

STUDYING FOR A MATERIALS SCIENCE AND ENGINEERING DEGREE

Materials Science and Engineering inter-twines numerous disciplines, including chemistry, physics and engineering. This is the one discipline within the College of Engineering that still gives the students the opportunity to study science while earning an engineering degree. Materials Scientists apply the principles of physics and chemistry to engineering problems, designing and developing new materials. This is a very critical aspect of engineering, as virtually all technological advances are limited by the available materials. As a result of this challenge, Materials Scientists and Engineers are engaged in exploring the many ways that materials can enrich everyday lives. Without this effort to discover and develop new materials, our world of computers, wireless phones, biomedical implants, aircraft, autos, and compact disks could not exist.

Materials Science and Engineering is a broad field that encompasses many different classes of materials. These include polymers, ceramics, electronic materials, composites, and biomaterials. The common thread between these materials is the need to improve processing and properties and to develop new materials. Continued materials research is critical for the advancement and improvement of materials that underlie technologies used to develop energy sources, protect the environment, preserve the national infrastructure, cure diseases, and improve communication.

An undergraduate degree in Materials Science and Engineering can also be a springboard to other careers. An engineering degree coupled with a Masters in Business Administration (MBA) provides an avenue into a career in management or the background for entrepreneurial efforts. Many graduates also choose to pursue a career in medicine or law after obtaining a B.S. in Materials Science and Engineering.

The Department of Materials Science and Engineering prides itself in being a student friendly department. As a small department, class sizes are small, allowing significant interactions with faculty. Many of our faculty have won teaching and research awards. While research is thought to detract from teaching, employing undergraduates to assist in conducting research in fact allows undergraduate students a unique opportunity. In addition, this increases one-on-one interactions with faculty and actually enhances the educational experience.

The administrative staff also seeks to serve the students. They are an invaluable source of information and students are highly encouraged to make themselves known to the administrative staff. Students first visit should be with the Academic Program Specialist to help plan their first year of studies. Students are encouraged to visit with the Academic Program Specialist yearly to plan their next year course of study. It is important for transfer students to make an appointment with the Academic Program Specialist to make sure that the University of Utah transferred their credits and what credits will transfer to the program.

Finally, here are some helpful suggestions to heighten your educational experience and to help you be more successful in your studies:

- ✓ Manage your time wisely
- ✓ Utilize university resources such as tutors, resource centers, etc.
- ✓ Utilize your professors by asking questions
- ✓ Make out-of-class contact within the MSE Department
- ✓ Follow the Program of Study
- ✓ **DO NOT** try to take too many credit hours

IMPORTANT DEPARTMENT PEOPLE YOU SHOULD KNOW

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Professor Jaye Magda jj.magda@m.cc.utah.edu	Polymers/Biomaterials
Professor Agnes Ostafin a.ostafin@utah.edu	Nanotechnology/ Biomaterials
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Professor Ashutosh Tiwari tiwari@eng.utah.edu	Nanotechnology/ Electronic Materials
Distinguished Professor Anil Virkar anil.virkar@utah.edu	Ceramics

The Mission of the Department of Materials Science and Engineering is to offer the students an environment of excellence in teaching, scholarly research, and service to the University community and the community at large that prepares students for successful careers in industry, academia, or the government.

The Program Educational Objectives of the Materials Science and Engineering Program are:

1. Graduates will be successful in entering graduate programs or professional programs, or in obtaining employment in a Materials Science and Engineering industrial profession.
2. Graduates will have a special knowledge of the various classes of materials in context of processing, structure, properties, characterization and selection.
3. Graduates will be provided the necessary tools and instruction to effectively communicate in oral and written form.
4. Graduates will be motivated to have a broad based education and a commitment to life-long learning.
5. Graduates will recognize their ethical responsibility and be prepared to answer contemporary questions in materials science in relation to technology and society.

Leave of Absence Policy

Any student that has obtained admission into the Department of Materials Science and Engineering but then does not enroll in the University of Utah for a period of two or more consecutive semesters (not including summer), will be required to fulfill the degree requirements that are in place upon their return to the Department of Materials Science and Engineering. The student may petition the appropriate advisor to apply courses previously taken to present degree requirements. These will be considered on a case-by-case basis. The student will not have to apply for re-admission to the department as long as he or she remains in good standing with a cumulative grade point average of 2.0 and is making satisfactory progress toward a degree.

Scholarships

Scholarships are available to incoming freshman from the College of Engineering as well as the Department of Materials Science and Engineering. All students interested in a Materials Science and Engineering degree are encouraged to apply. Deadlines for most incoming Freshman Scholarship vary from 1 February (University deadline) to 1 April (Department deadline). Additional information is available in the Materials Science and Engineering Administrative Office.

Materials Science and Engineering Undergraduate Program

Materials Science and Engineering is an integrated discipline of chemistry, physics and engineering. This is reflected in our Program of Study. The student receives a foundation of basic chemistry, physics and engineering coursework during their first two years. These courses are then woven into a Materials Science and Engineering framework. Students work towards a degree in Materials Science and Engineering so they will be taking many introduction to various materials courses during their junior year. During the Spring Semester of their junior year, student's will have the opportunity to choose and concentrate in one specific area of materials, satisfying degree requirements by completing technical electives in ceramics, polymers and polymer composites, semiconductors or biomaterials.

The detailed Program of Study is shown below. This must be used as a guideline to complete the degree requirements. Note that most courses have prerequisites; please follow these. Prerequisites can be found in the current University of Utah General Catalog which can be found on line at: www.acs.utah.edu/GenCatalog. Also note that many courses and virtually all MSE courses are only offered one semester per year. The Program of Study is planned as a roadmap to be used in planning your degree. It is necessary that students follow the Program of Study as closely as possible; any deviation must be worked out in advance with the Academic Program Specialist. Taking courses out of sequence may result in a conflict, particularly if a student is wishing to continue on the combined B.S./M.S. program.

Materials Science and Engineering Program of Study

FIRST YEAR		SECOND YEAR	
Autumn Semester	Spring Semester	Autumn Semester	Spring Semester
CHEM 1210 (4)	CHEM 1220 (4)	PHYS 2210 (4)	PHYS 2220 (4)
CHEM 1215 (1)	CHEM 1225 (1)	ME EN 1300 (4)	ECE 2210 (3)
MATH 1210 (4)	MATH 1220 (4)	MATH 2210 (3)	MATH 2250 (3)
MSE 1800 (1)	MSE 1801 (1)	MSE 2010 (4)	CHEM 2310 (4)
LEAP 1101 (3)	LEAP 1100 (3)	CH EN 1703 (2)	Gen Ed. (3)
WRTG 2010 (3)	Am. Institutions (3)		
<i>Total Credits-16</i>	<i>Total Credits-16</i>	<i>Total Credits-17</i>	<i>Total Credits-17</i>
THIRD YEAR		FOURTH YEAR	
Autumn Semester	Spring Semester	Autumn Semester	Spring Semester
MSE 3010 (3)	MSE 3011 (4)	MSE 5098 (2)	MSE 5099 (2)
MSE 3210 (3)	MSE 3310 (3)	MSE 5032 (4)	MSE 5034 (3)
MSE 3410 (3)	MSE 5025 (3)	Tech. Electives (3-4)	MSE 5061(3)
MATH 3150 (2)	MSE 5090 (3)	Gen Ed. (3)	Tech Electives (3-4)
CHEM 3060 (4)	CHEM 3070 (4)	Gen Ed. (3)	Tech Electives (3-4)
Gen Ed. (3)			
<i>Total Credits-18</i>	<i>Total Credits-17</i>	<i>Total Credits-15-16</i>	<i>Total Credits-14-16</i>

Technical Electives

Students are required, before their senior year, to choose one of the five areas of specialization to focus their emphasis on during their senior year. Their senior design project will coincide with their area of specialization. The areas of specialization are polymers, polymer composites, ceramics, semiconductors, and biomaterials. Students are required to take the courses in the area of specialization. The courses for each area of specialization are as follows:

Polymers		
MSE 5475	3	Intro to Composites
MSE 5473	3	Polymer Processing
MSE 5471	3	Polymer Synthesis
Total Hours	9	

Ceramics		
MSE 5353	4	Physical Ceramics
MSE 5354	4	Processing of Adv Ceramics
MSE 5010	3	X-Ray Diffraction OR
MSE 5035	4	SEM Techniques
Total Hours	11-12	

Semiconductors		
MSE 5201	3	Semicond Dev Phy I
MSE 5211	1	Semicond Dev Lab I
MSE 5202	3	Semicond Dev Phy II
MSE 5212	1	Semicond Dev Lab II
PHYS 3740	3	Intro to Quantum Theory
Total Hours	11	

Composites		
MSE 5475	3	Intro to Composites
MSE 5473	3	Polymer Processing OR
MSE 5471	3	Polymer Synthesis &
ME EN 5520	3	Mechanics of Composite Mats.
Total Hours	9	

Biomaterials		
MSE 5040	4	Intro to Modern Biomaterials &
MSE5071	3	Intro to Nano Biomaterials Technology
BIOEN 1101	3	Fund of Bioengineering I OR
BIOEN 1102	3	Fund of Bioengineering II OR
BIOL 2020	3	Cell Biology
Total Hours	10	

Students can petition to the MSE Undergraduate Committee with their proposed course changes with justification for the change. The MSE Undergraduate Committee will review any deviations to the technical elective courses on a case-by-case basis.

E-LEAP

Effective Fall Semester 2007 all incoming freshman will be required to register and complete the Engineering LEAP (E-LEAP) series. The E-LEAP series will complete two general education requirements and the diversity requirement. See General Education section for more details.

Intermediate Status

Intermediate Status is obtained by the student after their first year. Students' coursework will be evaluated by the Department's Academic Program Specialist. Students are required to visit with the Academic Program Specialist to evaluate the classes required for Intermediate Status. Intermediate Status must be obtained before students can register for MSE 2010 (Introduction to Materials Science & Engineering) or any other upper-division classes. Students must complete the following courses with a "C" or better grade to obtain Intermediate Status.

WRTG 2010	3.0	Intermediate College Writing
MATH 1220	4.0	Calculus II
CHEM 1220	4.0	General Chemistry II
CHEM 1225	1.0	General Chemistry Lab II
LEAP 1100	3.0	Engineering Leap I
LEAP 1101	3.0	Engineering Leap II
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	18.0	

Students who have Advanced Placement (AP) Credit or Transfer Credit may request to have these credits replace the courses. Exceptions are made, by the Academic Program Specialist, to the students DARS report to reflect the approval.

Major Status

In order to graduate in Materials Science & Engineering a student must have Major Status. Students cannot register for any 5000 level classes without obtaining major status. Advancement to major status typically happens during the students' junior year. Students are required to meet with the Academic Program Specialist to determine if they have completed the courses required for major status. Students must complete the following courses with a "C" or better grade to obtain Major Status.

CHEM 2310	4.0	Organic Chemistry I
MATH 2250	3.0	ODEs and Linear Algebra
PHYS 2220	4.0	Physics for Scientists & Engineers II
ME EN 1300	4.0	Statics & Strengths of Materials
MSE 2010	4.0	Introduction to Materials Science & Engineering
CH EN 1703	2.0	Numerical Methods
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	21.0	

Combined B.S./M.S. Program

The B.S./M.S. program is for undergraduate students interested in vigorous pursuit of research. The combined program is intended to foster undergraduate research and to accelerate progress toward the M.S. degree. The combined program is designed to be

completed in five years and to culminate with the simultaneous conferral of the Bachelor of Science and Master of Science degrees. This is one year shorter than the traditional sequential B.S. – M.S. program. As described in the General Catalog.

Students in the B.S./M.S. program would begin research during the senior year. The M.S. thesis topic is expected to be an outgrowth of the required senior project. The advisor of the senior project will be the same advisor for the M.S. thesis.

Applicants for admission to the B.S./M.S. program must have major status in Materials Science and Engineering at the University of Utah. A minimum cumulative GPA of 3.0 is required for admissions to the combined program.

See Academic Program Specialist for handbook and further information.

General Education Requirement

All students (transfer students included) are required to fulfill the general education and bachelor's degree requirements as set forth by the University of Utah's Undergraduate Student Handbook. The Department requires that the following courses be completed:

GENERAL EDUCATION REQUIREMENTS	
<u>American Institutions (AI)</u>	
<u>Writing (WR)</u>	WRTG 2010
<u>Quantitative Reasoning (QA and QB)</u>	
Quantitative Reasoning – Math (QA)	MATH 1210
Quantitative Reasoning – Statistics/Logic (QB)	MATH 1220
<u>Intellectual Exploration (IE)*</u>	
Fine Arts (FF)	
Fine Arts (FF)	
Humanities (HF)	LEAP 1101 (E-LEAP)
Humanities (HF)	PHIL 4540 (Eng, Ethics & Society)
Social/Behavioral Science (BF)	LEAP 1100 (E-LEAP)
Social/Behavioral Science (BF)	
BACHELOR'S DEGREE REQUIREMENTS	
<u>Upper-division Communication/Writing</u>	MSE 5090
<u>Diversity</u>	LEAP 1100 (E-LEAP)
<u>International Requirement**</u>	
BS Quantitative Intensive Requirement (QI)	MSE 3011
2 of these 3 required courses will fulfill this requirement	CHEM 3060
	CHEM 3070

* In addition Materials Science and Engineering students are required to take two IE courses at 3000 level or above. PHIL 4540 (Engineering, Ethics, & Society) will fulfill one of these two courses.

**The International Requirement is required for all students who enroll for the first time in Fall 2007, this includes transfer students and incoming freshman. See the Undergraduate Bulletin and Student Resource Guide for more information.

Transfer Students

Students with transfer credit must meet with an Academic Program Specialist as soon as they are admitted to the University of Utah and have declared Materials Science & Engineering as their major. In-State Transfer Credit is evaluated using the State Articulation Guide. Out-of-State Transfer Credit is evaluated on a case-by-case basis using course descriptions from the transfer school.

Advance Placement Credit

The AP Table below indicates the scores the department will accept for placement in Physics, Chemistry, Math, and English classes. The classes shown may be used toward graduation requirements. Although the University of Utah grants credit for AP scores of 3 and above, using a score of 3 in the major admissions process may jeopardize the student's progress toward degree completion. The MSE Academic Program Specialist should be contacted for an appointment to discuss each student's individual situation.

Subject	AP Score	Equivalent Class	Credit Hours
Calculus AB	4	Math 1210	4
	5	Math 1220	4
Calculus BC	3	Math 1210	4
	4	Math 1210, 1220	4,4
	5	Math 1210, 1220	4,4
Physics C, Mechanics	4	Physics 2210	4
	5	Physics 2210	4
Physics C, Elect & Mag	4	Physics 2220	4
	5	Physics 2220	4
Chemistry	4	Chem 1210, 1220	4,4
	5	Chem 1210, 1220	4,4
English	4	Wrtg 2010	3
	5	Wrtg 2010	3

Grading Policy

Materials Science & Engineering Undergraduates are required to take MSE courses and receive a grade of "C" or better in order to advance to higher level MSE courses. If a student does not receive a "C" or better in a MSE course then the course will have to be retaken.

Repeating Courses

Students needing to repeat any course more than once must get prior permission from the Undergraduate Committee by written petition. Petitions will be addressed and decided upon on a case by case basis. Grades of **W, I, or V** on the student's record count as having taken the course. Students should note that anyone who takes a required class twice and does not have a satisfactory grade the second time may not be able to graduate.

Senior Design & Thesis

The senior project is a capstone project that prepares the student for engineering design practice. It provides an avenue to determine if the student has an integrated understanding of the scientific and engineering principles.

MSE 5090 Case Studies is the pre-requisite to Senior Design & Thesis. Students must take MSE 5090 Spring Semester of their Junior Year. **There are no exceptions.**

The required senior thesis consists of two courses taken during your senior year.

Senior Design (MSE 5098) Fall Semester – 2 credits – Senior Year
Senior Thesis (MSE 5099) Spring Semester – 2 credits – Senior Year

Grades will not be given for MSE 5098 and MSE 5099 until the senior design and thesis project has been completed and signed off.

The student is responsible for initiating the senior project process. Each student can develop the idea or project independently or in conjunction with a faculty member, or a local company to assure the progress of the thesis. The senior thesis must be in the student's "area of specialization". It can be part of a summer work project, an intern project or it can be part of a large project defined and supported by a faculty member.

The completed senior design and thesis project is due the last day of classes of the Spring Semester the student is enrolled in MSE 5099, regardless if the student has classes to take Summer or Fall Semester. **There are no exceptions.**

Honors in Engineering Program

The Honors in Engineering Program in the College of Engineering is designed to provide a challenging, individualized educational experience to high achieving students and to promote life-long learning throughout their careers. The objective is to challenge top students by offering them access to more advanced levels of study, to facilitate the fullest possible use of their creative abilities, to encourage a sustained interest in advanced education and basic research, as well as to foster leadership and fellowship within the engineering community. Honors in Engineering is an undergraduate student honors program that is an option and not mandatory. Students can also receive University Honors in addition to Honors in Engineering.

Freshman are required to have an admission index score of 120 or higher, must have taken either the ACT or SAT and have a high school grade point average (GPA) of 3.4 or above. Continuing students or transfer students must have a 3.4 GPA or higher. Students must maintain a GPA of 3.4 to remain in the program.

The College of Engineering Honors program is intended to be flexible, to be rich in coursework and investigational challenges, as well as leadership and service learning opportunities. It is composed of three basic elements, including: general coursework; an

investigational or focused studies component; and a leadership or service component as described below.

To receive a Bachelor of Science in Engineering with Honors students must:

- Meet all University and Departmental requirements for a Bachelor of Science degree in Engineering
- Maintain a cumulative GPA of 3.4
- Complete at least 15 units of generalized Honors coursework
- Complete at least 16 units of investigational or focused studies^{1,2}
- Complete an Honors thesis (3 units) and submit a written thesis discussing the project. The format of the Honors thesis must be consistent with standard scholarly practice (i.e. Introduction, Methods, Results, Discussion, and References cited)
- Present the results of the thesis work in an appropriate public forum (i.e. Engineering Undergraduate Research Symposium, University Undergraduate Research Symposium or oral public defense), as approved by the Honors Director and
- Satisfy the Leadership and Service requirement³

For more information on the program go to

http://www.coe.utah.edu/current/UG/Honors_in_Engineering or contact the Honors in Engineering Advisor, Ashley Paulsen at (801) 581-4528 or ashley.paulsen@utah.edu

¹ The minimum requirement is two semester of investigational studies totaling 6 credit hours; however, students are encouraged to pursue research in greater depth. This is meant to be flexible to allow students in various disciplines to participate. It may, for example, take the form of laboratory research or a think-tank-like experience as currently offered by the University Honor's Program or may involve graduate level courses in a focus area, track or specialization.

² Upper division major honors courses or electives may be substituted to meet students' needs

³ Each student is required to participate in a minimum of two approved leadership or service opportunities. These may include any leadership position in any non-honorary or honorary student organization or any university, college or department level committee. In addition, credit can be obtained for tutoring and mentoring services that exist within the College of Engineering or across campus or other approved service learning opportunity.

Graduation

The following process is followed to help students prepare for graduation.

- During Spring semester of the junior year, a DARS report is generated by the Academic Program Specialist.
- During an appointment with the Academic Program Specialist the DARS report is evaluated with the student. Any problems detected during this appointment are verified and, if necessary, corrected as an exception to the student's DARS report.
- The student is advised what courses are still missing and a time-line schedule is discussed with the student for the senior year to ensure that they will complete their program requirements in order to graduate on time.

It is important that you communicate with the Academic Program Specialist about your intended graduation date, if it is not Spring Semester.

In order to graduate students must meet all of the University of Utah requirements as well as the department requirements for graduation.

Applying for Graduation

Graduation and Application Deadlines:

Spring Graduation (May) must apply by November 1 of preceding Fall Semester

Summer Graduation (August) must apply by February 1 of preceding Spring Semester

Fall Graduation (December) must apply by June 1 of preceding Summer Semester

Failure to take the appropriate steps and apply for graduation by the deadline will result in a \$10 late fee and may delay the student's graduation date. Students are able to renew their graduation application once without penalty. Any additional renewals are \$10 each.

Additional information regarding graduation can be found at:

<http://www.sa.utah.edu/regist/pages/graduation.htm>

Students must give the Academic Program Specialist sufficient time before the deadline to sign their graduation applications. It is the student's responsibility to obtain the signatures for their minors from the appropriate departments before turning in the application to the graduation window in Student Services.

University Policies

Withdrawal Procedures

Definition of Drop – implies that the student will not be held financially responsible and a “W” will not be listed on the transcript.

Definition of Withdraw – means that a “W” will appear on the student's transcript and tuition will be charged.

Drop Period – Student may DROP any class without penalty or permission during the FIRST TEN calendar days of the term.

Withdrawal from Full Term Length –Beginning the eleventh calendar day and continuing through the midpoint of the term, students may withdraw from a class or the University without instructor/department permission. After midpoint of the term, students may petition the deadline for withdrawal if they have a nonacademic emergency. A petition and supporting documentation must be submitted to the Dean's Office, 1610 Warnock (WEB) or University College (450 SSB, if you are a pre-major). Petitions must be received before the last day of classes (before finals week).

Check the academic calendar for specific drop and withdrawal dates.

Adding Classes

ALL CLASSES MUST BE ADDED WITHIN TWO WEEKS OF THE BEGINNING OF THE SEMESTER.

Adding classes after the deadline is not permitted in the College of Engineering, and requires a petition letter.

Appeals Procedures

See the Code of Student Rights and Responsibilities, located in the Class Schedule or on the U of U web site for more details.

Appeals of Grades and other Academic Actions

If a student believes that an academic action is arbitrary or capricious he/she should discuss the action with the involved faculty member and attempt to resolve. If unable to resolve, the student may appeal the action in accordance with the following procedure.

1. Appeal to the Department Chair (in writing) within 40 working days; chairs must notify student of a decision with 15 days. If the faculty member or student disagrees with decision then,
2. Appeal to Academic Committee (see flyers posted in MEB and EMCB for member of committee). See II Section D, Code of Student Rights and Responsibilities for details on Academic Appeal Committee hearings.

Additional information regarding these policies can be found at: <http://www.sa.utah.edu/regist/>

Americans with Disabilities Act Information

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in classes, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD) to make arrangements for accommodations.