

M O N T A N A B O A R D O F R E G E N T S

LEVEL II REQUEST FORM

Item No.:	138-1001-R0108	Date of Meeting:	January 10-11, 2008
Institution:	The University of Montana		
Program Title:	B.S. in Geoscience		

Level II proposals require approval by the Board of Regents.

Level II action requested (check all that apply): Level II proposals entail substantive additions to, alterations in, or termination of programs, structures, or administrative or academic entities typically characterized by the (a) addition, reassignment, or elimination of personnel, facilities, or courses of instruction; (b) rearrangement of budgets, cost centers, funding sources; and (c) changes which by implication could impact other campuses within the Montana University System and community colleges. Board policy 303.1 indicates the curricular proposals in this category:

- 1. Change names of degrees (e.g. from B.A. to B.F.A.)
- 2. Implement a new minor or certificate where there is no major or no option in a major;
- 3. Establish new degrees and add majors to existing degrees;
- 4. Expand/extend approved mission; and
- 5. Any other changes in governance and organization as described in Board of Regents' Policy 218, such as formation, elimination or consolidation of a college, division, school, department, institute, bureau, center, station, laboratory, or similar unit.

Specify Request:

The University of Montana – Missoula requests permission to establish a Bachelor's degree in Geosciences with suggested courses of study in 1) Earth History, Evolution, and Resources and 2) Water, Climate, and Environment. Currently offered B.S. options in Geology, Environmental Geology, and General Geology will be eliminated.

Overview: The Department of Geosciences at The University of Montana-Missoula has enjoyed a major diversification of its research and curricular offerings over the past five years, as a result of five new tenure-track hires and shifts in the research focus of some tenured faculty. Since its establishment in the late nineteenth century, the department has focused on research and curricular offerings in the field of traditional geology, including the nature of earth materials, evolution and fossils, Earth history over geologic timeframes, and the identification and assessment of economically important geologic resources. More recently, we have expanded our mission to include a major emphasis on water, climate change, and environmental issues associated with anthropogenic activities. To reflect these research and curricular changes, in 2005 we changed our name from the Department of Geology to the Department of Geosciences. In this request, we seek permission to establish a B.S. degree in Geosciences that will more accurately reflect the broadening of the department's mission while providing students with a curriculum designed to provide a solid foundation in two different courses of study: 1) Earth History, Evolution, and Resources; and 2) Water, Climate, and Environment.

Need: Geoscience is the analysis of phenomena that shape the Earth at different time and length scales. Relevant topics include geologic processes associated with evolution of the continents, ocean basins, atmosphere and biosphere; surficial processes that shape landscapes; the search for economic geologic deposits; the analysis of global and local climate change; and the study of pollutants and their interaction with the environment. Inherent in the field of Geoscience is analysis of the Earth's systems. That is, the solid Earth (the geosphere) and its evolution through time is inextricably linked to the evolution of the atmosphere, hydrosphere (oceans, surface and groundwater systems), and biosphere. The recognition that direct interactions and complex feedbacks exist among these different components of Earth's systems and that these interactions exert primary controls on Earth's evolution at different time and length scales has resulted in a more interdisciplinary approach within the Geosciences. Not only are geoscientists charged with exploring for geologic resources (oil, gas, water) and investigating the history of the Earth and its life forms through geologic time, but geoscientists also now are heavily involved with the analysis of landscape change over historic timeframes (years to centuries), the analysis and mitigation of anthropogenic pollutants, and the study of recent and ongoing climate change. In short, the traditional geological sciences have undergone a significant expansion in scope over the past decade or so.

The Department of Geosciences at The University of Montana-Missoula has adapted itself to keep pace with this expansion of the Geosciences by hiring five new tenure-track faculty with areas of expertise that include foci both in the more traditional 'deep time' areas of the Geosciences in addition to newer areas of focus on landscape evolution and climate change over short time-frames, river science, and water resources. To best position our undergraduate students for eventual employment in the Geoscience workforce, it is appropriate that we revise our undergraduate degree program accordingly. To that end, we propose the requested changes in our undergraduate degree titles and modifications in required coursework.

Institutional and System Fit: As reflected by the official adoption in 1865 of Montana's state seal and motto ('oro y plata', trans. 'gold and silver') the state has maintained an exceptionally close tie to the land and its resources. This close tie to the study of the Earth has been a central part of the university system since the awarding of its very first degree – a M.S. degree in Geology to Earle Douglass, discoverer of the famous Dinosaur National Monument locality. Since its founding in 1893, The University of Montana-Missoula has maintained a strong Geology/Geoscience program that has been at the forefront of understanding the Earth and its history – both ancient and recent, identifying economic geologic resources (petroleum, gas, coal, water), and analyzing the relatively recent effects of anthropogenic change on the environment. Importantly, as the geological sciences have evolved, the Department of

Geology/Geosciences has adapted to maintain its strong position as an active research department with a strong undergraduate and graduate program.

The proposed B.S. degree in Geosciences serves to advance directly several of the strategic goals of the institution. As articulated in the Core Values Statement for The University of Montana, the University seeks to engage in “Basic and applied research that contributes to knowledge and meets the needs of the State, region, nation, and world” and “involve all upper division undergraduates in research and creative activities by 2011.” The proposed undergraduate degree changes in the Geosciences will serve these goals by engaging students and faculty in research and classroom activities that focus on environmentally important issues, including the study of climate change, landscape evolution, riverine sciences, water resources, and analysis of anthropogenic pollutants and their mitigation, while at the same time maintaining a grounding in the fundamentals of the Geosciences field. Each of these topics now constitutes a significant portion of the undergraduate curriculum in the Department of Geosciences and the proposed degree changes will directly reflect the importance of these new areas of programmatic focus.

Degree Requirements:

BS in Geosciences

Required core courses:

GEOS 100	2 cr.	General Geology
GEOS 101	1 cr.	General Geology Laboratory
GEOS 200	3 cr.	Earth History & Evolution
GEOS 226	4 cr.	Earth Materials
GEOS 230	4 cr.	Field Methods & Interpretation

Also required are six additional 3 or 4 credit Geoscience courses, relevant to the student's interests, at the 300 or 400 level. The tables below suggest some courses to choose among depending student career interests. Courses may be combined from the two advising tracks, or chosen from other electives, but students should be aware of all prerequisites as listed in this catalog.

Course of study #1: Earth History, Evolution, and Resources

GEOS 306	4 cr.	Igneous & Metamorphic Petrology
GEOS 310	3 cr.	Invertebrate Paleontology
GEOS 311	3 cr.	Paleobiology
GEOS 327	4 cr.	Geochemistry
GEOS 330	3 cr.	Structural Geology
GEOS 429	6 cr.	Field Geology
GEOS 430	3 cr.	Global Tectonics
GEOS 432	4 cr.	Architecture of Sedimentary Deposits
GEOS 433	4 cr.	Sedimentary Petrology
GEOS 437	4 cr.	Seismology and Magnetism
GEOS 438	4 cr.	Gravity and Electromagnetics
GEOS 460	4 cr.	Process Geomorphology

Course of study #2: Water, Climate, and Environment

GEOS 320	3 cr.	Global Water
GEOS 327	4 cr.	Geochemistry
GEOS 330	3 cr.	Structural Geology
GEOS 382	3 cr.	Global Change
GEOS 395	3 cr.	Glacial and Alpine Processes
GEOS 432	4 cr.	Architecture of Sedimentary Deposits
GEOS 433	4 cr.	Sedimentary Petrology
GEOS 437	4 cr.	Seismology & Magnetism
GEOS 438	4 cr.	Gravity and Electromagnetics
GEOS 460	4 cr.	Process Geomorphology
GEOS 480	4 cr.	Hydrogeology

Thus, there are at least 32 credits required from Geosciences courses, 18-24 of those are upper division (numbered 300 or 400) credits.

Cognate sciences (at least 30 credits are required)

Required cognate science courses:

Physics 121 and 122 or 221 and 222 (10 credits)

Chemistry 151 and 152/154 or 161 and 162 (8 or 10 credits, respectively)

Math 150 and 158 or 152 and 153 (7 or 8 credits, respectively)

Three credits in Computer Science (modeling or programming), or GIS, or Statistics.

Additional cognate science courses must be completed such that the sum is a minimum of 30 credits. These may include additional courses in Chemistry, Computer Science, Math, and Physics above the listed minimum levels specified above. Biology 100 or above is also appropriate, but substitutions of other science courses must be approved by the student's Geoscience Department advisor.

Assessment: We propose to use a variety of means of assessing our undergraduate degree program from both formative and summative standpoints. Formative and summative assessments used to shape the program as it evolves include **1)** direct tracking of scholastic records of degree-seeking students; student persistence in the degree program from year-to-year; and student degree completion rates; **2)** Use of scaled survey and free-response questionnaires given to students at the completion of each Geoscience course. These surveys will be geared towards assessing student perceptions of the degree impact on their Geoscience skills, in addition to gaining feedback regarding the success of teaching effectiveness, laboratory design, pertinence and impact of assigned reading, etc.; and **3)** and faculty interviews with students following course completion to gauge effectiveness of instruction.

Summative evaluation of the entire degree program will take place every seven years in conjunction with mandatory departmental review and will include at a minimum: **1)** incorporation of all student-based formative evaluation data described above; **2)** interviews with faculty and senior undergraduate students to gauge curricular effectiveness; and **3)** deployment of a scaled survey for degree graduates to be issued upon degree completion and one year following degree completion. The main objective of these follow-up surveys will be to assess the actual professional benefits of each degree program.

Process leading to submission: The proposed undergraduate B.S. degrees described in this application were initially discussed by the Geoscience faculty during the 2005-06 academic year and beginning of the 2006-07 academic year as part of our internal review process. On November 16, 2006, the UM-M faculty voted unanimously to support the replacement of existing degrees with those proposed herein.

This proposal was reviewed and approved by the affected departments as follows:

Department Name: **Geosciences** Date: **Fall 2006**

In addition the deans of the following Schools/Colleges reviewed and approved the proposal:

Dean of: **Arts & Sciences** Date: **October 1, 2007**

The proposal was reviewed and approved by the Faculty Senate at the University of Montana Date: **December 2007**

[No outside consultants were employed for the development of this proposal.]