DEPARTMENT OF GEOSCIENCES
UNIVERSITY OF ARIZONA
Catalog Year: 2019-2020

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 three different sub-plans. The sub-plans are General Geology, Geophysics, and Earth, Ocean and Climate (EOC).

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

Did you know that we have a Faculty/Student Mentor Program?
https://www.geo.arizona.edu/content/faculty-mentoring-program

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

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/

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

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To schedule an advising appointment with a Geosciences Advisor, use Wise Advising:
https://trellis.arizona.edu/solutions/trellis-advise

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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 before coming in
- Take notes during the meeting so you remember information and resources we discussed

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:
   http://deanofstudents.arizona.edu/codeofacademicintegrity

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.

FIELD STUDIES IN GEOSCIENCES

PLEASE NOTE:

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 (http://drc.arizona.edu/), and then work with their instructor on an alternate assignment.

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 4-week, 6-unit, field mapping class held during the summer. The UA field camp cost for summer 2018 is $4,518 ($2,748 for 6 units of credit plus $1,370 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 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 http://geology.com/field-camp.shtml or in a list provided by UA Geosciences.

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.

BS in GEOSCIENCES
Sub-plan Coursework Comparison
Catalog Year: 2019-2020

GEOLOGY SUB-PLAN		
CATEGORY	**COURSE NAME**	**UNITS**
2nd Language - 2nd Semester Proficiency		4-8
General Education		21
English Composition	See apprvd opts	6
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
One additional Math	See apprvd opts	3
CHEM 151 or CHEM 141/143	General Chemistry I	4
CHEM 152 or CHEM 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	See apprvd opts	3-4
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
GEOS 304	Structural Geology	4
GEOS 306	Mineralogy	3
GEOS 308	Paleontology	3
GEOS 322	Geophysics	3
GEOS 356	Petrology	4
GEOS 414 or 405	Field Camp or Access. Earth	6
Approved emphasis		15
Free electives		13
TOTAL		**120**

GEOPHYSICS SUB-PLAN		
CATEGORY	**COURSE NAME**	**UNITS**
2nd Language - 2nd Semester Proficiency		4-8
General Education		21
English Composition	See apprvd opts	6
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 CHEM 141/143	General Chemistry I	4
Physics 141	Mechanics	4
Physics 142	Optics Thermodynamics	3
Computer Appl.	See apprvd opts	3-4
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
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
GEOS 414 or 405	Field Camp or Access Earth	6
Approved emphasis		9
Free electives		7
TOTAL		**120**

EARTH, OCEANS & CLIMATE (EOC) SUB-PLAN		
CATEGORY	**COURSE NAME**	**UNITS**
2nd Language - 2nd Semester Proficiency		4-8
General Education		21
English Composition	See apprvd opts	6
MATH 122A/B or 125	Calculus I	3-5
MATH 129	Calculus II	3
CHEM 151 or CHEM 141/143	General Chemistry I	4
CHEM 152 or CHEM 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	See apprvd opts	3-4
GEOS 251	Physical Geology	4
GEOS 300	Earth Surface Processes	3
GEOS 302	Strat. and Sedimentation	4
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
Research or field experience		6
Approved emphasis		17
Free electives		16
TOTAL		**120**

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Requirements for Geology Sub-plan: 2019-20 Catalog Year

SECOND LANGUAGE REQUIREMENT
(Requirement can be met with proficiency exam):

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

TIER ONE
Individuals and Societies (xxxx**150)** (6 units):

		3
		3

Traditions and Culture (xxxx**160)** (6 units):

		3
		3

TIER TWO
Arts (3 units):

		3

Individuals and Societies (3 units):

		3

Humanities (3 units):

		3

Diversity Emphasis (3 units) (class, ethnicity, gender, non-west, religion):

(Can be fulfilled with qualified Tier One or Tier Two)

ENGLISH (6 units):

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

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 Math Placement level, Calc 65+)	4
CHEM 152	General Chemistry II (P: CHEM 151)	4

or

CHEM 141	Introductory Chemistry I (P: Math Placement level, Calculus 45+, or MATH 112)	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 Placement level, Calculus 45+, or MATH 112)	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; CR: MATH 129	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141, MATH 129)	3

COMPUTER APPLICATIONS (3 units):

Choose one class from: CSC 110, ECE 175, GEOG 330, GEOG 417, GEOG 490, GEOS 280, ISTA 130	3-4

GEOLOGY CORE (Complete all 8 courses):

GEOS 251	Physical Geology (Fall and Spring)	4
GEOS 300	Earth Surface Processes (P: GEOS 251) (Spring)	3
GEOS 302	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall, sometimes Spring) (Writing Proficiency course; MCWA alternative)	4
GEOS 304	Structural Geology (P: GEOS 251, PHYS 102 or 141) (Fall, sometimes Spring)	4
GEOS 306	Mineralogy (P: GEOS 251, CHEM 151) (Fall)	3
GEOS 308	Paleontology (P: GEOS 251) (Fall, sometimes Spring)	3
GEOS 322	Intro to Geophysics (P: GEOS 251; P: MATH 122B or 125) (Spring)	3
GEOS 356	Petrology (P: GEOS 306, MATH 122B, PHYS 102 or 141) (Spring)	4

CORE CAPSTONE – FIELD EXPERIENCE (6 units):

GEOS 414 *or* GEOS 405	Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or Accessible Earth (both available in Summer Session)	6

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)

*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 103 units. Additional units may be required to meet the BS minimum requirement of 120 units.

Geology Advisor Approved Emphasis Courses

ANTH 235, ANTH 304, ANTH 335, ANTH 435, ANTH 439A, ASTR 403, ASTR 442, ATMO 412A, CHEM 241A, CHEM 241B, CHEM 325, CHEM 326, CHEM 480A, CHEM 480B, ECOL 182L, ECOL 182R, ECOL 183, 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 255, 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 250, HWRS 411, HWRS 431, HWRS 480, MATH 215, MATH 254, MCB 181L, MCB 181R, MCB 184, MNE 402, MNE 427, MSE 222, MSE 412, PHYS 403, PTYS 403, PTYS 411, PTYS 442, WSM 439A, Approved Transfer Course

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Guidelines for Geoscience majors in the Earth, Oceans and Climate (EOC) sub-plan: Field, internship, or independent study requirement

The Geosciences Earth, Oceans and Climate (EOC) sub-plan requires an internship, field or research experience (listed as GEOS 414, GEOS 405, or GEOS 498 on the AAPR.) **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. Each year, a faculty member will be designated to advise Earth Systems students on appropriate options.

YOU MAY CHOOSE FROM THE FOLLOWING OPTIONS:

OPTION 1. A summer field program in Geosciences or a related earth systems field (e.g. ecology, oceanography, hydrology). You can meet this requirement by taking UA classes GEOS 414, GEOS 405, or ECOL 463, Ecology & Natural History of the Sonoran Desert & Gulf of California.

Plan ahead: The UA Geology field camp is highly competitive and has three prerequisites that are not required for the EOC sub-plan; 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 here: 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 December-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). 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.

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 ES Contract for Independent Work
- 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 contract.

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Requirements for Earth, Oceans and Climate Sub-plan: 2019-20 Catalog Year

SECOND LANGUAGE REQUIREMENT
(Requirement can be met with proficiency exam):

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

TIER ONE
Individuals and Societies (xxxx**150)** (6 units):

		3
		3

Traditions and Culture (xxxx**160)** (6 units):

		3
		3

TIER TWO
Arts (3 units):

		3

Individuals and Societies (3 units):

		3

Humanities (3 units):

		3

Diversity Emphasis (3 units) (class, ethnicity, gender, non-west, religion):

(Can be fulfilled with qualified Tier One or Tier Two)

ENGLISH (6 units):

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

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 (6 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 Math Placement level, Calc 65+)	4
CHEM 152	General Chemistry II (P: CHEM 151)	4
or		
CHEM 141	Introductory Chemistry I (P: Math Placement level, Calculus 45+, or MATH 112)	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 Placement level, Calculus 45+, or MATH 112)	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; CR: MATH 129	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141, MATH 129)	3

COMPUTER APPLICATIONS (3 units):

Choose one class from: CSC 110, ECE 175, GEOG 330, GEOG 417, GEOG 490, GEOS 280, ISTA 130	3-4

EOC CORE (Complete all 8 courses):

GEOS 251	Physical Geology (Fall and Spring)	4
GEOS 300	Earth Surface Processes (P: GEOS 251) (Spring)	3
GEOS 302	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall, sometimes Spring) (Writing Proficiency course; MCWA alternative)	4
GEOS 308	Paleontology (P: GEOS 251) (Fall)	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

CORE CAPSTONE –RESEARCH OR FIELD EXPERIENCE (6 units):

Research	Consult with GEOS Faculty	6

or

GEOS 414 *or* GEOS 405	Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or Accessible Earth (both available in Summer Session)	6

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)

*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 100 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 490, ECOL 360, ECOL 404F, ECOL 404L, ECOL 404R, ECOL 410, ECOL 412B, ECOL 450, ENVS 330, ENVS 340, ENVS 410, ENVS 420, ENVS 422, ENVS 483, ENVS 490, GEN 330, GEN 416, GEN 448, GEOG 304, GEOG 330, GEOG 416A, GEOG 420, GEOG 430, GEOG 439A, GEOG 447, GEOG 473, GEOG 483, GEOG 490, GEOS 255, GEOS 304, GEOS 306, GEOS 322, GEOS 330, GEOS 340, GEOS 356, GEOS 397A, GEOS 400, GEOS 403, GEOS 408, GEOS 410, GEOS 411, GEOS 412B, GEOS 415, GEOS 416, GEOS 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 470L, GEOS 470R, GEOS 474A, GEOS 484, GEOS 489, GEOS 490, GIST 330, GIST 420, GIST 483, HWRS 250, HWRS 340, HWRS 411, HWRS 422, HWRS 431, HWRS 490, MNE 418, OPTI 490, PHYS 403, PLG 483, PLS 410, PTYS 403, PTYS 411, PTYS 442, REM 490, RNR 316, RNR 321, RNR 403, RNR 416A, RNR 417, RNR 420, RNR 427, RNR 440, RNR 458, RNR 473, RNR 480, RNR 483, RNR 490, WSM 330, WSM 439A, Approved Transfer Course

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Requirements for Geophysics Sub-plan: 2019-20 Catalog Year

SECOND LANGUAGE REQUIREMENT
(Requirement can be met with proficiency exam):

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

TIER ONE
Individuals and Societies (xxxx**150)** (6 units):

		3
		3

Traditions and Culture (xxxx**160)** (6 units):

		3
		3

TIER TWO
Arts (3 units):

		3

Individuals and Societies (3 units):

		3

Humanities (3 units):

		3

Diversity Emphasis (3 units) (class, ethnicity, gender, non-west, religion):

(Can be fulfilled with qualified Tier One or Tier Two)

ENGLISH (6 units):

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

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 reqs):

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 Math Placement level, Calc 65+)	4
or		
CHEM 141	Introductory Chemistry I (P: Math Placement level, Calculus 45+, or MATH 112)	3
CHEM 143	Introductory Laboratory I (CR: CHEM 141)	1

PHYSICS (7 units):

PHYS 141	Introductory Mechanics (P: MATH 122B; CR: MATH 129	4
PHYS 142	Introductory Optics and Thermodynamics (P: PHYS 141, MATH 129)	3

COMPUTER APPLICATIONS (3 units):

Choose one class from: CSC 110, ECE 175, GEOS 280, ISTA 130	3-4

GEOPHYSICS CORE (Complete all 8 courses):

GEOS 251	Physical Geology (Fall and Spring)	4
GEOS 300	Earth Surface Processes (P: GEOS 251) (Spring)	3
GEOS 302	Principles Stratigraphy and Sedimentation (P: GEOS 251, CHEM 151, PHYS 102 or 141) (Fall, sometimes Spring) (Writing Proficiency course; MCWA alternative)	4
GEOS 304	Structural Geology (P: GEOS 251, PHYS 102 or 141) (Fall, sometimes Spring)	4
GEOS 306	Mineralogy (P: GEOS 251, CHEM 151) (Fall)	3
GEOS 322	Intro to Geophysics (P: GEOS 251; P: MATH 122B or 125) (Spring)	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 2020])	3
GEOS 432	Intro to Seismology (P: MATH 254) (Fall)	3
GEOS 434A	Intro to Exploration Seismology (P: MATH 129) (Fall)	3

CORE CAPSTONE – FIELD EXPERIENCE (6 units):

GEOS 414 *or* GEOS 405	Geology Field Camp (P: GEOS 251, 302, 304, 306, 356) or Accessible Earth (both available in Summer Session)	6

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)

*UA BS degrees require a minimum of 120 units for graduation. This sub-plan totals a minimum of 109 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 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

Rev: 06/07/19 – sm

Requirements for Geosciences Minor

2018-19 & 2019-20

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

Complete one course:

GEOS 251	Physical Geology	None	Fall or Spring	4

Choose minimum of two:

GEOS 255	Historical Geology	GEOS 251	Spring	4
GEOS 280	Programming and Data Analysis in the Earth Sciences	None	Fall	3
GEOS 300	Earth Surface Processes	GEOS 251	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	Fall	4
GEOS 306	Mineralogy	GEOS 251, CHEM 151	Fall	3
GEOS 308	Paleontology	GEOS 251	Fall	3
GEOS 322	Intro to Geophysics	GEOS 251, MATH 122B	Spring	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: 06/07/19 – sm

Requirements for Marine Science Minor

2018-19 & 2019-20

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 412, "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.

MARINE SCIENCE MINOR

COURSE	TITLE	PRE-REQUISITE(S)	SEMESTER OFFERED	UNITS
The Biological Ocean – Complete one course:				
ECOL 182R	Introductory Biology II – lecture	None	Fall, Spring, or Summer	3
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

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	Fall	3
GEOS 342	The History of Earth's Climate	GEOS 251	Spring	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	Fall	3

Second Language Proficiency Options

All students attending the University of Arizona must fulfill their 2nd 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 2nd language. Additional options are listed below.

OPTION 1. For students in a BS program, take 2 semesters of the same 2nd 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://sbs.arizona.edu/coh/webcape/appointments
- Tests available: French, German, Latin, Russian, and Spanish
- For Chinese or Japanese - schedule with the Language Department:
  - http://eas.arizona.edu/information-placement-exam-proficiency-exam-and-credit-exam-chinese-and-japanese

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:
- Please contact Dr. Shiri to request a proficiency exam:
- http://menas.arizona.edu/user/sonia-shiri
- Email: soniashiri@email.arizona.edu
- Office: Marshall Bldg. #443

Portuguese Language Proficiency Exam:
- Please contact Dr. Ana Carvalho to request a proficiency exam:
- Email: anac@email.arizona.edu
- Phone: 621-3639
- Office: Modern Languages, Room 544

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

- http://www.testing.arizona.edu/test/clep
- Tests available: German, French, Spanish
- To CLEP in Arabic (up to 10 units) complete the Application for Special Examination (available on Registrars website) and make an appointment with Dr. Shiri (see Arabic section above).

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

- http://www.cesl.arizona.edu/endorsement-students

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://wiseadvising.arizona.edu/scheduling.php**