

Geology Major:

Environmental and applied geology will be a major area of growth in the next few years. They are interdisciplinary fields, requiring that students have a strong, broad background in geology as well as a general understanding of the other physical sciences. Our proposed changes will increase the core requirements and allow additional courses with environmental applications (e.g. ESC 455 Intro to Soils, GEL 457 Geochemistry) as designated electives. The minimum number of required coursework in the major will increase from 37 to 42 credit hours. The most significant change, however, will be to require 16 credit hours of corequisites: two semesters each of chemistry and physics. These courses have become important for employment in the environmental field, and are required for admission into geology graduate programs. The specific changes are highlighted below.

- Add ESC 350 Computational Methods in the Field Sciences to the core requirements.
- Replace GEL 491 Seminar in Geological Problems with ESC 493 Seminar in Earth Science Problems
- Expand the core requirements by shifting GEL 306 Introduction to Paleontology, GEL 408 Structural Geology, and GEL 431 Petrology from 'Designated Electives' to required core courses.
- Because of the increase in the core requirements, the number of required designated electives can be reduced from 18-19 to 8, bring the Geology major in line with the other majors. Several new courses will be added to the list of designated electives to reflect the current emphasis on surface processes and environmental applications. Students will be able to tailor their program towards post-graduate employment or graduate school, depending on their career goals.
- Add 16 hours of required corequisite courses: CHM 205/206, and PHS 115/116 or PHS 201/202

July 17, 1998

To: Larry Kline, Chair
Faculty Senate Curriculum Committee

From: Judy Massare, Chair *Judy Massare*
Earth Sciences Department

Re: Proposed changes to majors for Faculty Senate approval

Two years ago, the Department of the Earth Sciences added a technical writing course (ESC 391) to the degree requirements of its four majors (Geology, Earth Science, Meteorology & Water Resources). A senior seminar course (ESC 493) was also added to the Earth Science major. These changes reflect our desire to develop the written and oral communication skills of our graduates to make them more competitive. Senior seminars are required of three of our four majors. In order to emphasize the interrelationships among the disciplines within the earth sciences, we propose to combine the senior seminar course (GEL 491, ESC 491, and ESC 493) into a single seminar course (ESC 493) to be required of all majors. Furthermore, given the rapidly changing technologies and the nature of the job market, we strongly feel the need to improve the computational skills of our students as well. In particular, we would like our graduates to have a better understanding of current data analysis methods and computer visualization techniques in the various earth sciences disciplines. Therefore, we propose to add ESC 350 Computational Methods in the Field Sciences to the core requirements of our four majors. The course has been a recommended elective for three of the majors.

Furthermore, we propose herein to structure the degree requirements of our three technical majors following a single model. For each major, we have identified a list of core requirements which will provide a well-rounded background in the discipline and a set of designated electives to satisfy specific career goals or interests. No additional staffing is required to implement these changes. In fact, the expertise of our new faculty blends nicely with the proposed changes.

A comparison of the current and proposed major requirements for our four majors are presented in the attached pages. A brief text pertaining to each major explains the proposed changes.

Meteorology Major:

The changes that we are proposing do not substantially change the major, although the number of required credit hours will increase from 37 to 41. Corequisites will not change. The modifications to the major requirements are listed below.

- ESC 350 Computational Methods in the Field Sciences will be changed from a designated elective to a required core course. It has been typically taken by nearly all MET majors as one of their designated electives.
- ESC 351 Computational Methods Lab will be added to the required core. The National Weather Service requires a knowledge computer programming, preferably FORTRAN, for employment. Currently FORTRAN programming is a component of ESC 350, but students require more practice with the language than can be accommodated in that course.
- Replace ESC 491 Seminar in Meteorological Problems with ESC 493 Seminar in Earth Science Problems

**CURRENT REQUIREMENTS
MAJOR in METEOROLOGY**

**PROPOSED REQUIREMENTS
MAJOR in METEOROLOGY**

Required Major Courses

ESC 211	Weather with lab	4
ESC 311	Synoptic Meteorology	4
ESC 312	Weather Forecasting	4
ESC 391	Writing in the Earth Sciences	1
ESC 411-412	Hydrology and Hydrology Lab	4
ESG-413-414	or Climatology and Climatology Lab	4
ESC 415	Physical Meteorology	3
ESC 416	Thermodynamics and the Boundary Layer	3
ESC 417	Dynamic Meteorology	3
ESC 420	Atmospheric Sensing Methods	3
ESC 491	Seminar in Meteorological Problems	2
	Electives by advisement	6
		37

Required Major Courses

ESC 211	Weather with lab	4
ESC 311	Synoptic Meteorology	4
ESC 312	Weather Forecasting	4
ESC 350	Computational Methods	4
ESC 351	Programming in the Earth Sciences	3
ESC 391	Writing in the Earth Sciences	1
ESC 411-412	Hydrology and Hydrology Lab	1
ESC 413-414	or Climatology and Climatology Lab	4
ESC 415	Physical Meteorology	3
ESC 416	Thermodynamics and the Boundary Layer	3
ESC 417	Dynamic Meteorology	3
ESC 420	Atmospheric Sensing Methods	3
ESC 493	Seminar in Earth Sciences Problems	2
	Designated electives by advisement	6
		41

Designated Electives:

ESC 200	Oceanography (3)
ESC 350	Computational Methods (3)
ESC 412	Air Pollution Meteorology (3)
ESC 411	Hydrology (3)
ESC 412	Hydrology Lab (1)
ESC 413	Climatology (3)
ESC 414	Climatology Lab (1)
ESC 432	Tropical Meteorology (3)
ESC 442	Advanced Topics (3)
ESC 452	Mesoscale Meteorology (3)
ESC 460	Meteorology Internship (1-3)
ESC 490	Weather Briefing (1)
ESC 399/499	Independent Study (1-3)

Designated Electives:

ESC 200	Oceanography (3)
ESC 412	Air Pollution Meteorology (3)
ESC 411	Hydrology (3)
ESC 412	Hydrology Lab (1)
ESC 413	Climatology (3)
ESC 414	Climatology Lab (1)
ESC 432	Tropical Meteorology (3)
ESC 442	Advanced Topics (3)
ESC 452	Mesoscale Meteorology (3)
ESC 460	Meteorology Internship (1-3)
ESC 490	Weather Briefing (1)
ESC 399/499	Independent Study (1-3)

Required Co-requisite Courses

MT11 201-202	Calculus I and II	6
MT11 455	Differential Equations	3
PHS 201-202	College Physics I & II	8
CHM 205	College Chemistry I	4
		21

Required Co-requisite Courses

MT11 201-202	Calculus I and II	6
MT11 455	Differential Equations	3
PHS 201-202	College Physics I & II	8
CHM 205	College Chemistry I	4
		21

Geology Major:

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- Add 16 hours of required corequisite courses: CHM 205/206, and PHS 115/116 or PHS 201/202

CURRENT REQUIREMENTS
MAJOR in GEOLOGY

Required Core Courses	
GEL 101	Our Earth with lab
GEL 302	Historical Geology
GEL 312	Mineral Science
GEL 411	Sedimentology and Stratigraphy
GEL 491	Seminar in Geologic Problems
ESC 391	Writing in the Earth Sciences
	Designated electives
	18-19
	37-38

PROPOSED REQUIREMENTS
MAJOR in GEOLOGY

Required Core Courses	
GEL 101	Our Earth with lab
GEL 302	Historical Geology
GEL 306	Intro to Paleontology
GEL 312	Mineral Science
GEL 408	Structural Geology
GEL 411	Sedimentology and Stratigraphy
GEL 431	Petrology
ESC 350	Computational Methods
ESC 391	Writing in the Earth Sciences
ESC 493	Seminar in Earth Science Problems
	Designated electives by advisement
	42

Designated Electives: SELECT FIVE of the following six courses:

- GEL 306 Intro to Paleontology (4)
- GEL 408 Structural Geology (4)
- GEL 415-416 Geomorphology/Landform Analysis Lab (4)
- GEL 431 Petrology (4)
- GEL 462 Groundwater (4)
- ESC 350 Computational Methods (3)

Designated Electives:

- GEL 415-416 Geomorphology/Landform Analysis Lab (4)
- GEL 437 Geochemistry (4)
- GEL 462 Groundwater (4)
- GEL 463-464 Environmental Geology/Env Geo Lab (4)
- GEL 399/499 Independent Study (1-3)

Required Co-requisite Courses:

None
CHM 205 College Chemistry I is strongly recommended.

Required Co-requisite Courses

CHM 205-206 College Chemistry I II with lab
PHS 115-116 General Physics I & II with lab
OR
PHS 201-202 College Physics I & II with lab

8
16

Water Resources Major:

The proposed changes in the WTR major reorganizes the requirements into core courses and designated electives. The new core requirements would give our students a background in watershed systems and landforms, subsurface water, and low temperature geochemistry; the additional electives will allow them to select courses to emphasize surface water, groundwater, or water quality. The required courses for the major will increase from 34 to 43 credit hours. The required corequisites will remain unchanged. The modifications to the major requirements are shown below.

- Add ESC 351 Computational Methods Lab to the core requirements.
- Add ESC 493 Seminar in Earth Science Problems to the core requirements, which would match the senior seminar requirement in the other majors.
- Require both ESC 211 Weather and GEL 101 Our Earth, rather than requiring just one of the two. Given the interdisciplinary nature of the field, students need a good background in both geology and meteorology.
- Eliminate ESC 364 Water Resources Issues from the requirements. This course is designed for non-majors, as one of the Contemporary Issues courses for the General Education requirements. We should encourage our majors to take an issues course outside of their major. Furthermore, some of the problems addressed at an elementary level in this course can be better addressed at a more advanced level in the senior seminar.
- Introduce 6 credit hours of designated electives by changing some of the specialized courses that are currently required to 'Designated Electives'. Presently, the major does not allow students any choice in selection of their upper division courses within the major. With the recent hiring of two new faculty who contribute to the major, we will now be able to offer students more options beyond the core requirements.

CURRENT REQUIREMENTS
MAJOR in WATER RESOURCES

PROPOSED REQUIREMENTS
MAJOR in WATER RESOURCES

Required Courses	
GEL 101	Our Earth with lab
	<i>OR</i>
ESC 211	Weather with lab
ESC 307	Fluid Mechanics
ESC 350	Computational Methods
ESC 364	Water Resources Issues
ESC 391	Writing in the Earth Sciences
ESC 411-412	Hydrology with lab
ESC 418	Watershed Science
GEL 415	Geomorphology
GEL 462	Groundwater
BIO 419	Limnology
BIO 436	Water Quality Analysis
	34

Required Core Courses	
GEL 101	Our Earth with lab
ESC 211	Weather with lab
ESC 307	Fluid Mechanics
ESC 350	Computational Methods
ESC 351	Computational Methods Lab
ESC 391	Writing in the Earth Sciences
ESC 411-412	Hydrology & Hydrology lab
ESC 418	Watershed Science
ESC 495	Seminar in Earth Sciences Problems
GEL 415	Geomorphology
GEL 416	Landform Analysis Lab
GEL 457	Geochemistry
GEL 462	Groundwater
	<i>Designated electives by advisement</i>
	43

Designated Electives
There are no electives as part of the major requirements

Designated Electives

ESC 413	Environmental Climatology (3)
ESC 425	Wetlands Systems (3)
ESC 430	Geographic Info Systems (3)
ESC 455	Intro to Soil Science (3)
ESC 399/499	Independent Study (1-3)
GEL 312	Mineral Science (4)
GEL 411	Sedimentology and Stratigraphy (4)
BIO 419	Limnology (3)
BIO 436	Water Quality Analysis (4)

Required Co-requisite Courses	
MTM 201-202	Calculus I & II
CHM 205-206	College Chemistry I & II
PHS 201-202	College Physics I and II
	6
	8
	8
	22

Required Co-requisite Courses	
MTM 201-202	Calculus I & II
CHM 205-206	College Chemistry I & II
PHS 201-202	College Physics I and II
	6
	8
	8
	22

Earth Sciences Major:

The proposed changes mainly alter the distribution of requirements between the core and the designated electives. The number of required credit hours will increase from 31 to 32. The 8 hours of required co-requisite courses in lab sciences would remain unchanged. The modifications to the major are shown below.

- Eliminate the 'Analytical Methods' elective, and add ESC 350 Computation Methods in the Field Sciences to the a core requirements. This would change the core requirements from 14 hours to 17 hours.
- Add a fourth choice to the lists for the 'Geology Elective' and 'Meteorology Elective'. The added courses highlight topics that ESC majors pursuing Secondary Education Certification would find useful. It does not change the requirement, but merely gives additional recommendations for electives and allows students a wider choice of appropriate courses. Students are presently allowed to substitute these courses for existing requirements with the approval of their advisor. The only prerequisites for the electives listed are the required core courses.

**CURRENT REQUIREMENTS
MAJOR in EARTH SCIENCE**

**PROPOSED REQUIREMENTS
MAJOR in EARTH SCIENCE**

Required Core (14 hours):

GEL 101	Our Earth with Lab	4
ESC 200	Oceanography	3
ESC 211	Weather with Lab	4
ESC 391	Writing in the Earth Sciences	1
ESC 493	Seminar in Earth Science Problems	2

Required Core (17 hours):

GEL 101	Our Earth with Lab	4
ESC 200	Oceanography	3
ESC 211	Weather with Lab	4
ESC 350	Computational Methods	3
ESC 391	Writing in the Earth Sciences	1
ESC 493	Seminar in Earth Science Problems	2

Geology Elective (choose one of the following):

GEL 302	Historical Geology	3-4
GEL 312	Mineral Science	
GEL 415	Geomorphology	

Geology Elective (choose one of the following):

GEL 302	Historical Geology	3-4
GEL 312	Mineral Science	
GEL 415	Geomorphology	
GEL 463	Environmental Geology	

Meteorology Elective (choose one of the following):

ESC 413	Climatology	3
ESC 311	Synoptic Meteorology	
ESC 412	Air Pollution	

Meteorology Elective (choose one of the following):

ESC 413	Climatology	3-4
ESC 311	Synoptic Meteorology	
ESC 412	Air Pollution	
ESC 420	Atmospheric Sensing Methods	

Water Resources Elective (choose one of the following):

ESC 364	Water Resources Issues	3-4
ESC 412	Hydrology	
GEL 462	Groundwater	

Water Resources Elective (choose one of the following):

ESC 364	Water Resources Issues	3-4
ESC 412	Hydrology	
GEL 462	Groundwater	

Analytical Methods Elective (choose one of the following):

ESC 350	Computational Methods	3
ESC 430	Geographic Information Systems	

ESC/GEL electives by advisement

3-5	31	3-6	32
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Required Co-requisite Courses:
 CHM 205 College Chemistry I
 One additional laboratory course in chemistry, biology,
 or physics

Required Co-requisite Courses:
 CHM 205 College Chemistry I
 One additional laboratory course in chemistry, biology,
 or physics

4
4
4
1
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4
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