are looking for co-op students.

**Have more questions?**

Contact your advisor or stop by JEC 2012 on non-appointment days - we're here to help!