New Program Pre-proposal Committee
New Program Proposal Summary

Date: 08/08/2008

Department: Geological Sciences & Engineering

Proposed Program: Modifications to existing Major/Minor in Geophysics

Brief description of program:

We propose to streamline our course offerings and requirements for the existing major and minor in Geophysics. Specifics of the proposed new curriculum are attached. In summary the program proposal includes:

1) Creation of a new GPH course prefix identifier in the catalog.
2) Significant restructuring of the major degree requirements to streamline advising, courses offered and student ability to finish in a timely fashion.
3) Small changes to the degree minor requirements.
4) Creation of a new required course GPH 105, Introduction to Geophysics.
5) Modification of four existing courses from the current GEOL prefix to the GPH prefix.

Demonstrated need for program (academic, state, regional, national):

There is currently high demand for undergraduate geophysics majors nationwide due to the increased awareness of energy concerns and a sustained job market in exploration and natural hazards. Increased concern over a changing climate have heightened the visibility of studies of the Earth's cryosphere, ocean, atmospheres and interior. UNR has offered this program for several decades and currently our undergraduate enrollment is increasing after some years of low and fluctuating enrollments. Addition of a GPH prefix will demonstrate on the transcript that the student has completed a more rigorous degree program with coursework requiring significant mathematical abilities over the GEOL prefix. In establishing this new curriculum we have surveyed a number of approximately equivalent programs at western state universities where Geophysics as a degree or emphasis is offered within a Geology department. These included U. Arizona, Berkeley, U. of Colorado, U. Utah, and U. Texas-Austin. Our revised curriculum is more rigorous than most and capitalizes on our faculty strengths and current course offerings. Only Stanford and Colorado School of Mines have stronger requirements and both those schools have Geophysics as a stand-alone department. The addition of a GPH prefix will identify the major requirements as distinct from Geology, similar to the GE degree also offered through our department that has its own prefix and offers specialized engineering content or the ATMS prefix for the Atmospheric Sciences degree offered through the Physics department.
Describe how this program addresses needs identified in the university, college, and/or department strategic plans.

With the current search for a new director of the Nevada Seismological Lab we hope to raise the profile of NSL and geophysics research conducted at UNR both in the region and nation. Our revised curriculum fits both the Department and Mackay strategic plans and the department vision to become nationally and internationally recognized in geoscience research and education. Geophysics has a long history and takes advantage of Nevada’s place as the third most seismically active state. The revised program capitalizes on new strengths in remote sensing/geodesy/GIS (in collaboration with courses in Geography and faculty in NBMG), encourages cross-disciplinary study with courses in Physics and ATMS, and encourages synergy with Hydrogeology degrees also offered through DGSE. The revised program responds to criticisms of our programs from last years Departmental review committee by streamlining course offerings and presenting a clear curriculum focused on an essential knowledge base and preparation in undergraduate geophysics. The aim of the new program is to include both traditional exploration geophysics as typified by organizations such as the Society for Exploration Geophysics and offer emphasis lines coupled to future research careers and the sections of the American Geophysical Union.

Describe any resources needed to implement this program, including personnel, library holdings, facilities, or equipment.

The proposed changes should use existing resources more effectively. We already offer this BS degree and minor. We have 6 faculty in part-time teaching positions covering the required geophysics courses. We expect the GPH prefix coupled with a new introductory course will improve visibility and increase the number of majors. Streamlining major requirements will highlight those courses we consider to be truly important to the degree in geophysics, while reducing overall degree requirements and improving student elective options. The proposed program will simplify academic advising and improve FTE in required courses. There is only one new course to be developed.

Source of funds for these resources:

Faculty member Calvin has a 50% state funded position and the one new course will become part of her regular teaching load.

Date Reviewed by New Program Pre-proposal Committee: ______________

(Please try to limit your proposal to two pages.)

Please see the attached proposed curriculum – even though it is more than 2 pages our plan is well thought out and has the support of the Geophysics faculty. We are concurrently pursuing a faculty vote within DGSE and our Department C&C committee for the major/minor curriculum changes and modifications to the existing and new courses.
Bachelor of Science Geophysics Major  Proposed New Curriculum  25 Aug 2008

I. University Core Curriculum Requirements: (39-42 Credits)
   A. English (3-6 credits)
      Must complete ENG 102. Refer to the "English" section of the Core Curriculum chapter in this catalog. (3-6 credits)

   B. Mathematics (4 credits)
      MATH 181  Calculus I (4 credits)

   C. Natural Science (8 credits)
      PHYS 180 and PHYS 180L  Physics for Sci. & Eng. I (4 credits)
      PHYS 181 and PHYS 181L  Physics for Sci. & Eng. II (4 credits)

   D. Social Sciences (3 credits)
      Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog. (3 credits)

   E. Fine Arts (3 credits)
      Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. (3 credits)

   F. Core Humanities (9 credits)
      Must complete CH 201, CH 202, CH 203, refer to the Core Humanities section of the Core Curriculum chapter in this catalog (9 credits)

   G. Capstone Courses (6 credits)
      GPH (GEOL) 492 -- Applied Geophysics (4 credits) See degree requirements below (3 credits)
      Refer to the “Capstone” section of the Core Curriculum chapter of this catalog for a second capstone course outside the major. (3 credits)

   H. Diversity (3 credits)
      Refer to the "Diversity" section of the Core Curriculum chapter in this catalog. (3 credits)

II. Additional Requirements (0 credits)
   No additional requirements.

III. Major Requirements (65 credits)

A. Geophysics (16 credits)  (proposed course ID changes to GPH)
   GPH 105  Introduction to Geophysics (1 credit)  (new)
            (Co-Req with GEOL 101, geophysics and programming activities)
   GPH (GEOL) 333  Structure, Tectonics & Earth Phys II (4 credits) (Karlin)
   GPH (GEOL) 455  Geophysics and Geodynamics (4 credits) (Anderson/Calvin)
   GPH (GEOL) 492R  Applied Geophysics (4 credits) (Louie/Oppliger)
            (name change from Env. Expl. Geophys., change to Major Capstone)
   Summer Field Course or Research Experience (3 credits) - Options include a) GEOL 451, b) the Summer of Applied Geophysical Experience (SAGE) offered through Los Alamos Lab, c) a Geophysical Field Camp offered through another University, or d) GEOL 495 Special Problems taken with a Geophysics Faculty member. Advisor approval required.
B. Geological Sciences (12 credits)

GEOL 101 General Geology (3 credits) (GPH section and faculty)
GEOL 103 General Geology Laboratory (1 credit)
GEOL 211R Earth Materials and Geochemistry I (4 credits)
GEOL 332 Structure, Tectonics and Earth Physics I (4 credits)

C. Mathematics (17 credits)

MATH 182 Calculus II (4 credits)
MATH 283R Calculus III (4 credits)
MATH 285 Differential Equations (3 credits)
MATH 330 Linear Algebra (3 credits)
Mathematics elective (select one of the following)
   MATH 352 Probability & Statistics (3 credits)
   MATH 461 Probability Theory (3 credits)
   MATH 466 Numerical Methods I (3 credits)
   MATH 488 Partial Differential Equations (3 credits)
(Note - the addition of one more 300 or above level class will satisfy the Math minor.)

D. Physics (11 credits)

PHYS 182 and PHYS 182L Physics for Sci. & Eng. III (4 credits)
PHYS 301 Mathematical Methods for Physics (3 credits)
PHYS 473 Electricity and Magnetism (4 credits)
(Note - the addition of PHYS 323, PHYS 423, Intermed. & Adv Phys Lab - 3 credits total will satisfy the Physics minor.)

E. Technical electives (9 credits) -- Select among the following emphasis areas.

i. Hydrogeology
   CEE 241 / ME 241 Statics (3 credits)
   GEOL 414 Hydrologic Fluid Dynamics (3 credits)
   GE 484 Groundwater Hydrology (3 credits)
(With the addition of GEOL 202, 4 credits, this will satisfy the minor in Hydrogeology).

ii. Seismology/Geo-Engineering/Exploration
   GE 479 Earthquake Engineering (3 credits)
   GE 481 Introduction to Geomechanics (3 credits)
   GPH(GEOL ) 493 Mining Exploration Geophysics (4 credits)

iii. Oceans and Atmospheres
   GEOL 402 The Oceans (3 credits)
   ATMS 411 Introduction to Atmospheric Physics (3 credits)
   ATMS 414 Physical Climatology (3 credits)
(Note - the addition of ATMS 117 and ATMS 360 and one additional 400 level class, 9 credits total, will satisfy the minor in Atmospheric Sciences.)

iv. Remote Sensing/GIS/Geodesy
   GEOL 210 Measuring and Mapping the Earth (3 credits)
   GE 404 Intro to Aerospace Remote Sensing (3 credits)
   GEOG 405 GIS I (3 credits)
IV. MINOR REQUIREMENTS (0-8 credits)
There is no minor requirement. For students wishing to go into field geophysics, the energy or exploration industries the following courses are highly recommended and may be required for minors in Geology or Hydrogeology.

- GEOL 202  Earth Surface Processes and Deposits I (4 credits)
- GEOL 203R  Earth Surface Processes and Deposits II (4 credits)

Other minors that are highly complementary to the Geophysics degree include Physics, Mathematics, Atmospheric Sciences and Engineering programs.

V. ELECTIVES (13-24 credits)
Students are strongly encouraged to take courses in related fields of interest.

VI. TOTAL CREDITS (minimum 128 credits)
Forty or more credits must be in courses numbered 300 or above.

VII. RECOMMENDED SCHEDULE
First Year--Fall Semester
- GEOL 101--General Geology (3 credits)
- GEOL 103--General Geology Laboratory (1 credit)
- GPH 105 -- Introduction to Geophysics (1 credit)
- ENG 101--Composition I (3 credits)
- MATH 181--Calculus I (4 credits)
- Core Humanities – Social Science or Fine Arts (3 credits)
- TOTAL (15 credits)

First Year--Spring Semester
- ENG 102--Composition II (3 credits)
- MATH 182--Calculus II (4 credits)
- PHYS 180--Physics for Scientists and Engineers I (4 credits)
- PHYS 180L--Physics for Scientists and Engineers Lab I (1 credit)
- Core Humanities – Social Science or Fine Arts (3 credits)
- TOTAL (15 credits)

Second Year--Fall Semester
- GEOL 202 – or Minor Elective or General Elective (4 credits)
- GEOL 211R --Earth Materials and Geochemistry I (4 credits)
- MATH 283R --Calculus III (4 credits)
- PHYS 181--Physics for Scientists and Engineers II (3 credits)
- PHYS 181L--Physics for Scientists and Engineers Lab II (1 credit)
- TOTAL (16 credits)

Second Year--Spring Semester
- GEOL 203R – or Minor Elective or General Elective (4 credits)
- PHYS 182--Physics for Scientists and Engineers III (3 credits)
- PHYS 182L--Physics for Scientists and Engineers Lab III (1 credit)
MATH 285 -- Differential Equations (3 credits)
CH 201 -- Ancient and Medieval Cultures (3 credits)
General elective (3 credits)
TOTAL (17 credits)

Third Year-- Fall Semester
GEOL 332 -- Structure, Tectonics and Earth Physics I (4 credits)
PHYS 301 -- Mathematical Methods for Physics (3 credits)
CH 202 -- The Modern World (3 credits)
MATH 330 -- Linear Algebra (3 credits)
General elective (3 credits)
TOTAL (16 credits)

Third Year-- Spring Semester
GPH 333 -- Structure, Tectonics and Earth Physics II (4 credits)
PHYS 473 -- Electricity and Magnetism (4 credits)
CH 203 -- American Experience and Constitutional Change (3 credits)
Technical elective (3 credits)
Math elective (3 credits)
TOTAL (17 credits)

Third Year-- Summer Semester
GEOL 451 -- Summer Field Geology (3 credits) OR
GEOL 495 -- Special Problems (3 credits) OR
GEOL 497 -- Senior Research Project (3 credits) OR
Approved summer geophysical field experience
TOTAL (3 credits)

Fourth Year-- Fall Semester
GPH 455 -- Geophysics and Geodynamics (4 credits)
Core Curriculum Diversity course (3 credits)
General electives (6 credits)
Technical elective (3 credits)
TOTAL (16 credits)

Fourth Year-- Spring Semester
GPH 492R -- Applied Geophysics (4 credits) (Major Capstone)
Core Curriculum Capstone course (3 credits)
General electives (3 credits)
Technical elective (3 credits)
TOTAL (13 credits)
Minor in Geophysics (proposed mods)
The following courses are recommended for students seeking a degree with a minor in geophysics. These students must select a minor-program advisor in the department of Geological Sciences and Engineering, and must have their program approved.

GEOL 101 -- General Geology (preferred) (3 credits) OR
GEOL 100 -- Earthquakes, Volcanoes and Natural Disasters (may be substituted if already taken prior to deciding on the minor) (3 credits)
GPH 105 -- Introduction to Geophysics (1 credit)
GEOL 332 -- Structure, Tectonics & Earth Phys I (4 credits)
GPH 333 -- Structure, Tectonics & Earth Phys II (4 credits)
GPH (GEOL) 455 -- Geophysics and Geodynamics (4 credits)
GPH (GEOL) 492R -- Applied Geophysics (4 credits)
TOTAL (20 credits)

Proposed New Courses – Phase 2 Development
GPH 2xx Shape, Gravity Field & Rotation of the Earth (3 credits) (Plag)
GPH 4xx/6xx Geophysical Geodesy (3 credits) (Hammond/Kreemer)
GPH 4xx/6xx 3D Seismic Stratigraphy (Louie)
GPH 4xx Applied Geophysics Summer Field Camp (3 credits) (Louie/Plag)