A focus on applied mathematics prepares you to enter the job market with an undergraduate degree or to attend graduate school for science or engineering. Applied mathematicians use mathematical models to solve complex problems. Students earning a Bachelor of Science or Bachelor of Arts in Mathematics with an Applied Mathematics emphasis engage in interdisciplinary study with core mathematics courses and a minor that is independent of the Department of Mathematics. They master a variety of mathematical problem-solving methods. Upon graduation, students are primed to apply their quantitative and computational knowledge and logical thinking skills across industries like engineering, technology, natural science, manufacturing, business and government. Others choose to further their education in science or engineering graduate studies, taking on challenging research projects.

**LEARNING OUTCOMES**
- Apply computational methods; Math majors should be able to apply computational methods and mathematical concepts to analyze scientific problems.
- Apply mathematical models to current problems; Math majors should be able to critically evaluate and extend selected mathematical models in the current scientific literature.
- Create valid proofs; Students should be able to identify an appropriate proof strategy and almost always able to create a correct proof using multiple strategies as appropriate.
- Define terms precisely; Precision is essential in mathematics, and a crucial skill for math majors is to learn to define mathematical terms precisely.
- Effective communication of results; Math majors should be able to effectively communicate results to non-specialized audiences in written and verbal form.
- Recognize valid arguments; Logical rigor is a critical component of mathematical argumentation. We expect math majors to develop the ability to recognize when arguments are valid, and identify logical gaps and flaws.

**Undergraduate Graduation Requirements**
All course work and requirements for this degree must be completed prior to the date the degree is awarded. The University of Arizona requirements to follow in this audit are required for graduation and awarding of the degree.

Curriculum:
1. The University of Arizona and the Arizona Board of Regents have sole discretion over all curricula changes.
2. Courses, programs & requirements may be suspended, deleted, restricted, or changed in any manner, at any time.
3. Students must remain currently informed about all policies & other info that bears on completing a degree.

Required Units:
Additional units will be required to complete this degree if a student:
A) is admitted to the UA with deficiencies;
B) changes their academic plan(s);
C) fails to meet minimum course/plan requirements;
D) ineffectively plans or fails to execute a course of study that leads directly to degree completion; or
E) Candidates for a second bachelor's degree at The University of Arizona with a different award date than the first must earn no fewer than 30 units of University Credit in addition to the units required for the first degree, and must meet all requirements for the second degree.

The following requirements must be met for graduation.

**Units Required and Cumulative GPA**
120 units are required at a 2.0 GPA. View the pdf report grid for units earned toward this degree and cumulative GPA.

Completing a second bachelor's degree at The University of Arizona requires no fewer than 30 units in addition to the units required for the first degree, and all requirements for the second degree must be met.

**Upper Division Units**
- Not Satisfied: A minimum of 42 units of upper-division credit are required for this degree.
- Units: 42.00 required, 0.00 completed, 42.00 needed

Units in Residence
Not Satisfied: A minimum of 30 units in residence at The University of Arizona (excluding correspondence credit and credit by exam) is required.

- Units: 30.00 required, 0.00 completed, 30.00 needed

Upper Division Units in Residence
Not Satisfied: A minimum of 18 units of upper division credit in residence at the University of Arizona (excluding correspondence credit and credit by exam) is required.

- Units: 18.00 required, 0.00 completed, 18.00 needed

Correspondence and/or Exam Credit Limit
Satisfied: A maximum of 60 units of Correspondence Credit and/or Exam Credit may apply toward graduation.

- Units: 0.00 completed

Non Degree Seeking Limit
A maximum of 15 units completed as a non-degree seeking student may be used for fulfilling undergraduate degree requirements.
Units exceeding this limit (shown below) must be subtracted from the units required towards the degree and graduation requirements.

Non-Community College Units
Not Satisfied: Non-Community College Units: While there is no limit to the total number of units of course work that may be transferred from an accredited community college to The University of Arizona, no more than 64 units from a 2-year institution may be applied toward the requirements for a bachelor's degree. Therefore, to reach the required 120 units for a bachelor's degree, a minimum of 56 units must be completed from 1) coursework at a 4-year institution, 2) approved credit by examination (refer to UA Catalog for approved examinations and scores), or 3) any combination thereof.

- Units: 56.00 required, 0.00 completed, 56.00 needed

Success Course Limit
Satisfied: No more than 3 units will apply toward a student's graduation requirements.
All Success courses taken can be seen below. Success Course units exceeding the 3 unit maximum must be subtracted from the total units, residency requirements and cumulative grade point average.

PE Activity Course Limit
Satisfied: No more than 3 units will apply toward a student's graduation requirements.
All PE activity courses taken can be seen below. PE Activity units exceeding the 3 unit maximum must be subtracted from the total units, residency requirements and cumulative grade point average.
General Education Entry Course

Not Satisfied: General Education Entry Course

Introduction to General Education course.

Not Satisfied: Introduces students admitted to the university as First-Year students to General Education, reflecting on learning, and developing an ePortfolio. (1 unit)

- Units: 1.00 required, 0.00 completed, 1.00 needed

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Courses Available

UNIV 101

General Education Foundation Mathematics

Not Satisfied: General Education Foundation Mathematics

GE Substantial Math Strand

Not Satisfied: Complete 1 course.

GE Substantial Math Strand

Not Satisfied: Complete 1 course.

- Units: 2.67 required, 0.00 completed, 2.67 needed

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Courses Available

MATH 122B, MATH 125, MATH 129, MATH 215, MATH 223, MATH 254, MATH 313

General Education Foundation Composition & Second Language

Overall Requirement Not Satisfied: Undergraduate General Education Foundation Composition & Second Language

Foundation Composition

Not Satisfied: Complete 1 of the following 4 Foundation Composition options:
1. 3 Course Foundation Composition Sequence
2. 2 Course Foundation Composition Sequence
3. Honors Composition with grade of C or higher
4. Honors Composition with a grade of D and Second Semester Composition.

Please note: Students who earn a grade of D in Honors Composition may choose to repeat the course in order to earn a higher grade to satisfy the requirement. Please consult with your major advisor.

Mid-Career Writing Assessment - Complete 2nd semester English Composition with a B grade or higher. Students who do not earn a grade of B or better in 2nd semester English Composition must also satisfy a college or department writing requirement. Consult your major advisor if you do not earn a grade of B in 2nd semester English Composition.

Option 1: Foundation Composition - 3 Course Sequence

- Courses: 3.00 required, 0.00 completed, 3.00 needed

Courses Available

ENGL 1EIB, ENGL 101, ENGL 101A, ENGL 107, ENGL 107A, (***), ENGL 102, ENGL 108, ENGL 106

OR Option 2: Foundation Composition - 2 Course Sequence

Not Satisfied: Complete 2 courses. Complete ENGL 101/107 AND ENGL 102/108

- Courses: 2.00 required, 0.00 completed, 2.00 needed

Courses Available

ENGL 1EIB, ENGL 101, ENGL 101A, ENGL 107, ENGL 107A, (***), ENGL 102, ENGL 108

OR Option 3: Honors Composition

Not Satisfied: Complete 1 course with a C or better.

- Courses: 1.00 required, 0.00 completed, 1.00 needed

Courses Available

ENGL 109H

Foundation Second Language - Second Semester Proficiency

Not Satisfied: Credit will not be given for a course at an equivalent or lower level than prior language credit earned. Course must be taken for a grade, not as pass/fail. Third semester or higher courses used to fulfill this requirement may also be used to fulfill other requirements. A grade of C or higher is required in the course that satisfies the second language requirement.

Demonstrate second semester proficiency in a second language by completing a sequence of courses through a second semester or higher level or by passing a language proficiency examination at the second semester level or higher.

Second Semester Language Course

Not Satisfied: Complete 1 course with a grade of C or better.


- **Courses**: 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

AIS 104B, AIS 307B, ARB 102, CHN 102, CRL 102, FREN 102, FREN 112, GER 102, GRK 102, GRK 104, GRK 112, ITAL 102, ITAL 102Z, JPN 102, JUS 103B, KOR 102, LAS 305A, LAT 102, LAT 112, LING 104B, LING 307B, MENA 103B, PORT 102, PORT 305A, PORT 325A, PRS 102, RSSS 102, SERP 370B, SPAN 102, SPAN 103, SPAN 205, TURK 102

**General Education Core Requirements**

Overall Requirement Not Satisfied: General Education Core Requirements

**GE Exploring Perspectives**

Overall Requirement Not Satisfied: Choose one course from each category.

**Artist Courses**

Not Satisfied: Complete 1 course, 3 units total. Transfer students with quarter system credits may satisfy requirement with 1 course and 2.67 units.

- **Units**: 2.67 required, 0.00 completed, 2.67 needed
- **Courses**: 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

AFAS 218, AFAS 245, AFAS 373, ARC 160C1, ARC 303, ARH 320, ARH 322, ART 150B2, ART 242, ART 358, DNC 100, DNC 101, DNC 144A, DNC 152C, DNC 178A, DNC 179A, EAS 240, ENGL 201, ENGL 209, ENGL 210, ENGL 215, ENGL 245, ENGL 248B, FREN 245, FREN 284, FREN 373, FTV 352, HNRS 216, HNRS 222, ISTA 401, ITAL 330B, JPN 245, LAS 322, LAS 337, MAS 337, MUS 101A, MUS 109, MUS 328, MUS 337, MUS 360, PAH 150A1, RELI 240, SPAN 160C1, TAR 100, TAR 303

**Humanist Courses**

Not Satisfied: Complete 1 course, 3 units total. Transfer students with quarter system credits may satisfy requirement with 1 course and 2.67 units.

- **Units**: 2.67 required, 0.00 completed, 2.67 needed
- **Courses**: 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

AFAS 150B1, AFAS 160A1, AFAS 160D1, AFAS 200, AIS 212, APAS 250, ARH 201, ARH 316B, ARH 329, ART 329, CLAS 160D2, CLAS 329, CLAS 335, EAS 160A1, EAS 160A3, EAS 250, ENGL 160A1, ENGL 160D2, ENGL 265, ENGL 266, ENGL 280, ENGL 300, ENGL 375, FREN 280, FREN 375, FTV 325, FTV 375, GEOG 205, GER 160D1, GER 246,
Natural Scientist Courses

Not Satisfied: Complete 1 course, 3 units total. Transfer students with quarter system credits may satisfy requirement with 1 course and 2.67 units.

- Units: 2.67 required, 0.00 completed, 2.67 needed
- Courses: 1.00 required, 0.00 completed, 1.00 needed

Social Scientist Courses

Not Satisfied: Complete 1 course, 3 units total. Transfer students with quarter system credits may satisfy requirement with 1 course and 2.67 units.

- Units: 2.67 required, 0.00 completed, 2.67 needed
- Courses: 1.00 required, 0.00 completed, 1.00 needed

GE Building Connections

Not Satisfied: Building Connections brings together knowledge and modes of thinking from two or more disciplines and/or perspectives. Choose three courses (9 units minimum).

Building Connections Courses

Not Satisfied: Complete 3 courses, 9 units total. Transfer students with quarter system credits may satisfy requirements with 3 courses and 8.01 units.

- Units: 8.01 required, 0.00 completed, 8.01 needed
- Courses: 3.00 required, 0.00 completed, 3.00 needed
Courses Available


GE 32 unit check

Not Satisfied: Students must complete 32 units in General Education coursework while satisfying the requirements.

Check for 32 units of GE.

Not Satisfied: Students must complete 32 units in General Education coursework while satisfying the requirements.

- Units: 32.00 required, 0.00 completed, 32.00 needed
Not Satisfied: Students admitted to the university as First-Year students reflect on their General Education experience and complete their ePortfolio in the GE Capstone course. (1 unit)

- Units: 1.00 required, 0.00 completed, 1.00 needed

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Courses Available

UNIV 301

Additional Coursework

Courses listed in this section may include general elective credits, UA courses and transferable courses from other institutions. Consult with your advisor to determine if courses listed in this section may be used to fulfill a requirement or sub-requirement in your degree program.

Courses taken for Pass/Fail option can only count as elective credit. They cannot fulfill any General Education, Major, or Minor requirements.

BS in Mathematics

Overall Requirement Not Satisfied: Will appear fully satisfied when student satisfies Mathematics Supporting Laboratory Science Coursework, Mathematics Application Coursework, Mathematics Computer Science, Math Major Core Requirements, and selects an emphasis. All emphases require a minimum of 15 units of 400-level coursework in the major.

The Bachelor of Science in Mathematics requires the same Core Mathematics courses as the BA; BS students must satisfy specialized supporting laboratory science and application course requirements.

Equivalent MATV courses may be available through UA South. For approved courses consult with your advisor.

Mathematics Supporting Laboratory Science Coursework

Overall Requirement Not Satisfied: Will appear fully satisfied when student has satisfied two of the approved laboratory science courses.

Students seeking a BS in Mathematics must complete 2 of the following requirements. Choose from Chemistry, Physics, Biology, Physiology, and/or Geosciences.

Courses used to fulfill this requirement may also be used to fulfill other requirements.

Chemistry I

Not Satisfied: Complete 4 units from Chemistry 141 & (143 or 145), 151, 161 & 163, or 181

- Units: 4.00 required, 0.00 completed, 4.00 needed

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Courses Available

CHEM 141, CHEM 143, CHEM 145, CHEM 151, CHEM 161, CHEM 163, CHEM 181, Approved Transfer Course

Chemistry II

Not Satisfied: Complete 4 units from Chemistry 142 & (144 or 146), 152, 162 & 164, or 182

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**Courses Available**

CHEM 142, CHEM 144, CHEM 146, CHEM 152, CHEM 162, CHEM 164, Approved Transfer Course

**Geosciences**

- **Not Satisfied:** Complete 1 course
  - **Courses:** 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

GEOS 251

**Geosciences**

- **Not Satisfied:** Complete 1 course
  - **Courses:** 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

GEOS 255, GEOS 302, GEOS 304, GEOS 308, GEOS 322

**Biology I**

- **Not Satisfied:** Complete 4 units
  - **Units:** 4.00 required, 0.00 completed, 4.00 needed

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**Courses Available**

MCB 181L, MCB 181R, Approved Transfer Course, MCB 184

**Biology II**

- **Not Satisfied:** Complete 4 units
· **Units**: 4.00 required, 0.00 completed, 4.00 needed

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**Courses Available**

ECOL 182L, ECOL 182R, Approved Transfer Course

**Physiology I**

Not Satisfied: Complete 1 course

· **Courses**: 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

PSIO 201

**Physiology II**

Not Satisfied: Complete 1 course

· **Courses**: 1.00 required, 0.00 completed, 1.00 needed

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**Courses Available**

PSIO 202

Introductory Mechanics

Not Satisfied: Complete Introductory Mechanics Lecture with Lab

· **Units**: 4.00 required, 0.00 completed, 4.00 needed

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**Courses Available**

PHYS 139, PHYS 140, PHYS 141, PHYS 161H

Intro Optics and Thermodynamics
Not Satisfied: Complete Introductory Thermodynamics & Optics with Lab

- Courses: 1.00 required, 0.00 completed, 1.00 needed

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Courses Available

PHYS 142, PHYS 162H

Introductory Electricity and Magnetism with Lab.

Not Satisfied: Complete Introductory Electricity and Magnetism with Lab

- Units: 4.00 required, 0.00 completed, 4.00 needed

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Courses Available

PHYS 239, PHYS 240, PHYS 241, PHYS 261H

Mathematics Application Coursework

Overall Requirement Not Satisfied: Will appear fully satisfied when student has satisfied 3 units of non-math coursework with a prerequisite or corequisite of at least Calculus I (MATH 122B or higher).

Courses used to fulfill this requirement may also be used to fulfill other requirements.

This requirement does not apply to the Mathematics Education Emphasis.

Courses with Calculus Prerequisite

Not Satisfied: Consult with the advisor to discuss approved courses. Up to 3 units of internship credit (MATH 493) may apply to the application course requirement.

- Units: 3.00 required, 0.00 completed, 3.00 needed

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Courses Available

Mathematics Supporting Computer Science

Not Satisfied: Will appear fully satisfied when student satisfies Computer Science requirements.

Computer Science

Not Satisfied: Complete 1 course. One of the following courses is recommended for most students: CSC 110, ISTA 130, ECE 175, or CHEE 205; other options may require additional prerequisites and/or a major or minor declared in another subject.

Courses used to fulfill this requirement may also be used to fulfill other requirements.

- Courses: 1.00 required, 0.00 completed, 1.00 needed

Courses Available

BME 225, CHEE 205, CSC 110, CSC 120, CSC 250, ECE 175, GEOS 280, ISTA 130, MIS 301, NROS 311, PHYS 305

Math Major Core Requirements

Overall Requirement Not Satisfied: Will appear fully satisfied when student satisfies Calculus I and other Core Courses.

Calculus I

Not Satisfied: Complete 1 course

- Courses: 1.00 required, 0.00 completed, 1.00 needed

Courses Available

MATH 122B, MATH 125

Core Courses

Not Satisfied: Complete 5 courses. Credit allowed for only one course in each pair: MATH 313 or MATV 313, MATH 323 or MATV 323, MATH 355 or MATV 355. MATV courses are only available to UA South students.

- Courses: 5.00 required, 0.00 completed, 5.00 needed

Courses Available

MATH 129, MATH 223, MATH 313, MATH 323, MATH 355, MATV 313, MATV 323, MATV 355
Emphasis in Applied Mathematics

Overall Requirement Not Satisfied: Will appear fully satisfied when student satisfies Applied Emphasis course requirements, Graduation Requirements, and declares a minor.

Equivalent MATV courses may be available through UA South. For approved courses consult with your advisor.

Required Applied Math Modeling Course

Not Satisfied: Complete 1 course.

- Courses: 1.00 required, 0.00 completed, 1.00 needed

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Courses Available

MATH 481, MATH 485

Applied Required Course

Not Satisfied: Complete 1 course.

- Courses: 1.00 required, 0.00 completed, 1.00 needed

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Courses Available

MATH 422

Applied Emphasis Options

Not Satisfied: Will appear fully satisfied when student satisfies Option 1, 2, OR 3.

Option 1: Differential Equations

Not Satisfied: Complete Math 454 and 456

- Courses: 2.00 required, 0.00 completed, 2.00 needed

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Courses Available

MATH 454, MATH 456

OR Option 2: Probability and Statistics

Not Satisfied: OR Complete Math 464 and 466

- Courses: 2.00 required, 0.00 completed, 2.00 needed

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### Courses Available

**MATH 464, MATH 466**

**OR Option 3: Numerical Analysis**

**Not Satisfied:** OR Complete Math 475A and one course from the list below

- **Courses:** 1.00 required, 0.00 completed, 1.00 needed

### Courses Available

**MATH 475A**

**AND Option 3: Courses to Pair With Numerical Analysis**

**Not Satisfied:** Complete MATH 475A and one course from MATH 413, 424, 443, 445, 447, 454, 456, 464, 475B, 481, 485

- **Courses:** 1.00 required, 0.00 completed, 1.00 needed

### Applied Fifth Course

**Overall Requirement Not Satisfied:** Will appear fully satisfied when the additional advisor-approved course and 15 units of 400-level coursework are satisfied.

**Additional Course**

**Not Satisfied:** Complete one 400-level MATH course in consultation with your math faculty advisor. You may choose from the pre-approved list. If you prefer to select another course, you may do so ONLY if approved by your math faculty advisor.

- **Units:** 3.00 required, 0.00 completed, 3.00 needed

### Courses Available

**DATA 412, DATA 468, MATH 412, MATH 413, MATH 424, MATH 454, MATH 456, MATH 464, MATH 468, MATH 475A,**
MATH 481, MATH 485, MATH 488

**Major 400-level Upper Division**

- **Not Satisfied:** A minimum of 15 units of 400-level upper-division major coursework must be completed.
  - **Units:** 15.00 required, 0.00 completed, 15.00 needed

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**Applied Emphasis Graduation Requirements**

**Overall Requirement Not Satisfied:** Will appear fully satisfied when student satisfies Mid Career Writing Assessment, Major GPA, Residency requirement, and Major Upper Division unit requirement.

**Mid Career Writing Assessment**

- **Not Satisfied:** Complete 2nd semester English Composition with a B grade or higher. Students who do not earn a grade of B or higher in 2nd semester English Composition must also satisfy a college or department writing requirement. Consult your major advisor if you do not earn a grade of B or higher in 2nd semester English Composition.
  - **Courses:** 1.00 required, 0.00 completed, 1.00 needed

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**Major GPA**

- **Satisfied:** A minimum 2.0 GPA is required in the major coursework.
  - **GPA:** 2.000 required, 0.000 completed

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**Major Units**

- **Not Satisfied:** A minimum of 34 units must be completed in the major.
  - **Units:** 34.00 required, 0.00 completed, 34.00 needed

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### Major Residency

**Not Satisfied:** A minimum of 18 units in the major must be taken at the University of Arizona.

- **Units:** 18.00 required, 0.00 completed, 18.00 needed

### Major Upper Division

**Not Satisfied:** A minimum of 18 units of upper-division major coursework must be completed.

- **Units:** 18.00 required, 0.00 completed, 18.00 needed

### Minor Required

**Not Satisfied:** A minor outside of the Mathematics Department is required for this major. Consult with your advisor to select a minor or discuss other options such as selecting a second major.