This four-year degree program in the interdisciplinary physical sciences offers a strong 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 Applied Mathematics, Engineering, and Physics (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

DECLARATION 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.

The general expectation for admission to the AMEP program is completion of the introductory calculus and physics sequences with appropriate success. Specifically a student must have

- Completed MATH 221, MATH 222, and MATH 234 with at least a 2.75 GPA.
- MATH 375 and MATH 376 (together) may be substituted for MATH 234.
- Completed PHYSICS 247, PHYSICS 248, PHYSICS 249 with at least a 2.75 GPA.
- For alternate Introductory Physics courses, see the Requirements (https://guide.wisc.edu/undergraduate/letters-science/mathematics/applied-mathematics-engineering-physics-bs-amep/#requirementstext) tab.

Students who do not meet the above qualifications (transfer students, freshmen with advanced standings, etc.) may be admitted to the program on a probationary basis. However, such students who do not eventually meet the above admission requirement or maintain a 2.000 GPA in quality of work program requirements in their first term at UW-Madison may be reassigned to a standard BA or BS degree.

Finally, students who have accrued 86 or more credits will be admitted to the AMEP program only if:

- the student has a grade point average above 2.000 GPA in both the general and upper-level quality of work requirements (see Requirements (https://guide.wisc.edu/undergraduate/letters-science/mathematics/applied-mathematics-engineering-physics-bs-amep/#requirementstext)) and

DECLARING THE APPLIED MATHEMATICS, ENGINEERING, AND PHYSICS UNDERGRADUATE DEGREE PROGRAM

Any student who is interested in the AMEP program should meet with a program advisor as soon as possible. The advisor will help the student negotiate pre-AMEP status and eventually assist in declaration for the program. In general, this should be the AMEP academic advisor or an AMEP math faculty advisor.

Advising information can be found in the Advising and Careers (https://guide.wisc.edu/undergraduate/letters-science/mathematics/applied-mathematics-engineering-physics-bs-amep/#advisingandcareerstext) tab.

Students pursuing the BS-AMEP degree are not eligible to declare the following programs:

- Mathematics for Physical and Biological Sciences named option of the Mathematics major
- Mathematics certificate
- Physics certificate

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/#requirementsforundergraduatestudytext) section of the Guide.
COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF SCIENCE—APPLIED MATHEMATICS, ENGINEERING, AND PHYSICS (BS-AMEP)

Students pursuing a Bachelor of Science—Applied Mathematics, Engineering, and Physics degree in the College of Letters & Science must complete all of the requirements below. The BS—AMEP is a special degree program; it is not considered a major. The BS—AMEP degree is not available to students who intend to earn a degree outside the College of Letters & Science.

BACHELOR OF SCIENCE - AMEP DEGREE REQUIREMENTS

Mathematics

Complete the University General Education Requirements for Quantitative Reasoning A (QR-A) and Quantitative Reasoning B (QR-B) coursework.

Language

Complete the second unit of a language other than English.

Liberal Arts and Science Requirement

Complete a minimum of 20 credits in Liberal Arts and Science (LAS) coursework outside the physical and mathematical sciences, including:

- at least 12 credits of Humanities and/or Social Science, including at least 6 credits in Humanities and at least 3 credits of Social Science
- a maximum of 8 credits of Biological Science
- additional eligible coursework to reach 20 total credits.

Courses that carry the Physical Science breadth designation, or are listed (or cross-listed) in the MATH or COMP SCI subjects, are not eligible.

Total Credits

Complete at least 125 credits.

UW—Madison Experience

Complete both:

- 30 credits in residence, overall, and
- 30 credits in residence after the 90th credit.

Quality of Work

- 2.000 in all coursework at UW—Madison

PROGRAM OVERVIEW

A total of at least 125 credits with a minimum GPA of 2.000 is required for this degree plan. Of these credits, at least 83 must be devoted to the Applied Math, Engineering and Physics (AMEP) program requirements; 20 must be devoted to University General Education requirements; and the balance should be taken to meet the Bachelor of Science – AMEP Degree Requirements and Electives.

AMEP PROGRAM REQUIREMENTS

FOUNDATIONAL MATHEMATICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Variable Calculus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
<td>5</td>
</tr>
<tr>
<td>MATH 222</td>
<td>Calculus and Analytic Geometry 2</td>
<td>4</td>
</tr>
<tr>
<td>Multivariable Calculus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete one of the following:</td>
<td>4-10</td>
<td></td>
</tr>
<tr>
<td>MATH 234</td>
<td>Calculus—Functions of Several Variables</td>
<td></td>
</tr>
<tr>
<td>MATH 375 &amp; MATH 376</td>
<td>Topics in Multi-Variable Calculus and Linear Algebra and Topics in Multi-Variable Calculus and Differential Equations</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits

13-19

FOUNDATIONAL PHYSICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Introductory Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete one of the following:</td>
<td>3-5</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 247</td>
<td>A Modern Introduction to Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 207</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 201</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>E M A 202</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>M E 240</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>Second Introductory Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete one of the following:</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 248</td>
<td>A Modern Introduction to Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 208</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 202</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>Third Introductory Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 249</td>
<td>A Modern Introduction to Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 241</td>
<td>Introduction to Modern Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 205</td>
<td>Modern Physics for Engineers</td>
<td></td>
</tr>
<tr>
<td>PHYSICS/ E C E 235</td>
<td>Introduction to Solid State Electronics</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits

11-14

CHEMISTRY

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete one of the following:</td>
<td>5-9</td>
<td></td>
</tr>
<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 103 &amp; CHEM 104</td>
<td>General Chemistry I and General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Chemical Principles I</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits

5-9

MATHEMATICS

Complete at least six courses for 18 credits.
### Applied Mathematics, Engineering, and Physics, BS AMEP

**Core: Linear Algebra**  
Complete one of the following:  
- MATH 320: Linear Algebra and Differential Equations 2  
- MATH 340: Elementary Matrix and Linear Algebra  
- MATH 341: Linear Algebra  
- MATH 375: Topics in Multi-Variable Calculus and Linear Algebra  

**Credits:** 3-5

**Core: Differential Equations**  
Complete one of the following:  
- MATH 320: Linear Algebra and Differential Equations 2  
- MATH 319: Techniques in Ordinary Differential Equations  
- MATH 376: Topics in Multi-Variable Calculus and Differential Equations  

**Credits:** 0-5

**Core: Applied Analysis**  
Complete both.  
- MATH 321: Applied Mathematical Analysis 3  
- MATH 322: Applied Mathematical Analysis 3  

**Math Electives**  
Complete at least three courses for 9 credits. Select from:  
- MATH 415: Applied Dynamical Systems, Chaos and Modeling  
- MATH 421: The Theory of Single Variable Calculus  
- MATH/STAT 431: Introduction to the Theory of Probability  
- or MATH/STAT 309: Introduction to Probability and Mathematical Statistics I  
- MATH 443: Applied Linear Algebra  
- MATH/COMP SCI 513: Numerical Linear Algebra  
- MATH/COMP SCI 514: Numerical Analysis  
- MATH 519: Ordinary Differential Equations  
- MATH 521: Analysis I  
- MATH 522: Analysis II  
- MATH 531: Probability Theory  
- MATH 561: Differential Geometry  
- MATH 616: Data-Driven Dynamical Systems, Stochastic Modeling and Prediction  
- MATH 619: Analysis of Partial Differential Equations  
- MATH 623: Complex Analysis  
- MATH 627: Introduction to Fourier Analysis  
- MATH/I SY E/OTM/STAT 632: Introduction to Stochastic Processes  

**Credits:** 9

**Physics Electives**  
Remaining courses/credits from any PHYSICS course numbered 307 and above.  

**Credits:** 9

**Total Credits:** 18-25

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### ENGINEERING

**Complete 21 credits meeting the following criteria:**  
Must be distinct from any courses used to fulfill math and physics requirements above.  
Selected from the following:  
- Biomedical Engineering (BME) 300-699  
- Chemical and Biological Engineering (CBE) 300-699  
- Civil and Environmental Engineering (CIV ENGR) 300-699  
- Electrical and Computer Engineering (ECE) 300-699  
- Engineering Mechanics and Aerospace Engineering (EMA) 300-699  
- Engineering Physics (EP) 300-699  
- Engineering Professional Development (EPD) 300-699  
- Geological Engineering (GLE) 300-699  
- Industrial and Systems Engineering (ISYE) 300-699  
- Interdisciplinary Courses (Engineering) (INTEREGR) 300-699  
- Materials Science and Engineering (MSE) 300-699  
- Mechanical Engineering (ME) 300-699  
- Nuclear Engineering (NE) 300-699  

**Credits:** 21

---

### LABORATORY EXPERIENCE

**Completed with a minimum of 3 credits selected from the options below.**  
The following course applies as 3 credits of lab:  
- E M A 522: Aerodynamics Lab  
The following courses apply as 2 credits of lab each:  
- PHYSICS 307: Intermediate Laboratory-Mechanics and Modern Physics  
- PHYSICS 321: Electric Circuits and Electronics  
- PHYSICS 325: Optics  
- PHYSICS 407: Advanced Laboratory  
- PHYSICS 623: Electronic Aids to Measurement  
- PHYSICS 625: Applied Optics  
The following courses apply as 1 credit of lab each:  
- E C E 270: Circuits Laboratory I  
- E M A/M E 307: Mechanics of Materials Lab  

**Credits:** 0-3

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**Total Credits:** 18-25

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**PHYSICS**  
Complete at least five courses for 15 credits.
COMPUTATIONAL EXPERIENCE 

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP SCI 412</td>
<td>Introduction to Numerical Methods</td>
<td>0-3</td>
</tr>
<tr>
<td>E P/ E M A 471</td>
<td>Intermediate Problem Solving for Engineers</td>
<td></td>
</tr>
<tr>
<td>MATH/ COMP SCI 513</td>
<td>Numerical Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>MATH/ COMP SCI 514</td>
<td>Numerical Analysis</td>
<td></td>
</tr>
</tbody>
</table>

RESIDENCE AND QUALITY OF WORK

- Minimum 2.000 GPA in AMEP program courses.  
- Minimum 2.000 GPA and 15 upper-level AMEP program credits, taken in residence.  
- 15 credits in AMEP program courses, taken on the UW–Madison campus.

HONORS IN THE MAJOR
Honors in the Major is not available in Applied Mathematics, Engineering, and Physics.

FOOTNOTES

1. MATH 375 may also be used to fulfill the Linear Algebra requirement below. MATH 376 may be used to fulfill the Differential Equations requirement below.
2. MATH 320 fulfills both the Linear Algebra and Differential Equations requirements. AMEP students are encouraged to consider the honors version of the course which is taught by AMEP faculty.
3. Courses used to fulfill this requirement need not be distinct from courses used to fulfill Mathematics, Physics, and Engineering requirements in AMEP.
4. This includes only those courses which may be used to fulfill Mathematics, Physics, Engineering, Chemistry, Laboratory, and Computational requirements described in the tables above.
5. A course numbered 300 or above is considered upper-level in the program.

LEARNING OUTCOMES

1. 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. 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. Develop strategies to synthesize applied mathematics and physical sciences to address engineering problems, with emphasis on problems of current interest.
4. 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. 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.

UNIVERSITY DEGREE REQUIREMENTS

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.

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.

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.

FOUR-YEAR PLAN

This Four-Year Plan is only one way a student may complete an L&S degree with this major. Many factors can affect student degree planning, including placement scores, credit for transferred courses, credits earned by examination, and individual scholarly interests. In addition, many students have commitments (e.g., athletics, honors, research, student organizations, study abroad, work and volunteer experiences) that necessitate they adjust their plans accordingly. Informed students engage in their own unique Wisconsin Experience by consulting their academic advisors, Guide, DARS, and Course Search & Enroll for assistance making and adjusting their plan.

PROGRAM EXPECTATIONS

AMEP students come to UW-Madison with a wide range of mathematics preparation. Please see Advising and Careers (https://guide.wisc.edu/undergraduate/letters-science/mathematics/applied-mathematics-engineering-physics-bs-amep/#advisingandcareertext) for more information and alternative plans.

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 247</td>
<td>5</td>
<td>Communication A</td>
<td>3</td>
</tr>
<tr>
<td>MATH 234</td>
<td></td>
<td>MATH 320 (honors)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 109</td>
<td></td>
<td>PHYSICS 248</td>
<td>5</td>
</tr>
<tr>
<td>Foreign Language 1</td>
<td>4</td>
<td>Foreign Language 2</td>
<td>4</td>
</tr>
</tbody>
</table>

18 15
In addition to providing basic support like resume reviews and interview practice, SuccessWorks offers ways to explore interests and build career skills from their very first semester/term at UW all the way through graduation and beyond.

Students can explore careers in one-on-one advising, try out different career paths, complete internships, prepare for the job search and/or graduate school applications, and connect with supportive alumni and even employers in the fields that inspire them.

- SuccessWorks (https://careers.ls.wisc.edu/)
- Set up a career advising appointment (https://successworks.wisc.edu/make-an-appointment/)
- Enroll in a Career Course (https://successworks.wisc.edu/career-courses/) - a great idea for first- and second-year students:
  - INTER-LS 210 L&S Career Development: Taking Initiative (1 credit)
  - INTER-LS 215 Communicating About Careers (3 credits, fulfills Comm B General Education Requirement)
- Learn about internships and internship funding (https://successworks.wisc.edu/finding-a-job-or-internship/)
- INTER-LS 260 Internship in the Liberal Arts and Sciences
- Activate your Handshake account (https://successworks.wisc.edu/handshake/) to apply for jobs and internships from 200,000+ employers recruiting UW-Madison students
- Learn about the impact SuccessWorks has on students’ lives (https://successworks.wisc.edu/about/mission/)

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• Set up a career advising appointment (https://successworks.wisc.edu/make-an-appointment/)
• Enroll in a Career Course (https://successworks.wisc.edu/career-courses/) - a great idea for first- and second-year students:
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• Learn about the impact SuccessWorks has on students’ lives (https://successworks.wisc.edu/about/mission/)