PROGRAM/DEGREE REQUIREMENT CHANGE (MAJOR/MINOR)

SUBMITTED BY:

Department
Geology and Geophysics

College/School
Natural Science and Mathematics

Prepared by
Erin Pettit

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907-474-5389

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ecpettit@alaska.edu

Faculty Contact
Erin Pettit

See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

PROGRAM IDENTIFICATION:

DEGREE PROGRAM
Geoscience

Degree Level: (i.e., Certificate, A.A., A.A.S., B.A., B.S., M.A., M.S., Ph.D.)
B.S.

A. CHANGE IN DEGREE REQUIREMENTS: (Brief statement of program/degree changes and objectives)

We would like to drop the requirement for CHEM 106 for the geophysics option and replace it with an additional upper level elective requirement. We also need to change the course number for one course (we have filed paperwork to change GEOS F3770 to GEOS F4770).

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Dean’s Office
College of Natural Science & Mathematics

Minimum Requirements for Degree: 120 credits

Graduates in geoscience have broad backgrounds in the earth sciences and firm foundations in mathematics, physics and chemistry. Four options are available to allow students to pursue their own emphasis: geology, paleontology, geospatial science and geophysics. The options allow students to focus earlier in their studies but are flexible enough to allow students to pursue their own interests in the junior and senior years. All of the options are designed to prepare students for industry jobs in oil, mining and environmental consulting; jobs with agencies such as U.S. Geological Survey, NASA, Alaska Division of Geological and Geophysical Surveys; or graduate studies.

The geology option offers students a sound background in a spectrum of geological disciplines with an emphasis on current field mapping techniques essential to exploration and research. The paleontology option is designed to provide students with the skills necessary to locate, excavate, interpret and curate specimens for museums, agencies or universities. The geospatial sciences option focuses on the principles, techniques and applications of remote sensing, GIS and GPS to prepare students for careers that require geospatial data analysis and visualization. The geophysics option challenges students to use physics in understanding geoscience concepts, emphasizing applications in seismology, volcanology and glaciology in the context of the Alaskan landscape. This option is designed to prepare students for graduate work in geophysics and environmental engineering fields or other disciplines that use geophysical tools such as ground penetrating radar or exploration seismology. Major -- B.S. Degree
1. Complete the general university requirements. (As part of the core curriculum requirements, complete MATH F200X, CHEM F105X and F106X.)

2. Complete the following:*
   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits
   GEOS F309--Plate Tectonics--3 credits

3. Complete one of the following options:*

   **Option I -- Geology**
   1. Complete the following:*
      GEOS F213--Mineralogy--4 credits
      GEOS F214--Petrology and Petrography--4 credits
      GEOS F225--Field and Computer Methods in Geology--2 credits
      GEOS F304--Geomorphology--3 credits
      GEOS F314--Structural Geology--4 credits
      GEOS F315W--Paleobiology and Paleontology--4 credits
      GEOS F322--Stratigraphy and Sedimentation--4 credits
      GEOS F351W--Field Geology**--8 credits
      GEOS F430--Statistics and Data Analysis in Geology--3 credits
      PHYS F103X and PHYS F104X--College Physics (8)
      or PHYS F211 and PHYS F212--General Physics (8)--8 credits
      STAT F200X--Elementary Probability and Statistics (3)
      or STAT F300X--Statistics (3)--3 credits

   2. Complete 12 additional credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, to include one O (oral intensive) course.*

   **Option II -- Paleontology**
   3. Complete the following:*
      GEOS F213--Mineralogy--4 credits
      GEOS F214--Petrology and Petrography--4 credits
      GEOS F225--Field and Computer Methods in Geology--2 credits
      GEOS F304--Geomorphology--3 credits
      GEOS F314--Structural Geology--4 credits
      GEOS F322--Stratigraphy and Sedimentation--4 credits
      GEOS F351W--Field Geology**--8 credits
      GEOS F430--Statistics and Data Analysis in Geology--3 credits
      PHYS F103X--College Physics (4)
      or PHYS F211--General Physics (4)--4 credits
      STAT F200X--Elementary Probability and Statistics (3)
      or STAT F300X--Statistics--3 credits

   4. Complete the following:*
      GEOS F315W--Paleobiology and Paleontology--4 credits
      GEOS F3170--Paleontological Research and Laboratory Methods--2 credits

   5. Complete at least two of the following electives:*
      GEOS F453--Palynology and Paleopalynology--4 credits
      GEG F485--Mass Extinctions, Neocatastrophe and the History of Life--3 credits
      GEOS F486--Vertebrate Paleontology--3 credits
      GEOS F488--Undergraduate Research--2 credits

   6. Complete the requirements for a minor in biological sciences--20 credits

   **Option III -- Geospatial Sciences**
   7. Complete the following:*
      GEOS F213--Mineralogy--4 credits
      GEOS F214--Petrology and Petrography--4 credits
      GEOS F304--Geomorphology--3 credits
      GEOS F314--Structural Geology--4 credits
      GEOS F322--Stratigraphy and Sedimentation--4 credits
      GEOS F351W--Field Geology**--8 credits
      PHYS F103X and PHYS F104X--College Physics (8)
      or PHYS F211 and PHYS F212--General Physics (8)--8 credits
8. Complete the following:*  
GEOS/GEOG F222--Fundamentals of Geospatial Sciences--3 credits  
GEOS F225--Field and Computer Methods in Geology--3 credits  
GEOS F430--Statistics and Data Analysis in Geology--3 credits  

9. Complete at least two of the following remote sensing electives:*  
GEOS F408--Photogeology--2 credits  
GEOS F422--Geoscience Applications of Remote Sensing--3 credits  
GEOS F488--Undergraduate Research--2 credits  
NRM F641--Remote Sensing of Natural Resources--4 credits  

10. Complete at least two of the following GIS electives:*  
GEOG F309--Cartography and Geovisualization--4 credits  
GEOG F435--GIS Analysis--3 credits  
GEOS F458--Geoscience Applications of GPS and GIS--3 credits  
NRM F338--Introduction to GIS--3 credits  

11. Complete 9 additional credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, to include one O (oral intensive) and one additional W (writing intensive) course.*  

Option IV-- Geophysics  
12. Complete the following:*  
MATH F201X and MATH F202X--Calculus II and III--8 credits  
MATH F302--Differential Equations--3 credits  
MATH F314--Linear Algebra--4 credits  
PHYS F211 and PHYS F212--General Physics--8 credits  
PHYS F213X--Elementary Modern Physics--4 credits  
PHYS F220--Introduction to Computational Physics--4 credits  

13. Complete the following:*  
GEOS F262--Rocks and Minerals--3 credits  
GEOS F318--Solid Earth Geophysics--3 credits  
GEOS F377O--Ice in the Climate System--3 credits  
GEOS F406--Volcanology--3 credits  
GEOS F431--Foundations of Geophysics--4 credits  
GEOS F475W,O--Presentation Techniques in the Geosciences--2 credits  
GEOS F488--Undergraduate Research--2 credits  

14. Complete at least three of the following science and engineering electives:*  
ES F331--Mechanics of Materials--3 credits  
ES F341--Fluid Mechanics--4 credits  
GEOS F314--Structural Geology--4 credits  
GEOS F322--Stratigraphy and Sedimentation--4 credits  
GEOS F422--Geoscience Applications of Remote Sensing--3 credits  
ME F441--Heat and Mass Transfer--3 credits  
PHYS F301--Introduction to Mathematical Physics--4 credits  
PHYS F313--Thermodynamics and Statistical Physics--4 credits  
PHYS F341--Classical Physics I: Particle Mechanics--4 credits  

15. Complete one W (writing intensive) course approved by the undergraduate advisor*--3 credits  

4. Minimum credits required--120 credits  

* Students must earn a C grade (2.0) or better in each of these courses.  

** GEOS F351 is offered at UAF during the summer of odd-numbered years. Students may substitute a 6-credit field geology class at another institution. The geology and geophysics undergraduate advisor will assist students in placement in an approved field geology class.  

Minor  
Geology  
1. Complete the following:  
GEOS F101X--The Dynamic Earth--4 credits  
GEOS F112X--The History of Earth and Life--4 credits  
2. Complete 12 additional credits of GEOS courses as approved by the undergraduate geoscience advisor--12 credits  
3. Minimum credits required--20 credits
### Paleontology

1. Complete the following:
   - GEOS F101X--The Dynamic Earth--4 credits
   - GEOS F112X--The History of Earth and Life--4 credits
2. Complete three of the following:
   - GEOS F315W--Paleobiology and Paleontology--4 credits
   - GEOS F317O--Paleontological Research and Laboratory Methods--2 credits
   - GEOS F322--Stratigraphy and Sedimentation--4 credits
   - GEOS F453--Palynology and Paleopalynology--4 credits
   - GEOS F485--Mass Extinctions, Neocatastrophism and the History of Life--3 credits
   - GEOS F486--Vertebrate Paleontology--3 credits
3. Minimum credits required--16 - 20 credits

### Geospatial Sciences

1. Complete the following:
   - GEOS F101X--The Dynamic Earth--4 credits
   - GEOS F112X--The History of Earth and Life--4 credits
   - GEOS/GEOG F222--Fundamentals of Geospatial Sciences--3 credits
   - GEOS F225--Field and Computer Methods in Geology--2 credits
   - GEOS F422--Geoscience Applications of Remote Sensing--3 credits
   - GEOS F458--Geoscience Applications of GPS and GIS--3 credits
2. Minimum credits required--19 credits

### Geophysics

1. Complete the following:
   - GEOS F101X--The Dynamic Earth--4 credits
   - GEOS F112X--The History of Earth and Life--4 credits
   - GEOS F318--Solid Earth Geophysics--3 credits
   - GEOS F406--Volcanology--3 credits
   - GEOS F431--Foundations of Geophysics--4 credits
2. Minimum credits required--21 credits

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C. PROPOSED REQUIREMENTS AS IT WILL APPEAR IN THE CATALOG WITH THESE CHANGES:

(Underline new wording strike-through-old-wording and use complete catalog format)

### Geoscience

College of Natural Science and Mathematics  
Department of Geology and Geophysics  
907-474-7565  
www.uaf.edu/geology/  
B.S. Degrees; Minor  
Downloadable PDF

Minimum Requirements for Degree: 120 credits

Graduates in geoscience have broad backgrounds in the earth sciences and firm foundations in mathematics, physics and chemistry. Four options are available to allow students to pursue their own emphasis: geology, paleontology, geospatial science and geophysics. The options allow students to focus earlier in their studies but are flexible enough to allow students to pursue their own interests in the junior and senior years. All of the options are designed to prepare students for industry jobs in oil, mining and environmental consulting; jobs with agencies such as U.S. Geological Survey, NASA, Alaska Division of Geological and Geophysical Surveys; or graduate studies.
The geology option offers students a sound background in a spectrum of geological disciplines with an emphasis on current field mapping techniques essential to exploration and research. The paleontology option is designed to provide students with the skills necessary to locate, excavate, interpret and curate specimens for museums, agencies or universities. The geospatial sciences option focuses on the principles, techniques and applications of remote sensing, GIS and GPS to prepare students for careers that require geospatial data analysis and visualization. The geophysics option challenges students to use physics in understanding geoscience concepts, emphasizing applications in seismology, volcanology and glaciology in the context of the Alaskan landscape. This option is designed to prepare students for graduate work in geophysics and environmental engineering fields or other disciplines that use geophysical tools such as ground penetrating radar or exploration seismology.

Major -- B.S. Degree

5. Complete the general university requirements. (As part of the core curriculum requirements, complete MATH F200X, and CHEM F105X and F106X.)

6. Complete the following:*

   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits
   GEOS F309--Plate Tectonics--3 credits

7. Complete one of the following options:*

   Option I -- Geology
   1. Complete the following:*  
      CHEM F106X—General Chemistry II--4 credits  
      GEOS F213--Mineralogy--4 credits  
      GEOS F214--Petrology and Petrography--4 credits  
      GEOS F225--Field and Computer Methods in Geology--2 credits  
      GEOS F304--Geomorphology--3 credits  
      GEOS F314--Structural Geology--4 credits  
      GEOS F315W--Paleobiology and Paleontology--4 credits  
      GEOS F322--Stratigraphy and Sedimentation--4 credits  
      GEOS F351W--Field Geology**--8 credits  
      GEOS F430--Statistics and Data Analysis in Geology--3 credits  
      PHYS F103X and PHYS F104X--College Physics (8)  
      or PHYS F211 and PHYS F212--General Physics (8)--8 credits  
      STAT F200X--Elementary Probability and Statistics (3)  
      or STAT F300X--Statistics (3)--3 credits
   2. Complete 12 additional credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, to include one O (oral intensive) course.*

   Option II -- Paleontology
   1. Complete the following:*  
      CHEM F106X—General Chemistry II--4 credits  
      GEOS F213--Mineralogy--4 credits  
      GEOS F214--Petrology and Petrography--4 credits  
      GEOS F225--Field and Computer Methods in Geology--2 credits  
      GEOS F304--Geomorphology--3 credits  
      GEOS F314--Structural Geology--4 credits  
      GEOS F322--Stratigraphy and Sedimentation--4 credits  
      GEOS F351W--Field Geology**--8 credits  
      GEOS F430--Statistics and Data Analysis in Geology--3 credits  
      PHYS F103X--College Physics (4)  
      or PHYS F211--General Physics (4)--4 credits  
      STAT F200X--Elementary Probability and Statistics (3)  
      or STAT F300X--Statistics--3 credits
   2. Complete the following:*  
      GEOS F315W--Paleobiology and Paleontology--4 credits  
      GEOS F3170--Paleontological Research and Laboratory Methods--2 credits
   3. Complete at least two of the following electives:*  
      GEOS F453--Palynology and Paleopalynology--4 credits  
      GEOG F485--Mass Extinctions, Neocatastrophism and the History of Life--3 credits  
      GEOS F486--Vertebrate Paleontology--3 credits
GEOS F488--Undergraduate Research--2 credits

4. Complete the requirements for a minor in biological sciences--20 credits

Option III -- Geospatial Sciences

1. Complete the following:*  
   CHEM F106X—General Chemistry II--4 credits  
   GEOS F213--Mineralogy--4 credits  
   GEOS F214--Petrology and Petrography--4 credits  
   GEOS F304--Geomorphology--3 credits  
   GEOS F314--Structural Geology--4 credits  
   GEOS F322--Stratigraphy and Sedimentation--4 credits  
   GEOS F351W—Field Geology**--8 credits  
   PHYS F103X and PHYS F104X--College Physics (8)  
   or PHYS F211 and PHYS F212--General Physics (8)--8 credits  
   STAT F200X--Elementary Probability and Statistics (3)  
   or STAT F300X--Statistics--3 credits

2. Complete the following:*  
   GEOS/GEOG F222--Fundamentals of Geospatial Sciences--3 credits  
   GEOS F225--Field and Computer Methods in Geology--3 credits  
   GEOS F430--Statistics and Data Analysis in Geology--3 credits

3. Complete at least two of the following remote sensing electives:*  
   GEOS F408--Photogeology--2 credits  
   GEOS F422--Geoscience Applications of Remote Sensing--3 credits  
   GEOS F488--Undergraduate Research--2 credits  
   NRM F641--Remote Sensing of Natural Resources--4 credits

4. Complete at least two of the following GIS electives:*  
   GEG F309--Cartography and Geovisualization--4 credits  
   GEG F435--GIS Analysis--3 credits  
   GEOS F458--Geoscience Applications of GPS and GIS--3 credits  
   NRM F338--Introduction to GIS--3 credits

5. Complete 9 additional credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, to include one O (oral intensive) and one additional W (writing intensive) course.*

Option IV-- Geophysics

1. Complete the following:*  
   MATH F201X and MATH F202X--Calculus II and III--8 credits  
   MATH F302--Differential Equations--3 credits  
   MATH F314--Linear Algebra--4 credits  
   PHYS F211 and PHYS F212--General Physics--8 credits  
   PHYS F213X--Elementary Modern Physics--4 credits  
   PHYS F220--Introduction to Computational Physics--4 credits

2. Complete the following:*  
   GEOS F262--Rocks and Minerals--3 credits  
   GEOS F318--Solid Earth Geophysics--3 credits  
   GEOS F477S7O--Ice in the Climate System--3 credits  
   GEOS F406--Volcanology--3 credits  
   GEOS F431--Foundations of Geophysics--4 credits  
   GEOS F475W.O--Presentation Techniques in the Geosciences--2 credits  
   GEOS F488--Undergraduate Research--2 credits

3. Complete at least three of the following science and engineering electives:*  
   ES F331--Mechanics of Materials--3 credits  
   ES F341--Fluid Mechanics--4 credits  
   GEOS F314--Structural Geology--4 credits  
   GEOS F322--Stratigraphy and Sedimentation--4 credits  
   GEOS F422--Geoscience Applications of Remote Sensing--3 credits  
   ME F441--Heat and Mass Transfer--3 credits  
   PHYS F301--Introduction to Mathematical Physics--4 credits  
   PHYS F313--Thermodynamics and Statistical Physics--4 credits
PHYS F341--Classical Physics I: Particle Mechanics--4 credits

4. Complete 3 additional credits of upper-division GEOS course or other upper-division course approved by the undergraduate advisor*

5. Complete one W (writing intensive) course approved by the undergraduate advisor*--3 credits

2. Minimum credits required--120 credits

* Students must earn a C grade (2.0) or better in each of these courses.

** GEOS F351 is offered at UAF during the summer of odd-numbered years. Students may substitute a 6-credit field geology class at another institution. The geology and geophysics undergraduate advisor will assist students in placement in an approved field geology class.

Minor

Geology

1. Complete the following:
   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits

2. Complete 12 additional credits of GEOS courses as approved by the undergraduate geoscience advisor:--12 credits

3. Minimum credits required--20 credits

Paleontology

1. Complete the following:
   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits

2. Complete three of the following:
   GEOS F315W--Paleobiology and Paleontology--4 credits
   GEOS F3170--Paleontological Research and Laboratory Methods--2 credits
   GEOS F322--Stratigraphy and Sedimentation--4 credits
   GEOS F453--Palynology and Paleopollonology--4 credits
   GEOS F485--Mass Extinctions, Neocatastrophism and the History of Life--3 credits
   GEOS F486--Vertebrate Paleontology--3 credits

3. Minimum credits required--16 - 20 credits

Geospatial Sciences

1. Complete the following:
   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits
   GEOS/GEOG F222--Fundamentals of Geospatial Sciences--3 credits
   GEOS F225--Field and Computer Methods in Geology--2 credits
   GEOS F422--Geoscience Applications of Remote Sensing--3 credits
   GEOS F458--Geoscience Applications of GPS and GIS--3 credits

2. Minimum credits required--19 credits

Geophysics

1. Complete the following:
   GEOS F101X--The Dynamic Earth--4 credits
   GEOS F112X--The History of Earth and Life--4 credits
   GEOS F477--Ice in the Climate System--3 credits
   GEOS F406--Volcanology--3 credits
   GEOS F318--Solid Earth Geophysics--3 credits
   GEOS F431--Foundations of Geophysics--4 credits

2. Minimum credits required--21 credits
D. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

These changes are minor and little impact on budget or facilities/space is expected.

E. IMPACTS ON PROGRAMS/DEPTS:

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

From the students’ perspective, this change will allow geophysics-option students to take an additional upper-division GEOS or related course, providing a more challenging program that allows them to graduate with a stronger geophysics background.

From the Departments’ perspectives, there will be fewer Geoscience students taking CHEM F106X, which is often overcrowded. There will be more students in upper-division GEOS courses, which will help prevent cancellation of more specialized courses with limited enrollment.

F. IF MAJOR CHANGE - ASSESSMENT OF THE PROGRAM:

Description of the student learning outcomes assessment process.)

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize program/degree change applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you drop a course, is it because the material is covered elsewhere? Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the program is not compromised as a result.

As stated above, by taking away a 100-level course and replacing it with a upper-division course, this change will provide geophysics-option students with a more challenging program that allows them to graduate with a stronger and broader geophysics background.
**APPROVALS:**

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**ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE**

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