

**BACHELOR OF
MATERIALS SCIENCE AND ENGINEERING
PROGRAM**

**DEPARTMENT OF CHEMICAL ENGINEERING
AND MATERIALS SCIENCE**

UNIVERSITY OF MINNESOTA

151 AMUNDSON HALL
421 WASHINGTON AVE SE
MINNEAPOLIS, MN 55455

August 24, 2009

MSE Director of Undergraduate Studies: Lorraine Francis
(406 AmH, lfrancis@umn.edu, 625-0559)

Assistant to Directors of Undergraduate Studies: Laura Ericksen
(151 AmH, ericksen@cems.umn.edu, 626-5762)

TABLE OF CONTENTS

I.	MATERIALS SCIENCE AND ENGINEERING (MSE)	3
II.	PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM OUTCOMES	4
III.	INSTITUTE OF TECHNOLOGY BULLETIN AND PUBLICATIONS	5
IV.	REQUIREMENTS FOR THE B.MAT.S.E. DEGREE Liberal Education (LE) and Writing (WI) Requirements Lower Division Upper Division Technical Electives Academic Performance Expectations	5
V.	SCHEDULING YOUR PROGRAM	7
VI.	ONE-YEAR PLANS AND ADVISING APPOINTMENTS	8
VII.	GRADUATION	8
VIII.	SENIOR THESIS OPTION	9
IX.	HONORS DEGREE	9
X.	COOP PROGRAM	9
XI.	RESEARCH EXPERIENCE	9
XII.	SCHOLARSHIPS	10
XIII.	STUDY ABROAD	10
XIV.	JOBS WHILE STUDYING	10
XV.	CONDUCT AND DISCIPLINE	11
XVI.	CEMS FACILITIES AND MSE STUDENT ORGANIZATIONS Undergraduate Study Room Computer Facilities	11
XVII.	OTHER FACILITIES AND ORGANIZATIONS OF INTEREST IT Computer Facilities Counseling Libraries Career Services Student Organizations Tutoring	11
XVIII.	REQUIREMENTS FOR DOUBLE MAJORS, MINORS	12
XIX.	CURRICULUM MAP FOR MSE MAJORS	13

I. MATERIALS SCIENCE AND ENGINEERING (MSE)

Advances in technology and improvements in our quality of life are linked to the development of engineering materials. For example, high purity silicon makes it possible to have miniaturized electronics and high speed computers; strong, light-weight alloys increase the fuel efficiency of cars; polymeric contact lenses are available as an alternative to traditional eyewear; and ceramic space shuttle tile have helped to revolutionize space travel. How were engineering materials such as these selected? What physical properties of the candidate materials influenced the choices? How can the materials be manufactured into the needed size and shape? These are questions for a materials scientist or materials engineer. Materials scientists and engineers are trained to develop new and improved materials for engineering applications. These engineers know how to measure a material's properties, characterize its structure and determine how properties and structure are affected by the conditions of use. Materials scientists and engineers are also involved in the design of the manufacturing processes used to fabricate the engineering materials into products.

A Bachelor's degree in MSE prepares you to be on the forefront of developing new materials and technology. Coursework in MSE covers the structure, properties, processing and performance of engineering materials. An engineering material's structure is made up of atoms and molecules as the fundamental building blocks. The nature of the interatomic and intermolecular bonds and the way in which the atoms or molecules pack in the solid structure are responsible for many of the differences in materials properties. For example, differences in bonding explain why most metals are good conductors of electricity and most ceramics are not. Structure on a larger length scale (microstructure) influences properties as well. Characterization methods, including atomic force microscopy and light microscopy, allow us to image structural features down to an atomic scale and up to the millimeter level. A host of physical properties are of interest to materials scientists and engineers, including mechanical properties, such as strength and ductility, and electrical properties, such as conductivity. In addition, an engineer may need to know about the magnetic, optical, thermal and chemical properties of material. For any engineering material to be used, it must be fabricated or processed into the necessary shape and size. The way in which a material is processed determines its structure and therefore influences its properties. Students in the MSE program gain an appreciation of the interrelationships between structure, properties and processing, and can contribute effectively to the development of new products and applications for materials.

Materials scientists and engineers are employed in many industries, including microelectronics, automotive, aerospace, biomedical, consumer products and communications. They may contribute to the engineering operations of a company or to a research and development team. In these jobs, they often work in groups with other engineers, such as electrical, mechanical and chemical engineers. They may also enter management, marketing, service or sales positions, which make use of their scientific and engineering background. Some go on to graduate school to earn advanced engineering degrees or enter law or medical degree programs.

II. EDUCATIONAL OUTCOMES AND OBJECTIVES

The MSE program is accredited by the Engineering Accreditation Commission of ABET. The program is designed to achieve educational objectives and lead its graduates to achieve outcomes. These objectives and outcomes will be updated, based on feedback from students, faculty, industrial advisors and alumni.

Program Educational Objectives

The MSE program is designed to prepare students to achieve the following career and professional accomplishments after graduation:

- 1: Be employed as a materials engineer or in a related engineering or science position, using and developing his or her skills based on the demands of the job.
- 2: Enter into a graduate or professional program, applying his or her knowledge and experience toward an advanced or professional degree.
- 3: Be an effective team member, using and developing communication and teamwork skills.
- 4: Be a responsible engineer/scientist or professional, demonstrating ethical and professional responsibility and continuing to learn through formal and informal educational experiences.

Program Outcomes

MSE graduates equipped with:

- 1: an ability to apply knowledge of the scientific and engineering principles underlying the four major elements of materials engineering: structure, properties, processing, and performance of engineering materials (including metals and alloys, ceramics, polymers, electronic materials and composites).
- 2: an ability to design and conduct experiments relevant to MSE, including the use of experimental, statistical and computational techniques, and the analysis and interpretation of data.
- 3: an ability to apply and integrate knowledge of the four elements in outcome 1 to identify, formulate and solve materials selection problems and design problems.
- 4: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- 5: an ability to work in teams, as well as a beginning ability to work in multidisciplinary teams.
- 6: an appreciation of professional and ethical responsibility, and the importance of continued learning after graduation.
- 7: an ability to communicate effectively.
- 8: an elementary understanding of the impact of engineering on society, including safety, the economy and the environment.
- 9: an introduction to contemporary issues in MSE.

Any comments or suggestions related to the Program Educational Objectives or Program Outcomes should be given to the Director of Undergraduate Studies.

III. INSTITUTE OF TECHNOLOGY INFORMATION

The IT website (<http://www.it.umn.edu>) is a great source of information. The Institute of Technology section of the Undergraduate Catalog (<http://www.catalogs.umn.edu/ug/index.html>) is also a valuable source of official information. These resources supplement the University information contained on the Student OneStop (<http://onestop.umn.edu/>).

IV. REQUIREMENTS FOR THE B.Mat.S.E. DEGREE

In order to obtain your Bachelor of Materials Science and Engineering degree, you must complete the requirements below. See section XX for sample 4 year plan. Students must complete 128 semester credits.

Liberal Education (LE) and Writing Intensive (WI) Requirements

Students need to complete enough courses to satisfy the LE requirements. Note that 2 core course requirements (physical sciences with a lab and mathematical thinking) are satisfied by the lower division required courses, and the environmental theme requirement is satisfied by Chem 1021. Students are advised to take EngC 1011 (or equivalent) and Biol 1009 (or equivalent biology with a lab) in their freshman year.

Students must take at least 4 courses with the writing intensive (WI) designation. Note that 2 of the required lower division courses are writing intensive (Phys 1301W, Phys 1302W). At least 2 WI courses must be taken at a level of 3xxx or above. The following MSE courses have WI designation: MatS 3851W, MatS 4301W, and MatS 4511W.

Lower Division

The following is a list of required courses that are taken in the lower division. All required courses must be taken on the A/F grade basis and a grade of C- or better is required for the course to fulfill your program requirement.

Chem 1021, 1022, 2301
Math 1371 or 1271, 1372 or 1272, 2374 or 2263, 2373 or 2243
Phys 1301, 1302, 2303
AEM 2011
CE 3101
MatS 3011

You should apply to enter upper division by filing an application with IT (105 LindH). To be admitted to the upper division of the Materials Science and Engineering program, you must have a technical GPA of 2.0 or higher, and you must have taken AEM 2011, Chem 2301, Math 2374 or 2263, 2373 or 2243, and Phys 2303. CE 3101 may be taken in sophomore year or first semester of the junior year. **MatS 3011 (Introduction to Materials Science and Engineering) should be taken in the sophomore year.**

Upper Division

The following is a list of required courses that are taken in the upper division. All required courses, including technical electives, must be taken on the A/F grade basis and a grade of C- or better is required for the course to fulfill your program requirement.

MatS 4001, 4002, 3012, 3801, 3851W, 4013, 4212, 4214, 4221, 4301W, 4400

AEM 3031, 4511

Technical Electives (13 cr, see below)

Individual courses in this core may be replaced by appropriate substitutes if acceptable justification for replacement can be stated, but replacement always requires approval by the MSE Director of Undergraduate Studies.

Technical Electives

Students must complete at least 13 semester credits of technical electives in addition to the required courses stated above. The table below shows a selection of IT courses that may be taken as technical electives. The technical electives are grouped into emphasis areas so that students can easily find courses that suit their interests. **Students do not need to choose an emphasis area; they may pick technical electives from a variety of areas.** Most of the courses in the table do not require prerequisites beyond those already required in the MSE program, but prereq's should always be checked as some courses must be taken in sequence. The table below does not include all possible technical electives. Most upper division IT courses (3xxx, 4xxx or 5xxx level) may serve as technical electives but only with permission of the MSE Director of Undergraduate Studies.

Technical Electives in the B.Mat.S.E. Program

Interest Area	Course Number	Title	Credits
Advanced MSE	MatS 4512/ MatS 4511W	Corrosion and Electrochemistry of Corrosion	4
	MatS 5531	Electrochemical Engineering	3
	MatS 5517	Electron Microscopy	3
	ChEn 5771	Colloids and Dispersions	3
Biomaterials	BioC 3021	Biochemistry	3
	BME 5001	Advanced Biomaterials	3
	MatS 4512	Corrosion and Electrochemistry of Corrosion	4
Chemistry	Chem 2302	Organic Chemistry II	3
	Chem 2311	Organic Chemistry Lab	4
	Chem 4701	Inorganic Chemistry	3
	Chem 5201	Materials Chemistry	4
Chem. Eng.	ChEn 2001	Material and Energy Balances	4
	ChEn 4xxx	Any ChEn upper division course	4
Civil Eng.	CE 3402	Construction Materials	3
	CE 3501	Environmental Engineering	3
	CE 3502	Fluid Mechanics	4
	CE 4232	Cemented Materials	3
	CE 4121	Computer Applications II	3
Electr. Mat'ls	EE 3005	Fundamentals of Electrical Engineering	4
	EE 3006	Fundamentals of Electrical Engineering-Lab	1

Interest Area	Course Number	Title	Credits
	EE 3161	Semiconductor Devices	3
	EE 5171	Microelectronic Fabrication	4
	EE 5173	Basic Microelectronics Laboratory	1
Industrial Eng.	IE 4521	Statistics, Quality & Reliability	4
	IE 5441	Engineering Cost Accounting, Analysis and Control	4
	IE 5541	Project Management	4
Math/Statistics	Math 4242	Applied Linear Algebra	4
	Math 4512	Differential Equations with Applications	3
	Math 4428	Mathematical Modeling	4
	Math 4457	Methods of Applied Mathematics I	4
	Math 4458	Methods of Applied Mathematics II	4
	Stat 3011*	Introduction to Statistical Analysis	4
	Stat 3012*	Introduction to Probability and Statistics	3
	Stat 3022	Data Analysis	4
Polymers	Chem 2302	Organic Chemistry II	3
	MatS 4223W	Polymer Lab	2
Physics	Phys 4001	Analytical Mechanics	4
	Phys 4002	Electricity and Magnetism	4
	Phys 5701	Solid State Phys. for Engineers & Scientists	4

**students may not take both Stat 3011 and Stat 3012*

Academic Performance Expectations

Students must meet the University requirements for maintaining academic performance. A student is placed on probation if his/her cumulative or term GPA drops below a 2.0. IT notifies all students who are placed on probation and instructs them to see an advisor immediately. Any upper division MSE student who is placed on probation must see the MSE Director of Undergraduate Studies immediately to discuss probation and how to improve performance. A probation contract must be completed for the current term.

V. SCHEDULING YOUR PROGRAM

A sample schedule for a student who starts his or her higher education on the Twin Cities Campus and a curriculum map are given in section XX. If you follow this schedule, you will be able to obtain your B.Mat.S.E. degree in four years. Note that this is a sample course schedule, and that your own situation may lead you to depart from it, particularly in scheduling your Liberal Education and technical electives. New students and new transfer students entering the University in Fall 2002 and thereafter are required to register for at least 13 credits each semester. This new rule is designed to encourage students to complete their degrees in a timely fashion.

In planning your program, you should remember that many courses, especially those in the core required courses in MSE, are offered only once a year and have prerequisites that you must satisfy. Department and University policy prohibits taking two courses offered with overlapping class hours.

VI. ONE-YEAR PLAN FORMS AND ADVISING APPOINTMENTS

One-year plan forms facilitate the advising and course planning processes. New juniors should see a faculty advisor in the Fall to fill out a one year plan for the junior year. All students are required to prepare a one-year plan each year in the Spring. The one-year plan forms are available on the web. After completing the form, the student should schedule an appointment with his or her advisor (see below) to review the plan. Students should bring a copy of their transcript to the appointment. One-year plan forms for the academic year need to be signed by an advisor before the registration period for fall semester of that year. A copy of the one year plan form should then be given to the MSE Director of Undergraduate Studies and the academic hold can be lifted. Since registration for Fall Semester starts in April, you will have to submit a one-year plan in March or April of each year.

Every student majoring in Materials Science and Engineering has an advisor. These advisors are assigned based on the first letter of your family name. You may always consult with the MSE Director of Undergraduate Studies as an alternate. Lower division students in general receive advising through the IT Lower Division Programs Office in 128 Lind Hall. However, lower division students are still welcome to consult with their departmental advisor.

First letter of your Family Name	Advisor	Email address
A, B, C, D	W. W. Gerberich	wgerb@umn.edu
E, F, G	R. J. Holmes	rholmes@umn.edu
H, I, J, K	C. W. Macosko	macosko@umn.edu
L, M, N	D. A. Shores	dshores@umn.edu
O, P, Q, R	L. F. Francis	lfrancis@umn.edu
S, T, U, V, W, X, Y, Z	C. Leighton	leighton@umn.edu

To make an appointment with your advisor, you should stop by his or her office or send email. If you have difficulty contacting your advisor, you may consult the MSE Director of Undergraduate Studies. Those pursuing a double major or seeking approval for course substitutions should see the MSE Director of Undergraduate Studies.

VII. GRADUATION

You should review your Academic Progress Audit System (APAS) report at least two semesters before you plan to graduate. A copy of your APAS is available from the Registrar in 200 Fraser Hall and on line (<http://www.onestop.umn.edu> and click on APAS link). The APAS shows courses you must complete successfully in order to obtain your B.Mat.S.E degree, and it reflects all the requirements stated above. One semester before your intended graduation date, review your APAS to be sure that all requirements are satisfied. If you have questions, see the MSE Director of Undergraduate Studies. Recall that to graduate, you must complete the courses listed on the APAS, accumulate 128 semester credits, and maintain a grade point average of at least 2.0.

Complete and submit an Application for Degree Form by the deadlines listed on the web under the academics section of the student one stop (typically mid-September for December graduation and late January for May graduation). There is no fee associated with this form. Copies of the form are available on the web <http://www.onestop.umn.edu/onestop/graduating.html>. The completed form must be submitted to 150 Williamson Hall.

VIII. SENIOR DESIGN THESIS OPTION

Students interested in carrying out a more intensive, typically laboratory-based, senior project should consider doing a 2-semester senior design thesis (MatS 4401 and MatS 4402). This 2-semester experience is an alternative to MatS 4400 – Senior Design Project, which is offered in the Spring semester. To qualify for the thesis option, students must have a GPA of 3.0 or higher and arrange the project with a faculty advisor. The best way to go about finding an advisor and project is to identify CEMS faculty carrying out research interesting to you. Check the web site. Any faculty member in CEMS can advise a senior design thesis. You will note that the 2-semester option carries 4 credits while the one semester senior design project is 3 cr. Students choosing the thesis option will have the number of required technical electives dropped from 13 to 12 cr. The culmination of the 2-semester is a written thesis that will qualify as an honors thesis. If you have any questions, please ask the MSE Director of Undergraduate Studies.

IX. HONORS DEGREES

You may earn the B.Mat.S.E. degree with one of the Latin honors designations *cum laude*, *magna cum laude*, or *summa cum laude* if the requirements are satisfied and proper applications submitted. Questions about the honors program should be directed to the current CEMS Honors Program Director, Professor Prodromos Daoutidis.

For students initiating their honors plans before Fall 2008 through IT and CEMS, the requirements are found at http://honors.umn.edu/academics/collegiate_programs/College-basedHonorsReqsforITpre-fall08.html

For students initiating their honors plans after Fall 2008, participation in the Undergraduate Honors Program (UHP) is required. In order to obtain a Latin Honors degree, a student must apply for admission to UHP before they enter into their last 4 semesters of study. UHP program admission procedure and requirements are found at: <http://honors.umn.edu/admission/index.html> Requirements for the Latin degrees are found at <http://honors.umn.edu/academics/graduation.html>

If you do not participate in the honors program, you will still automatically receive your bachelor's degree with the designations *with distinction* or *with high distinction* if your overall grade point average is in the ranges 3.50–3.79 and 3.80–4.00, respectively.

Participation in UHP is not required for students to carry out research in the department.

X. CO-OP AND INTERNSHIP PROGRAM

The co-operative education (Co-Op) experience involves two assignments at a company integrated with coursework. An internship is a shorter industrial project. Both programs give students valuable experience. In some cases, academic credit can also be earned. See Prof. D. A. Shores, the Faculty Internship/Co-op Coordinator (108 Amundson Hall, dshores@tc.umn.edu) for more information.

XI. RESEARCH EXPERIENCE

Many opportunities exist on campus and in the department for students to participate in a research project. Participating in a research project is a very good way to learn what research is all about. For those interested in graduate school, undergraduate research is the best way to sample graduate student life and become better acquainted with a professor. One can either receive credits

by registering for independent study or directed research (MatS 4591 or MatS 4594) or receive monetary compensation for research. For MatS 4591 or MatS 4594, the student must first receive the consent of the supervising faculty member. Upon completion of the project, a short summary (no more than two pages) of the project must be submitted to the MSE Director of Undergraduate Studies, in addition to a full report submitted to the supervising faculty member.

The research section of the department website (<http://www.cems.umn.edu>) can be used to learn about the professors' research. Paid positions are generally available in the department; some professors post announcements of these opportunities near room 132. Other opportunities are:

UROP Awards of limited stipend and research expenses are available from the Education Development Office under the Undergraduate Research Opportunities Program (UROP). See <http://www.urop.umn.edu> for more information

Work Study If you qualify for work-study be sure to tell the professors you are interested in working with. They need to use research funds for a portion of the stipend on work-study jobs.

XII. SCHOLARSHIPS

In the Spring Semester or shortly thereafter, some scholarships are awarded by the department and others are awarded by IT. These are TWO SEPARATE SCHOLARSHIP PROGRAMS. You may apply to BOTH. At the beginning of the Spring Semester, obtain the application forms for department scholarships in the department office (151 Amundson Hall) and for the IT scholarships in 105 Lind.

XIII. STUDY ABROAD

Students interested in exploring foreign cultures may be able to arrange up to one year of study in a materials science and engineering department in a foreign country. Studying abroad is a great opportunity for one to cultivate a global view of technological and economical development and to appreciate a different culture. Many courses taken in a university abroad can be transferred for credits. However, it is likely that foreign study will delay graduation beyond the normal four-year period. Students should view such an experience as a personal enrichment, but not merely a partial substitution of regular education in this department. Students interested in studying abroad are urged (i) to consult with their Director of Undergraduate Studies as early as your freshmen year regarding planning for academic coursework, (ii) to arrange foreign language courses if necessary, and (iii) to assess financial cost and possible assistance from various sources. Information on study abroad programs at the University of Minnesota can be found at Learning Abroad Center, 230 Heller Hall (<http://www.umabroad.umn.edu> ; http://www.it.umn.edu/students/learning_abroad.html).

XIV. JOBS

Many students hold a part time job while pursuing their B.Mat.S.E. degree. Some jobs provide technical experience as well as financial benefits. For example, you can be employed as an undergraduate research assistant in a university laboratory or a technical aid or intern at a company. While such jobs are beneficial, students should be aware of the hazards of overwork, especially during upper division years. Even without part-time work, many students find themselves having to adjust their study habits after entering upper division. Students must put education as the first priority. Working more than 10 hours a week during the semester is not advised for those who plan to finish the B.Mat.S.E. degree in four years.

XV. CONDUCT AND DISCIPLINE

The following is an excerpt from the IT web sites: <http://it.umn.edu/students/policies/index.html>
http://it.umn.edu/students/policies/acad_integrity.html

Any act of scholastic dishonesty is considered a serious offense that may result in expulsion. IT defines scholastic dishonesty as:

- submission of false records of academic achievement
- cheating on assignments or examinations; plagiarizing
- altering, forging, or misusing a University academic record
- taking, acquiring, or using test materials without faculty permission
- acting alone or in cooperation with another to falsify records or to obtain dishonest grades, honors, awards, or professional endorsement.

All students in the Department of Chemical Engineering and Material Science are expected to abide by the highest professional ethical standards. In the unfortunate event that dishonest conduct occurs, the department will pursue actions diligently according to the procedures outlined by the Office of Student Conduct and Academic Integrity (<http://www1.umn.edu/oscai/>).

XVI. CEMS FACILITIES AND MSE STUDENT ORGANIZATIONS

Undergraduate Study Room

The departmental Undergraduate Study Room is in Amundson 132. The room is accessed by a key code, which changes each semester. The key code is communicated to CEMS upper division students by email.

Computer Facilities

The Department of Chemical Engineering and Materials Science has an Undergraduate Study Room in Amundson 132. There are computers for your use in 132A and 132C inside room 132. Upper division CEMS students can have accounts on the CEMS computer system. For more information, contact the CEMS systems administrator by email (uglab@cems.umn.edu) or in person (185 Amundson Hall).

MSE Student Organizations

There are two student organizations in the department: Material Advantage and the student chapter of the Materials Research Society (MRS). Students should watch for postings, emails and class announcements about meetings and activities. Students are also invited to meetings of the Minnesota Chapter of ASM International. Involvement in these activities will increase your awareness of opportunities in your profession, give you a chance to meet materials scientists and engineers working in industry, and give you leadership experience.

XVII. OTHER FACILITIES AND OTHER ORGANIZATIONS

IT Computer Facilities

IT computer facilities in other locations (<http://www.it.umn.edu/students/computing.html>)

Counseling

University Counseling and Consulting Services in Eddy Hall offers a wide variety of services and provides help on problems of study skills, career decisions, communication skills, anxiety, stress, time management, etc. Drop by 109 Eddy Hall, call 624-3323 or visit <http://www.uccs.umn.edu/>

Libraries

Visit <http://www.lib.umn.edu>.

Career Center

The Career Center for Science and Engineering is in Room 50, Lind Hall (<http://www.ccse.umn.edu/>). Every year, particularly in the Fall Semester, companies seeking to hire engineers set up interview schedules through this office. Interviews are set up for summer internships, co-ops and permanent positions. You can also drop by to browse through the Career Center's collection of company brochures.

Student Organizations

There are student organizations for virtually every kind of activity — sports, hobbies, politics, religion, arts, student government, professions, music, travel, ethnic culture, etc. Engineering student groups include the IT Student Board (624-4366), the IT Board of Publications (624-9816), which publishes Minnesota Technologist and IT Connection, Tau Beta Pi (626-0209), Plumb Bob (626-1552), the Society of Women Engineers (626-0093) and National Society of Black Engineers (626-7501), as well as many others. Go to http://www.it.umn.edu/students/campuslife/student_orgs.html for a complete list. Most of these organizations have offices in Lind Hall.

Tutoring

The IT Undergraduate Academic Center in 150 Lind provides free one-on-one tutoring by experienced students for help with Math, Physics, and Chemistry problems. Similar tutoring is available in dormitories. Call 624-2890.

XVIII. REQUIREMENTS FOR DOUBLE MAJORS AND MINORS

If you wish to earn a second major (e.g., ChEn, BME) or a minor, follow the directions in the IT Student Survival Guide (available in 128 Lind). The Director of Undergraduate Studies in MSE has sample plans and course lists for the two common double majors – ChEn/MSE and BME/MSE. Individual advising is necessary to plan these degree programs. Plan on an extra year to earn a second degree. Be aware that engineering degrees cannot be chosen as minors.

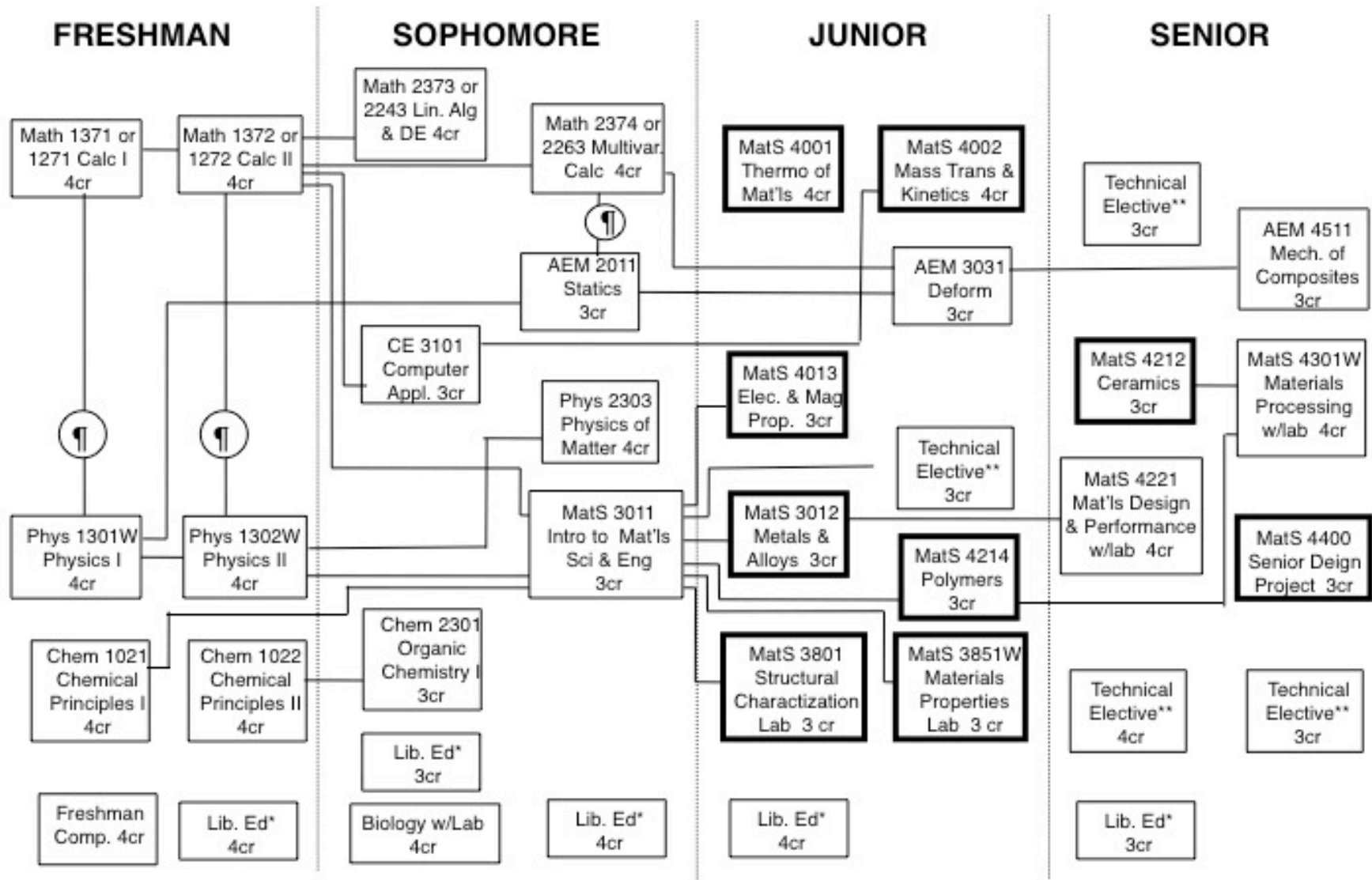


Figure 1. MSE curriculum map. Prerequisites are shown as lines, and bold boxes have a prerequisite of upper division MSE major (Math 2373 & 2374; Phys 2303; Chem 2301; AEM 2011). The prerequisite for MatS 4400 is MSE senior.