TO: College of Arts and Sciences Curriculum Committee

FROM: Doug Dunham, Chair, Department of Materials Science and Biomedical Engineering

DATE: October 14, 2020

RE: Program Change

We request implementation of the following program change with the next possible Catalog.

Name of Program: Materials Science and Engineering, Comprehensive Major

Program Code: 251-001

Date of Department/Program Approval: October 6, 2020


To: (Revisions in red)

The Bachelor’s of Science in Materials Science and Engineering (MS&E) is a traditional engineering major, rigorously structured and grounded in science and math. Students in this major develop a strong foundation in mathematics, and the major emphasizes science themes more strongly than other engineering disciplines. As with all engineering degrees, the application of fundamental ideas through design is central to the major.

Students, who typically begin their study as Pre-MSE majors, must apply to be admitted to the MS&E major (application materials available at the Materials Science office). A minimum average GPA of 2.5 in “foundation” courses (CHEM 115 or CHEM 103 & CHEM 104 or CHEM 105 & CHEM 106 & CHEM 109, MATH 114 & MATH 215, MSE 120 & MSE 221, PHYS 231, and WRIT 114, WRIT 116, or WRIT 118) is required for admittance to the major; students should apply during registration in the spring semester of their sophomore year.
A minimum of 92 credits is required for the major and a minimum of 128 credits for the degree. In addition to core courses, students must complete 3 credits of engineering electives and 6 credits of technical electives from the courses listed below. Two technical electives; electives can be selected from appropriate UW-Eau Claire, UW-River Falls, UW-Stout, or Chippewa Valley Technical College courses.

Core courses:

**MATERIALS SCIENCE**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 120</td>
<td>Introduction to Engineering</td>
<td>2</td>
</tr>
<tr>
<td>MSE 221</td>
<td>Living in a Materials World</td>
<td>3</td>
</tr>
<tr>
<td>MSE 256</td>
<td>Introduction to Computer Aided Design</td>
<td>1</td>
</tr>
<tr>
<td>MSE 286</td>
<td>Engineering Sophomore Seminar</td>
<td>1</td>
</tr>
<tr>
<td>MSE 307</td>
<td>Engineering Statistics</td>
<td>4</td>
</tr>
<tr>
<td>MSE 315</td>
<td>Materials Characterization</td>
<td>4</td>
</tr>
<tr>
<td>MSE 334</td>
<td>Soft Materials</td>
<td></td>
</tr>
<tr>
<td>MSE 350</td>
<td>Thermodynamics of Materials</td>
<td>4</td>
</tr>
<tr>
<td>MSE 357</td>
<td>Phase Transformation &amp; Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>MSE 362</td>
<td>Microelectronic Materials Processing</td>
<td>2</td>
</tr>
<tr>
<td>MSE 367</td>
<td>Macroprocessing of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 368</td>
<td>Macroprocessing Materials Lab</td>
<td>2</td>
</tr>
<tr>
<td>MSE 372</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>MSE 374</td>
<td>Electrical, Optical and Magnetic Properties of Materials</td>
<td>4</td>
</tr>
<tr>
<td>MSE 386</td>
<td>Engineering Junior Seminar(^1)</td>
<td>1</td>
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</tbody>
</table>

Remove MSE 387

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MSE 451</td>
<td>Computational Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>MSE 475</td>
<td>Nanomaterials</td>
<td></td>
</tr>
<tr>
<td>MSE 486</td>
<td>MS&amp;E Capstone (^1)</td>
<td>2</td>
</tr>
<tr>
<td>MSE 487</td>
<td>MS&amp;E Capstone (^2)</td>
<td>2</td>
</tr>
</tbody>
</table>

**CHEMISTRY**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>Chemical Principles</td>
<td>6</td>
</tr>
</tbody>
</table>

or

Remove CHEM 103 & 104 option

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 105</td>
<td>General Chemistry I Lecture</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 106</td>
<td>General Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 109</td>
<td>General Chemistry II with Lab (^2)</td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 325</td>
<td>Organic Chemistry I with Laboratory</td>
<td>4</td>
</tr>
</tbody>
</table>
MATHEMATICS
MATH 114  Calculus I  4
MATH 215  Calculus II  4
MATH 312  Differential Equations and Linear Algebra  4
Remove MATH 345

PHYSICS
PHYS 231  University Physics I  5
PHYS 232  University Physics II  5
Removed PHYS 255

Elective Courses, Choose from:
Engineering Elective Courses  3

Any BME course 200 or above  3
PHYS 240 Computational Physics  3
PHYS 255 Statics  3
PHYS 350 Electric and Electronic Circuits  3
PHYS 360 Electronics  3

Technical Elective Courses, Choose from:  6
UWEC
Any BME course 200 or above  3
CHEM 213  Quantitative Analysis
CHEM 326  Organic Chemistry II with Laboratory
CHEM 352  Fundamentals of Biochemistry
CS 145  Programming for New Programmers or CS 148 Programming for Experienced Programmers
CS 163  Introduction to Programming in C++
CS 170  Computing for the Sciences and Mathematics
CS 245  Advanced Programming and Data Structures
CS 252  Computer Systems
CS 330  Programming Languages
MATH 216  Calculus III
MATH 313  Digital Signal Processing
MATH 314  Discrete Mathematics
MATH 315  Advanced Calculus I
MATH 316  Introduction to Real Analysis
MATH 317  Introduction to Real Analysis II
MATH 318  Introduction to Complex Variables
MATH 324  Linear Algebra
MATH 351  Numerical Analysis I  
MATH 352  Numerical Analysis II  
MATH 354  Introduction to Mathematical Modeling  
MATH 355  Linear Programming  
MATH 358  Introduction to Optimization  
MATH 440  Digital Image Processing  
MATH 441  Linear Regression Analysis, with Time Series  
MATH 443  Experimental Design and Analysis  
MSCI 395  Directed Studies  
MSCI 399  Independent Study - Juniors  
MSCI 499  Independent Study - Seniors  
MSE 363  Microelectronic Materials Processing Lab  
MSE 493  Collaborative Internship  
MSE 494  Off-campus Materials Science Internship  
PHYS 240  Computational Physics  
PHYS 255  Statics  
PHYS 340  Optics  
PHYS 350  Electric and Electronic Circuits  
PHYS 356  Dynamics  
PHYS 360  Electronics  
PHYS 361  LabVIEW Basics  
PHYS 362  LabVIEW Applications  

A maximum of three credits from MSCI 395, MSCI 399, MSCI 499, MSE 493, and MSE 494 toward the technical electives.  

Consult your Materials Science and Engineering advisor for elective options from other institutions.  

1 Students must be admitted to the MS&E major to take these courses.  

2 Only six credits apply to the major.  

3 Course used to satisfy the engineering elective may not also be used as a technical elective.  

Why:  
Addition of MSE 286: For engineering majors, internships can be an important professional development activity. In order to better prepare students to competitively seek internships in the summer between sophomore and junior years, we need to move content from the curriculum in MSE 386 to the sophomore year. Some content from MSE 387 is also moved to MSE 286 so it becomes a 1 credit course. MSE 286 becomes
the sophomore seminar course that covers internships, resumes, etc. that prepares students for summer internships, research opportunities, and upper level Engineering courses. The remaining curriculum from the current MSE 386 and MSE 387 are combined into an expanded MSE 386 course that will also include content related to biomedical engineering (changed from 0.5 credits to 1.0 credits).

Elimination of MSE 387: Content from MSE 387 is moved into MSE 286 and MSE 386.

Addition of MSE 307: Feedback from the ABET accreditation process indicated our graduates would benefit from a more applied statistics course that included more examples of the statistics used by engineers in industry. With the addition of the Biomedical Engineering major, there will be additional need for an engineering statistics course.

Engineering Elective: In order to give students a bit more flexibility and choice in their education, we are eliminating PHYS 255 as a requirement. Instead students will get to choose 3 credits of engineering electives, with PHYS 255 as one of those options. Other specified PHYS and BME courses can be selected as engineering elective options. Due to ABET requirements on the number of engineering credits required for accreditation, the 3 credits must be from engineering type courses. The engineering electives not chosen may be used for the technical electives category.

MSE 307 will take the place of MATH 345 as a required statistics course.

Students can choose either CS 145 or CS 148 as the courses are comparable, but designed for students with differing levels of programming experience.

There is no need to specify the option of counting courses from other campuses. We have not had any request to do so since the program began. If needed, a relevant course can be allowed to count for an individual student.

Removal of CHEM 103 & 104 option: these courses have been out of the catalog for a number of years. If there is a student who has had these courses, we can always allow them to count for the major.

Total Credits: The total credits for the major remains unchanged. Adding MSE 286 adds 1 credit, changing MSE 386 from 1/2 credit to 1 credit adds 1/2 credit. Removing MSE 387 reduces 1/2 credit. MSE 451 is changing from 4 credits to 3 credits reducing 1 credit from the major. The net result is there is no change in the number of credits.