May 8, 2014

MEMORANDUM

TO: Jayanth Banavar  
Dean, College of Computer, Mathematical, & Natural Sciences

FROM: Elizabeth Beise  
Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Establish a Minor in Geochemistry (PCC log no. 13062)

At its meeting on May 2, 2014, the Senate Committee on Programs, Curricula, and Courses approved your proposal to establish a Minor in Geochemistry. A copy of the approved proposal is attached.

The change is effective Fall 2014. Please ensure that the change is fully described in the Undergraduate Catalog and in all relevant descriptive materials.

MDC/

Enclosure

cc: Marilee Lindemann, Chair, Senate PCC Committee  
Barbara Gill, Office of Student Financial Aid  
Reka Montfort, University Senate  
Erin Howard, Division of Information Technology  
Pam Phillips, Institutional Research, Planning & Assessment  
Anne Turkos, University Archives  
Linda Yokoi, Office of the Registrar  
Doug Roberts, Undergraduate Studies  
Roberta Rudnick, Department of Geology
THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM PROPOSAL

DIRECTIONS: Provide one form with original approval signatures in lines 1 - 4 for each proposed action. Keep this form to one-page in length. Forms and appropriate attachments should be submitted to the Office of Academic Affairs, who will assign a Log Number to each proposal. Also submit an electronic version of as much of the proposal as is possible.

<table>
<thead>
<tr>
<th>COLLEGE/SCHOOL CMNS</th>
<th>GEOL</th>
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PROPOSED ACTION (A separate form for each) ADD X DELETE CHANGE

DESCRIPTION (Provide a succinct account of the proposed action. Details should be provided in an attachment. Provide old and new sample programs for curriculum changes.)

This is a proposal for the creation of a minor in Geochemistry. See attached.

JUSTIFICATION/REASONS/RESOURCES (Briefly explain the reason for the proposed action. Identify the source of new resources that may be required. Details should be provided in an attachment.)

To provide a coherent geochemistry curriculum for interested students in related majors. This change requires no additional resources. See attached.

<table>
<thead>
<tr>
<th>APPROVAL SIGNATURES</th>
<th>DATE</th>
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<tbody>
<tr>
<td>1. Department Committee Chair</td>
<td>9/18/13</td>
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<td>2. Department Chair</td>
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<td>3. College/School PCC Chair</td>
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<td>4. Dean</td>
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<td>5. Dean of the Graduate School (if required)</td>
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<td>6. Chair, Senate PCC</td>
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<td>7. Chair of Senate</td>
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<td>8. Vice President for Academic Affairs &amp; Provost</td>
<td>5/18/2014</td>
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VPAAP Rev. 3/1/04
Proposal for a new Minor in Geochemistry

1. This is a proposal to create a new minor.

2. **Reasons for the minor:** For over twenty years, geochemistry – the application of the methods of chemistry to geologic issues – has been the primary research focus of the Department of Geology. These methods have wide and expanding applicability to geosciences research, and are especially vital to growing research areas such as paleoclimatology, environmental geosciences, and planetary sciences. Since 2006, Geology has ranked among the nation’s top ten geochemistry programs in the rankings of US News and World Report. This expertise has significantly influenced the undergraduate geology experience. In a typical semester, for example, over half of undergraduate senior thesis rely on the application of geochemical methods. To date, however, with the exception of a single geochemistry major requirement, curriculum in this field has only been offered through elective upper-level courses. The purpose of the proposed minor is to consolidate our geochemistry curriculum into a coherent course of study that would encourage students in related fields to take advantage of this significant area of campus strength, and of the new avenues for interdepartmental synergy offered by the recent formation of CMNS.

3. **Objectives of the minor:** This minor will provide students with a detailed understanding of the application of the methods of chemistry to the broad range of geosciences research and with specific technical expertise in the field. It is intended for all students with an interest in the practical application of chemistry, however, we expect it especially to dovetail with the professional goals of Chemistry, Biology, Environmental Science and Policy, Environmental Science and Technology, and Physical Sciences majors.

Building on a three-course base of fundamental knowledge of geology, mineralogy, and the principles of geochemistry, the program is completed by two advanced elective courses addressing specific topics in geochemistry. The Geochemistry minor does require prerequisite knowledge of 100-level introductory chemistry and pre-calculus. Some optional course may require prerequisites in calculus.

**Courses required for the proposed minor are:**

**Required:**

- One of the following:
  - GEOL 100/110 Physical Geology/Physical Geology Lab (4)
  - GEOL 120/110 Environmental Geology/Physical Geology Lab (4)
- GEOL322 Mineralogy (4)
- One of the following:
  - GEOL444 Low Temperature Geochemistry (4)
  - GEOL445 High Temperature Geochemistry (4)

Plus two from the following.
• GEOL435 Environmental Geochemistry (3)
• GEOL 436 Biogeochemistry (3)
• GEOL 443 Petrology (4)
  • GEOL 444 Low-Temperature Geochemistry (4) (if not used to satisfy
    requirement above)
  • GEOL 445 High-Temperature Geochemistry (4) (if not used to satisfy
    requirement above)
• GEOL 471 Geochemical Methods of Analysis (3)
• GEOL 499 Special Problems in Geology (3)

Depending on the optional course taken, there is a total of 18 - 20 required credits
(excluding prerequisites. See below). All courses presented for the minor must be passed
with a grade of C- or better.

4. Oversight and Record Keeping

Oversight of this minor program will be through the normal academic processes of the
Department of Geology. The department’s Undergraduate Director will ensure that
students are properly advised and that records are appropriately kept.

5. Prerequisites

Any student completing the Geochemistry minor would need to have completed or
placed out of a 100-level introductory chemistry course and precalculus (MATH115). We
deem it improbably that an interested student would not already have completed this
course work. Depending on the optional courses chosen, a person may have to take, in
addition, prerequisites in calculus or geology.

Prerequisites for required courses for the minor are:

• GEOL322 – Mineralogy: (CHEM131/132 or CHEM135/136, GEOL100 or
  GEOL120, GEOL110)
• GEOL444 - Low Temperature Geochemistry (GEOL322, GEOL100, and
  MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and
  CHEM136))
• GEOL445 - High Temperature Geochemistry (GEOL322, GEOL100, and
  MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and
  CHEM136))

Prerequisites for optional courses are:

• GEOL435 Environmental Geochemistry: MATH115; and (GEOL100 or
  GEOL120); and (GEOL436 or GEOL444). And CHEM131 and CHEM132; or
  (CHEM135 and CHEM136)
• GEOL 436 Biogeochemistry MATH140 or MATH220; and (GEOL100 or
  GEOL120); and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and
• GEOL 443 Petrology: GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103. And must have completed or be concurrently enrolled in GEOL423; and (GEOL100 or GEOL120); and GEOL110
• GEOL 444 Low-Temperature Geochemistry: (GEOL322, GEOL100, and MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and CHEM136)
• GEOL 445 High-Temperature Geochemistry: (GEOL322, GEOL100, and MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and CHEM136)
• GEOL 471 Geochemical Methods of Analysis: CHEM131 and CHEM132; or (CHEM135 and CHEM136)
• GEOL499 Special Problems in Geology: GEOL100 or GEOL120, GEOL110, GEOL102, or equivalent; and permission of department.

Of these, only the following elective courses have supporting prerequisites not already required for the minor, that go beyond those for required courses:
• GEOL 436 Biogeochemistry MATH140 or MATH220
• GEOL 443 Petrology: GEOL423 (Optical Mineralogy)
  • GEOL499 Special Problems in Geology: GEOL102 – Historical Geology, or equivalent; and permission of department.

6. Anticipated enrollment:

On the basis of enrollment of non-majors in the geology courses listed above, and conversations with interested students, we estimate approximately 5 - 10 students are likely to be Geochemistry minors on an ongoing basis, if this option were available to undergraduates. For comparison, Geology currently has roughly 42 undergraduate majors, plus 14 students currently declared in all of its current minors.