

# DEPARTMENT OF GEOSCIENCES

## UNIVERSITY OF ARIZONA

Catalog Year: 2022-2023

Our department focuses on research and education in the nature, genesis, and history of the Earth and its crust, and the evolution of the environment and biota at the Earth's surface.

Our faculty, graduate, and undergraduate students are active in biogeochemistry; climate dynamics; geoarchaeology; geochemistry; geochronology; geomorphology; geophysics; mineral resources; mineralogy; paleolimnology; palynology; paleontology; petrology; sedimentology and stratigraphy; structure; and tectonics.

We encourage interdisciplinary approaches to research in the geosciences, both within the department and through interdepartmental programs.

The Department of Geosciences, University of Arizona, offers a BS in Geosciences in which students can choose to follow one of four different sub-plans. The sub-plans are General Geology, Geophysics, Earth, Ocean and Climate (EOC), and Gem Science (New as of Fall 2021!).

**You may view sub-plan course lists and additional program information for the Geosciences BS degree:**  
<https://www.geo.arizona.edu/UndergraduateStudents>

Get to know your GEOS instructors:  
<http://www.geo.arizona.edu/faculty>

Our students are encouraged to engage in any number of professional development programs, such as our GEOS Undergraduate Career Preparation Seminar Series and our Faculty/Student Mentor Program:  
<https://www.geo.arizona.edu/CareerResources>

Our students and faculty are working in field areas around the world:  
<https://www.geo.arizona.edu/Research>

The Society of Earth Science Students (SESS) is our undergraduate student club!  
<https://www.geo.arizona.edu/content/sess-club>

Review GEOS scholarship opportunities:  
<https://www.geo.arizona.edu/TigerScholarship> and <https://www.geo.arizona.edu/content/scholarships>

Full lists of courses offered by Geosciences, and policies governing undergraduate careers at U of A can be found in the academic catalogs:  
<http://catalog.arizona.edu/>

Review the Office of Scholarships and Financial Aid website regarding loans and scholarships:  
<https://financialaid.arizona.edu/>

**TBD, GEOS Undergraduate Advisor**  
Gould-Simpson 210A  
520-621-4845

**Rocina Garcia, GEOS Graduate Advisor**  
Gould-Simpson 210  
520-621-6004  
[rocinagarcia@email.arizona.edu](mailto:rocinagarcia@email.arizona.edu)

To schedule an advising appointment with a Geosciences Advisor, use Trellis Advise:  
<https://trellis.arizona.edu/solutions/trellis-advise>

# IMPORTANT GEOSCIENCES INFORMATION

## ADVISOR RESPONSIBILITIES

Among other things, your GEOS BS Advisors provide guidance on...

- Courses & programmatic opportunities, such as research and mentorships
- Outlining and achieving your goals
- Best practices for a good academic experience
- Navigating UA Policies, especially when academic problems arise
- Contacting different departments on campus
- Contacting sponsors/writing sponsor letters for academic progress

## STUDENT RESPONSIBILITIES

- Tell us about your academic and career interests
- Tell us if things are not going as planned – be honest with us and yourself
- Questions! Ask lots of questions
- Bring ideas about which courses you are interested in taking - review the GEOS Handbook you're your Advisement Report before coming in
- Take notes during the meeting so you remember information and resources we discuss

## STUDENT GUIDELINES FOR INDIVIDUAL AND GROUP WORK

### 1. Underlying Principle

Unless specified in the assignment, all work and all words used to describe the results of an assignment must be the student's own. No material, whether paragraphs, sentences or phrases must be copied from another student or any external source. External material that is used, usually for a specific reason, must be accompanied by a citation of the source.

### 2. Individual Assignments

In some cases, students will be told that no conferring is allowed; if that is the case, students must not discuss their work with others, or show others their work. More often, Geosciences faculty will encourage discussion among students, because this facilitates learning. In such a case, any ideas and concepts may be discussed openly, but the student is still responsible for his/her own work turned in for grading. Identical paragraphs, sentences, phrases, or notations on a map/illustration may not be used by two or more students. The best way to avoid this is for students to discuss the assignment, but then separate from each other in order to produce the work to be turned in for grading, and not share electronic files using e-mail, flash drives or other method.

### 3. Group Assignments

Geosciences faculty routinely give two kinds of group assignments. Category 1 is a group assignment where students work in parallel on the same material (for instance a mapping exercise), but then turn in individual work for grading. Discussion is encouraged, but it is essential that each student first perform the written or map work individually, after which ideas may be exchanged and interpretations modified before the work is graded. Copying of another's work is prohibited, and this can be avoided in the same way as for individual assignments. Category 2 is a group assignment where students work explicitly as teams, perhaps with each member performing parts of a complex task (such as a geophysical or analytical experiment), and a combined product will be graded with equal scores for all members of the team. In this case, full discussion of the work, before any write-up takes place, is expected. The instructor will inform students whether a group assignment is Category 1 or 2.

#### 4. Reporting Cheating

All incidents of cheating or plagiarism, including facilitating of same, will be reported to the Dean of Students' office and the College of Science. As well as the violations in take-home or field assignments detailed above, this will include any violations during quizzes and exams. The University's procedure and forms give students an opportunity to explain to the instructor, and to comment upon (or rebut) any accusations in writing before the forms are turned in. But the forms can be turned in, reporting the cheating incident, even if the student fails to meet with the instructor or does not countersign the paperwork.

#### 5. Expectation of Student Integrity

Instructors in the Department of Geosciences set a high standard for themselves as educators, and they expect that students, both in general education and majors' classes, will do the same for their own education. Thus, cheating and plagiarism will not be tolerated.

#### 6. UA Code of Academic Integrity

This document is a statement of what students and faculty should expect within Department of Geosciences, or in general education courses offered by the Department. It does not replace the UA's Code of Academic Integrity, which can be read in full at:

<https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity>

### **GEOSCIENCES PROGRAM FEE**

A \$300 program fee is assessed for enrollment in the Geosciences undergraduate program per academic year. "Program Fees" are additional amounts charged to students in select degree programs within colleges, schools or departments, including honors colleges or programs, that have demonstrably higher costs of delivering instruction overall, or because of the need for or use of special equipment, technology, or key personnel expenses, or market conditions. This fee is applied to your Bursar's account as a "TUI:UGrad Geosciences Prog Fee" of \$150 each fall and spring semester. No program fees are assessed in Winter or Summer sessions. Students who pay this fee, have a FAFSA on-file with the Financial Aid and Scholarship office, and have unmet financial need may apply for the GEOS Need-based scholarships: <https://www.geo.arizona.edu/content/scholarships>.

### **CAPSTONE EXPERIENCES IN GEOSCIENCES**

#### **UA GEOS Field Camp Options for all sub-plans, especially for the Geology and Geophysics sub-plans which require an in-person Field Camp Experience of 6-units minimum:**

Many classes in this BS degree have required field trips that will involve walking and hiking. The field trips require some degree of physical fitness as they can be physically and scientifically demanding.\* Students will need field gear.

\*Students who need short-term or long-term medical accommodations for physical activity required on class field trips, or for field camp, should register with the Disability Resources Center (<https://drc.arizona.edu/students/connect-drc>), and then work with their instructor on an alternate assignment or with their major advisor to develop an alternative Field Camp option.

A minimum of 6-units of Core Capstone Field Experience is required for the Geology and Geophysics sub-plans. Students in the Earth, Oceans, and Climate (EOC) sub-plan may choose to complete 6-units of field camp or research to fulfill the Core Capstone requirement. The Field Camp Experience may be fulfilled in a variety of ways. The two options that are available through UA are GEOS 414 Field Camp and GEOS 405 Accessible Earth. Additional details for these two options are listed below.

Many other universities offer 6-unit field camps that can be transferred to UA, so students are urged to apply for a variety of field camps around the US as well as ours, to ensure they are able to complete the course in a timely fashion. Field camp experiences vary in unit value from one institution to another.

Students are required to complete a minimum of 6-units to fulfill the Core Capstone Field Experience requirement, which may mean engaging in more than one field camp experience if you would like to engage in a field camp that is valued at less than 6-units of credit.

### **GEOS 414 – Field Camp**

Field camp is a 5-week, 6-unit, field mapping class held during the summer. The UA field camp for summer 2022 cost approximately \$5,376 (\$3,006 tuition/fees for 6 units of credit plus \$1,970 for food and transportation plus a \$400 deposit).

Students enrolled in GEOS 414 will take the geologic principles they have learned in required lab courses and apply them to making their own geologic maps in the field. Students depart in vans from Tucson, accompanied by faculty and graduate students, and travel from campsite to campsite for the duration of the 4-week period.

**Field camp will be the most physically and scientifically challenging course students take in the major and they must be prepared for long days of strenuous physical exercise, variable weather conditions, and extremely rough terrain. Backcountry campgrounds have extremely limited facilities. For campgrounds with no water, the camp will provide water. Cellphone reception is also limited and students should not expect to be in contact by phone with friends/family.**

Because students at field camp are supervised 24/7 by faculty and safety standards must be met, **space in the UA field camp is limited to 25 students each summer. Admission to our field camp is therefore not guaranteed for UA students.** All qualified students from the University of Arizona are welcome to apply. However, admission is highly competitive and based on GPA and overall application.

Applications to the UA Geosciences Field Camp will be due in December of the previous year. Information on other field camps can be found at <https://www.usgs.gov/science-support/osqi/youth-education-science/survey-geoscience-field-camps> or <http://geology.com/field-camp.shtml>.

### **GEOS 405 – Accessible Earth Study Abroad Program**

The Accessible Earth Study Abroad Program is a 10-week, 6-unit class held during the summer. Accessible Earth will fulfill the 6-unit Core Capstone Field Camp requirement for the Geology and Geophysics sub-plans, and is an option for the Earth Systems sub-plan. This course is taken through the Study Abroad Office. The application deadline, eligibility, and cost information can be viewed at <https://global.arizona.edu/study-abroad/program/accessible-earth>.

The Accessible Earth Study Abroad Program targets senior level undergraduate and first/second year graduate students seeking to utilize modern Earth observation systems (e.g., satellite observation systems, ground-based Geophysical networks) and data science technologies in their Geoscience research. The Program is based in the beautiful Umbrian hilltop City of Orvieto, Italy, an exceptional location from which to reflect upon the history of science from the Renaissance to the Space Age, and gain an appreciation of the global scope of modern Earth observation systems, the societal relevance of Geoscience research, and the range of research topics that may be performed with a combination of instrumentation and data science technologies.

From Orvieto, students will have ample opportunities to immerse themselves in Italian culture and history, as well as develop ideas for how to utilize 21st century technologies to further our understanding of the Earth system. A five-day field trip will touch on a wide range of Geoscience and related topics, including the tectonic history of the Mediterranean region, the Cretaceous-Paleogene boundary, the enigmatic geodynamics of the Northern Apennines orogen, past and modern coastal hazards along the Adriatic coast, present-day Geological processes in the Alps, Neolithic and Etruscan Archaeology, and other topics. From Orvieto, students will learn to use several software tools for acquiring, analyzing, and interpreting Earth observation data sets, including data transfer protocols, Bash and Python shell scripting, Generic Mapping Tools (GMT), iPython/Jupyter notebooks for interactive analysis and documentation, git and GitHub for version control, scientific collaboration, and social networking, and other software tools that are empowering modern scientific discovery.

## **Capstone Field Experience Guidelines for the Gem Science and Earth, Oceans & Climate (EOC) sub-plans – Field camp, internship, independent study, or research**

The Geosciences Gem Science and Earth, Oceans, & Climate (EOC) sub-plans require a minimum of 6-units of field camp, internship, independent study, or research experience. **The goal of this requirement is to provide you with an individualized, meaningful, direct experience outside the classroom.** We have identified diverse ways that you can satisfy this requirement. You should begin thinking about this requirement early in your career: ALL of these options require advance planning. The requirement is flexible, but *you must plan ahead to identify an appropriate path, or risk delaying your graduation.*

All of these options must comprise the equivalent of 6 credits, must allow for an independent evaluation of the students work at the end of the experience (a grade or a written evaluation), and must be approved in advance by a GEOS faculty member. Students should meet with their GEOS Academic Advisor to discuss field camp options and resources as early as the spring of their sophomore year.

### **YOU MAY CHOOSE FROM THE FOLLOWING OPTIONS:**

**OPTION 1.** A summer field camp program in Geosciences or a related earth systems field (e.g. ecology, oceanography, hydrology). You can meet this requirement by taking UA classes such as GEOS 414 Field Camp, GEOS 405 Accessible Earth, ECOL 463 Ecology & Natural History of the Sonoran Desert & Gulf of California, as well as equivalent transferable experiences that have been pre-approved by the GEOS Field Camp Committee.

**Plan ahead:** The UA Geology field camp is highly competitive and has 2-3 prerequisites that are not required for the Gem Science and EOC sub-plans. Other geology camps may have similar requirements but some have a less competitive admissions process. Field camps in other sciences may also have prerequisites. A list of geological field camps can be found at <https://www.usgs.gov/youth-and-education-in-science/survey-geoscience-field-camps> and <http://geology.com/field-camp.shtml>. For field programs in other sciences, you will need to get departmental approval. Application deadlines vary but can be as early as November -January. Many of these camps demand 4-6 weeks in the summer.

**OPTION 2.** Participation in an NSF REU (Research Experience for Undergraduates) program in an Earth System science (you can find these listed at [http://www.nsf.gov/crssprgm/reu/reu\\_search.cfm](http://www.nsf.gov/crssprgm/reu/reu_search.cfm)). A faculty member will sign off on this as fulfilling the requirement. REU positions include a stipend. You can access REU opportunities in diverse fields, including geosciences, ecology, hydrology, ocean science, and atmospheric science. You can meet this requirement by enrolling in UA classes such as GEOS 492 Directed Research, GEOS 498 Senior Capstone Thesis, or GEOS 498H Honor's Thesis. The student must submit a GEOS Independent Study, Research, & Thesis Enrollment form with instructor signature for administrative enrollment into the appropriate course and units.

**Plan ahead:** These are highly competitive summer research programs in a variety of settings. Application deadlines vary by program and can be as early as December for the following summer.

**OPTION 3.** An internship or independent study, on or off campus. This may be a senior thesis project based on your interests, a research assistant position in a campus lab, or an internship in a company, a non-profit organization, or a government agency office. A wide range of activities may fulfill this option, but the following requirements must be met:

- The position must be earth system science-related.
- The position must include working a minimum of 12 hours/week for 15 weeks, or the equivalent.
- The student must complete the appropriate enrollment form with instructor signature: the GEOS Independent Study, Research, & Thesis Enrollment form or the UA Internship Work Plan.

- During the course of the independent activity, the student must update the approving faculty member regularly and provide the information needed to obtain an independent evaluation of the student's work by the end of the activity, such as a final project report, to enable grading.

**Plan ahead:** You will need to plan ahead for all of these, although the details will vary depending on your choice of activity. At a minimum, you will need to organize and obtain the required approvals for any independent activity during the semester before it is to take place. You will be evaluated and graded based on your supervisor's assessment and your adherence to the project expectations and deadlines.

**BS in GEOSCIENCES**  
**Sub-plan Coursework Comparison**  
**Catalog Year: 2022-2023**

<b>GEOLOGY SUB-PLAN</b>		
<b>CATEGORY</b>	<b>COURSE NAME</b>	<b>UNITS</b>
2nd Language - 2nd Semester Proficiency		4-8
General Education		21-23
English Composition	See apprvd opts	3-9
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
One additional Math	See apprvd opts	3
CHEM 151 or 141/143	General Chemistry I	4
CHEM 152 or 142/144	General Chemistry II	4
PHYS 102/181 or 141	Physics I	4
PHYS 103/182 or 142	Physics II	3-4
Computer Applications	GEOS 280 or GEOS 285	3
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
Capstone Field Exp	GEOS 414 or GEOS 405	6
GEOS 304	Structural Geology	4
GEOS 306	Mineralogy	3
GEOS 308	Paleontology	3
GEOS 322	Geophysics	3
GEOS 356	Petrology	4
Approved emphasis		15
Free electives		1-20
<b>MINIMUM TOTAL REQUIRED</b>		<b>120</b>

<b>GEOPHYSICS SUB-PLAN</b>		
<b>CATEGORY</b>	<b>COURSE NAME</b>	<b>UNIT</b>
2nd Language - 2nd Semester Proficiency		4-8
General Education		21-23
English Composition	See apprvd opts	3-9
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
MATH 223	Vector Calc (Calculus III)	4
MATH 254	Differential Equations	3
MATH 313	Intro to Linear Algebra	3
MATH 322	Math. Analysis for Engin.	3
CHEM 151 or	General Chemistry I	4
Physics 141	Mechanics	4
Physics 142	Optics Thermodynamics	3
Computer Appl.	GEOS 280 or GEOS 285	3
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
Capstone Field Exp	GEOS 414 or GEOS 405	6
GEOS 304	Structural Geology	4
GEOS 306	Mineralogy	3
GEOS 322	Geophysics	3
GEOS 356	Petrology	4
Geophysics 400-lev	GEOS 419, 432, 434A	9
Approved emphasis		9
Free electives		0-14
<b>MINIMUM TOTAL REQUIRED</b>		<b>120</b>

<b>EARTH, OCEANS &amp; CLIMATE (EOC) SUB-PLAN</b>		
<b>CATEGORY</b>	<b>COURSE NAME</b>	<b>UNITS</b>
2nd Language - 2nd Semester Proficiency		4-8
General Education		21-23
English Composition	See apprvd opts	3-9
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
CHEM 151 or 141/143	General Chemistry I	4
CHEM 152 or 142/144	General Chemistry II	4
PHYS 102/181 or 141	Physics I	4
PHYS 103/182 or 142	Physics II	3-4
Computer Applications	GEOS 280 or GEOS 285	3
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
Capstone Research or field experience		6
GEOS 308	Paleontology	3
GEOS 342	History of Earth's Climate	3
GEOS 412A	Ocean Science	3
GEOS 478	Global Change	3
GEOS 479	Climate Dynamics	3
Approved emphasis		17
Free electives		4-23
<b>MINIMUM TOTAL REQUIRED</b>		<b>120</b>

<b>GEM SCIENCE SUB-PLAN</b>		
<b>CATEGORY</b>	<b>COURSE NAME</b>	<b>UNIT</b>
2nd Language - 2nd Semester Proficiency		4-8
General Education		21-23
English Composition	See apprvd opts	3-9
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
MATH 223	Vector Calculus (Calc III)	3
CHEM 151 or	General Chemistry I	4
MSE 110	Solid State Chemistry	4
PHYS 141	Mechanics	4
PHYS 142	Optics Thermodynamics	3
Computer Appl.	GEOS 280 or GEOS 285	3
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
Capstone Research or Field Exp (e.g. GIA, RealReal)		6
GEOS 260	Intro to Gem Science	3
GEOS 306	Mineralogy	3
GEOS 356	Petrology	4
GEOS 400 or 474	Geochem or Geo-Thermochron	3
GEOS 462	Petrology of Gems	3
MSE 480	Adv Characterization	3
Approved emphasis		13
Free electives		7-23
<b>MINIMUM TOTAL REQUIRED</b>		<b>120</b>

## Requirements for Geology Sub-plan: 2022-23 Catalog Year

### SECOND LANGUAGE REQUIREMENT

(Requirement can be met with proficiency exam):

Semester 1		4
Semester 2	(completion with a grade of C or higher)	4

### GENERAL EDUCATION

#### GE: Introduction Course

UNIV 101	Introduction to General Ed (Waived for new transfer students)	1
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#### GE: Exploring Perspectives (12 units):

Artist		3
Humanist		3
Natural Scientist	Can be fulfilled with Chem 151 or GEOS 251	3
Social Scientist		3

#### GE: Building Connections (9 units):

		3
		3
		3

#### GE: Capstone (3 units):

UNIV 301	General Ed Capstone (Waived for new transfer students)	3
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### ENGLISH (6 units):

ENGL 101	English Composition	3
ENGL 102	English Composition (grade of B or higher to meet MCWA)	3

or

ENGL 109H	English Composition	3
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or

ENGL 106	English Composition for ESL Students	3
ENGL 107	English Composition for ESL Students	3
ENGL 108	English Composition for ESL Students (grade of B or higher to meet MCWA)	3

### MATHEMATICS (9 units):

MATH 122A&B or MATH 125	Calculus I (P: MATH 120R, or MATH 112 plus MATH 111, with a grade of C or higher, or appropriate math placement)	3-5
MATH 129	Calculus II (P: MATH 122B or MATH 125 with grade of C or higher)	3

#### Choose one of the following:

MATH 163	Basic Statistics (P: MATH 112)	3
MATH 223	Vector Calculus (P: MATH 129)	4
MATH 263	Statistics and Biostatistics (P: MATH 112)	3
MATH 313	Intro to Linear Algebra (P: MATH 129)	3

### CHEMISTRY (8 units):

CHEM 151	General Chemistry I (P: MATH 112 or appropriate math placement)	4
CHEM 152	General Chemistry II (P: CHEM 151)	4

or

CHEM 141	Introductory Chemistry I (P: MATH 112 or appropriate math placement)	3
CHEM 143	Introductory Laboratory I (CR: CHEM 141)	1
CHEM 142	Introductory Chemistry II (P: CHEM 141)	3
CHEM 144	Introductory Laboratory II (P: CHEM 143; CR: CHEM 142)	1

### PHYSICS (7-8 units):

PHYS 102	Introductory Physics I (P: MATH 112 or appropriate math placement)	3
PHYS 181	Introductory Laboratory I (CR: PHYS 102)	1
PHYS 103	Introductory Physics II (P: PHYS 102)	3
PHYS 182	Introductory Laboratory II (P: PHYS 181; CR: PHYS 103)	1

or

PHYS 141	Introductory Mechanics (P: MATH 122B or MATH 125; CR: MATH 129)	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141 and MATH 129 or appropriate math placement)	3

### COMMON CORE (Complete 5 courses):

GEOS 251	Physical Geology (Fall and Spring)	4
Computer Ap: GEOS 280 or GEOS 285	MatLab (P: GEOS 251) (Fall) or Accessible Earth (P: GEOS 251) (Spring)	3
GEOS 300	Earth Surface Processes (P: GEOS 251, Calculus I proficiency recommended) (Spring)	3
GEOS 302	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall) (Writing Proficiency course; MCWA alternative)	4
Capstone Experience: Field Camp (in-person)	GEOS 414 Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or  or GEOS 405 Accessible Earth (P: GEOS 251, GEOS 302 recommended) (both available in Summer Session)  or Advisor-approved, in-person, equivalent transfer Field Camp(s)	6

### GEOLOGY CORE (Complete all 5 courses):

GEOS 304	Structural Geology (P: GEOS 251, PHYS 102 or PHYS 141) (Spring)	4
GEOS 306	Mineralogy (P: GEOS 251, CHEM 151) (Fall)	3
GEOS 308	Paleontology (P: GEOS 251) (Spring)	3
GEOS 322	Intro to Geophysics (P: GEOS 251; P: MATH 122B or 125) (Fall)	3
GEOS 356	Petrology (P: GEOS 306, MATH 122B, PHYS 102 or 141) (Spring)	4

### GEOLOGY ADVISOR APPROVED EMPHASIS COURSES (15 units)

Majority of courses should consist of GEOS 300 or 400 level	
Full list of approved classes on advisement report	
No more than 3 units of Preceptor (GEOS 397A)	
Up to 6-units of a combination of Internship, Preceptorship (3-unit max), and/or Research allowed.	
No double-dipping Emphasis credits with Capstone or other GEOS BS requirements.	

\*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 100 units. Additional units or "Free Electives" may be required to meet the BS minimum requirement of 120 units.

### Geology Advisor Approved Emphasis Courses

ANTH 304, ANTH 335, ANTH 435, ANTH 439A, ASTR 403, ASTR 442, ATMO 412A, CHEM 325, CHEM 326, CHEM 480A, CHEM 480B, ECOL 335, ECOL 360, ECOL 406L, ECOL 406R, ECOL 412A, ECOL 412B, ENVS 412A, GEN 402, GEN 416, GEN 427, GEN 448, GEOG 430, GEOG 438, GEOG 439A, GEOS 195D, GEOS 240, GEOS 255, GEOS 260, GEOS 270, GEOS 342, GEOS 400, GEOS 403, GEOS 411, GEOS 412A, GEOS 412B, GEOS 415, GEOS 416, GEOS 417, GEOS 419, GEOS 423, GEOS 424A, GEOS 425, GEOS 427, GEOS 430, GEOS 432, GEOS 434A, GEOS 439A, GEOS 440, GEOS 442, GEOS 446, GEOS 448, GEOS 450, GEOS 453, GEOS 456, GEOS 460, GEOS 462, GEOS 466, GEOS 469, GEOS 470L, GEOS 470R, GEOS 477, GEOS 478, GEOS 482, GEOS 489, HWRS 350, HWRS 411, HWRS 431, HWRS 480, MATH 313, MATH 322, MNE 402, MNE 427, MSE 412, PHYS 403, PTYS 403, PTYS 411, PTYS 442, WSM 439A, Approved Transfer Course



**Geology sub-plan: MATH 125 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	2 GEOL emphasis	5
MATH 125	3	Additional Math	3	GEOS 322	3	BC GE	3
ENGL 101/107	3	PHYS 102	3	CompApps course	3	2 Free electives**	6
CHEM 151	4	PHYS 181	1	BC GE	3		
UNIV 101	1	EP: Humanist GE	3				
		1 Free elective**	3				
	<b>15</b>		<b>16</b>		<b>13</b>		<b>14</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 300	3	GEOS 304	4	1 GEOL emphasis	6
MATH 129	3	GEOS 356	4	GEOS 308	3	UNIV 301	1
CHEM 152	4	PHYS 103	3	BC GE	3	2 Free electives**	5
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3		
EP: Artist GE	3	EP: Social Scientist GE	3				
					<b>13</b>		
	<b>17</b>		<b>14</b>	<b>Summer</b>			
<b>TOTAL UNITS</b>	<b>32</b>		<b>14</b>	Capstone Field Experience	<b>6</b>		<b>12</b>
			<b>30</b>		<b>32</b>		<b>26</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Geology sub-plan: MATH 122 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	2 GEOL emphasis	5
MATH 122A	1	Additional Math	3	GEOS 322	3	BC GE	3
MATH 122B	4	PHYS 102	3	CompApps course	3	1 Free elective**	3
ENGL 101/107	3	PHYS 181	1	BC GE	3		
EP: Artist GE	3	EP: Humanist GE	3	1 Free elective**	3		
UNIV 101	1	1 Free elective**	3				
	<b>16</b>		<b>16</b>		<b>16</b>		<b>11</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 300	3	GEOS 304	4	2 GEOL emphasis	6
MATH 129	3	GEOS 356	4	GEOS 308	3	UNIV 301	1
CHEM 151	4	PHYS 103	3	BC GE	3	1 Free elective**	3
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3		
		EP: Social Scientist GE	3				
	<b>14</b>		<b>14</b>		<b>13</b>		<b>10</b>
<b>Summer</b>				<b>Summer</b>			
CHEM 152	4			Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>34</b>		<b>30</b>		<b>35</b>		<b>21</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Geology sub-plan: MATH 120R placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	MATH 129	3	GEOS 302	4	2 GEOL emphasis	5
MATH 120R	4	GEOS 306	3	GEOS 322	3	BC GE	3
ENGL 101/107	3	PHYS 102	3	CompApps course	3	2 Free electives**	4
EP: Artist GE	3	PHYS 181	1	BC GE	3		
UNIV 101	1	EP: Humanist GE	3				
		1 Free elective**	3				
	<b>15</b>		<b>16</b>		<b>13</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	3	GEOS 300	3	GEOS 308	3
MATH 122A	1	Additional Math	3	GEOS 304	4	2 GEOL emphasis	5
MATH 122B	4	PHYS 103	3	BC GE	3	UNIV 301	1
CHEM 151	4	PHYS 182	1	1 Free elective**	3		
ENGL 102/108	3	EP: Social Scientist GE	3				
		1 Free elective**	3				
	<b>16</b>		<b>16</b>		<b>13</b>		<b>9</b>
<b>Summer</b>				<b>Summer</b>			
CHEM 152	4			Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>35</b>		<b>32</b>		<b>32</b>		<b>21</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Geology sub-plan: MATH 112 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	3 GEOL emphasis	5
MATH 112	3	MATH 122A	1	GEOS 322	3	BC GE	3
ENGL 101/107	3	MATH 122B	4	CompApps course	3	1 Free elective**	3
EP: Artist GE	3	PHYS 102	3	BC GE	3		
UNIV 101	1	PHYS 181	1	1 Free elective**	3		
		EP: Humanist GE	3				
	<b>14</b>		<b>15</b>		<b>16</b>		<b>11</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	4	GEOS 308	3
MATH 120R	4	MATH 129	3	GEOS 304	4	1 GEOL emphasis	3
CHEM 151	4	PHYS 103	3	BC GE	3	UNIV 301	1
ENGL 102/108	3	PHYS 182	1	1 GEOL emphasis	3	1 Free elective**	1
		EP: Social Scientist GE	3				
	<b>15</b>		<b>14</b>		<b>14</b>		<b>8</b>
<b>Summer</b>		<b>Summer</b>		<b>Summer</b>			
CHEM 152	4	Additional Math	3	Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>33</b>		<b>32</b>		<b>36</b>		<b>19</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Geology sub-plan: MATH 100 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 322	3
MATH 100	3	MATH 122A	1	CompApps course	3	2 GEOL emphasis	5
ENGL 101/107	3	MATH 122B	4	PHYS 103	3	UNIV 301	1
EP: Artist GE	3	CHEM 152	4	PHYS 182	1	1 Free Elective**	3
UNIV 101	1	EP: Social Scientist GE	3	BC GE	3		
	<b>14</b>		<b>15</b>		<b>14</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 300	3	GEOS 304	4	GEOS 308	3
MATH 112	3	MATH 129	3	GEOS 356	4	1 GEOL emphasis	3
ENGL 102/108	3	PHYS 102	3	1 GEOL emphasis	3	1 Free Electives**	2
EP: Humanist GE	3	PHYS 181	1	BC GE	3		
		BC GE	3				
	<b>13</b>		<b>13</b>		<b>14</b>		<b>8</b>
<b>Summer</b>		<b>Summer</b>		<b>Summer</b>			
MATH 120R	4	Additional Math	3	Capstone Field Experience	6		
CHEM 151	4						
	<b>8</b>		<b>3</b>		<b>6</b>		
<b>TOTAL UNITS</b>	<b>35</b>		<b>31</b>		<b>34</b>		<b>20</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

## Requirements for Geophysics Sub-plan: 2022-23 Catalog Year

### SECOND LANGUAGE REQUIREMENT

(Requirement can be met with proficiency exam):

Semester 1		4
Semester 2	(completion with a grade of C or higher)	4

### GENERAL EDUCATION

#### GE: Introduction Course

UNIV 101	Introduction to General Ed (Waived for new transfer students)	1
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#### GE: Exploring Perspectives (12 units):

Artist		3
Humanist		3
Natural Scientist	Can be fulfilled with Chem 151 or GEOS 251	3
Social Scientist		3

#### GE: Building Connections (9 units):

		3
		3
		3

#### GE: Capstone (3 units):

UNIV 301	General Ed Capstone (Waived for new transfer students)	3
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### ENGLISH (6 units):

ENGL 101	English Composition	3
ENGL 102	English Composition (grade of B or higher to meet MCWA)	3

or

ENGL 109H	English Composition	3
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or

ENGL 106	English Composition for ESL Students	3
ENGL 107	English Composition for ESL Students	3
ENGL 108	English Composition for ESL Students (grade of B or higher to meet MCWA)	3

### MATHEMATICS (19 units; fulfills Math Minor requirements):

MATH 122A&B or MATH 125	Calculus I (P: MATH 120R, or MATH 112 plus MATH 111, with a grade of C or higher, or appropriate math placement)	3-5
MATH 129	Calculus II (P: MATH 122B or MATH 125 with grade of C or higher)	3
MATH 223	Vector Calculus (P: MATH 129)	4
MATH 254	Differential Equations (P: MATH 129 or 223)	3
MATH 313	Introduction to Linear Algebra (MATH 129, MATH 223, MATH 243, MATH 254, or CSC 245)	3
MATH 322	Mathematical Analysis for Engineers (P: MATH 254)	3

### CHEMISTRY (4 units):

CHEM 151	General Chemistry I (P: MATH 112 or appropriate math placement)	4
or		
CHEM 141	Introductory Chemistry I (P: MATH 112 or appropriate math placement)	3
CHEM 143	Introductory Laboratory I (CR: CHEM 141)	1

### PHYSICS (7 units):

PHYS 141	Introductory Mechanics (P: MATH 122B or MATH 125; CR: MATH 129)	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141 and MATH 129 or appropriate math placement)	3

### COMMON CORE (Complete 5 courses):

GEOS 251	Physical Geology (Fall and Spring)	4
Computer Ap: GEOS 280 or GEOS 285	MatLab (P: GEOS 251) (Fall) or Accessible Earth (P: GEOS 251) (Spring)	3
GEOS 300	Earth Surface Processes (P: GEOS 251, Calculus I proficiency recommended) (Spring)	3
GEOS 302	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall) (Writing Proficiency course; MCWA alternative)	4
Capstone Experience:  Field Camp (in-person)	GEOS 414 Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or  or GEOS 405 Accessible Earth (P: GEOS 251, GEOS 302 recommended) (both available in Summer Session)  or Advisor-approved, in-person, equivalent transfer Field Camp(s)	6

### GEOPHYSICS CORE (Complete all 8 courses):

GEOS 304	Structural Geology (P: GEOS 251, PHYS 102 or PHYS 141) (Spring)	4
GEOS 306	Mineralogy (P: GEOS 251, CHEM 151) (Fall)	3
GEOS 308	Paleontology (P: GEOS 251) (Spring)	3
GEOS 322	Intro to Geophysics (P: GEOS 251; P: MATH 122B or 125) (Fall)	3
GEOS 356	Petrology (P: GEOS 306, MATH 122B, PHYS 102 or 141) (Spring)	4
GEOS 419	Physics of the Earth (P: MATH 254) (Spring – even years [Spring 2024, Spring 2026])	3
GEOS 432	Intro to Seismology (P: MATH 254) (Fall)	3
GEOS 434A	Intro to Exploration Seismology (P: MATH 129) (Fall)	3

### GEOPHYSICS ADVISOR APPROVED EMPHASIS COURSES (9 units)

Majority of courses should consist of GEOS 300 or 400 level
Full list of approved classes on advisement report
No more than 3 units of Preceptor (GEOS 397A)
Up to 6-units of a combination of Internship, Preceptorship (3-unit max), and/or Research allowed.
No double-dipping Emphasis credits with Capstone or other GEOS BS requirements.

\*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 106 units. Additional units may be required to meet the BS minimum requirement of 120 units.

### Geophysics Advisor Approved Emphasis Courses

ASTR 403, ASTR 442, ENVS 330, GEN 330, GEN 416, GEN 448, GEOG 330, GEOG 403, GEOG 417, GEOG 419, GEOG 420, GEOS 240, GEOS 255, GEOS 260, GEOS 270, GEOS 330, GEOS 400, GEOS 403, GEOS 411, GEOS 416, GEOS 417, GEOS 423, GEOS 424A, GEOS 425, GEOS 427, GEOS 440, GEOS 442, GEOS 446, GEOS 448, GEOS 469, GEOS 477, GEOS 479, GEOS 482, GEOS 567, GEOS 568, GIST 330, GIST 417, GIST 420, HWRS 411, HWRS 431, MATH 363, PHYS 403, PTYS 403, PTYS 407, PTYS 411, PTYS 442, PTYS 567, RNR 403, RNR 417, RNR 419, RNR 420, WSM 330, Approved Transfer Course

**Geophysics subplan: MATH 125 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 432	3
MATH 125	3	PHYS 141	4	GEOS 322	3	GEOS 434A	3
CHEM 151	4	MATH 223	4	MATH 313	3	1 GEOPHYS Emphasis	3
ENGL 101/107	3	EP: Humanist GE	3	BC GE	3	BC GE	3
UNIV 101	1					1 Free elective**	3
	<b>15</b>		<b>14</b>		<b>13</b>		<b>15</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
*GEOS 255	4	GEOS 356	4	GEOS 300	3	GEOS 419 (even years only)	3
CompApps course	4	CompApps course	3	GEOS 304	4	1 GEOPHYS Emphasis	2
MATH 129	3	PHYS 142	3	MATH 322	3	UNIV 301	1
ENGL 102/108	3	MATH 254	3	BC BE	3	2 Free electives**	5
EP: Artist GE	3	EP: Social Scientist GE	3				
	<b>17</b>		<b>16</b>		<b>13</b>		<b>11</b>
				<b>Summer</b>			
				Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>32</b>	<b>30</b>			<b>32</b>		<b>26</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOPHYS course selection & math courses due to math placement.

**Geophysics subplan: MATH 122 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 432	3
MATH 122A	1	PHYS 141	4	GEOS 322	3	GEOS 434A	3
MATH 122B	4	MATH 223	4	MATH 313	3	BC GE	3
ENGL 101/107	3	EP: Social Scientist GE	3	BC GE	3	2 Free electives**	5
EP: Artist GE	3						
UNIV 101	1						
	<b>16</b>		<b>14</b>		<b>13</b>		<b>14</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	GEOS 419 (even years only)	3
MATH 129	3	CompApps course	3	GEOS 304	4	1 GEOPHYS emphasis	2
CHEM 151	4	PHYS 142	3	1 GEOPHYS Emphasis	3	UNIV 301	3
ENGL 102/108	3	MATH 254	3	MATH 322	3	1 Free Elective**	3
EP: Humanist GE	3	BC GE	3				
	<b>17</b>		<b>16</b>		<b>13</b>		<b>11</b>
				<b>Summer</b>			
				Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>33</b>	<b>30</b>			<b>32</b>		<b>25</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOPHYS course selection & math courses due to math placement.

**Geophysics sub-plan: MATH 120R placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 434A	3
MATH 120R	4	MATH 129	3	GEOS 322	3	GEOS 432	3
ENGL 101/107	3	PHYS 141	4	MATH 254	3	MATH 322	3
EP: Artist GE	3	EP: Humanist GE	3	BC GE	3	BC GE	3
UNIV 101	1					1 Free elective**	3
	<b>15</b>		<b>13</b>		<b>13</b>		<b>15</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	GEOS 419 (even years only)	3
MATH 122A	1	CompApps course	3	GEOS 304	4	1 GEOPHYS emphasis	2
MATH 122B	4	PHYS 142	3	1 GEOS Emphasis	3	BC GE	3
CHEM 151	4	MATH 223	4	MATH 313	3	UNIV 301	1
ENGL 102/108	3	EP: Social Scientist GE	3			2 Free elective**	6
	<b>16</b>		<b>17</b>		<b>13</b>		<b>12</b>
				<b>Summer</b>			
				Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>31</b>	<b>30</b>			<b>32</b>		<b>27</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOPHYS course selection & math courses due to math placement.

**Geophysics sub-plan: MATH 112 placement**

<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 432	3
MATH 112	3	MATH 129	3	GEOS 322	3	GEOS 434A	3
ENGL 101/107	3	PHYS 141	4	MATH 254	3	MATH 322	3
EP: Artist GE	3	EP: Humanist GE	3	BC GE	3	BC GE	3
UNIV 101	1	EP: Social Scientist GE	3			1 Free elective**	3
	<b>14</b>		<b>16</b>		<b>13</b>		<b>15</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	GEOS 419 (even years only)	3
MATH 120R	4	CompApps course	3	GEOS 304	4	1 GEOPHYS emphasis	2
CHEM 151	4	PHYS 142	3	1 GEOPHYS Emphasis	3	BC GE	3
ENGL 102/108	3	MATH 223	4	MATH 313	3	UNIV 301	1
	<b>15</b>		<b>14</b>		<b>13</b>	2 Free electives**	4
<b>Summer</b>				<b>Summer</b>			
MATH 122A	1			Capstone Field Experience	6		
MATH 122B	4						
							<b>10</b>
<b>TOTAL UNITS</b>	<b>33</b>		<b>30</b>		<b>32</b>		<b>25</b>

**120**

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOPHYS course selection & math courses due to math placement.

**Geophysics sub-plan: MATH 100 placement**

<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 306	3	GEOS 302	4	GEOS 432	3
MATH 100	3	MATH 122A	1	GEOS 322	3	GEOS 434A	3
ENGL 101/107	3	MATH 122B	4	MATH 223	4	MATH 322	3
EP: Artist GE	3	PHYS 141	4	BC GE	3	BC GE	3
UNIV 101	1	EP: Social Scientist GE	3				
	<b>14</b>		<b>15</b>		<b>14</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	GEOS 419 (even years only)	3
MATH 112	4	CompApps course	3	GEOS 304	4	1 GEOPHYS Emphasis	2
ENGL 102/108	4	MATH 129	3	1 GEOPHYS Emphasis	3	UNIV 301	1
ENGL 102/108	3	PHYS 142	3	MATH 254	3	1 Free elective**	2
	<b>15</b>	BC GE	3		<b>13</b>		<b>8</b>
<b>Summer</b>				<b>Summer</b>			
CHEM 151	4			Capstone Field Experience	6		
EP: Humanist GE	3						
<b>TOTAL UNITS</b>	<b>36</b>		<b>31</b>		<b>33</b>		<b>20</b>

**120**

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOPHYS course selection & math courses due to math placement.

## Requirements for Gem Science Sub-plan: 2022-23 Catalog Year

### SECOND LANGUAGE REQUIREMENT

(Requirement can be met with proficiency exam):

Semester 1		4
Semester 2	(completion with a grade of C or higher)	4

### GENERAL EDUCATION

#### GE: Introduction Course

UNIV 101	Introduction to General Ed (Waived for new transfer students)	1
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#### GE: Exploring Perspectives (12 units):

Artist		3
Humanist		3
Natural Scientist	Can be fulfilled with Chem 151 or GEOS 251	3
Social Scientist		3

#### GE: Building Connections (9 units):

		3
		3
		3

#### GE: Capstone (3 units):

UNIV 301	General Ed Capstone (Waived for new transfer students)	3
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### ENGLISH (6 units):

ENGL 101	English Composition	3
ENGL 102	English Composition (grade of B or higher to meet MCWA)	3

or

ENGL 109H	English Composition	3
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or

ENGL 106	English Composition for ESL Students	3
ENGL 107	English Composition for ESL Students	3
ENGL 108	English Composition for ESL Students (grade of B or higher to meet MCWA)	3

### MATHEMATICS (9 units):

MATH 122A&B or MATH 125	Calculus I (P: MATH 120R with a grade of C or higher, or appropriate math placement)	3-5
MATH 129	Calculus II (P: MATH 122B or MATH 125 with grade of C or higher)	3
MATH 223	Vector Calculus (P: MATH 129 with a grade of C or higher)	4

### CHEMISTRY (8 units):

CHEM 151 or CHEM 141/143	General Chemistry I (P: MATH 112 or appropriate math placement)	4
MSE 110	Solid State Chemistry (P: CHEM 151)	4

### PHYSICS (7-8 units):

PHYS 141	Introductory Mechanics (P: MATH 122B or MATH 125; CR: MATH 129)	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141 and MATH 129 or appropriate math placement)	3

### COMMON CORE (Complete 5 courses):

<b>GEOS 251</b>	Physical Geology (Fall and Spring)	4
<b>Computer Ap:</b> GEOS 280 or GEOS 285	MatLab (P: GEOS 251) (Fall) or Accessible Earth (P: GEOS 251) (Spring)	3
<b>GEOS 300</b>	Earth Surface Processes (P: GEOS 251, Calculus I proficiency recommended) (Spring)	3
<b>GEOS 302</b>	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall) (Writing Proficiency course; MCWA alternative)	4
<b>Capstone Experience:</b>  Field Camp  &/or Research or Thesis  &/or Internship	  GEOS 414 Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or GEOS 405 Accessible Earth (P: GEOS 251, GEOS 302 recommended) (both available in Summer Session)  &/or GEOS 492 Directed Research, GEOS 499 or 499H Independent Study, GEOS 498 Sr. Capstone Thesis, GEOS 498H Honor's Thesis  &/or GEOS 393 (1-6-unit exp.) or GEOS 493 (3-un exp.)	6

### GEM SCI CORE (Complete 6 courses):

GEOS 260	Intro to Gem Science (P: CHEM 151 or CHEM 141 and CHEM 143 or MSE 110) (Spring)	4
GEOS 306	Mineralogy (P: GEOS 251, CHEM 151 or CHEM 141 and CHEM 143) (Fall)	3
GEOS 356	Petrology (P: GEOS 306, MATH 122B, PHYS 102 or 141) (Spring)	4
GEOS 400 or GEOS 474	Intro to Geochemistry (P: GEOS 251; CHEM 152 or CHEM 142 and CHEM 144) (Fall) or Geochronology-Thermochronology (P: GEOS 251, MATH 122B or 125) (Fall 2023)	3
GEOS 462	Petrology of Gems (P: GEOS 306, GEOS 356) (Spring)	3
MSE 480	Adv Characterization Methods in Materials Science & Engr (Spring)	3

### GEM SCI ADVISOR APPROVED EMPHASIS COURSES (13 units)

Majority of courses should consist of GEOS 300 or 400 level
Full list of approved classes on advisement report
No more than 3 units of Preceptor (GEOS 397A)
Up to 6-units of a combination of Internship, Preceptorship (3-unit max), and/or Research allowed.
No double-dipping Emphasis credits with Capstone or other GEOS BS requirements.

\*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 97 units. Additional units may be required to meet the BS minimum requirement of 120 units.

### Geology Advisor Approved Emphasis Courses

ANTH 201, ART 237, CHEM 325, CHEM 326, CHEM 480A, CHEM 480B, GEOS 240, GEOS 255, GEOS 304, GEOS 400 or GEOS 474, GEOS 408, GEOS 427, GEOS 446, GEOS 474, MNE 201, OPTI 201R, OPTI 201L, OPTI 202R, OPTI 202L, OPTI 210, OPTI 330, OPTI 340, OPTI 340A, OPTI 404, OPTI 484, OPTI 485, RCSC 114, RCSC 240, RCSC 320, RCSC 360, Approved Transfer Course

**Gem Science sub-plan: MATH 125 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 260	3	GEOS 302	4	GEOS 400 or GEOS 474	3
MATH 125	3	GEOS 306	3	1 GEMSC emphasis	3	BC GE	3
ENGL 101/107	3	Additional Math	3	CompApps course	3	2 Free electives**	6
CHEM 151	4	PHYS 102	3	BC GE	3		
UNIV 101	1	PHYS 181	1				
		1 EP: Humanist GE	3				
	<b>15</b>		<b>16</b>		<b>13</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 300	3	GEOS 462	3	MSE 480	3
MATH 129	3	GEOS 356	4	1 GEMSC emphasis	3	1 GEMSC emphasis	3
MSE 110	4	PHYS 103	3	BC GE	3	UNIV 301	1
ENGL 102/108	3	PHYS 182	1	2 Free electives**	6	2 Free electives**	5
EP: Artist GE	3	EP: Social Scientist GE	3				
				<b>Summer</b>			
	<b>17</b>		<b>14</b>	Capstone Field Experience	6		<b>12</b>
<b>TOTAL UNITS</b>	<b>32</b>		<b>30</b>		<b>34</b>		<b>24</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Gem Science sub-plan: MATH 122 placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 260	3	GEOS 302	4	GEOS 400 or GEOS 474	3
MATH 122A	1	GEOS 306	3	MSE 110	4	1 GEMSC emphasis	3
MATH 122B	4	Additional Math	3	CompApps course	3	BC GE	3
ENGL 101/107	3	PHYS 102	3	EP: Social Scientist GE	3	2 Free electives**	6
Tier I gen. ed.	3	PHYS 181	1				
UNIV 101	1	EP: Artist GE	3				
	<b>16</b>		<b>16</b>		<b>14</b>		<b>15</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 300	3	GEOS 462	3	MSE 480	3
MATH 129	3	GEOS 356	4	2 GEMSC emphasis	6	BC GE	4
CHEM 151	4	PHYS 103	3	BC GE	3	UNIV 301	1
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3	1 Free elective**	2
	<b>14</b>	EP: Humanist GE	3				
			<b>14</b>	<b>Summer</b>			<b>10</b>
				Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>30</b>		<b>30</b>		<b>35</b>		<b>25</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Gem Science sub-plan: MATH 120R placement**

Year 1		Year 2		Year 3		Year 4	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 260	3	GEOS 302	4	GEOS 400 or GEOS 474	3
MATH 120R	4	GEOS 306	3	MSE 110	4	1 GEMSC emphasis	3
ENGL 101/107	3	MATH 129	3	CompApps course	3	BC GE	3
EP: Artist GE	3	PHYS 102	3	BC GE	3	1 Free electives**	3
UNIV 101	1	PHYS 181	1				
		EP: Humanist GE	3				
	<b>15</b>		<b>16</b>		<b>14</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	MSE 480	3
MATH 122A	1	Additional Math	3	GEOS 462	3	2 GEMSC emphasis	6
MATH 122B	4	PHYS 103	3	BC GE	3	UNIV 301	1
CHEM 151	4	PHYS 182	1	2 Free electives**	6	1 Free electives**	2
ENGL 102/108	3	EP: Social Scientist GE	3				
	<b>16</b>		<b>14</b>				
				<b>Summer</b>			<b>12</b>
				Capstone Field Experience	6		
<b>TOTAL UNITS</b>	<b>31</b>		<b>30</b>		<b>35</b>		<b>24</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Gem Science sub-plan: MATH 112 placement**

<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 260	3	GEOS 302	4	GEOS 400 or GEOS 474	3
MATH 112	3	GEOS 306	3	MSE 110	4	1 GEMSC emphasis	3
ENGL 101/107	3	MATH 122A	1	CompApps course	3	BC GE	3
EP: Artist GE	3	MATH 122B	4	BC GE	3	2 Free electives**	4
UNIV 101	1	EP: Humanist GE	3				
	<b><u>14</u></b>		<b><u>14</u></b>		<b><u>14</u></b>		<b><u>13</u></b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	MSE 480	3
MATH 120R	4	MATH 129	3	GEOS 462	3	2 GEMSC emphasis	6
CHEM 151	4	PHYS 103	3	BC GE	3	UNIV 301	1
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3		
1 Free elective**	1	EP: Social Scientist GE	3				
	<b><u>16</u></b>		<b><u>14</u></b>		<b><u>12</u></b>		<b><u>10</u></b>
<b>Summer</b>		<b>Summer</b>		<b>Summer</b>			
PHYS 102	3	Additional Math	3	Capstone Field Experience	6		
PHYS 181	1						
	<b><u>4</u></b>		<b><u>3</u></b>		<b><u>6</u></b>		
<b>TOTAL UNITS</b>	<b>34</b>		<b>31</b>		<b>32</b>		<b>23</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.

**Gem Science sub-plan: MATH 100 placement**

<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>	
GEOS 251	4	GEOS 260	3	GEOS 302	4	GEOS 400 or GEOS 474	3
MATH 100	3	GEOS 306	3	CompApps course	3	1 GEMSC emphasis	3
SAS 100AX	2	MATH 122A	1	PHYS 103	3	BC GE	3
ENGL 101/107	3	MATH 122B	4	PHYS 182	1	1 Free electives**	2
EP: Artist GE	3	EP: Humanist GE	3	BC GE	3		
UNIV 101	1						
	<b><u>15</u></b>		<b><u>14</u></b>		<b><u>14</u></b>		<b><u>11</u></b>
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>	
GEOS 255*	4	GEOS 356	4	GEOS 300	3	MSE 480	3
MATH 112	3	MATH 129	3	GEOS 462	3	2 GEMSC emphasis	6
ENGL 102/108	3	PHYS 102	3	BC GE	3	UNIV 301	1
Tier I gen. ed.	3	PHYS 181	1	1 Free electives**	3		
	<b><u>13</u></b>	EP: Social Scientist GE	3		<b><u>12</u></b>		<b><u>10</u></b>
<b>Summer</b>		<b>Summer</b>		<b>Summer</b>			
MATH 120R	4	Additional Math	3	Capstone Field Experience	6		
CHEM 151	4						
	<b><u>8</u></b>		<b><u>3</u></b>		<b><u>6</u></b>		
<b>TOTAL UNITS</b>	<b>36</b>		<b>31</b>		<b>32</b>		<b>21</b>
							<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on GEOL course selection & math courses due to math placement.



## Requirements for Earth, Oceans and Climate Sub-plan: 2022-23 Catalog Year

### SECOND LANGUAGE REQUIREMENT

(Requirement can be met with proficiency exam):

Semester 1		4
Semester 2	(completion with a grade of C or higher)	4

### GENERAL EDUCATION

#### GE: Introduction Course

UNIV 101	Introduction to General Ed (Waived for new transfer students)	1
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#### GE: Exploring Perspectives (12 units):

Artist		3
Humanist		3
Natural Scientist	Can be fulfilled with Chem 151 or GEOS 251	3
Social Scientist		3

#### GE: Building Connections (9 units):

		3
		3
		3

#### GE: Capstone (3 units):

UNIV 301	General Ed Capstone (Waived for new transfer students)	3
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### ENGLISH (6 units):

ENGL 101	English Composition	3
ENGL 102	English Composition (grade of B or higher to meet MCWA)	3

or

ENGL 109H	English Composition	3
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or

ENGL 106	English Composition for ESL Students	3
ENGL 107	English Composition for ESL Students	3
ENGL 108	English Composition for ESL Students (grade of B or higher to meet MCWA)	3

### MATHEMATICS (9 units):

MATH 122A&B or MATH 125	Calculus I (P: MATH 120R, or MATH 112 plus MATH 111, with a grade of C or higher, or appropriate math placement)	3-5
MATH 129	Calculus II (P: MATH 122B or MATH 125 with grade of C or higher)	3

### CHEMISTRY (8 units):

CHEM 151	General Chemistry I (P: MATH 112 or appropriate math placement)	4
CHEM 152	General Chemistry II (P: CHEM 151)	4

or

CHEM 141	Introductory Chemistry I (P: MATH 112 or appropriate math placement)	3
CHEM 143	Introductory Laboratory I (CR: CHEM 141)	1
CHEM 142	Introductory Chemistry II (P: CHEM 141)	3
CHEM 144	Introductory Laboratory II (P: CHEM 143; CR: CHEM 142)	1

### PHYSICS (7-8 units):

PHYS 102	Introductory Physics I (P: MATH 112 or appropriate math placement)	3
PHYS 181	Introductory Laboratory I (CR: PHYS 102)	1
PHYS 103	Introductory Physics II (P: PHYS 102)	3
PHYS 182	Introductory Laboratory II (P: PHYS 181; CR: PHYS 103)	1

or

PHYS 141	Introductory Mechanics (P: MATH 122B or MATH 125; CR: MATH 129)	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141 and MATH 129 or appropriate math placement)	3

### COMMON CORE (Complete 5 courses):

<b>GEOS 251</b>	Physical Geology (Fall and Spring)	4
<b>Computer Ap:</b> GEOS 280 or GEOS 285	MatLab (P: GEOS 251) (Fall) or Accessible Earth (P: GEOS 251) (Spring)	3
<b>GEOS 300</b>	Earth Surface Processes (P: GEOS 251, Calculus I proficiency recommended) (Spring)	3
<b>GEOS 302</b>	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall) (Writing Proficiency course; MCWA alternative)	4
<b>Capstone Experience:</b>  Field Camp  &/or Research or Thesis  &/or Internship	  GEOS 414 Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or GEOS 405 Accessible Earth (P: GEOS 251, GEOS 302 recommended) (both available in Summer Session)  &/or GEOS 492 Directed Research, GEOS 499 or 499H Independent Study, GEOS 498 Sr. Capstone Thesis, GEOS 498H Honor's Thesis  &/or GEOS 393 (1-6-unit exp.) or GEOS 493 (3-un exp.)	6

### EOC CORE (Complete all 5 courses):

GEOS 308	Paleontology (P: GEOS 251) (Spring)	3
GEOS 342	The History of Earth's Climate (Fall)	3
GEOS 412A	Ocean Sciences (P: One year of science) (Spring)	3
GEOS 478	Global Change (P: junior standing) (Fall)	3
GEOS 479	Climate Dynamics (P: MATH 122B) (Spring)	3

### EOC ADVISOR APPROVED EMPHASIS COURSES (17 units)

Majority of courses should consist of GEOS 300 or 400 level		
Full list of approved classes on advisement report		
No more than 3 units of Preceptor (GEOS 397A)		
Up to 6-units of a combination of Internship, Preceptorship (3-unit max), and/or Research allowed.		
No double-dipping Emphasis credits with Capstone or other GEOS BS requirements.		

\*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 97 units. Additional units may be required to meet the BS minimum requirement of 120 units.

### Earth, Oceans and Climate Advisor Approved Emphasis Courses

ANTH 332, ANTH 439A, ASTR 403, ASTR 442, ATMO/ENVS/GEOG/HWRS/RNR 490, ECOL 360, ECOL 404F, ECOL 404R/L, ECOL 410, ECOL/GEOS 412B, ECOL 450, ENVS/GEN/GEOG/GEOS/GIST/WSM 330, ENVS 340, ENVS 410, ENVS 420, ENVS 422, ENVS 483, GEN 416, GEN 448, GEOG 304, GEOG/GEOS/RNR 416A, GEOG/GIST 420, GEOG 430, GEOG 439A, GEOG 447, GEOG 473, GEOG/GIST 483, GEOS 240, GEOS 255, GEOS 260, GEOS 270, GEOS 304, GEOS 306, GEOS 322, GEOS 340, GEOS 356, GEOS 400, GEOS 403, GEOS 408, GEOS 410, GEOS/HWRS/PTYS 411, GEOS 415, GEOS 416, GEOS/RNR 417, GEOS 418, GEOS 419, GEOS 422, GEOS 423, GEOS 424A, GEOS 430, GEOS 432, GEOS 434A, GEOS 439A, GEOS 440, GEOS 442, GEOS 447, GEOS 448, GEOS 450, GEOS 453, GEOS 462, GEOS 466, GEOS 469, GEOS 470R/L, GEOS 474A, GEOS 484, GEOS 489, HWRS 340, HWRS 350, HWRS 422, HWRS 431, MNE 418, PHYS 403, PLG 483, PLS 410, PTYS 403, PTYS 442, RNR 316, RNR 321, RNR 403, RNR 420, RNR 427, RNR 440, RNR 458, RNR 473, RNR 480, RNR 483, WSM 439A, Approved Transfer Course

**Earth, Oceans and Climate (EOC) sub-plan: MATH 125 placement**

	<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		
GEOS 251	4	GEOS 342	3	GEOS 302	4	GEOS 478	3	
MATH 125	3	PHYS 102	3	1 EOC emphasis	3	1 EOC emphasis	3	
ENGL 101/107	3	PHYS 181	1	CompApp course	3	BC GE	3	
CHEM 151	4	EP: Humanist GE	3	BC GE	3	1 Free elective**	3	
UNIV 101	1	2 Free elective**	6					
	<b>15</b>		<b>16</b>		<b>13</b>		<b>12</b>	
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		
GEOS 255*	4	GEOS 300	3	GEOS 412A	3	GEOS 479	3	
MATH 129	3	GEOS 308	3	3 EOC emphasis	7	UNIV 301	1	
CHEM 152	4	PHYS 103	3	BC GE	3	2 Free elective**	5	
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3			
EP: Artist GE	3	EP: Social Scientist GE	3					
	<b>17</b>	1 Free elective**	3		<b>16</b>		<b>9</b>	
			<b>16</b>	<b>Summer</b>				
				Capstone Field Experienc	6			
<b>TOTAL UNITS</b>	<b>32</b>		<b>32</b>		<b>35</b>		<b>21</b>	<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on EOC course selection & math courses due to math placement.

**Earth, Oceans and Climate (EOC) sub-plan: MATH 122 placement**

	<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		
GEOS 251	4	GEOS 342	3	GEOS 302	4	GEOS 478	3	
MATH 122A	1	PHYS 102	3	1 EOC emphasis	3	1 EOC emphasis	3	
MATH 122B	4	PHYS 181	1	CompApp course	3	BC GE	3	
ENGL 101/107	3	EP: Humanist GE	3	BC GE	3	1 Free elective**	3	
EP: Artist GE	3	2 Free electives**	6					
UNIV 101	1		<b>16</b>		<b>13</b>		<b>12</b>	
	<b>16</b>			<b>Spring</b>		<b>Spring</b>		
<b>Spring</b>		<b>Spring</b>		GEOS 300	3	GEOS 412A	3	
GEOS 255*	4	GEOS 308	3	3 EOC emphasis	7	GEOS 479	3	
MATH 129	3	PHYS 103	3	BC GE	3	UNIV 301	1	
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3	1 Free elective**	3	
CHEM 151	4	EP: Social Scientist GE	3					
	<b>14</b>	1 Free elective**	3		<b>16</b>		<b>7</b>	
<b>Summer</b>			<b>16</b>	<b>Summer</b>				
CHEM 152	4			Capstone Field Experienc	6			
<b>TOTAL UNITS</b>	<b>34</b>		<b>32</b>		<b>35</b>		<b>19</b>	<b>120</b>

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on EOC course selection & math courses due to math placement.

**Earth, Oceans and Climate (EOC) sub-plan: MATH 120R placement**

	<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>	
<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		<b>Fall</b>		
GEOS 251	4	GEOS 342	3	GEOS 302	4	GEOS 478	3	
MATH 120R	3	PHYS 102	3	1 EOC emphasis	3	1 EOC emphasis	3	
ENGL 101/107	3	PHYS 181	1	CompApp course	3	BC GE	3	
EP: Artist GE	3	MATH 129	3	BC GE	3	1 Free elective**	3	
UNIV 101	1	EP: Humanist GE	3					
		1 Free elective**	3					
	<b>14</b>		<b>16</b>		<b>13</b>		<b>12</b>	
<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		<b>Spring</b>		
GEOS 255*	4	1 GEOS 300	3	GEOS 412A	3	GEOS 479	3	
MATH 122A	1	GEOS 308	3	3 EOC emphasis	7	UNIV 301	1	
MATH 122B	4	PHYS 103	3	BC GE	3	1 Free elective**	3	
ENGL 102/108	3	PHYS 182	1	1 Free elective**	3			
CHEM 151	4	EP: Social Scientist GE	3					
		1 Free electives**	3		<b>16</b>		<b>7</b>	
<b>Summer</b>	<b>16</b>		<b>16</b>	<b>Summer</b>				
CHEM 152	4			Capstone Field Experienc	6			
<b>TOTAL UNITS</b>	<b>34</b>		<b>32</b>		<b>35</b>		<b>19</b>	<b>120</b>

**Earth, Oceans and Climate (EOC) sub-plan: MATH 112 placement**

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>			
<b>Fall</b>		<b>Fall</b>	<b>Fall</b>	<b>Fall</b>			
GEOS 251	4	GEOS 342	3	GEOS 302	4	GEOS 478	3
MATH 112	3	PHYS 102	3	1 EOC emphasis	3	1 EOC emphasis	3
ENGL 101/107	3	PHYS 181	1	CompApp course	3	BC GE	3
EP: Artist GE	3	MATH 122A	1	BC GE	3	1 Free elective**	3
UNIV 101	1	MATH 122B	4				
		EP: Humanist GE	3				
	<b>14</b>		<b>15</b>		<b>13</b>		<b>12</b>
<b>Spring</b>		<b>Spring</b>	<b>Spring</b>	<b>Spring</b>			
GEOS 255*	4	GEOS 300	3	GEOS 412A	3	GEOS 479	3
MATH 120R	4	GEOS 308	3	3 EOC emphasis	7	UNIV 301	1
ENGL 102/108	3	PHYS 103	3	BC GE	3	2 Free electives**	5
CHEM 151	4	PHYS 182	1	1 Free elective**	3		
		MATH 129	3				
	<b>15</b>	EP: Social Scientist GE	3		<b>16</b>		<b>9</b>
<b>Summer</b>			<b>16</b>	<b>Summer</b>			
CHEM 152	4			Capstone Field Experienc	6		
<b>TOTAL UNITS</b>	<b>33</b>	<b>31</b>	<b>35</b>	<b>21</b>	<b>120</b>		

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on EOC course selection & math courses due to math placement.

**Earth, Oceans and Climate (EOC) sub-plan: MATH 100 placement**

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>			
<b>Fall</b>		<b>Fall</b>	<b>Fall</b>	<b>Fall</b>			
GEOS 251	4	GEOS 342	3	GEOS 302	4	GEOS 478	4
MATH 100	3	CHEM 151	4	PHYS 103 & 182	4	1 EOC emphasis	3
ENGL 101/107	3	MATH 120R	4	MATH 129	3	CompApp course	3
EP: Artist GE	3	EP: Social Scientist GE	3	BC GE	3	UNIV 301	3
UNIV 101	1						
	<b>14</b>		<b>14</b>		<b>14</b>		<b>13</b>
<b>Spring</b>		<b>Spring</b>	<b>Spring</b>	<b>Spring</b>			
GEOS 255*	4	GEOS 308	3	GEOS 300	3	GEOS 479	3
MATH 112	3	CHEM 152	4	GEOS 412A	3	2 EOC emphasis	6
ENGL 102/108	3	MATH 122A	1	1 EOC emphasis	3		
EP: Humanist GE	3	MATH 122B	4	BC GE	3		
Free electives**	3	BC GE	3	1 Free elective**	3		
	<b>16</b>		<b>15</b>		<b>15</b>		<b>9</b>
		<b>Summer</b>		<b>Summer</b>			
		PHYS 102 & 181	4	Capstone Field Experienc	6		
<b>TOTAL UNITS</b>	<b>30</b>	<b>33</b>	<b>35</b>	<b>22</b>	<b>120</b>		

\* GEOS 255 counts as emphasis course. \*\* Number of free electives varies depending on EOC course selection & math courses due to math placement.

## Requirements for Geosciences Minor

2018-2019, 2019-2020, 2020-2021, 2021-2022, & 2022-2023

The Geosciences minor requires 20 units.

Any additional coursework required to reach 20 units should be Geosciences Electives selected in consultation with your academic advisor. The minor requires a minimum of 9 upper-division units.

The cumulative GPA for the minor must be 2.0 or higher. A minimum GPA presupposes that at least one 3-unit course in the minor is University Credit.

### GEOSCIENCES MINOR

COURSE	TITLE	PRE-REQUISITE(S)	SEMESTER TYPICALLY OFFERED	UNITS
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#### Complete one course:

GEOS 251	Physical Geology	None	Fall & Spring	4
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#### Choose minimum of two:

GEOS 255	Historical Geology	GEOS 251	Spring	4
GEOS 260	Intro to Gems & Minerals	CHEM 151 or CHEM 141/143 or MSE 110	Fall	3
GEOS 280	Programming and Data Analysis in Earth Sciences	None	Fall	3
GEOS 285	Introduction to Python in Geosciences	GEOS 251	Spring	3
GEOS 300	Earth Surface Processes	GEOS 251, MATH 122B recommended	Spring	3
GEOS 302	Stratigraphy and Sedimentation	GEOS 251, CHEM 151, PHYS 102 or 141	Fall	4
GEOS 304	Structural Geology	GEOS 251, PHYS 102 or 141	Spring	4
GEOS 306	Mineralogy	GEOS 251, CHEM 151	Fall	3
GEOS 308	Paleontology	GEOS 251	Spring	3
GEOS 322	Intro to Geophysics	GEOS 251, MATH 122B	Fall	3
GEOS 342	The History of Earth's Climate	GEOS 251	Fall	3
GEOS 356	Petrology	GEOS 306, MATH 122B, PHYS 102 or 141	Spring	4
GEOS 412A	Ocean Science	One year of science, or consent of instructor	Spring	3

#### Geosciences Electives\* – Complete 20 units (9 units overall, including above, must be upper-division):


\*Students can use one class from GEOS 212, 216, 218, 220, 222.

Rev: 06/01/2022 – sm

## Requirements for Marine Science Minor

2018-2019, 2019-2020, 2020-2020, 2021-2022, & 2022-2023

The Marine Science minor requires a minimum of 18 units.

A minimum of 12 units must be upper-division units.

The cumulative GPA for the minor must be 2.0 or higher. A minimum GPA presupposes that at least one 3-unit course in the minor is University Credit.

The Marine Science minor is intended to serve as a broad introduction to the world's oceans and therefore is designed to acquaint the student with the major aspects of the marine system. These can be broadly categorized as the biological ocean, the physical ocean and human impacts on the ocean.

The marine science minor curriculum addresses these core competencies by requiring a choice of two lower division courses from the biological ocean and human impact categories.

A basic understanding of the physical science of the ocean is essential to understanding the biological ocean and the causes and consequences of human impacts on the ocean. For this reason, all students in the minor are required to take GEOS 412A, "Ocean Science", a three-unit course.

The remaining nine units are selected from a variety of upper division courses chosen at the student's discretion, classified as biology, human impact or geoscience of the oceans, but with no more than six of the remaining nine units coming from the same category.

A minimum of 6-units must be unique to the minor.

### **MARINE SCIENCE MINOR**

COURSE	TITLE	PRE-REQUISITE(S)	SEMESTER OFFERED	UNITS
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#### **The Biological Ocean – Complete one course:**

ECOL 182R	Introductory Biology II – lecture	None	Fall, Spring, or Summer	3
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#### **Human Impact on the Oceans – Complete one of the following:**

ANTH 203	Caribbean Transformations		Fall	3
ECOL 206	Environmental Biology	Not currently scheduled		3
GEOG 230	Our Changing Climate	One year of science, or consent of instructor	Fall, Summer (sometimes Spring and Winter)	3
GEOS 212	Introduction to Oceanography	One year of science, or consent of instructor	Fall, Spring, Summer	3

#### **Survey Course of the Oceans, Upper-Division – Complete one course:**

GEOS 412A	Ocean Science	One year of science, or consent of instructor	Spring	3
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**Area Studies – Complete three courses from the following, with no more than two courses from any given category:**

**Biology of the Oceans, Upper-Division**

ECOL 404R	Biology of the Oceans	Not currently scheduled		3
ECOL 450	Marine Discovery	ECOL 182R and ECOL 182L or ECOL 183 or GEOS 212 or GEOS 412A	Fall	4
ECOL 482	Ichthyology	ECOL 182R and ECOL 182L	Fall	4
ECOL 496O-SA	Galapagos Marine Ecology	None	Summer dynamic	6

**Human Impact on the Oceans, Upper-Division**

ACBS 456	Introduction to Aquaculture	ECOL 181R, ECOL 182R, ECOL 182L, CHEM 103A, CHEM 103B, CHEM 104A, CHEM 104B	Spring	3
ECOL 360	Marine Ecology and Conservation	ECOL 182R	Spring	3
ECOL 406	Conservation Biology	ECOL 182R and ECOL 182L, ECOL 302	Spring	3
ECOL 474	Aquatic Plants and the Environment	None	Fall	4
ECOL 475	Freshwater and Marine Algae	Four units of biological or plant sciences	Spring	4
RNR 480	Natural Resources Policy and Law	RNR 200	Spring	3
WFSC 385	Zoo and Aquarium Management	None	Fall	3
WFSC 455R/L	Fisheries Management	WFSC 441	Spring	4

**Geoscience of the Oceans, Upper-Division**

GEOS 302	Sedimentology and Stratigraphy	GEOS 251, CHEM 151, PHYS 102 or 141	Fall	3
GEOS 308	Paleontology	GEOS 251	Spring	3
GEOS 342	The History of Earth's Climate	GEOS 251	Fall	3
GEOG 430	The Climate System	None	Fall	3
GEOS 478	Global Change	Junior standing	Fall	3
GEOS 479	Introduction to Climate Dynamics	MATH 122B	Spring	3

## Second Language Proficiency Options

All students attending the University of Arizona must fulfill their 2<sup>nd</sup> language proficiency requirement. For international students, this is commonly through the IELTS or TOEFL exam required for admittance to the University. For domestic students, this is commonly fulfilled through classes in a 2<sup>nd</sup> language. Additional options are listed below.

**OPTION 1.** For students in a BS program, take 2 semesters of the same 2<sup>nd</sup> language  
(For example: Spanish 101 and Spanish 102)

**OPTION 2.** Take a Proficiency Exam (fulfills language requirement, does not earn credits)

### **College of Humanities Exam Options:**

- <https://advising.humanities.arizona.edu/language-placement-and-proficiency-exams-faqs>  
Tests available: Chinese, French, German, Italian, Japanese, Korean, Latin, Russian and Spanish
- For French and Italian – schedule with the French-Italian Studies Department:  
<https://french.arizona.edu/undergraduate/student-resources/placement-exams-and-credit-exam>
- For Chinese, Japanese, or Korean - schedule with the East Asian Department:  
<https://eas.arizona.edu/undergraduate/information-placement-exams>

### **Department of Linguistics Exam Options:**

- <https://linguistics.arizona.edu/second-language-proficiency-exam>
- Commonly tested languages (not a complete list):  
Armenian, Bengali, Gujarati, Hindi, Igbo, Korean, Malay, Navajo, Polish, Romanian, Sinhala, Slovak, Somali, Thai, Twi, Vietnamese

### **Critical Languages Exam Options:**

- Please contact the offering department to request a proficiency exam:  
<http://clp.arizona.edu/>
- Language Options (may be additional options):  
Cantonese, Chechen, Czech, Dutch, Finnish, Modern Greek, Hindi, Hungarian, Kazakh, Korean, Kurdish, Norwegian, Polish, Scots-Gaelic, Swahili, Swedish, Tagalog, Thai, Ukrainian, Vietnamese

### **Arabic Language Proficiency Exam:**

- <https://menas.arizona.edu/arabic/testing>

### **Portuguese Language Proficiency Exam:**

- <https://spanish.arizona.edu/undergraduate/student-resources/faqs>

**OPTION 3.** Take a CLEP Exam (Earn course credits)

- <https://testing.arizona.edu/test/clep>
- Tests available: French, German, Spanish
- For Arabic (up to 10 units) complete the Application for Special Examination (available on Registrars website) and make an appointment with Dr. Shiri (<https://menas.arizona.edu/arabic/testing>).

**OPTION 4.** Students who received conditional admission to the University of Arizona through CESL may apply for CESL Endorsement to fulfill the 2<sup>nd</sup> language proficiency requirement.

- <https://cesl.arizona.edu/endorsement>

**OPTION 5.** If you have taken the TOEFL or IELTS and your advisement report says you have NOT fulfilled the Second Language Requirement, please let your advisor know as soon as possible.

**\*\*\*Come visit your advisor if you have questions!!!** <https://trellis.arizona.edu/solutions/trellis-advise>