February 19, 2016

MEMORANDUM

TO: Jayanth R. Banavar
Dean, College of Computer, Mathematical, and Natural Sciences

FROM: Elizabeth Beise
Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Modify the Bachelor of Science in Geology – Professional Specialization (PCC Log No. 15024)

At its meeting on February 5, 2016, the Senate Committee on Programs, Curricula and Courses approved the proposal to modify the Bachelor of Science in Geology – Professional Specialization. A copy of the proposal is attached.

The change is effective Fall 2016. Please ensure that the change is fully described in the Undergraduate Catalog and in all relevant descriptive materials, including the undergraduate program’s four-year plan (contact Lisa Kiely at lkiely@umd.edu for more information).

MDC/
Enclosure

cc: Andrew Harris, Chair, Senate PCC Committee
Barbara Gill, Office of Enrollment Management
Reka Montfort, University Senate
Erin Taylor, Division of Information Technology
Pam Phillips, Institutional Research, Planning & Assessment
Anne Turkos, University Archives
Linda Yokoi, Office of the Registrar
Cynthia Stevens, Office of Undergraduate Studies
Robert Infantino, College of Computer, Mathematical, and Natural Sciences
Richard Walker, Department of Geology
This is a proposal for the modification of the Geology Major – Professional Track. See attached.

To address significant defects in the current professional track that create obstacles to student enrollment in the full range of our upper-level course offerings.

APPROVAL SIGNATURES

1. Department Committee Chair
2. Department Chair
3. College/School PCC Chair
4. Dean
5. Dean of the Graduate School (if required)
6. Chair, Senate PCC
7. Chair of Senate
8. Vice President for Academic Affairs & Provost

DATE

7/31/15

10/14/2015

10/15/15

2/5/2015

2/19/2015

VPAAP Rev. 3/1/04
Geology Major, Professional Track

1. This is a proposal to alter requirements for an existing major.

2. The “Requirements for the Major” section of the Catalog Description is to be modified to the following:

Current text:

Requirements for the Geology Major, Professional Track

The geology curriculum is designed to meet the requirements of industry, graduate school, and government. For the B.S. degree, the students are required to complete the departmental requirements (49 credits) and the supporting requirements (23/24 credits) in addition to the General Education Program requirements and the completion of at least 120 credits. The department requires that to receive a degree in Geology, students must have a grade of C- or better in the required geology courses, and an average of C- or better in the supporting courses.

Courses required for the B.S. in Geology are listed below. Some courses require field trips for which the students are expected to pay for room (if required) and board. Field camp is taken during the summer at institutions other than the University of Maryland, College Park, that offer camps approved by the department.

Proposed text:

Requirements for the Geology Major, Professional Track

The geology curriculum is designed to meet the requirements of industry, graduate school, and government. For the B.S. degree, the students are required to complete departmental requirements, capstones, core discipline options, and elective (58 - 62 credits) and the supporting requirements (16 credits) in addition to the General Education Program requirements and the completion of at least 120 credits. The department requires that to receive a degree in Geology, students must have a grade of C- or better in the required geology courses, and an average of 2.0 or better in the supporting courses.

Courses required for the B.S. in Geology are listed below. Some courses require field trips for which the students are expected to pay for room (if required) and board. Field camp is taken during the summer at institutions other than the University of Maryland, College Park, that offer camps approved by the department.

These revisions update the breakdown of credits in geology requirements and supporting requirements, and correct the infelicitous substitution of a C- letter grade for the numerical designation of the minimum acceptable GPA for supporting courses that was erroneously introduced during the introduction of plus and minus grading and not noticed until this point.

The proposed major requirements involve both changes in required courses and modifications to the organization of the major.
Current requirements for the major are:

**Geology Courses**

One of the following:
- GEOL 100/110—Physical Geology and Laboratory (4)
- GEOL 120/110—Environmental Geology and Lab (4)
- GEOL 102—Historical Geology (4)
- GEOL 322—Mineralogy (4)
- GEOL 340—Geomorphology (4)
- GEOL 341—Structural Geology (4)
- GEOL 342—Stratigraphy and Sedimentation (4)
- GEOL 393—Technical Writing (3)
- GEOL 394—Research Problems (3)

One of the following:
- GEOL 444—Low-Temperature Geochemistry (4)
- GEOL 445—High-Temperature Geochemistry (4)

One of the following:
- GEOL 446—Geophysics (3) or GEOL 447—Observational Geophysics (3)
- GEOL 451—Groundwater (3)
- GEOL 423—Optical Mineralogy (4)
- GEOL 443—Petrology (4)
- GEOL 490—Field Camp (6)

Total credits: 54

**Supporting Courses:**

One of the following:
- CHEM 131—Fundamentals of General Chemistry and CHEM 132—Fundamentals of General Chemistry Laboratory (4)
- CHEM 135—Chemistry for Engineers and CHEM 136—Chemistry for Engineers Laboratory (4)
- MATH 140—Calculus I (4)
- MATH 141—Calculus II (4)

One of the following:
- PHYS 141—Principles of Physics (4)
- PHYS 161—General Physics: Mechanics and Particle Dynamics (3) and PHYS 174—Physics Laboratory Introduction (1)
- PHYS 171—Introductory Physics: Mechanics and Relativity (3) and PHYS 174—Physics Laboratory Introduction (1)

One of the following:
- PHYS 142—Principles of Physics (4)
- PHYS 260 General Physics: Vibration, Waves, Heat, Electricity and Magnetism (3) and PHYS 261 General Physics: Vibrations, Waves, Heat, Electricity and Magnetism (Laboratory) (1)
- PHYS 272 Introductory Physics: Fields (3)
- BIOM 301—Introduction to Biometrics (3)

Any of GEOL 444, 445, 446 or 472 not already completed to meet the requirements above or any other 3-4 credit 300 or 400 level Geology course not listed above. (3-4)

Total credits: 19 - 20

Overall total credits: 73 – 74
Requirements for the major for under the proposed revision are:

**Required Geology Courses:**
One of the following:
- GEOL 100 Physical Geology (3)
- GEOL 120 Environmental Geology (3)
GEOL 110—Introductory Geology Lab (1)
GEOL 102—Historical Geology (4)
GEOL 322—Mineralogy (4)
GEOL 341—Structural Geology (4)
GEOL 342—Stratigraphy and Sedimentation (4)
GEOL 423—Optical mineralogy (4)
GEOL 443—Petrology (4)

Total credits: 28

**Geology Capstones**
GEOL 393—Senior Thesis I - Proposal (3)
GEOL 394—Senior Thesis II - Research (3)
GEOL 490—Field Camp (6)

Total credits: 12

**Geologic Core Discipline options:** Choose one course from each of the following groups.*

**Quantitative Reasoning:**
- GEOL 351— Statistics for Geoscientists (3)
- GEOL 352 (currently 489G)— Geoscientific Modeling (3) (Under development with VPAC proposal pending.)
- GEOL447— Observational Geophysics (3)

**Surface Processes:**
- GEOL 340— Geomorphology (4)
- GEOL 451— Groundwater (3)

**Geophysics:**
- GEOL412 — Geology of the Terrestrial Planets (3)
- GEOL 446 — Geophysics (3)
- GEOL 455 — Marine Geophysics (3)
- GEOL 457 — Seismology (3)

**Geochemistry:**
- GEOL 444 — Low-Temperature Geochemistry (4)
- GEOL 445 — High-Temperature Geochemistry (4)
- GEOL 463 — Economic Geology (3)
Geobiology:
- GEOL 331—Principles of Paleontology (4)
- GEOL 435—Environmental Geochemistry (3)
- GEOL 436—Biogeochemistry (3)
- GEOL 437—Global Climate Change, Past and Present (3)

Total credits: 15 – 18

Geology Elective:
- Any 3-4 credit 300 – 400 level GEOL course not taken to satisfy the above requirements or appropriate substitution with the approval of the department.

Total credits: 3 - 4

Supporting Courses:
One of the following
- CHEM 131—Fundamentals of General Chemistry and CHEM 132—Fundamentals of General Chemistry Laboratory (4)
- CHEM135—Chemistry for Engineers and CHEM 136—Chemistry for Engineers Laboratory (4)
- MATH 140—Calculus I
- MATH 141—Calculus II
One of the following
- PHYS 161—General Physics: Mechanics and Particle Dynamics and PHYS174—Introductory Physics Laboratory
- PHYS 171—Introductory Physics: Mechanics and Relativity and PHYS174—Introductory Physics Laboratory

Total credits: 16

Overall total credits: 74 – 78

Matriculated Geology majors are expected to take all courses on campus unless specific departmental permission is given.

* Or appropriate substitutions with the approval of the department.

Reasons for the proposal:

The revised Geology Professional Track major presented below seeks to optimize the fit between the requirements of the standard geology major, with particular focus on the expertise necessary to succeed in senior thesis research and at field camp, and the resources of the department. The significant increase in the number of regularly offered elective courses makes this particularly urgent. (In 2000, there were six regularly offered 300-400 level elective courses. Currently, there are fifteen, with two additionally under development.) Thus, the goals of the revision are to:

1.) Increase students’ flexibility to craft major curricula, including coursework and senior theses, that sample the full breadth of faculty expertise represented by existing courses, including electives. The current major offers very limited opportunities for curriculum flexibility. These are limited to: the choice between two similar geochemistry courses,
GEOL444 – Low Temperature Geochemistry and GEOL445 – High Temperature Geochemistry, the similar choice in geophysics between GEOL446 – Geophysics and GEOL447 – Observational Geophysics, and a single free elective. Given the increase in elective options, the lack of opportunity for students actually to enroll in them for major credit is perverse and frustrating from the student’s perspective.

2.) Encourage enrollment in the full range of our courses and improve recruitment to the major. Both are greatly curtailed by the scarcity of free elective credits in the major.

3.) Maintain equitable levels and distribution of faculty workload.

To achieve this, the major will be restructured, however with exceptions noted below, courses to be offered and their descriptions and prerequisites remain the same:

• **Capstone courses**, including:
  - GEOL490 - Geologic Field Camp
  - GEOL393 and GEOL394 - The two semesters of the Geology Senior Research Thesis are specifically delineated. These courses are required in the current major.

• **Required Geology Courses** are specifically those that a student must take in order to enroll in the capstones. All of these are currently major requirements, however the following current major requirements are relocated to core discipline options:
  - GEOL340 – Geomorphology
  - GEOL444 – Low Temperature Geochemistry
  - GEOL445 – High Temperature Geochemistry
  - GEOL446 – Geophysics
  - GEOL447 – Observational Geophysics
  - GEOL451 - Groundwater

• **Geologic Core Discipline Options**: High-priority upper level courses that are not essential prerequisites for the capstones are organized in a series of five bins representing:
  - Quantitative Reasoning
  - Surface Processes
  - Geophysics
  - Geochemistry
  - Geobiology

The roster of bins is intended to optimize student access to curriculum in areas of departmental strength without sacrificing breadth of background. The bins are not exhaustive lists of electives. Rather, they represent gateways into major areas of geoscience which a student might follow up with later study. All courses are currently taught with the exception of GEOL352 – Geoscientific Modeling, which is currently under development.

• **Elective**: As in the current major, a free elective is included through which a student might achieve a degree of concentration on subjects of interest.

• **Supporting courses**: These are unchanged from the current major but for:
  - The removal of PHYS141, which is being phased out by the university
  - The removal of a second semester of calculus based physics or BIOM301 – Biometrics.
In the former case, it is assumed that students seeking specialization in physics will prefer our proposed geophysics major track. We consider the Quantitative Reasoning core discipline option to replace the latter.

**Prerequisites:** The proposed revision invokes no hidden prerequisites and involves no changes in current prerequisites. Although the overall credit load of the proposed major is one to four credits greater than currently, we anticipate that its increased flexibility will actually make scheduling and advising easier.

**Oversight and Record Keeping:** Will be performed, as currently, by the Department of Geology. The proposed revision places no additional demands on Departmental, college, or campus resources.