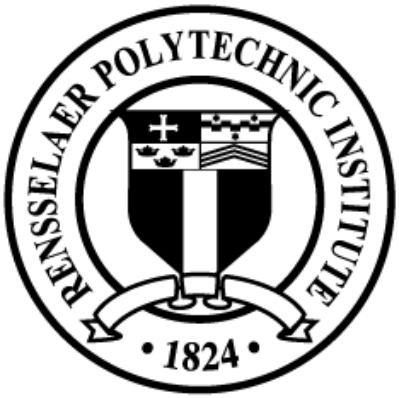

RENSSELAER POLYTECHNIC INSTITUTE

School of Engineering

MATERIALS SCIENCE & ENGINEERING

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Department of Materials Science & Engineering
http://mse.rpi.edu/

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.

The US Department of Labor (http://www.bls.gov/) provides information on the various fields of engineering and statistics concerning salary and job outlooks.

- Nature of the Work
- National estimates for Materials Engineers
- Geographic profile for Materials Engineers
- Employment Statistics for Engineering Field

Contact List for MSE

Department Head:	Robert Hull (hullr2@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:	Pawel Keblinski (keblip@rpi.edu)	MRC 115
Graduate Advising	Minoru Tomozawa (tomozm@rpi.edu)	MRC 109B

General Links:
Advising and Learning Assistance Center: http://alac.rpi.edu/setup.do
Center for Career and Professional Development (CCPD): 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/
Registrar Forms: http://srfs.rpi.edu/update.do?catcenterkey=29
Student Handbook: http://doso.rpi.edu/setup.do
Student Information System: http://sis.rpi.edu/

Educational Objectives

While certain objectives of an undergraduate education in engineering are common to all programs, there are subtle but important differences that require some subset of objectives specific to ensuring that all graduates have specialized technical knowledge in their chosen field. Graduates of the materials engineering baccalaureate program who remain within their field, as graduate students or professionals, will have within a few years of their graduation:

1. Used their broad knowledge of all classes of materials, and their background in mathematics and science, to contribute effectively to the solution of engineering problems, including problems involving design.
2. Demonstrated expertise in understanding the interdependence of the structure, properties, processing, and performance of materials and have utilized this interdependence in their professional activities.
3. Demonstrated themselves capable of dealing with emerging and continuing engineering problems and their societal consequences.
4. Demonstrated themselves effective in working with multi-disciplinary teams and in communicating clearly and convincingly in a variety of contexts.
5. Demonstrated the capacity for continued learning and an enthusiasm for engagement in such learning.

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.

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.

The requirements of each baccalaureate program are outlined as follows:

- The number of courses and credit hours is prescribed by each curriculum. Minimum requirements are124 credit hours for science and for humanities and social sciences majors, 124 for management, **128 for engineering**, and 168 for the professional degree in the School of Architecture.

- 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**, including **at least eight credit hours of mathematics**. For information on additional requirements see the School of Science section of this 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 this 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 writing-intensive and 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.

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.

Required Courses for a B.S. in Materials Science & Engineering

ENGR 1600 Materials Science for Engineers
Introduction to "real" (defect-containing) solids, and equilibria and kinetic processes in solids. Macroscopic properties, such as mechanical strength and electrical conductivity, are dominated by structure and bonding, and the course continuously emphasizes this connection. Each of the materials classes (metals, ceramics, semiconductors, and polymers) is discussed in detail in this context.
Prerequisite: CHEM 1100.
Fall and Spring terms annually. ***5 contact hours, 4 credit hours***

MTLE 2100 Structure of Engineering Materials
The first course in Materials Science and Engineering. Structures of metals, ceramics, and polymers and experimental techniques for their determination are discussed. Laboratory experience is included.
Prerequisite: ENGR 1600 or equivalent.
Spring term annually. ***4 credit hours***

MTLE 4100 Thermodynamics of Materials
Rigorous development of classical thermodynamics as applied to prediction of materials properties. Nonideal gases, solutions, phase equilibria, chemical equilibria, defects.
Prerequisites: ENGR 2250, CHEM 1100, ENGR 1600 or equivalent.
Fall term annually. ***4 credit hours***

MTLE 4150 Kinetics in Materials Systems
Kinetic processes in materials. Overview of kinetics in relation to equilibrium thermodynamics, atomistics and mathematics of diffusion, phase transformations, and microstructural evolution. All materials classes, including metals and alloys, ionic and intermetallic compounds, glasses, semiconductors, and polymers, will be considered in terms of similarities and differences. Includes laboratory component.
Prerequisites: MTLE 4100, CHEM 1100, ENGR 1600.
Spring term annually. ***4 credit hours***

MTLE 4200 Electrical and Optical Properties of Materials
Electronic and optical properties of metals, dielectrics, semiconductors, and organic molecular solids. Introduction to quantum mechanics. Lattice vibrations, magnetism, energy bands in solids. Free and nearly free electron models. Effect of electronic structure on interatomic bonding. Semiconductors and their devices.
Prerequisites: ENGR 1600, MTLE 2100, PHYS 1200.
Fall term annually. ***4 credit hours***

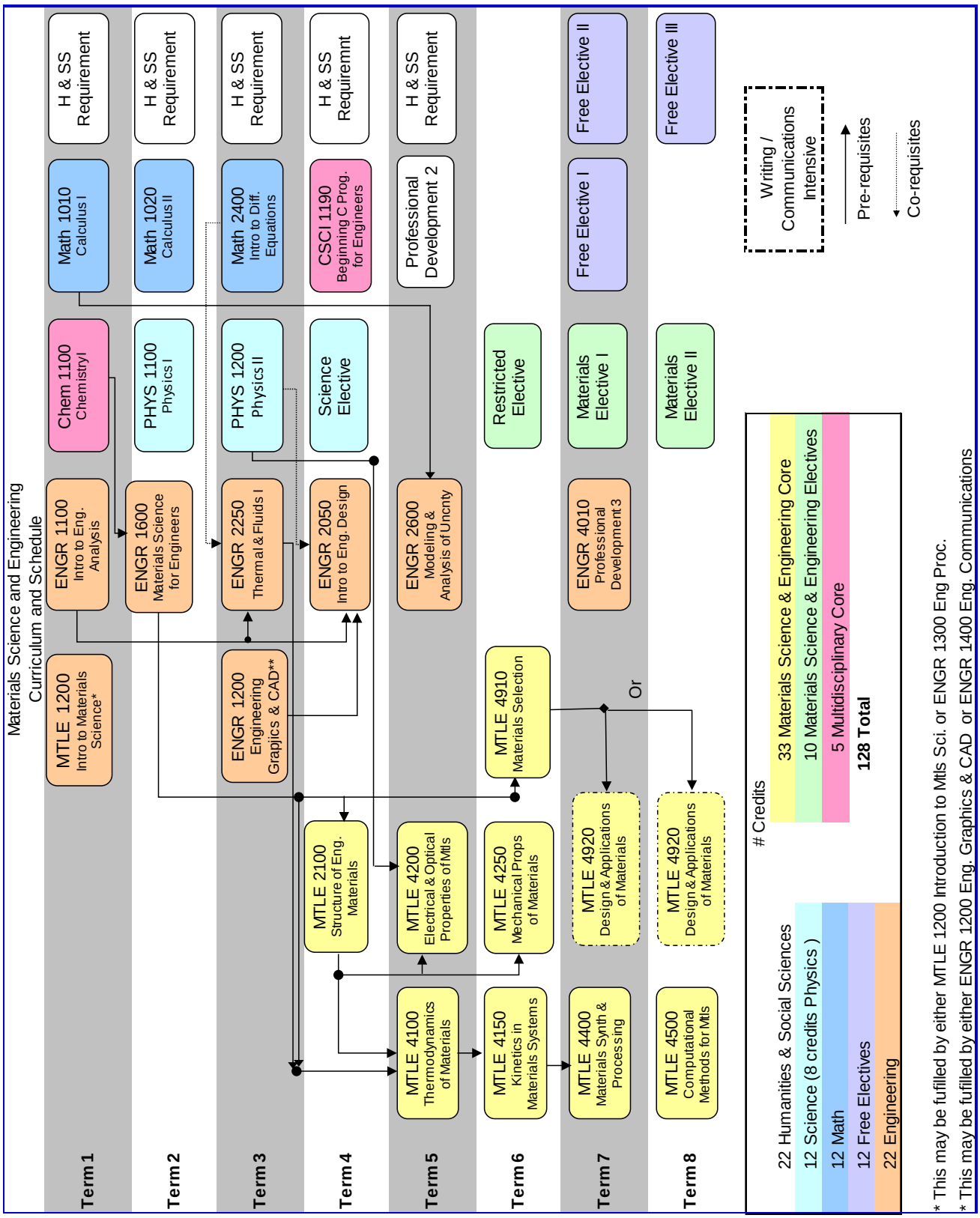
MTLE 4250 Mechanical Properties of Materials
This is a required departmental course, but is also appropriate for biomedical engineers and other engineering disciplines as an elective. This course teaches the mechanical properties of metals, ceramics, and polymers from both the macroscopic and atomistic or micromechanical viewpoints. An introduction to three-dimensional stresses and strains. Elastic behavior, plastic behavior, strengthening mechanisms, fracture, creep, and fatigue are all addressed. Includes laboratory component.
Prerequisites: ENGR 1600, MTLE 2100.
Spring term annually. ***4 credit hours***

MTLE 4400 Materials Synthesis and Processing
This course covers materials processing in the area of metals, polymers, ceramics and electronic materials. Some processes covered include casting, molding, deformation processing, additive processing and joining methods. Design and analysis of experiments and process modeling are emphasized. Includes laboratories.
Prerequisites: MTLE 4200, MTLE 4150, MTLE 4250.
Spring term annually. ***4 credit hours***

MTLE 4500 Computational Methods for Materials Design
This course will provide the background and a set of examples of how computational methods can be applied to design of materials with desired structure and properties. The methods will span multi-length and time scales, including first-principles approaches, molecular dynamics simulations, stochastic methods for optimization and sampling, and computational thermodynamics. Lectures will be complemented by computer labs with hands-on exercises using publicly available or commercial software packages.
Undergraduates must have Junior standing or permission of the instructor.
Spring term annually. ***3 credit hours***

MTLE 4910 Materials Selection
This class covers basic materials selection concepts and the underlying structure-property-process-performance interaction. Engineering materials, structures and properties, principles and process of materials selection, generation of materials performances indices, assessment and optimization of performance, processing routes and manufacturing issues, role of reverse engineering and failure analysis in design are covered. Materials selection against yielding, fracture, flexure, buckling, fatigue, creep, corrosion, and wear are addressed. Decomposition of engineering problems into functional, geometric and materials constraints are emphasized. Materials selection based on simple and complex or conflicting constraints will be developed. Students will perform written assignments and oral presentations to develop communication skills. Enrollment for MS&E majors is restricted to juniors, seniors or graduates.
Prerequisites: CHEM 1100 and ENGR 1600 or ENGR 2010.
Spring term annually. ***3 credit hours***

MTLE 4920 Design and Applications of Materials
A capstone experience to afford seniors in MS&E the unique and invaluable opportunity to participate as a vital member of a truly multidisciplinary design team (comprised of engineering students from other disciplines, as well as MBAs) and function just as they will as professionals in practice, in preparation for practice. This course acquaints students with all the phases of the design process from recognizing the need through a detailed conceptual design. Students work in teams on a semester-long project with the assistance of faculty consultants. The design projects require students to draw upon their engineering background, experience, and other pertinent resources. Oral and written presentations are required. This is a communication-intensive course.
Prerequisite: satisfactory completion of MTLE 4910.
Fall and Spring terms annually. ***3 credit hours***



* This may be fufilled by either MTLE 1200 Introduction to Mtls Sci. or ENGR 1300 Eng Proc.
* This may be fufilled by either ENGR 1200 Eng. Graphics & CAD or ENGR 1400 Eng. Communications

NAME: _____ E-mail: _____

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	Design and Appl. of Mtls[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 4430 – Fundamentals Alloy Systems Credit Hours: 3
MTLE 4460 – Materials for Energy Credit Hours: 3
MTLE 4500 – Materials Extreme Cond. Credits: 3
MTLE 4050 - Introduction to Polymers Credit Hours: 3
MTLE 4420 - Joining of Advanced Materials 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

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.
Note this checklist is to be used as a guide to developing the registration plan for Materials Science & Engineering students. It is not a replacement for the Rensselaer Course Catalog.

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.

Biomaterials Track in
Materials Science & Engineering

This track is for students who desire a degree in Materials Science and Engineering who have specific interest in materials for biological and biomedical application.

Science Elective (Choose One)
BIOL 2120 Introduction to Cell and Molecular Biology - essential course to help students understand cell structure and function.

CHEM 2250 Organic Chemistry (CHEM 1100 and 1200 required) - structure and chemical behavior of organic molecules is covered and will provide a solid foundation for understanding polymer behavior in engineering applications.

Specialization Electives (Choose Three)
BMED 4240 Tissue-Biomaterial Interactions - course focuses on the biological response to biomaterials. This is essential for students who aim to work on implantable materials.

BIOL 4750 Cell-Extracellular Matrix Interactions - course examines the mechanical and biological transduction mechanisms used to link cells into functional units (tissues). The composition and material properties of materials, both natural and manmade, is introduced as a means of controlling cell/tissue function.

MTLE 4050 Introduction to Polymers - students will learn the structure of macromolecules (both synthetic and natural) at molecular and microscopic scales and how the structure influences properties. Examples are chosen from synthetic, biocompatible, and natural macromolecules.

MTLE 4470 Biomaterials Processing - students will learn how to process biomaterials to be used in various biological applications; materials range from ceramics to polymers to living cells. Students will be introduced to aseptic processing, cell culture, biomimickry, biosensing, and tissue engineering.

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.

Use the RPI Open Course Scheduler (ROCS) to help develop your schedule of courses.

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. The table to the right shows the range of earned credit hours associated with each class. Please note that classes which are still in progress or courses which have been graded as "incomplete" do *not* count towards earned credits, nor do transferred courses and Advanced Placement (AP) credit.

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).

FAQs

What do I do if a class I want to register for is full?

Meet with the instructor of the course and request to be admitted to the course. If the class is a core/required course every effort will be made to accommodate the request. If this is an elective course you may be asked to take it in a subsequent semester.

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.

The HUB

The HUB is the new School of Engineering advising center launched in Fall 2013. The main purpose of the HUB is to complement the job of the freshmen and sophomore academic advisors. The HUB is located in the Ansell Lounge in the Jonsson Engineering Center (JEC), 3rd floor. The HUB is staffed with one faculty/staff member and one upperclassman student. The HUB is open weekdays during the following hours:

Faculty/Staff: Monday-Thursday 10:00-4:00, Friday 10:00-1:00
Student: Monday-Thursday 3:30-5:30 p.m.

HUB personnel will help answer academic as well as career questions, authorize forms, handle wait lists for ENGR courses, rapid prototyping work orders, etc. 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. Each personnel member will have access to every student's CAPP reports and transcripts to be able to supply the student with the best advice. 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.

Professional / Student Societies

Alpha Sigma Mu - Faculty Advisor: G. Ramanath, MRC 111
Alpha Sigma Mu International Professional Honor Society is dedicated to encouraging and recognizing excellence in the materials engineering field. Members consist of students, alumni, and other professionals who have demonstrated exceptional academic and professional accomplishments. Student members are selected on the basis of scholastic standing, character and leadership. Through Chapter involvement, students develop lifelong skills that prepare them for leadership positions in industry and academia. Members are much better prepared for the post-college world and are valuable and attractive to employers.

Material Advantage – Faculty Advisor: Daniel Lewis, MRC 110
Material Advantage is a student program specifically created for undergraduate and graduate students enrolled in Materials Science & Engineering and other technical engineering programs at universities around the world. Material Advantage Chapters give you a much-needed edge in the global job market and the knowledge, experience and networking you need to begin your career successfully. You are also provided a single low-cost membership that provides access to the materials science and engineering professional's most preeminent societies including ACERS, AIST, ASM, and TMS.

ACerS - The American Ceramic Society - ACerS serves the informational, educational, and professional needs of the global ceramics community. The members comprise a wide variety of individuals and interest groups including engineers, scientists, researchers, manufacturers, plant personnel, educators, students, marketing and sales professionals, and others in related materials disciplines.

AIST - Association for Iron & Steel Technology - The Association for Iron & Steel Technology (AIST) is a non-profit organization that advances the technical development, production, processing and application of iron and steel. AIST membership is comprised of over 15,000 individuals worldwide and includes iron and steel producers, suppliers, academics and students.

ASM International - ASM International is Everything Material®. We are the society dedicated to serving the materials science and engineering profession. Through our network of 36,000 members worldwide, ASM provides authoritative information and knowledge on materials and processes, from the structural to the nanoscale.

TMS - The Minerals, Metals and Materials Society - The Minerals, Metals & Materials Society (TMS) is a rare professional organization that encompasses the entire range of materials and engineering, from minerals processing and primary metals production to basic research and the advanced applications of materials.

Society of Plastics Engineers (SPE) – Faculty Advisor: Rahmi Ozisik, MRC 205
The objective of the Society is to promote the scientific and engineering knowledge relating to plastics. By spreading knowledge, strengthening skills and promoting plastics the Society of Plastics Engineers (SPE) helps people and companies in the plastics industry succeed. SPE is the only place where people from all parts of the industry can come together around important issues and technologies.

Undergraduate Research Program (URP)

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:

- Strengthen Glass via Ion-Exchange
- Placement of cancer epithelial cells onto substrates
- Nanostructure Synthesis of Energy Materials
- Fuel Cells and Electrode Coating Development

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. Also, you may want to talk to students that have already done a URP project. Ask them about their experience. Some events of the Materials Advantage are good places to connect to more advanced students.

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, Nancy Beatty; 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.

Research Areas and Related Faculty

	Advanced Processing & Synthesis	Composites	Computational Materials	Electrochemistry of Materials / Corrosion	Electronic Materials	Glasses / Ceramics	Materials/Biology Interface	Materials Characterization	Materials for Energy	Metals	Nanomaterials	Polymeric Materials
Ying Chen			x		x			x			x	
David Duquette	x			x	x					x		
Daniel Gall					x			x	x	x		
Liping Huang			x			x		x	x		x	
Robert Hull	x				x			x			x	
Pawel Keblinski			x		x						x	
Daniel Lewis			x						x		x	
Rahmi Ozisik		x	x								x	x
Edmund Palermo					x		x					x
G. Ramanath	x				x			x	x		x	
Linda Schadler		x							x		x	x
Richard Siegel		x					x				x	
Jian Shi				x					x		x	
Yunfeng Shi			x						x		x	
Minoru Tomozawa						x						
Chaitanya Ullal											x	x
Joint Faculty Members												
Nikhil Koratkar	x	x		x	x			x	x		x	
E. Bruce Watson						x		x		x		
Vincent Meunier			x		x				x		x	
Jonathan Dordick		x					x				x	x

Guide to Minor in Materials Science & Engineering

In order to earn a Minor in Materials Science and Engineering, you need to take 15 or more credits of courses offered by the Department of Materials Science and Engineering. These must be courses with MTLE designation. As general preparation for these courses, you should have taken ENGR-1600, Materials Science for Engineers. Courses may not be taken Pass/No credit basis.

A list of suggested courses, together with the normal time students in the Department of Materials Science and Engineering take them, is given on the accompanying page. But these are only suggestions, and you can choose courses according to your interest and schedule. It is even possible to take some courses out of sequence if you are willing to put in the appropriate effort. Note, however, that some courses in the Department of Materials Science and Engineering are offered once a year, whereas others are offered only every other year.

We think that an excellent program for a Minor in Materials Science and Engineering, giving you a solid foundation, would be to take Structure of Materials, plus any two of the remaining four-credit courses listed below, plus one three-credit course of your choice:

MTLE-2100	Structure of Materials	4 credits
MTLE-4100	Thermodynamics of Materials	4 credits
MTLE-4150	Kinetics in Materials	4 credits
MTLE-4200	Electrical & Optical Properties of Mtls	4 credits
MTLE-4250	Mechanical Properties of Materials	4 credits
MTLE-xxxx		3 credits

The suggested program would allow you to obtain a Minor in Materials Science and Engineering with the minimum number of four courses. However, as we mentioned above, many other combinations of courses are possible, and you should choose according to your interests.

Minor Approval Form: http://www.rpi.edu/dept/srfs/MINORAPPRVFORM.pdf

Suggested courses for Minor in Materials Science & Engineering

Course Nr.	Course	Credits	Offered	Year taken
MTLE-2100	Structure of Materials	4	S every year	sophomore
MTLE-4100	Thermodynamics of Materials	4	F every year	junior
MTLE-4150	Kinetics in Materials Systems	4	S every year	junior
MTLE-4200	Electrical & Optical Properties of Mtls	4	F every year	junior
MTLE-4250	Mechanical Properties of Materials	4	S every year	junior
MTLE-4030	Introduction to Glass Science	3	F every year	
MTLE-4050	Introduction to Polymers	3	F every year	
MTLE-4310	Corrosion	3	S every other	senior
MTLE-4400	Matls Synthesis & Processing	4	F every year	
MTLE-4470	Processing of Biomaterials	3	F every other	
MTLE 4500	Computational Methods for Mtls Design	3	S every year	senior
MTLE 49##	Special Topics Courses	3	As needed	

International Programs

http://undergrad.rpi.edu/update.do?catcenterkey=81

The Office of International Programs sponsors a variety of exchange programs that give students the opportunity to enroll directly into the host university, allowing full immersion with host country peers. With the exception of NTU and DTU, these programs do not send students in large groups. Participation in this type of study abroad experience requires a great deal of initiative, independence and maturity on the part of the student.

The Global Engineering Education Exchange Program
Global E^3 is an international exchange program for engineering students at member institutions. The program offers the opportunity for U.S. students to study in one of 17 countries and for international students at partner campuses to study in the United States.
Contact: Jamie Obst
Senior Program Administrator
Office of International Programs
Walker Lab; 4th floor
518-276-6663

Academic Requirements and Eligibility - Generally a 3.0 minimum GPA is required. More importantly, students must make sure that a period of study abroad will not delay their graduation date. Although students typically study abroad during the junior year, sophomores and seniors may be eligible.

Application procedures and deadlines - Generally an RPI study abroad application and official transcript as well as an application from the host institution are required. Deadlines vary by program but are typically September for spring and February for fall. You should begin the research process at least one semester prior to the semester of application.

Fees and Billing - Students who participate in affiliated study abroad or exchange programs are charged the cost of regular RPI tuition for their term(s) abroad. Some programs carry an additional fee. Unless otherwise noted, transportation, housing and other living expenses are paid directly by each student and are not billed by RPI.

Financial Aid - With the exception of work-study money, all forms of financial aid can be applied to Rensselaer-affiliated programs. Students must maintain full-time status (the equivalent of 12 Rensselaer credits or above) in order to be eligible for financial aid.

Grades and Credit - Full credit is granted for courses completed with a grade of C- or above. All courses must be approved by the relevant academic department in order for the transfer of credit to take place. With the exception of the Architecture programs, grades earned overseas are not factored into the GPA.

It is important for students to work with their advisor when applying to study abroad. Course mapping for selected programs has been completed but this has not been completed for all of the universities involved. Mapping for the engineering focused schools can be found at:
http://sis.rpi.edu/trfequiv/transfer_equiv.pdf

Study Abroad FAQs can be found at: http://undergrad.rpi.edu/update.do?catcenterkey=124

Co-Terminal B.S. / M.S. or M.E. Program

Juniors who meet certain requirements can apply for admission to the graduate program and, by delaying completion of the B.S., can get continuing undergraduate support (student aid) for a fifth year. In this way, they can complete requirements for both the B.S. and M.S. degrees at the same time.

Student must:

- Have a cumulative GPA of 3.3 or above
- GRE exam is required, unless the student is currently Materials Science & Engineering major and has GPA of 3.6 or above
- Have completed 90 credits of coursework (including AP credits, transfer credits, and courses in progress)
- A letter of recommendation is required from the student's advisor or another RPI faculty with knowledge about student suitability for the graduate program at RPI.

Students intending to do this in Materials Science & Engineering should be aware of the following:

The M.S. in Materials Science & Engineering requires a thesis. This can count towards 6 of the 30 credits beyond the B.S. required for the M.S. degree. This is a research thesis that will require a significant effort that probably cannot be accomplished in two academic years. Students must be prepared to spend at least one and probably two summers of full time research work. Summer support is not included as part of the program, but students may get support from their research advisor, if he or she has funding available and is willing to use it for this purpose. In the event that time beyond the fifth year is required to complete the M.S. requirements, additional support is not guaranteed but may be provided by the research advisor. Because of the research component, students should choose a research advisor as early as possible, preferably before applying for admission to the program. Students who have already begun undergraduate research will have an advantage; early participation in undergraduate research is strongly advised for students contemplating this option.

The M. Eng. in Materials Science & Engineering does not require a thesis; however a research project worth 3 credits is required. As with the M.S. summer support is not guaranteed.

All graduate students have to take the core coursework that consists of five courses, Advanced Mechanical Properties, Advanced Thermodynamics, Advanced Structure, Advanced Kinetics, and Advanced Electrical Properties. These coursework constitute 18 credit hours. In addition M.S. students need to take two graduate level elective courses either from the School of Science or School of Engineering constituting 6 credit hours. M.E. students need to take three graduate level elective courses either from the SoS or SoE constituting 9 credit hours. No undergraduate level courses can be counted against M.S. or M.E. degree requirements.

Upon admission to the program, students will be regarded as graduate students by the department but will not normally receive departmental financial support. They will not be required to take the placement exams. Students in this program who wish to transfer to the Ph.D. program must apply for it, and will be considered new applicants.

Materials Science & Engineering majors can apply for the co-terminal degree program in another department, getting a B.S. in Materials Science & Engineering and an M.S. in the other discipline if accepted. The M.S. in Applied Science is a possible option that does not require a thesis. Students need to discuss their plans with an advisor from the department from which they plan to obtain the M.S. degree.

Please see the Co-Terminal FAQ's page for more information.

Graduate Program

Areas of Study/Degrees	Materials Science and Engineering: M.S., M.Eng., and Ph.D.	Typical Degree Requirements M.S. 30 credits (24 coursework, 6 thesis) + M.S. thesis M.Eng. 30 credits (27 coursework, 3 research project) Ph.D. 72 credits (27 coursework, 45 thesis) + PhD. Thesis
Research Areas	We offer a wide range of disciplines that are sufficiently flexible to accommodate individual interests, but the main research areas of interest are separated into several broad categories:	
	Advanced Processing and Synthesis Composites Computational Materials Electrochemistry of Materials / Corrosion Electronic Materials Glasses / Ceramics	Materials / Biology Interface Materials Characterization Materials for Energy Metals Nanomaterials Polymeric Materials
Participating Research Centers	Center for Fuel Cell and Hydrogen Research Center for Future Energy Systems Center for Integrated Electronics Center for Multiphase Research Computational Center for Nanotechnology Innovations (CCNI)	Multiscale Science and Engineering Center National Science Foundation Center for Directed Assembly of Nanostructures Rensselaer Nanotechnology Center Scientific Computation Research Center
Admission	Submit on-line at: http://admissions.rpi.edu/graduate/ Deadlines are January 1 for Summer and Fall admission and August 15 for Spring admission You'll need: a well-written Statement of Background & Goals; official transcripts from all colleges attended; at least 2 letters of recommendation (preferably from faculty); official GRE scores (general test only) and official TOEFL or IELTS scores (required for all international applicants); non-refundable application fee.	
Financial Aid/Tuition	Most students receive financial aid. Apply for financial aid through the admission application, *no separate form is required.* Financial aid is available in the form of Fellowships, Teaching Assistantships and Research Assistantships. International students are eligible for all forms of aid except some fellowships that require US citizenship. Awards are made based on merit, not on need, and priority is given to doctoral candidates. Tuition for the 2014-2015 academic year is $ 46,700; fees and insurance are approximately $2,215; Living expenses, books and supplies can vary widely but are estimated at approximately $15,765	
Contact Us	Nancy Beatty, Administrative Specialist Materials Science and Engineering Phone: 518-276-6372 Fax: 518-276-8554 Email: beattn@rpi.edu http://mse.rpi.edu/	

Frequently Asked Questions

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.

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.

What to do to get a minor in Materials or (if the student is MSE major) in another discipline?
In order to earn a minor in Materials Science and Engineering, you need to take 15 or more credits of courses offered by the department with the MTLE designation. As general preparation for these courses, you should have taken ENGR-1600, Materials Science for Engineers. Minors vary in their requirements from 16 to 20 credit hours, with most having 16 credit hours. A student wishing to develop a minor should consult with his or her advisor for that minor before completing the second course in it. The minor approval form must be completed and signed by your advisor as well as the department head in the department you will be taking the minor in.

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. An approval form must be completed and submitted to the Dean of Graduate Education before the second week of classes.

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 a designated representative. Where substitutions are granted, written notice must be 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 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 advisor and/or the curriculum coordinator.

What research is there done in your Department?
We offer a wide range of disciplines that are sufficiently flexible to accommodate individual interests. Some examples are biomaterials, computational materials, materials for energy, and nanotechnology.

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 Center for Career and Professional Development (CCPD). An important first step is to officially register in the co-op program. You will then have access to JobLink, the CCPD'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 Materials Science and Engineering Department are offered only once a year and some course 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.
http://www.rpi.edu/dept/cdc/students/experience/coop/major/materials.html