APPLIED MATHEMATICS, ENGINEERING, AND PHYSICS, B.S. AMEP

This four-year degree program in the interdisciplinary physical sciences offers a strong theoretical foundation in related areas of engineering sciences, mathematics, and physics for professional work in the field of industrial research and technology. It also provides a foundation for graduate degree work in applied mathematics, engineering sciences, and physics.

The AMEP program is an excellent choice for the student with broad interests in mathematics, physics, and engineering. AMEP emphasizes an integrated mathematics and physics curriculum and strives to achieve an optimum balance of breadth and depth in the physical sciences within the confines of a four-year degree.

HOW TO GET IN

ENTRANCE REQUIREMENTS

Because admission into AMEP is internal to UW–Madison, a student must be admitted to UW–Madison or already be a UW–Madison student to join AMEP.

Admission into AMEP as a freshman requires placement into MATH 222 at least, although placement into MATH 234 (4 or 5 on the AP Calculus BC exam) is preferred. Admission into AMEP as a sophomore or junior requires a 2.75 GPA in introductory core courses taken in the mathematics and physics departments.

DECLARING APPLIED MATHEMATICS, ENGINEERING, AND PHYSICS UNDERGRADUATE DEGREE PROGRAM (AMEP)

Students should declare AMEP as soon as possible. The first step in declaring the AMEP degree is to visit an AMEP math faculty advisor.

Students fill out an AMEP degree declaration form (https://www.math.wisc.edu/sites/default/files/private/AMEP_MAJOR_Declaration_form.pdf) (PDF) to change to the "AMP" designation and meet with an AMEP math faculty advisor (see AMEP faculty advisors (https://www.math.wisc.edu/amep/advising/#advisors)) who needs to approve and sign the declaration form.

Look for AMEP faculty advisors’ office hours in the MATH ADVISING CALENDAR (https://www.math.wisc.edu/undergraduate/math-major-advising-calendar) or on the professor’s web page (see Declaring AMEP (https://www.math.wisc.edu/amep/advising/#declare)). When contacting a professor, students should make sure they put "AMEP (https://www.math.wisc.edu/amep)" in the subject line and send a brief clear message, since professors receive many emails.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetestudytext) section of the Guide.

Requirements Detail

<table>
<thead>
<tr>
<th>General Education</th>
<th>Requirements</th>
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<tbody>
<tr>
<td></td>
<td>• Breadth—Humanities/Literature/Arts: 6 credits</td>
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<td></td>
<td>• Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits</td>
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<td>• Breadth—Social Studies: 3 credits</td>
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<td>• Communication Part A &amp; Part B *</td>
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<td></td>
<td>• Ethnic Studies *</td>
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<td></td>
<td>• Quantitative Reasoning Part A &amp; Part B *</td>
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<td>* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.</td>
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COLLEGE OF LETTERS & SCIENCE

LIBERAL ARTS AND SCIENCE: BS-AMEP

LIBERAL ARTS AND SCIENCE (LAS) REQUIREMENT

A minimum of 20 credits in Liberal Arts and Science courses outside the physical and mathematical sciences are required. Courses may not carry a Physical Science designation or be listed (or cross-listed) in the MATH or COMP SCI subjects.

1. Complete a minimum of 12 credits in humanities and/or social studies (including a minimum of 6 credits of humanities and 3 credits of social studies as part of the University General Education Requirements).
2. Credits may include a maximum of 8 credits in biological sciences.
3. Additional L&S credits outside physical sciences (excluding computer science and mathematics).

FOREIGN LANGUAGE REQUIREMENT

AMEP degree candidates must complete the 2nd unit of a foreign language either through high school language study or college coursework. A unit of a foreign language is equivalent to one year of high school work or one semester/term of college-level work.

REQUIREMENTS FOR THE MAJOR

A total of at least 125 credits with a minimum GPA of 2.000 is required.
The basic requirements for the major include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>FOUNDATION: Mathematics (2.750 GPA)</strong> 1</td>
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<td>13</td>
</tr>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
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<tr>
<td>or MATH 275</td>
<td>Topics in Calculus I</td>
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<tr>
<td>MATH 222</td>
<td>Calculus and Analytic Geometry 2</td>
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<tr>
<td>or MATH 276</td>
<td>Topics in Calculus II</td>
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<tr>
<td>MATH 234</td>
<td>Calculus–Functions of Several Variables</td>
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</tr>
<tr>
<td><strong>FOUNDATION: Physics (2.750 GPA)</strong></td>
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<td>13-14</td>
</tr>
</tbody>
</table>

**First Introductory course**

- PHYSICS 201 General Physics
- PHYSICS 207 General Physics
- PHYSICS 247 A Modern Introduction to Physics
- E M A 201 Statics
- & E M A 202 and Dynamics 1

**Second Introductory course**

- PHYSICS 202 General Physics
- PHYSICS 208 General Physics
- PHYSICS 248 A Modern Introduction to Physics

**Third Introductory course**

- PHYSICS 205 Modern Physics for Engineers
- PHYSICS/ E C E 235 Introduction to Solid State Electronics
- PHYSICS 241 Introduction to Modern Physics
- PHYSICS 249 A Modern Introduction to Physics

**CORE: Chemistry** 5-9

- CHEM 109 Advanced General Chemistry
- CHEM 103 General Chemistry I
- & CHEM 104 and General Chemistry II

**CORE: Mathematics** 18

- MATH 321 Applied Mathematical Analysis
- MATH 322 Applied Mathematical Analysis
- MATH 320 Linear Algebra and Differential Equations 2

**Additional CORE MATH electives from:**

- MATH 415 Applied Dynamical Systems, Chaos and Modeling
- MATH/STAT 431 Introduction to the Theory of Probability
- MATH/ COMP SCI 513 Numerical Linear Algebra
- MATH/ COMP SCI 514 Numerical Analysis
- MATH/ I SY E/ OTM/STAT 632 Introduction to Stochastic Processes

**CORE Physics** 15

- PHYSICS 311 Mechanics
- PHYSICS 322 Electromagnetic Fields

**Additional CORE PHYSICS electives from:**

- PHYSICS 321 Electric Circuits and Electronics
- PHYSICS 325 Wave Motion and Optics
- PHYSICS 415 Thermal Physics

**CORE Engineering**

- 21 credits in Engineering courses approved by your AMEP Engineering advisor

**Laboratory Experience** 3

- PHYSICS 307 Intermediate Laboratory-Mechanics and Modern Physics
- PHYSICS 308 Intermediate Laboratory-Electromagnetic Fields and Optics
- PHYSICS 321 Electric Circuits and Electronics
- PHYSICS 407 Advanced Laboratory

**Computational Experience** 4

- COMP SCI 310 Problem Solving Using Computers
- COMP SCI 412 Introduction to Numerical Methods
- MATH/ COMP SCI 513 Numerical Linear Algebra
- MATH/ COMP SCI 514 Numerical Analysis

**RESIDENCE AND QUALITY OF WORK REQUIREMENT**

Minimum 2.000 GPA in AMEP program courses

Minimum 2.000 GPA and 15 upper-level AMEP program credits, taken in residence 5

15 credits in AMEP program courses, taken on the UW–Madison campus

**DISTINCTION IN THE MAJOR**

Students earning an AMEP program GPA of 3.500 and higher will be nominated for Distinction in the Major.

1 M E 240 Dynamics substitutes for E M A 202 Dynamics
2 MATH 319 & MATH 340 or MATH 375-MATH 376 may substitute for MATH 320
3 Laboratory experience credits may double-count in Physics and/or Engineering CORE
4 Computational experience credits may double-count in Mathematics CORE
5 The following course numbers are considered upper level in AMEP: MATH 300–699
   PHYSICS 311–699
   E C E 310–699
   E M A 405–699
   I SY E 313–699
   M E 303–699
   Courses meeting CORE, Lab, and Computation that are numbered 300-699

**HONORS IN THE MAJOR**

Honors in the Major is not available in Applied Math, Engineering and Physics.
UNIVERSITY DEGREE REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirements Detail</th>
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<tbody>
<tr>
<td>Total Degree To receive a bachelor’s degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.</td>
</tr>
<tr>
<td>Residency Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. “In residence” means on the UW–Madison campus with an undergraduate degree classification. “In residence” credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.</td>
</tr>
<tr>
<td>Quality of Work Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.</td>
</tr>
</tbody>
</table>

LEARNING OUTCOMES

1. Students will state, explain and apply principal theorems and techniques of applied mathematics, including (but not limited to) the subject areas of vector and complex calculus, linear algebra, and differential equations.

2. Students will state, explain and apply theory and methods of classical and modern physics such as mechanics (classical, statistical, quantum), electricity, magnetism, thermodynamics, radiation and atomic physics.

3. Students will develop strategies to synthesize applied mathematics and physical sciences to address engineering problems, with emphasis on problems of current interest.

4. Students will be able to design and conduct experiments to explore hypotheses regarding science and/or technology and/or engineering problems, and will use mathematics to help interpret experimental results.

5. Students will work in multidisciplinary groups of mathematicians, physical scientists, and engineers to formulate and solve STEM problems, which includes the creation and evaluation of models for natural phenomena.

6. Through written and oral presentations, students will communicate technical/scientific ideas and results to experts and non-experts.

ADVISING AND CAREERS

For information about advising for the special Letters & Science degree program, students should refer to AMEP Advising (https://www.math.wisc.edu/amep/advising).

Students can also get questions answered about declaring the major and getting advising by contacting the Department of Mathematics at 608-263-2546.