# MSNE

## Materials Science and NanoEngineering

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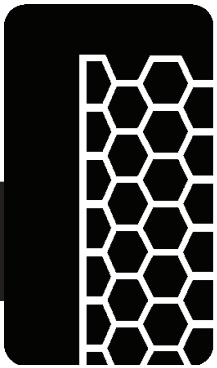
| **WEB LINKS** | https://msne.rice.edu |
| **FRANK ADVICE** | Many MSNE students pursue graduate degrees in top graduate schools after earning their B.S. degree, so undergraduate research experiences are quite important. Research intern experiences also help students obtain industrial jobs after graduation. |
| **ADVICE FOR STUDENTS WITH AP CREDIT** | Students with AP credit for calculus would do well to move the MATH and CAAM sequence up. If the CAAM sequence can be fully completed in the sophomore year, this reduces the junior year pressure and also allows for more opportunities to participate in undergraduate research. |
| **ALTERNATIVE CURRICULA** | Not applicable. |
| **BS VERSUS BA** | Students are encouraged to pursue the B.S. degree instead of the B.A. degree, especially those who plan to pursue a graduate degree or practice engineering. |

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| **RESEARCH** | Many MSNE majors participate in undergraduate research; some even start during their freshman year. To get involved, speak to a MSNE undergraduate adviser or directly to a MSNE faculty member. |
| **INTERNSHIPS** | Summer research internships are often available through individual MSNE research labs, as well as universities abroad. Many students also pursue industrial or government lab internships as well. Notices are posted to the MSNE undergrad email list. |
| **STUDY ABROAD AND INTERNSHIPS** | Study abroad and full-time off-campus internships need to be scheduled in the fall semester of the sophomore and junior years. This avoids conflicts with lab classes and the year-long senior design sequence. |
| **PROFESSIONAL ORGANIZATIONS** | American Ceramic Society (ACerS)<br>ceramics.org<br>Association for Iron & Steel Technology (AIST)<br>aist.org<br>ASM International asminternational.org<br>The Minerals, Metals, and Materials Society (TMS)<br>tms.org<br>Rice Undergraduate Materials Science and NanoEngineering Society<br>materialsociety.blogs.rice.edu<br>Rice Center for Engineering Leadership(RCEL)<br>rcel.rice.edu |
| **INTERESTING COURSES FOR NON–MAJORS** | MSNE 201 Introduction to NanoEngineering<br>MSNE 301 Materials Science<br>MSNE 402 Mechanical Properties of Materials<br>MSNE 406 Physical Properties of Solids<br>MSNE 435 Crystallography and Diffraction |

# B.S. In Materials Science and NanoEngineering

**Specializations:** None Available. Students select specialization electives to suit their academic interests and career plans.

**Engineering Sciences Electives:** At least four electives for a total of 12 hours of credit approved by a department academic adviser. One basic Math & Science selected elective at the 200 level or higher (no MSNE or Engineering selected electives), one engineering selected elective (no MSNE) and two Technical selected electives (MSNE or Engineering selected electives).

## Sample Degree Plan

*THIS IS ONE EXAMPLE OF MANY POSSIBLE SCHEDULES.*
*CONSULT A DIVISIONAL OR DEPARTMENTAL ADVISER TO CUSTOMIZE YOUR DEGREE PLAN.*

| FALL | | | SPRING | | |
|---|---|---|---|---|---|
| **FRESHMAN** | | **18 credits** | **FRESHMAN** | | **17 credits** |
| MATH 101 or 105 | Single Variable Calculus I | 3 | MATH 102 or 106 | Single Variable Calculus II | 3 |
| CHEM 121 | General Chem I w/Lab | 4* | CHEM 122 | General Chem II w/Lab | 4* |
| PHYS 101• or 111 | Mechanics w/Lab | 4* | PHYS 102•• or 112 | Electr & Magnetism w/Lab | 4* |
| MSNE 201 | Introduction to NanoEngineering | 3 | OPEN | Open elective | 3 |
| FWIS | Freshman Writing | 3 | DIST | Distribution elective | 3 |
| LPAP | Lifetime Phys Activity elective | 1 | | | |
| **SOPHOMORE** | | **15 credits** | **SOPHOMORE** | | **18 credits** |
| MATH 211 | Ord Diff Eqs & Linear Algebra | 3 | MATH 212 | Multivariable Calculus | 3 |
| PHYS 201 or CHEM 211/ 311 | Waves & Optics | 3 | CAAM 210 | Intro to Eng Computation | 3 |
| | | | DIST | Distribution elective | 3 |
| SPEC | Technical selected elective | 3 | DIST | Distribution elective | 3 |
| MSNE 301 | Materials Science | 3 | SPEC | Technical selected elective | 3 |
| DIST | Distribution elective | 3 | OPEN | Open elective | 3 |
| **JUNIOR** | | **17 credits** | **JUNIOR** | | **13 credits** |
| CAAM 335 | Matrix Analysis | 3 | MSNE 302 | Materials Processing | 3 |
| MSNE 311 | Materials Selection and Design | 4 | MSNE 303 | Materials Science Junior Lab | 1 |
| MSNE 401 | Thermodynamics in Mat Sci | 3 | MSNE 411 | Mtllogrphy & Phase Relations | 3 |
| MSNE 406 | Physical Properties of Solids | 3 | MSNE 415 | Ceramics and Glasses | 3 |
| MSNE 451 | Materials Science Seminar | 1 | OPEN | Open elective | 3 |
| DIST | Distribution elective | 3 | | | |
| **SENIOR** | | **16 credits** | **SENIOR** | | **16 credits** |
| MSNE 402 | Mechanical Properties of Materials | 3 | MSNE 408 | Capstone Design II | 3 |
| MSNE 407 | Capstone Design I | 4 | MSNE 435 | Crystallography and Diffraction | 3 |
| MSNE 450 | Materials Science Seminar | 0 | MSNE 437 | Materials Science Senior Lab | 1 |
| SPEC | Engineering selected elective | 3 | OPEN | Open elective | 3 |
| SPEC | Math and Sci selected elective | 3 | OPEN | Open elective | 3 |
| DIST | Distribution elective | 3 | OPEN | Open elective | 3 |

** In addition to class hours, these courses have a regularly scheduled lab and/or discussion session that must fit into your schedule.*

*• When registering for PHYS 101, you must also register for PHYS 103, the discussion section for 101.*

*•• When registering for PHYS 102, you must also register for PHYS 104, the discussion section for 102.*

*§ When registering for CHEM 211, you must also register for CHEM 213, the discussion section for 211.*

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| BASIC REQUIREMENTS | General math & science courses | 37 |
| | Core courses in major | 43 |
| ELECTIVE REQUIREMENTS | Specialization electives | 12 |
| | Open electives and LPAP | 19 |
| | FWIS and distribution courses | 21 |
| | Minimum credit required for the B.S. | 132 |

Of the 132 total credits, the B.S. in Materials Science and NanoEngineering requires 80 credits in general math and science courses and core courses.

## Major Requirements

| NUMBER | CREDIT | TITLE |
|---|---|---|
| MATH 101/105 | 3 | Single Variable Calculus I /AP or other credit in Calculus I |
| MATH 102/106 | 3 | Single Variable Calculus II /AP or other credit in Calculus II |
| MATH 211 | 3 | Ordinary Differential Equations & Linear Algebra |
| MATH 212 | 3 | Multivariable Calculus |
| PHYS 101•/111 | 4* | Mechanics w/Lab |
| PHYS 102••/112 | 4* | Electricity and Magnetism w/Lab |
| CHEM 121/123 | 4* | General Chemistry I w/Lab |
| CHEM 122/124 | 4* | General Chemistry with II Lab |
| CAAM 210 | 3 | Introduction to Engineering Computation |
| CAAM 335 | 3 | Matrix Analysis |
| PHYS 201/CHEM 211/311 | 3 | Waves and Optics/Organic Chemistry/Physical Chemistry |
| MSNE 201 | 3 | Introduction to NanoEngineering |
| MSNE 301 | 3 | Materials Science |
| MSNE 302 | 3 | Materials Processing |
| MSNE 303 | 3 | Materials Science Junior Lab |
| MSNE 311 | 4 | Materials Selection & Design |
| MSNE 401 | 3 | Thermodynamics in Materials Science |
| MSNE 402 | 3 | Mechanical Properties of Materials |
| MSNE 406 | 3 | Physical Properties of Solids |
| MSNE 407 | 4 | Capstone Design I |
| MSNE 408 | 3 | Capstone Design II |
| MSNE 411 | 3 | Metallography and Phase Relations |
| MSNE 415 | 3 | Ceramics and Glasses |
| MSNE 435 | 3 | Crystallography and Diffraction |
| MSNE 437 | 1 | Crystallography & Diffraction Lab |
| MSNE 450 | 0 | Materials Science Seminar |
| MSNE 451 | 1 | Materials Science Seminar |
| Elective | 3 | 1 approved Math and Science selected elective (no MSNE or Engineering selected electives) |
| Elective | 6 | 2 approved technical selected electives (MSNE or Engineering selected electives) |
| Elective | 3 | 1 approved Engineering selected elective (no MSNE) |

** In addition to class hours, these courses have a regularly scheduled lab and/or discussion session that must fit into your schedule.*

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*•• When registering for PHYS 102, you must also register for PHYS 104, the discussion section for 102.*

*§ When registering for CHEM 211, you must also register for CHEM 213, the discussion section for 211.*