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.:	**144-1002-R0709**	**Date of Meeting:**	**July 9-10, 2009**
Institution:	**The University of Montana—Missoula**		
Program Title:	**Establish B.S. in Geography**		

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 of Science degree in Geography, and to move an existing option in Physical Geography from the B.A. to the proposed B.S.

Proposal

1. Overview

The University of Montana – Missoula seeks to add a Bachelor of Science (B.S.) in Geography. Geography is often called a "synthetic" or "bridging" discipline because of the way it integrates both physical and social sciences. At The University of Montana, the Geography Department has traditionally had representation on both the Science and Social Science General Education Subcommittees. Most Geography Departments offer both B.A. and B.S. degrees. Regionally, the University of Oregon, University of Wyoming, and University of Utah provide this choice for their students. Appendix A lists the degree programs offered by other regional universities. Although the Geography Department at The University of Montana currently only offers a B.A. degree, it has a curriculum that is as diverse and broad within the physical and information technologies as these other universities, and which should allow students a broad range of professional choices upon completion. This proposal will remedy this discrepancy between U.M. and other Universities in the region by creating a B.S. degree to complement our existing B.A. It will also move the option in Physical Geography to the B.S. from the B.A. This will better serve our existing students with interests in science, technology, and planning, broaden the appeal of Geography to a wider range of students, increase the attractiveness of the existing Physical Geography option, and uphold a "contractual agreement" between the Geography Department and the U.M. Administration to create a B.S. degree.

2. Need

a. Specific Needs.

In response to a departmental review in 2005 and rapid growth in student enrollment over the last decade, the Geography Department has undertaken a restructuring of its undergraduate programs. This proposal is to create a Bachelor of Science (B.S.) Degree in Geography. This B.S. degree would allow our students with interests in Physical Geography, Geographic Information Systems (GIS), and Planning to elect to pursue a more appropriate degree for their professional goals. Also, this proposal will move an existing option in Physical Geography from the B.A. to the proposed B.S. It is envisioned that this new degree and modified option will strengthen the undergraduate program in Geography and the existing option.

The Department of Geography has more than doubled the enrollment in undergraduate programs over the last decade and supported a variety of options within the B.A. program (Appendix B). However, technology has also changed dramatically over that period and fully one-third of our graduates each year are enrolled in the Cartography and GIS Option. In 2007, in response to conversations with local and state employers, the Department of Geography and the College of Forestry implemented a new Undergraduate Certificate in Geographic Information and Technologies that is designed to accompany any undergraduate major on campus without requiring the student to major in Geography. Although this Certificate also serves Geography majors and is replacing our Cartography and GIS Option, we still have a substantial number of majors who are concentrating in the science and technology aspects of the field and would be better served by a B.S. degree than a B.A. when they go into the work force.

In addition, the Geography Department began offering the Option in Physical Geography in 1999, and it has had a small but increasing enrollment (from 1 in 2002 to 5 in 2007) which corresponds to the hiring of two physical geography professors since 2003 (Appendix B). However, each year there have been students that have indicated to faculty that they perceive the lack of a B.S. degree associated with the physical geography track as a significant problem, but that they did not have time in their schedules to complete all of the requirements. (It was the only Option that required a Senior Thesis, additional mathematical courses, and two years of additional science courses.) For these students looking at future employment in applied and technical fields, a B.S. degree is typically the standard credential. For instance, the U.S. Forest Service often requires, or preferentially hires, a B.S. or M.S. instead of a B.A. or M.A. The time constraints have led to the situation in which students who have been enrolled in the

Physical Geography option but do not fulfill the requirements by the time they have obtained adequate credits to graduate to select a different option or degree. During the Geography Department Assessment in 2005, the issues associated with the Physical Geography option were discussed and the disparity between the existing rigorous curriculum requirements and resulting B.A. degree was identified as problematic. The existing curriculum is not in line with those of other options in Geography, with the programs of other Geography departments in the U.S., nor with requirements in other B.S. degree programs at The University of Montana (Appendix C). The addition of a well-designed B.S. degree will provide more options to students interested in the physical and technical aspects of Geography and provide graduates with the appropriate credentials for employment with public and private enterprises in the state and region.

Students interested in planning can follow the Planning Option in the B.A. program, but for those interested in environmental planning and hydrology, for instance, a B.A. does not offer the opportunities for advancement that a B.S. would. The B.S. degree would allow these students to customize their program to include planning courses, but also integrate science-based training in physics and hydrology courses to better prepare for their career goals.

b. How will students and other constituencies be served?

The B.S. will allow students increased professional opportunities in areas that require emphasis in science and technology. Those students interested in double-majoring or moving from other science majors will find it easier to integrate their prior coursework into the revised curriculum, and allow timely completion of their undergraduate program of study.

Although our students are successful in finding employment within the field, some have reported that additional opportunities would be available if they had a “science” degree. Creation of a B.S. will help these students gain appropriate recognition for the science-rich course loads they have completed and assist with attainment of reasonable employment with a variety of agencies and firms.

c. Anticipated demand.

The graph in Appendix B indicates an increasing demand for majoring in geography. There has been a steady, consistent desire expressed by undergraduates focusing on cartography and GIS each year for a B.S. degree. Additionally, each year students have specifically requested that the Physical Geography Option to be made more flexible and less cumbersome in terms of credit hours and the requirement for a senior thesis. This change would also make our program more attractive to existing and prospective students and also to prospective faculty. Each of the last 3 hires in the department have expressed concern about the lack of a B.S. program in Geography. While many of these students would come from the existing B.A. program, we anticipate attracting additional students as freshmen.

3. Institutional and System Fit

a. Connection between existing and proposed programs.

There are no specific guidelines at U.M. as to what criteria should distinguish a B.A. from a B.S. For instance, Forestry has B.S. degrees in Wild Land Restoration, Recreation Management, Resource Conservation, and Wildlife Biology. U.M. also offers B.S. degrees in Business Administration, Chemistry, Computer Science, Health and Human Performance, Medical Technology, and Microbiology. However, Math and Physics offer B.A. degrees. Therefore, we examined existing programs within the University and developed similar requirements. Appendix B lists math, science, and writing courses required by several similar degrees at U.M.

Geography has interactions with a wide range of departments from all across campus. Presumably the proposed B.S. will have small impacts on those departments with which we have “shared” students in the past. Appendix D shows a graph of the second majors taken by students with a primary major in Geography over the past five years. Fourteen different majors were taken by 25 students with the most

being eight students in Environmental Studies, three in Anthropology, and two each in Business Administration and Forestry. These departments offer a combination of B.A. and B.S. degrees and we do not anticipate that the addition of a B.S. degree to Geography's curriculum will cause large numbers of students to switch majors from any of these departments. Indeed, the implementation of the Undergraduate Certificate in Geographic Information Sciences and Technologies makes it much easier for students to add technical skills without having to minor or major in Geography.

b. Will approval of the proposed program require changes to any existing programs at the institution?

There will be no changes to existing programs aside from the creation of the B.S. program and minor changes to course requirements in the Physical Geography option. Although the curriculum requires coursework from other departments, this has been the case already with the Physical Geography option. We do not expect the impact to be large on any department due to the flexibility of the courses that can be chosen.

c. Describe what differentiates this program from other, closely related programs at the institution.

An undergraduate B.S. in Geography reflects the synthetic nature of geography as a discipline at the core of integrative Earth Science. It emphasizes that the student is well trained with scientific skills in addition to the breadth considered the hallmark of a Geographer. The option in Physical Geography allows students to focus their studies and research in the traditional core areas of biogeography, climatology, and geomorphology, although this has broadened to include cold climate processes, hydrology, and many of the facets of human-environment interaction that are considered classic problems in Geography. Some of the options in the Geosciences Department's undergraduate offerings are somewhat similar, but these have existed harmoniously for many years with the existing option in Physical Geography, and this proposal is not anticipated to affect that program.

d. How does the proposed program serve to advance the strategic goals of the institution?

The University of Montana has long sought to support educational experiences that are international and interdisciplinary. Geography naturally satisfies these goals by looking at problems in an international, comparative context and by integrating knowledge from multiple disciplines in earth science and technology. This degree will allow those students with an interest in the technology, quantitative techniques, and physical sciences to have increased opportunities within the major. Another goal of the University is to identify and support new academic programs. While this degree in not an entirely new program, it diversifies the Geography major that increased dramatically in enrollment over the last 5 years. Additionally, much of the increase in the major has been due to the use of Geospatial Technologies in many, many industries and agencies. This proposal will serve as another choice for students who are particularly interested in the technical side of these fields.

e. Describe the relationship between the proposed program and any similar programs within the Montana University System.

Geography is similar to many other departments because of the breadth of the discipline. Individual geographers may be similar in their research interests to others in departments ranging from Anthropology to Zoology but the geographical perspective, emphasis on place and scale, and integrative nature of inquiry makes the discipline unique. Geography tends to be housed and co-exist harmoniously with a wide range of other disciplines. The Department of Earth Sciences at Montana State University offers a B.S. degree with a concentration in Geography as well as 5 other concentrations in other allied areas (Appendix A). Examination of the course offerings in the Geography concentration show some overlap of basic introductory courses with those offered by the Department of Geography at the University of Montana. However, these similarities have existed for some time and no changes to the current undergraduate course offerings within the Department of Geography are proposed. Accordingly, there should be no impact on the existing programs at MSU. None of the other units of the Montana University

Systems have similar programs that might be affected. Clearly, there has been overlapping interests between some U.M. Geography faculty and some U.M. Geoscience faculty for some time, but students are easily able to take courses between the two departments and the proposed B.S. should not impact that relationship negatively.

4. Program details

The B.S. will require students to follow a similar curriculum to the B.A. but with the addition of requiring the Math track for the Symbolic Systems requirement, with Calculus encouraged. Students must also complete a two-course sequence in science (e.g., Chem 151 and 152). They must also either complete a Senior Thesis or an upper-level writing course focused on science so that students become familiar with the style of writing used in scientific discourse.

Students interested in the Physical Geography Option must fulfill the B.S. requirements and an additional 3 or more credits in a higher-level math course (Calculus or a senior-level statistics class), their two-course sequence must be in Biology, Chemistry, or Physics), and they must complete all three of the Physical Geography systematic courses (Geog 322, 324, and 426). These changes, from two-course science sequences and only two Physical Geography systematic courses, will increase flexibility and ensure the broad background assumed in a Geographer.

a. Detailed description of the proposed curriculum.

B.S. in GEOGRAPHY (General Geography without Option: minimum of 36 credits/ maximum of 60 credits)

The B.S. in Geography is designed to accommodate those students who are interested in pursuing more technical areas of study and work in the field of Geography, such as aspects of geospatial technologies, environmental planning, and physical geography. The curriculum for the Physical Geography option is similar to that of the general degree, but includes some additional course work in the sciences and directs several of the choices available within the Core requirements.

Geography students pursuing the B.S. in Geography MUST meet the symbolic systems requirement by taking Math 117 and Math 241, or just one of Math 150, 152, or 444. Regular calculus (Math 152) is strongly recommended.

In addition to completing the core requirements for ALL geography majors, students electing the B.S. option must complete 6-10 additional credits (a two-course sequence) of science coursework. The classes must be selected and approved by the student and advisor as appropriate to individual student goals (e.g., Biol 120 and 121).

In addition, those pursuing the B.S. must either select to complete a senior thesis OR complete an upper-level science-based writing class (e.g. Geog335, Geos320, Geos499, Bio 304, Bio306, etc.) [Students will be advised to see GenEd Requirements for a list of potential classes and consult an advisor to make sure they are science-based.]

B.S. in GEOGRAPHY with option in Physical Geography (minimum of 41 credits/ maximum of 60 credits)

Geography students pursuing the Physical Geography option must meet ALL of the requirements of the B.S. in Geography degree and complete the following additional courses (18-22 credits in option).

<u>Required Courses</u> (18-22 credits, 9-12 of which may overlap with B.S. requirements)*

Math-3-4	Math 151, 153, 444, or equivalent

An additional appropriate course must be taken to the complement the ones used to fulfill the symbolic systems requirement. For instance, if Math 152 meets the symbolic systems requirement, then Math 153 (the second semester of Calculus) would work to fulfill the Physical Geography Math course.

One of the following five science sequences must be used for the Geography B.S. science requirement (6-10 credits)

Chem 151-3 Gen. & Inorg. Chem
Chem 152-3 Org. & Biol. Chem.
(for those interested in bio but not doing any biochem)

Or

Chem 161-5 College Chemistry I
Chem 162-5 College Chem. II
(no organic; suitable for hard-rock process interests)

Phys 121-5 Fund. of Physics I
Phys 122-5 Fund. of Physics II
(for those interested in physics but not going into atm dynamics or hydrologic modeling)

Or

Phys 221-5 Physics w/ Calc
Phys 222-5 Physics w/ Calc II
(needed for interests in atm or hydrologic modeling)

Biol 120-3 General Botany
Biol 121-3 Introductory Ecology
(for those interested in ecological interactions)

Select three of the following courses (9 credits)

Geog 322N-3 Weather and Climate
Geog 324-3 Geomorphology
Geog 426N-3 Biogeography

Substitutions of other suitable courses from allied fields (e.g. Biology, Chemistry, Forestry, Geosciences, Physics, or Wildlife Biology) may be made with the approval of your advisor. Any substituted course must broaden the curriculum of study to include a range of sciences. Also, an additional science sequence from above may replace one of the 3 physical geography core courses.

*Note: The proposal was approved on campus prior to Common Course Numbering. Modifications to the course lists will be made in accordance with requirements of the CCN Transfer Policy.

b. Planned implementation.

The courses within the degree program and option are already offered at UM, and this proposal can be implemented without delay. Initially, the B.S. will attract students from the existing B.A. program, but as the program is more widely known it will be more attractive to students interested in double majors within the sciences and new students looking at a degree program that allows for a wide range of careers based in science and technology upon completion. Over the next few years it is estimated that average annual enrollment should grow to be a dozen within the B.S. general degree program, and a half dozen within the option.

5. Resources

a. Faculty resources.

Our current faculty resources are adequate as there are no changes to existing courses.

b. Other resources.

There are no additional space or curriculum needs.

6. Assessment

The Geography Department's 2007 assessment plan will be expanded to include measuring learning outcomes specific to the B.S. general degree and Physical Geography option, as are presently done for the other degrees and options. In addition, a variety of statistics are collected concerning changes in enrollments and matriculation for each program and this will include the new B.S. and Option once approved.

7. Process leading to submission

This proposal has been a goal of the department for more than 5 years. The original proposal for the Physical Geography Option was led by a Geography professor just before his retirement, and when enrollments did not prove to be as large as anticipated the Geography faculty determined that it was the added rigor of the curriculum requirements that discouraged students. This assessment was formalized in the 2005 Geography Department Assessment, and the recommendation was to develop a B.S. degree program and Physical Geography option such as is proposed here. This proposal was developed by a subcommittee over the last 2 years, and revised and approved by the Geography faculty. The Chair of Geography and the Dean of the College of Arts and Sciences then signed the documents necessary to submit the proposal to the Provost's Office and the Faculty Senate.

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

Department Name: Geography Date: 09/18/2008

Department Name: _____ Date: _____

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

Dean of: The College of Arts and Sciences Date: 09/23/2008

Dean of: Library Services Date: 10/01/2008

The proposal was reviewed and approved by the Faculty Senate at the University of Montana Date: January 2009

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

Appendix A.

Institution & Department	Undergrad Degrees and Difference Between Them	Options/Concentrations
U. of Idaho - Geography	BS in Geog	Physical, Global and Regional, GIS
U. of Wyoming - Geography	BA and BS in Geog. They require the same core courses.	Human, Physical, GIS, Natural Resource Management/Recreation, Planning. They also offer an interdisciplinary Earth System Science BS with concentration in Geography in cooperation with Anthro., Atm. Sci., Biol., Botany, Geology & Geophysics, Secondary Ed. and Soil Sci.
U. of Washington - Geography	BA	GIS, Economic, Urban Social & Political, Regional & International Dev, Society & Environment
Montana State U – Earth Science	BS in Earth Science	Geography, Geology, Geohydrology, Snow Science, Paleontology, GIS/Planning
Oregon State – Dept of Geosciences	BS's in Geology, Geography, and "Natural Resources and Earth Science"	None, but several minors
U of Oregon - Geography	BA and BS. BA requires a language and BS requires one of several math sequences. See quote below table from their catalog.**	Physical, Environmental, Culture Politics & Place, GIS, or Geog Ed
U of Utah - Geography	BA and BS. Following U policy, BA has language requirement and BS has a quantitative requirement.	Int Regional Geography, Urban & Economic, Environmental/Earth Sys Science, GIScience, Hazards & Emergency Management

****From U of Oregon. General Requirements for a Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) in Geography**

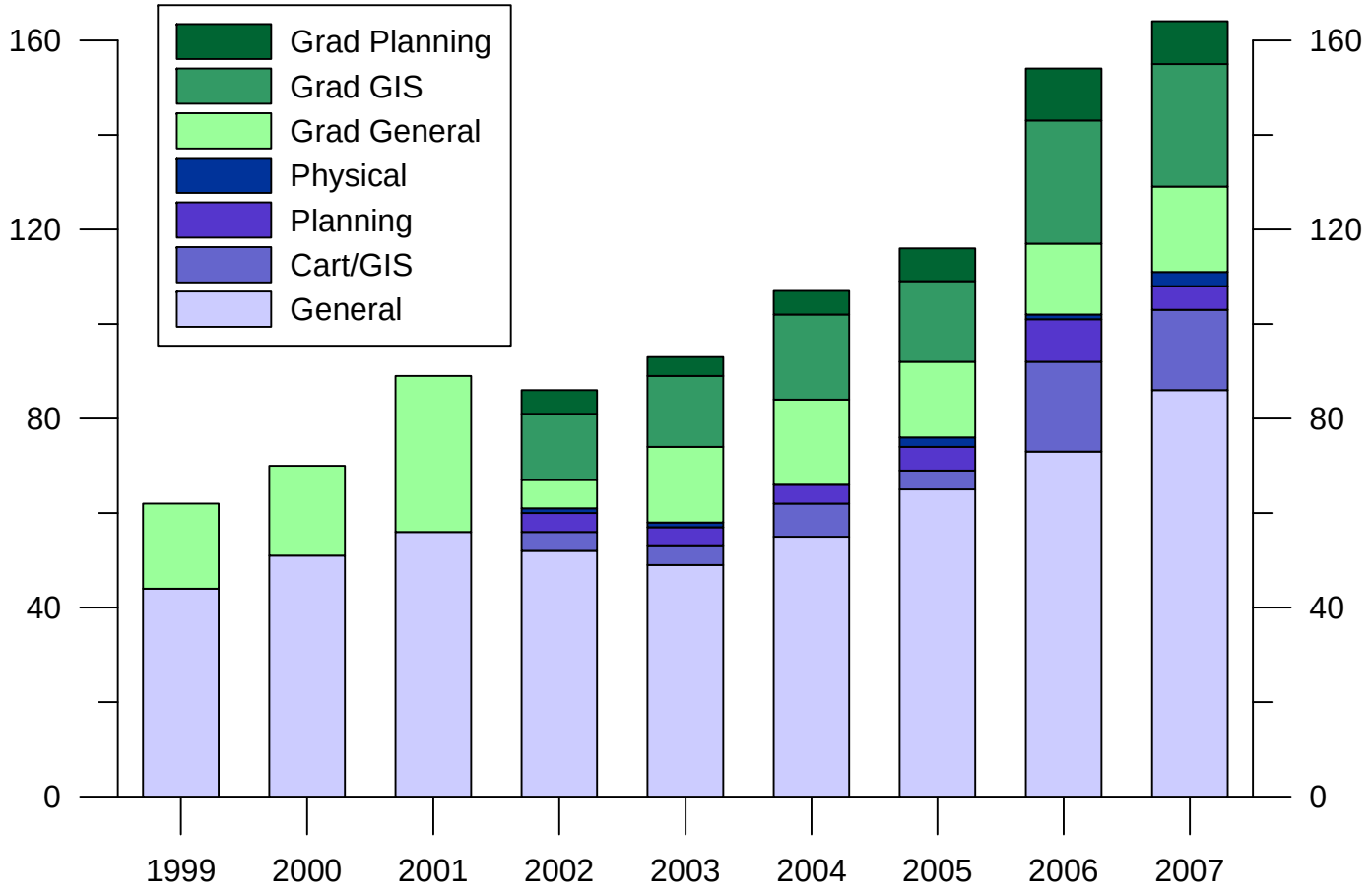
Bachelor of Science. All Geography majors seeking a B.S. degree will be required to complete any math sequence that satisfies the University's math requirement for a B.S. degree. Math classes must be passed with a grade of at least C- or P. For the ***Environmental Geography Track*** we recommend either a statistics sequence or a calculus sequence. For the ***Geographic Information Science Track***, we recommend a computer programming sequence. For students interested in the ***Physical Geography Track***, there are recommendations based on your more specific interests. For *geomorphology* we recommend a calculus emphasis; for *biogeography* we recommend a statistics emphasis; and for *climatology* we recommend a calculus or computer programming emphasis.

Bachelor of Arts. All Geography majors seeking a B.A. degree must demonstrate proficiency in a second language either by passing the third quarter of a second-year university language course with a grade of C- or better or by an examination indicating an equivalent level of proficiency.

If you are considering applying to graduate school in the future, we strongly recommended that you complete *both* the math and language requirements.

Appendix B.

Students Majors in the Department of Geography by Option



Numbers are spring enrollments. Option data not available before 2002. By graduation, more than half of students have an option. For instance, in 2007 1/3 of graduates were in the Cart/GIS Option and 10% were in planning.

Appendix C.

	Current Phys .Geog. B.A. option	Proposed General Geog. B.S.	Proposed B.S. w/ Phys. Geog. option	General Comp Sci. B.S.	B.S. in Resource Conservation w/ Land & People option	Interdisciplinary Geoscience B.S.
Math	Math 150, 444, or equivalent	Math 117 & 241, or just one of Math 150, 152, or 444. Math 152 is recommended.	Gen req. plus an additional course of Math 150, 153, 444, or equivalent.	Math 152–153, 221 OR 325, 225, and 341.	Math 121; Econ 111 &2; Stats: For 201, Math 241, Soc 202, OR Psych 220.	Math 121 or above.
Allied Sciences	Two 2-course sequences in Chem (151 & 2 or 161&2), Phys (121&2 or 221&1), OR Bio (120&121)	One 2-course sequence of natural science (e.g., Biol 120 & 121) approved by advisor.	One 2-course sequence of natural science which MUST be in Chem (151 & 2 or 161&2), Phys (121&2 or 221&1), OR Bio (120&121).	One of the sequences: Biol 108N-109N, 110N; Chem 161N, 162N; OR Phys 211N/213N & 212N/214N, AND 2 additional courses from a list.	Chem 151; Bio 121; CS 101 or 172;	Chem (151 & 2 or 161&2), One course in CS, GIS, or Stats, and 27 additional credits in Chem, Math, CS, Phys, Biol, or For
Within Dept. Sci. Courses	2 of Geog322, 324, or 426.	One of Geog322, 324, and 426 in addition to Geog385, 387/9	Geog322, 324, and 426 in addition to Geog385, 387/9	CS121, 131–2, 241-2, 281, 332, 344, 346, 365, 441-2, 488, & 9 more CS credits.	For200, 210, 230, 320, 330, 347, 360, 385 or 455, 422, 424, 480 etc.	Geos200, 226 & 230 and 13 more Geos credits at 200 or above.
Writing	Senior thesis	Senior thesis OR complete an upper-level natural science-based writing class.	Senior thesis OR complete an upper-level natural science-based writing class.	CS415E and For220, and either Comm111A or 242.	For220	An upper-level natural science-based writing class.

*Introductory 100-level courses within each department were not listed but complete titles of courses are on following page.

Assorted Course titles for Reference:

Geography
322N Weather and Climate
324 Geomorphology
426N Biogeography

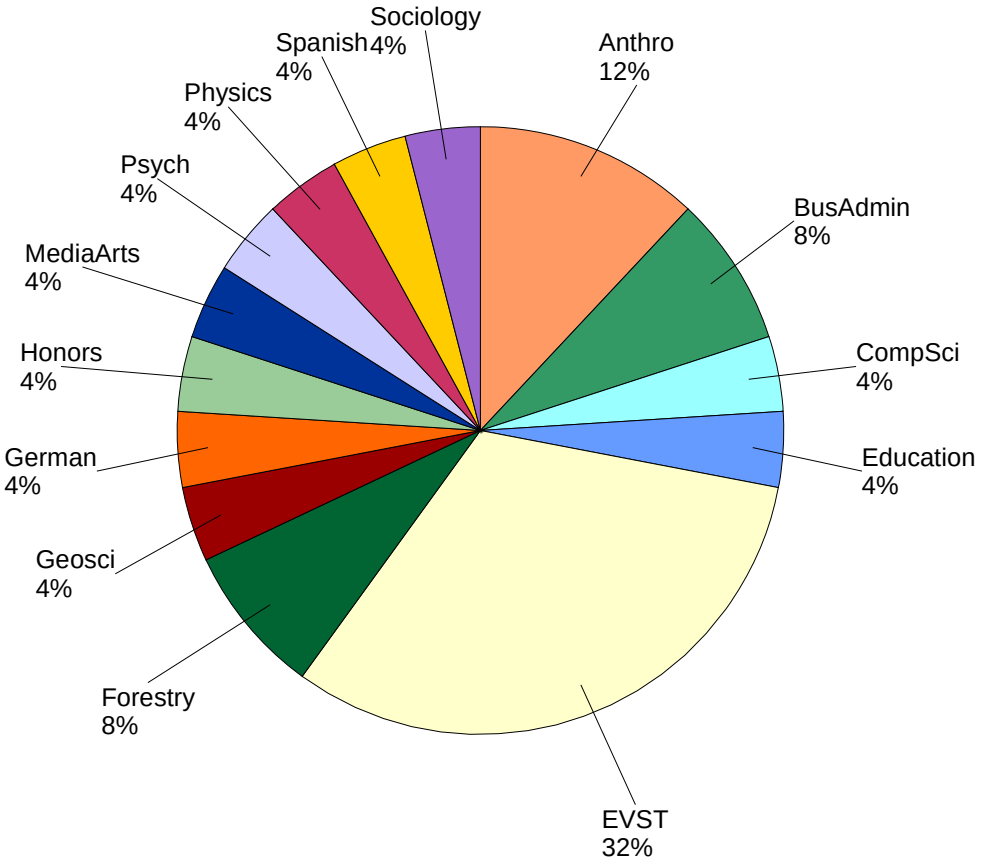
Mathematics
117 Probability and Linear Mathematics
121 Precalculus
150 Applied Calculus
152 Calculus I
153 Calculus II
221 Linear Algebra
225 Discrete Mathematics
241 Statistics
305 Introduction to Abstract Mathematics
325 Discrete Mathematics (cont of 225).
341 Introduction to Probability and Statistics (Prerec Calc)
441&2 Mathematical Statistics
444&5 Statistical Methods

Chemistry
151N General and Inorganic Chemistry
152N Organic and Biological Chemistry
161N College Chemistry
162N College Chemistry

Physics
121N Fundamentals of Physics
122N Fundamentals of Physics II
211N Fundamentals of Physics with Calculus I
212N Fundamentals of Physics with Calculus II

Appendix D.

Second Majors among Geography Majors



Data from 2004-2008 (n=25). Majors are listed in alphabetic order.