

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

From Current Catalog Web Page: <https://catalog.uwec.edu/undergraduate/arts-sciences/materials-science/materials-science-engineering-comprehensive-major-bs/>

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

MSE 120	Introduction to Engineering	2	
MSE 221	Living in a Materials World	3	
MSE 256	Introduction to Computer Aided Design		1
MSE 286	Engineering Sophomore Seminar	1	
MSE 307	Engineering Statistics	4	
MSE 315	Materials Characterization	4	
MSE 334	Soft Materials	4	
MSE 350	Thermodynamics of Materials		4
MSE 357	Phase Transformation & Kinetics		3
MSE 362	Microelectronic Materials Processing		2
MSE 367	Macroprocessing of Materials		3
MSE 368	Macroprocessing Materials Lab		2
MSE 372	Transport Phenomena		3
MSE 374	Electrical, Optical and Magnetic Properties of Materials		4
MSE 386	Engineering Junior Seminar ¹	1	
Remove MSE 387			
MSE 451	Computational Materials Science		3
MSE 475	Nanomaterials	3	
MSE 486	MS&E Capstone I ¹	2	
MSE 487	MS&E Capstone II ¹	2	

CHEMISTRY

CHEM 115 Chemical Principles 6

or

~~Remove CHEM 103 & 104 option~~

CHEM 105 General Chemistry I Lecture
& CHEM 106 General Chemistry I Laboratory
& CHEM 109 General Chemistry II with Lab ²

CHEM 325 Organic Chemistry I with Laboratory 4

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 above³~~
~~PHYS 240 Computational Physics³~~
~~PHYS 255 Statics³~~
~~PHYS 350 Electric and Electronic Circuits³~~
~~PHYS 360 Electronics³~~

~~Technical Elective Courses, Choose from: 6~~

~~UWEC~~

~~Any BME course 200 or above³~~
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 ³
PHYS 255 Statics ³
PHYS 340 Optics
PHYS 350 Electric and Electronic Circuits ³
PHYS 356 Dynamics
PHYS 360 Electronics ³
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.