FORMAT 5

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PROGRAM/DEGREE REQUIREMENT CHANGE (MAJOR/MINOR)

SUBMITTED BY:

Department	Geology & Geophysics	College/School	CNSM
Prepared by	Sarah Fowell	Phone	474-7810
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See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

PROGRAM IDENTIFICATION:

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

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

We have added 4 options to the renamed Geoscience major and 4 minors to the program in order to 1) take advantage of new hires and increasing strengths in geophysics, remote sensing and paleontology, 2) offer a greater variety of course and degree options, 3) provide students the option of earlier specialization, 4) increase the number of undergraduate research opportunities, 4) better prepare students for admission to competitive graduate programs and/or successful careers in industry, 5) leverage resources through interdepartmental cooperation, and 6) increase program enrollments.

B. CURRENT REQUIREMENTS AS IT APPEARS IN THE CATALOG:

GEOLOGY

B.S. Degree

Minimum Requirements for Degree: 130 credits

Graduates in geology have broad backgrounds in the earth sciences and firm foundations in mathematics, physics and chemistry. There are many concentrations available in the geological sciences, and the suggested curricula are intended to be flexible enough to allow students to pursue their own emphasis in the junior and senior years. The bachelor's degree prepares students for positions with industry or government or for graduate studies.

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 B.S. degree requirements. (As part of the B.S. degree, complete: STAT F200X or F300; PHYS F103X and F104X, or PHYS F211X and F212X.)

3. Complete the following program (major) requirements:*
   GEOS F101X--The Dynamic Earth.....4 credits
   GEOS F112X--The History of Earth and Life.....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

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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
MATH F201X--Calculus II.....4 credits
Electives.....open

4. Complete 15 credits of upper-division GEOS courses or upper-division courses approved by the undergraduate advisor.*

5. Minimum credits required.....130

* *Student must earn a C grade or better in each GEOS course and in all courses that fulfill requirement 4.*

** *GEOS F351 is offered at UAF when there is sufficient demand. In years when GEOS F351 is not offered (decision made early in fall semester), students are required to take a 6-credit field geology class at another institution. The geology and geophysics undergraduate advisor will assist students in placement in a field geology class.*

Note: Studies in geophysics: Students interested in pursuing a program in geophysics are encouraged to pursue a major in geology which includes GEOS F418 and F416 with a minor in physics. Students should consult with the geology department regarding constructing a plan of study.

Minor

1. Complete the following:
GEOS F101X--The Dynamic Earth.....4 credits
Approved GEOS electives.....12 credits

2. Minimum credits required.....16 credits

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)

~~GEOLOGY~~ GEOSCIENCE

B.S. Degree

Minimum Requirements for Degree: ~~130~~ 120 credits

Graduates in geology 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 Sciences; and Geophysics. ~~There are many concentrations available in the geological sciences, and the suggested curricula~~ The options allow students to focus earlier in their studies but are flexible enough to allow students to pursue their own ~~emphasis~~ interests in the junior and senior years. ~~The bachelor's degree prepares students for positions with industry or government or for graduate studies.~~ All of the options include flexibility in order to prepare students for industry jobs in oil, mining, and environmental consulting; agency jobs such as U.S. Geological Survey, NASA, or AK Division of Geological & 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 ~~in Alaska~~. 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 B.S. degree requirements. (As part of the B.S. degree, complete: STAT F200X or F300; PHYS F103X and F104X, or PHYS F211X and F212X.)~~

2. Complete the following required foundation courses.*

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:

Geoscience Option I – Geology

a. Complete the following:*

~~4. Complete the following program (major) requirements:*~~

~~GEOS F101X--The Dynamic Earth.....4 credits~~
~~GEOS F112X--The History of Earth and Life.....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 credits
STAT F200X—Elementary Probability and Statistics (3)
or STAT F300X--Statistics.....3 credits
~~MATH F201X--Calculus II.....4 credits~~
~~Electives.....open~~

b. Complete 15 additional credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, including one O course.*

Geoscience Option II - Paleontology

a. 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 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 credits
STAT F200X—Elementary Probability and Statistics (3)
or STAT F300X--Statistics.....3 credits

b. Complete the following Paleontology option requirements:*
GEOS F315W--Paleobiology and Paleontology.....4 credits
GEOS F317O--Paleontological Research and Laboratory Methods.....2 credits

c. Complete at least two of the following Paleontology electives:*
GEOS 453--Palynology and Paleopalynology.....4 credits
GEOS F485--Mass Extinctions, Neocatastrophism and the History of Life.....3 credits
GEOS F486--Vertebrate Paleontology.....3 credits
GEOS F488--Undergraduate Research.....2 credits

d. Complete the requirements for a minor in Biological Sciences.....20 credits

Geoscience Option III – Geospatial Sciences

a. 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 credits
STAT F200X—Elementary Probability and Statistics (3)
or STAT F300X--Statistics.....3 credits

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

c. 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

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

e. Complete 9 additional of credits of upper-division GEOS courses or other upper-division courses approved by the undergraduate advisor, including one O and one additional W course.*

Geoscience Option IV - Geophysics

a. Complete the following Science and Math requirements:*
PHYS F211X and F212X--General Physics.....8 credits
MATH F201X and F202XCalculus II and III.....8 credits
PHYS F213X--Elementary Modern Physics.....4 credits
PHYS F220--Introduction to Computational Physics.....4 credits
MATH F302--Differential Equations.....3 credits
MATH F314--Linear Algebra.....4 credits

b. Complete the following Geophysics option requirements:*
GEOS F262--Rocks and Minerals .....3 credits
GEOS F318--Solid Earth Geophysics.....4 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

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

d. Complete one W course approved by the undergraduate advisor.*.....3 credits

4. Minimum credits required.....~~130~~ 120 credits

* *Student must earn a C grade or better in each GEOS course and in all courses that fulfill requirement 4.*

** *GEOS F351 is offered at UAF during the summer of odd-numbered years ~~when there is sufficient demand. In years when GEOS F351 is not offered (decision made early in fall semester), students are required to~~ Students may substitute a 6-credit field geology class taken at another institution. The geology and geophysics undergraduate advisor will assist students in placement in an approved field geology class.*

~~*Note: Studies in geophysics: Students interested in pursuing a program in geophysics are encouraged to pursue a major in geology which includes GEOS F418 and F416 with a minor in physics. Students should consult with the geology department regarding constructing a plan of study.*~~

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. ~~Approved GEOS electives.....12 credits~~

~~2.~~ 3. Minimum credits required.....~~16~~ 20 credits

Paleontology

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

2. Complete three of the following Paleontology electives:
GEOS F315W--Paleobiology and Paleontology.....4 credits

GEOS F322--Stratigraphy and Sedimentation.....4 credits
GEOS F317O--Paleontological Research and Laboratory Methods.....2 credits
GEOS 453--Palynology and Paleopalynology.....4 credits
GEOS F486--Vertebrate Paleontology.....3 credits
GEOS F485--Mass Extinctions, Neocatastrophism and the History of Life.....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 F458--Geoscience Applications of GPS and GIS.....3 credits
GEOS F422--Geoscience Applications of Remote Sensing.....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 F418—Geophysics of the Earth.....3 credits
GEOS F377O--Ice in the Climate System.....3 credits
GEOS F406--Volcanology.....3 credits
GEOS F431--Foundations of Geophysics.....4 credits

3. Minimum credits required.....21 credits

D. ESTIMATED IMPACT

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

Despite the number of new courses, the proposed program changes will not result in faculty teaching overloads due to the number of recent hires. The proposed options will allow new faculty to design and teach courses in their specialties, thus fulfilling their workloads. Four of the six associated new course proposals are therefore crafted by relatively recent hires. Associate and full professors have also participated in the program revitalization by making changes to existing courses, co-teaching new courses and/or teaching courses on an alternate year basis.

Program changes are intended to attract students and increase enrollments, which will have a positive impact on the departmental budget. New lab courses include course fees to compensate for the expense of materials and supplies.

Projected impacts on space are both positive and negative. Required undergraduate courses geoscience courses are currently filled to (or slightly beyond) capacity. Offering options with somewhat different requirements is expected to reduce crowding and alleviate the need for more medium-sized classrooms (seating 30-50 students). On the other hand, the new Plate Tectonics course is required by all 4 options, so it *may* require a large lecture hall such as REIC 201A, 201B, or 202, for which competition is already steep. In addition, increased enrollment in the program may intensify the need for more parking spaces in the vicinity of the Reichardt building, but this is a problem that will need to be dealt with regardless of changes to the Geology program.

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)

Both the Department of Geology and Geophysics and the UA Geography Program will be affected by the new option in Geospatial Sciences. Undergraduate degree offerings in both departments were revised to include an option to take a geospatial sciences emphasis track. This option and the associated new course (Fundamentals of Geospatial Sciences) have been developed through close collaboration between the faculty and leadership in both departments. This collaborative effort enhances options in both departments by providing a greater diversity of courses and a more thorough foundation than either can provide alone.

The options are intended to increase enrollment in the Geology & Geophysics courses, and we will be advertising and recruiting in an attempt to ensure this result. Options will be considered successful if they attract a minimum of 5 majors per year (see assessment, below). Therefore, a successful Geophysics option would lead to increased enrollments in physics, math and engineering which would be particularly noticeable in upper division courses. Similarly, a successful Paleontology option would lead to higher enrollments in upper and lower division Biology and Wildlife courses.

F. IF MAJOR CHANGE - ASSESSMENT OF THE PROGRAM:

Description of the student learning outcomes assessment process.)

administered to new GEOS 101 students during the fall 2011 semester. Students will repeat the test at the end of the semester. Those students who go on to complete GEOS 112 will take the test a third time upon completion of that course. The GCI is designed to test student understanding of fundamental concepts such as the scale of geologic time and the relationship between tectonic plates and geologic features. Evaluation of pre/post student performance will provide insight into preconceptions and provide data regarding student learning gains, both of which will be used to design and modify instruction.

All of the new options include undergraduate research as an elective or a requirement. We will keep track of undergraduate presentations, meeting participation, publications and dedicated undergraduate research funding in order to assess the success of this aspect of our program.

In general, an option will not be considered successful unless it attracts *at least* 5 students per year. Whereas we realize that it may take a few years for advertising and word of mouth to produce the numbers we want, we do not want students to struggle with course cancellations due to insufficient enrollments. Therefore, we have consulted with the CNSM Dean and decided that 5 years is a reasonable trial period for the proposed options. Any option that is not generating 5 new majors per year will be discontinued in academic year 2017/2018.

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.

Recent hires in glaciology, seismology, volcanology, teconics and vertebrate paleontology and an on-going search for a new remote sensing faculty member have increased our research strengths and provide an opportunity for course and curriculum development. Based on data from a recent externally facilitated workshop, a departmental retreat, and student surveys, we have identified 4 emphasis areas, which we have crafted into 4 options within the degree. The geology option will continue to offer students a broad background in classical geological studies with an emphasis on current field mapping techniques essential to exploration and research in Alaska. The paleontology option is designed to provide students with the skills necessary to locate, excavate, and curate new specimens while ensuring that they have sufficient background in biology to be accepted by and successful in graduate programs in paleontology. The geospatial sciences option allows students to focus on the principles, techniques and applications of remote sensing, GIS and GPS to prepare students for an increasing number of government or industry positions that require geospatial data analysis and visualization. The geophysics option... .

By providing multiple, clear paths to a B.S. degree in Geoscience that include opportunities for research, we hope to attract students who may be unfamiliar with the variety of emphasis areas included under the Geoscience umbrella and appeal to students who seek to specialize earlier in their undergraduate studies. We believe that this strategy will increase both enrollments and student success in the workforce and graduate studies.

Geoscience is an inherently interdisciplinary field. The geology minor continues to provide a flexible option for BA students, whereas the Paleontology, Geospatial Sciences and Geophysics minors are designed to provide a customized emphasis for interested Biological Sciences, Geography and Physics majors, respectively. Please see the associated new minor forms for additional details.

APPROVALS:

Signature, Chair, Program/Department of: Geology + Geophysics	Date	9/26/11
Signature, Chair, College/School Curriculum Council for: CNSM	Date	10/5/11
Signature, Dean, College/School of: CNSM	Date	Oct 7, 2011

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

Signature, Chair, UAF Faculty Senate Curriculum Review Committee	Date	

Hi Sarah,
The CNSM curriculum council met on 30 Sep and discussed program changes in geoscience. We have the following suggestions.

1. The requirements listed under #2 (baccalaureate requirements) are redundant with some options and conflict with others. We suggest you drop #2 entirely; since baccalaureate requirements are met by courses required within each of the options.
2. Drop the course GEOG 293 from the Option III list of courses. I don't think we want special topics courses in the catalog. I realize you probably had this in there as a placeholder for a new course of the same name, but, at least when I spoke with her yesterday, Patricia Heiser (curr chair for NRM) does not think that the new course proposal for that particular course will be submitted in time for this round of review. You can always add it to the list next year.
3. Please avoid making students guess which courses are "relevant" to the degree program. More specifically, make the wording for Option III e. more like the wording for Option I b. Similarly, how would a student know what an "approved GEOS elective" was for the geology minor? Can you be more specific?
4. A minor point - list c of the Geophysics Option IV is called "Science and Math" but contains no math.
5. Option I requires only a single 400 level course. This is not necessarily a problem if that is the way you want it, since there are credits left over for elective 400 level work, but we thought we'd point it out.
6. Do you think the instructor for NRM 641, an option for Opt III, would accept GEOS 435 as a prereq? This is probably not something to deal with right now, but something to consider for the future.

A few other issues regarding geology programs:
- Some of the paperwork for new 600 level courses referred to restructuring of the grad program. Are there curricular changes planned to the grad program? Some on the council pointed out that it is easier to review new courses in the context of the program, and if the program is changing, we don't have a sense of how it is changing.
- The new course proposal GEOS 418 refers to a new course GEOS 409. We received a new course proposal for GEOS 609, but not 409. Moreover, the proposed 609 course does not look particularly appropriate for the undergraduate level. Can you clear this up?

You can email revised paperwork directly to me.
Best,
Diane Wagner

CNSM Curriculum Council
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Tom Green
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–
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