## Table of Contents

- Materials Science & Engineering .................................................. 1
- Contact Information .................................................................... 2
- Responsibilities ........................................................................... 3
- Bachelor Degree Requirements ................................................... 4
- Required Courses .......................................................................... 6
- Curriculum and Schedule .............................................................. 8
- Curriculum Checklist (Plan of Study) ............................................. 9
- Registration .................................................................................. 10
- Student Societies .......................................................................... 11
- Undergraduate Research Projects ................................................ 12
- Minor in Materials Science & Engineering ..................................... 14
- International Study ........................................................................ 15
- Co-terminal Degrees ..................................................................... 16
- Graduate Degree in Materials Science & Engineering .................... 17
- Frequently Asked Questions ......................................................... 18
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, 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/oco/ocos027.htm) provides information on the various fields of engineering and statistics concerning salary and job outlooks.

Nature of the Work
Training, Other Qualifications, and Advancement
Employment
Job Outlook
Projections
Earnings
Wages
Related Occupations
Sources of Additional Information
Contact List for MSE

Department Head: Robert Hull (hullr2@rpi.edu) MRC 102
Administrative Assistant: Dana M Chichester (chichd@rpi.edu) MRC 103

Undergraduate Advising: Daniel Gall (galld@rpi.edu) MRC 204
Dan Lewis (lewisd2@rpi.edu) MRC 110
Rahmi Ozisik (ozsik@rpi.edu) MRC 205

Department Coordinator (for URP) Nancy Beatty (beattn@rpi.edu) MRC 140

Graduate Admissions: Pawel Keblinski (keblip@rpi.edu) MRC 115

General Links:
Advising and Learning Assistance Center: http://alac.rpi.edu/setup.do
Career Development Center: http://www.rpi.edu/dept/cdc/
Co-Op / Internships: http://www.rpi.edu/dept/cdc/students/experience/coop/index.html
Course Catalog: http://www.rpi.edu/academics/catalog/
Registrar Forms: http://srfs.rpi.edu/update.do?catcenterkey=29
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. In this regard, the graduates of the Department of Materials Science and Engineering’s baccalaureate program will be prepared for entry-level positions as Materials Engineers or for Graduate School. In particular, graduates will:

1. Be able to use 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. Be especially aware of the interdependence of the structure, properties, processing, and performance of materials.
3. Be broadly educated and thus capable of dealing with engineering problems and their societal consequences.
4. Be experienced in working with multi-disciplinary teams and in communicating clearly and convincingly in a variety of contests.
5. Recognize the need for continued future learning and have a desire to engage 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 are 124 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 **1.80**.

• 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 the course catalog.

• The course content in humanities and social sciences must total a minimum of **24 credit hours**, including at least **eight credit hours** in the humanities and **eight credit hours** in the social sciences. For information on additional requirements see the School of Humanities, Arts, and Social Sciences section of the course catalog.

• Every student is required to take at least two communication-intensive courses. At least one of these must be in the students’ major and at least one of the courses must be writing intensive and taught in the School of Humanities, Arts, and Social Sciences.

• 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 **48 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 48 needed for the bachelor’s degree. The student’s Plan of Study at Rensselaer must include at least 16 credits of courses above the 1000 level in the major field, or in an approved concentration.
ACADEMIC INFORMATION AND REGULATIONS

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

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

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

Double Degrees
A student may become a candidate for a second baccalaureate degree when he or she has completed: (1) the equivalent of at least two terms (30 credit hours) of additional work beyond the requirements of a single degree, and (2) the courses in the department in which the student is registered and such other courses as are required for the second degree.

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

MTLE 4250 Properties of Engineering Materials II
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 I
Emphasis is on materials synthesis, with four instructional modules drawn from aspects of melt and extractive metallurgy and from the synthesis of polymers, ceramics and glasses, electronic materials, composite materials and nanophase materials. Includes laboratory experience.
Prerequisites: MTLE 4200, MTLE 4150, MTLE 4250.
Fall term annually. 4 credit hours

MTLE 4450 Materials Synthesis and Processing II
Emphasis is on materials processing, with four instruction modules drawn from aspects of casting and molding, deformation processing, powder processing, joining and additive processes, cutting and removal processes, and annealing/heat treatment processes. Includes laboratory component.
Prerequisite: MTLE 4400.
Spring term annually. 4 credit hours

MTLE 4910 Design in Materials Engineering
Basic design 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. Generic design against yielding, fracture, flexure, buckling, fatigue, creep, corrosion, and wear are addressed, as opposed to design of specific products or in specific areas. A semester-long team design project is a principal focus. Team-building and leadership skills are developed. Non-technical issues of environmental impact, cultural and societal impact, safety and health, ethics, and cost are discussed. Writing assignments and oral reports develop communication skills.
Enrollment for MS&E majors is restricted to seniors or graduates.
Prerequisites: CHEM 1100 and ENGR 1600 or ENGR 2010.
Fall term annually. 3 credit hours

MTLE 4920 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. The course revolves totally around a design project, focusing on the structure-property-process-performance interaction underlying all design, with no homework or exams; just memos on progress, individual and group meetings with the instructor, conceptual design report, project notebook or journal, and final report.
Prerequisite: satisfactory completion of MTLE 4910.
Spring term annually. 2 credit hours
# MATERIALS SCIENCE & ENGINEERING CURRICULUM CHECKLIST

## Class of 20__

### NAME: ________________________________

### E-mail: ____________________________

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>FIRST YEAR</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM-1100 Chemistry I</td>
<td>4</td>
<td>ENGR-1300 Engineering Processes</td>
</tr>
<tr>
<td>MATH-1010 Calculus I</td>
<td>4</td>
<td>MATH-1020 Calculus II</td>
</tr>
<tr>
<td>ENGR-1100 Intro. to Eng. Analysis</td>
<td>4</td>
<td>PHYS-1100 Physics I</td>
</tr>
<tr>
<td>ENGR-1600 Materials Science for Engs</td>
<td>4</td>
<td>ENGR-1600 Materials Science for Engs</td>
</tr>
<tr>
<td>Hum., Arts or Soc. Sci. El.</td>
<td>4</td>
<td>Hum., Arts or Soc. Sci. El.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECOND YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1200 Eng. Graphics &amp; CAD</td>
</tr>
<tr>
<td>ENGR 2250 Thermal Fluids</td>
</tr>
<tr>
<td>PHYS 1200 Physics II</td>
</tr>
<tr>
<td>MATH 2400 Intro. to Differential Eqns.</td>
</tr>
<tr>
<td>Hum., Arts or Soc. Sci. El.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THIRD YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLE 4100 Thermodynamics of Mtls</td>
</tr>
<tr>
<td>MTLE 4200 Properties of Materials I</td>
</tr>
<tr>
<td>ENGR 2600 Modeling &amp; Analysis</td>
</tr>
<tr>
<td>Professional Dev II</td>
</tr>
<tr>
<td>Hum., Arts or Soc. Sci. El.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOURTH YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLE 4400 Materials Syn &amp; Proc I</td>
</tr>
<tr>
<td>MTLE 4910 Design in Materials Eng</td>
</tr>
<tr>
<td>ENGR 4010 Professional Devpt II</td>
</tr>
<tr>
<td>Materials Elective I</td>
</tr>
<tr>
<td>Free Elective II</td>
</tr>
</tbody>
</table>

1 May be taken either term.
2 Students are encouraged to select a life science course, such as BIOL-1010.
3 The free electives must total to at least 12 credits.

### 128 credits minimum

#### RESTRICTED ELECTIVE

- ENGR 2090 - Engineering Dynamics 4 credit hours (Fall & Spring)
- ENGR 2350 - Embedded Control 4 credit hours (Fall & Spring)
- ENGR 2530 - Strength of Materials 4 credit hours (Fall & Spring)
- ENGR 4300 - Electronic Instrumentation 4 credit hours (Fall & Spring)

### MATERIALS ELECTIVE

- MTLE 4030 - Glass Science (Fall)
- MTLE 4050 - Introduction to Polymers (Fall)
- MTLE 4061 - Processing of Biomaterials (Fall)
- MTLE 4160 - Semiconducting Materials (Spring)
- MTLE 4310 - Corrosion (Spring)
- MTLE 4400 - Joining of Advanced Materials (Spring)

**Note:** The courses in the Materials Electives list may be substituted by any MTLE 4000 or 6000 level course.

### Communications Intensive

- MTLE 4250 – Properties of Engineering Materials II
- MTLE 4450 – Materials Synthesis & Processing II
- MTLE 4490 – Applications of Materials

### Laboratory Intensive

- MTLE 4250 – Properties of Engineering Materials
- MTLE 4450 – Materials Synthesis & Processing II
- MTLE 4490 – Applications of Materials

---

MATERIALS SCIENCE AND ENGINEERING UNDERGRADUATE HANDBOOK 11/8/2010

---
Registration

**When:** Registration for the Spring semester generally occurs in early November. Registration for the Fall semester occurs the preceding Spring, usually in early April. Exact dates are included in the [Academic Calendar](#).

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

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

**Time tickets**

As a student here at Rensselaer, you are issued a "time ticket," which assigns you a specific window of time during which you may register for the next semester. Your time ticket will be sent to your RPI email address, 2 - 3 weeks before registration.

Your registration time is assigned based on the number of credit hours you have earned as a student. 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.

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.
Professional / Student Societies

**Alpha Sigma Mu** - Faculty Advisor: Daniel Lewis, MRC 110
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.

**Materials Advantage** – Faculty Advisor: Daniel Lewis, MRC 110
Materials 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.

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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Doug Chrisey</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>David Duquette</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daniel Gall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liping Huang</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Hull</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pawel Keblinski</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daniel Lewis</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rahmi Ozisik</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Ramanath</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linda Schadler</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yunfeng Shi</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richard Siegel</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minoru Tomozawa</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roger Wright</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Research Areas and Related Faculty | | | | | | | | | | | |
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.

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 Properties of Eng. Materials I 4 credits
MTLE-4250 Properties of Eng. Materials II 4 credits
MTLE-xxxx 3 credits

Keep in mind that Properties of Eng. Materials I concentrates on electronic properties of materials, whereas Properties of Eng. Materials II focuses on mechanical properties. 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](http://www.rpi.edu/dept/srfs/MINORAPPRVFORM.pdf)

Suggested courses for Minor in Materials Science & Engineering

<table>
<thead>
<tr>
<th>Course Nr.</th>
<th>Course</th>
<th>Credits</th>
<th>Offered</th>
<th>Year taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLE-2100</td>
<td>Structure of Materials</td>
<td>4</td>
<td>S every year</td>
<td>sophomore</td>
</tr>
<tr>
<td>MTLE-4100</td>
<td>Thermodynamics of Materials</td>
<td>4</td>
<td>F every year</td>
<td>junior</td>
</tr>
<tr>
<td>MTLE-4150</td>
<td>Kinetics in Materials Systems</td>
<td>4</td>
<td>S every year</td>
<td>junior</td>
</tr>
<tr>
<td>MTLE-4200</td>
<td>Properties of Eng. Materials I</td>
<td>4</td>
<td>F every year</td>
<td>junior</td>
</tr>
<tr>
<td>MTLE-4250</td>
<td>Properties of Eng. Materials II</td>
<td>4</td>
<td>S every year</td>
<td>junior</td>
</tr>
<tr>
<td>MTLE-4030</td>
<td>Introduction to Glass Science</td>
<td>3</td>
<td>F every year</td>
<td></td>
</tr>
<tr>
<td>MTLE-4050</td>
<td>Introduction to Polymers</td>
<td>3</td>
<td>F every year</td>
<td></td>
</tr>
<tr>
<td>MTLE-4160</td>
<td>Semiconductor Materials</td>
<td>3</td>
<td>F even years</td>
<td></td>
</tr>
<tr>
<td>MTLE-4310</td>
<td>Corrosion</td>
<td>3</td>
<td>S every other</td>
<td></td>
</tr>
<tr>
<td>MTLE-4400</td>
<td>Materials Synthesis &amp; Processing</td>
<td>4</td>
<td>F every year</td>
<td></td>
</tr>
<tr>
<td>MTLE-4420</td>
<td>Joining of Advanced Materials</td>
<td>3</td>
<td>S odd years</td>
<td></td>
</tr>
<tr>
<td>MTLE-4450</td>
<td>Materials Synthesis &amp; Processing II</td>
<td>4</td>
<td>S every year</td>
<td></td>
</tr>
<tr>
<td>MTLE 49##</td>
<td>Special Topics Courses</td>
<td>3</td>
<td>F &amp; S every year</td>
<td></td>
</tr>
</tbody>
</table>
International Programs

Rensselaer Education Across Cultural Horizons, or REACH, is part of Rensselaer’s initiative to provide all undergraduate students with an international experience. Initially launched in spring 2009 as an exchange program for engineering students, REACH has evolved to include all international opportunities for undergraduates, including semester-long study abroad and exchange opportunities, short-term and faculty-led international programs, and other international experiences such as internships and service learning. All students are encouraged and expected to take advantage of some sort of international experience during their four-year undergraduate education.

**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.

The Study Abroad program available at Rensselaer is an excellent opportunity for your professional and personal growth. However, you need to start planning early for a stay abroad in order to minimize its impact on your graduation plans. Most MSE students choose to study abroad during their Junior year. With proper planning, the time spent away from RPI will not delay your graduation.

It is important for students to work with their advisor when applying to study abroad. Course mapping for selected REACH programs has been completed but this has not been completed for all of the universities involved. Mapping for the engineering focused schools as well as for MTLE-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) under REACH Transfer Equivalencies (http://sis.rpi.edu/trfequiv/transfer_equiv.pdf). Students are encouraged to choose from these pre-approved courses. If you are considering a course that does not appear on the pre-approved list, please procure the course description from the university abroad and if possible a syllabus for that course, and discuss your plans with your advisor. 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 at http://www.rpi.edu/dept/srfs/transfer_credit_approval.pdf. Please note that it may be difficult to transfer credit for a course which is required for our MSE program. Often the university abroad does not offer a course which is directly equivalent to such a required course at RPI. However, you should have no
problems finding courses in Materials, or in other engineering or science disciplines, that will count as technical or free electives. While abroad, students are particularly encouraged to take Humanities and Social Science (H&SS) courses. Courses considered by the host university to be at the junior or senior level can usually be transferred in to RPI. Also, please pay attention to the issue of semester credit hours. The system at RPI is based on 3- or 4-credit-hour courses while foreign universities may operate under a different system. For example, you may wind up taking 2 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 CAPP report.

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 and first semester seniors 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 3.4 or above
- Have completed 90 credits of coursework (including AP credits, transfer credits, and courses in progress)
- GRE exam

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 from 6 to 9 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.

Upon admission to the program, students will be regarded as graduate students by the department but will not normally receive departmental 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

<table>
<thead>
<tr>
<th>Materials Science and Engineering:</th>
<th>Typical Degree Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S., M.Eng., and Ph.D.</td>
<td>M.S. 30 credits (24 coursework, 6 thesis) + M.S. thesis</td>
</tr>
</tbody>
</table>

### 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
- The Focus Center - NY, Rensselaer: Interconnections for Gigascale Integration

### Admission

Submit on-line at: [http://gradadmissions.rpi.edu/](http://gradadmissions.rpi.edu/)

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 2008-2009 academic year is $36,950; fees and insurance are approximately $1,650; Living expenses, books and supplies can vary widely but are estimated at approximately $11,000.

### Contact Us

Nancy Beatty, Department Specialist Materials Science and Engineering

Phone: 518-276-6372

Email: beattn@rpi.edu

[http://www.eng.rpi.edu/mse/](http://www.eng.rpi.edu/mse/)
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 must be approved by the Degree Clearance Officer (DCO) within the department and written notification is sent to the Registrar’s Office. You should meet with your advisor and/or the DCO to determine which substitutions are most commonly approved.

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

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. Students from H&SS, MatheIT, EMAC, and Management all participate regularly in the URP program.

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

When should a co-op be taken?
Many courses in the 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/coop/major/materials.html