7 January 2022

TO: Faculty Senate

FROM: Sarah Read, Chair, Graduate Council

RE: Professional Science Master in Applied Geoscience

The following proposal has been approved by the Graduate Council and is recommended for approval by the Faculty Senate.

You may read the full text of the program proposal, as well as Budget Committee comments, at the Online Curriculum Management System (OCMS) Dashboard.

PROPOSAL SUMMARY FOR
College of Liberal Arts and Sciences
Professional Science Master in Applied Geoscience

Effective Term
Fall 2022

Overview of the Program

The Professional Science Master (PSM) in Applied Geoscience provides practicing geologists and post-baccalaureate students an opportunity to upgrade their geoscience credentials in an accessible way, to obtain skills relevant to professional geologists. This degree includes two common core courses, G 561 Research Methods – Writing, and G 523 Data Analysis. The coursework foundation of the Professional Master's degree centers on the completion of two Geology Certificate options in (1) Engineering Geology, (2) Environmental Geology and (3) Hydrogeology. We plan to give credit for optional internships and/or research projects with county, state and federal agencies, and private geologic consulting firms when possible, though the primary degree path requires only coursework. The proposed certificate-based framework provides formal recognition of work completed even if a student does not complete degree requirements. A professional development component of this degree requires students complete four credits of courses outside the department, from the Environmental Science and Management (ESM), Geography (Geog), Engineering Technology Management (ETM), or Public Administration (PA) Departments. This proposed degree will draw on classes from multiple departments/colleges, including ESM and Department of Geography within CLAS, as well as the Department of Civil and Environmental Engineering (CEE).

Disciplinary foundations and connections of this program are established in part through an advisory board of Geology professionals from private firms, state and federal agencies that have provided us with valuable input on updates to the Geology Certificates. We have met with an advisory board of practicing professionals regarding the certificates and the proposed program, and have solicited responses to a questionnaire from a variety of firms and outside organizations that can serve as partners for internships and projects.

Evidence of Need

The proposed Professional Science Master of Applied Geoscience is related to the approved MS in Geology and is based on three approved certificates in Geology (Engineering Geology, Environmental Geology, and Hydrogeology). The new program expands on the existing MS and certificates by including professional development courses focused on management and communication offered by other departmental units and by an experiential internship component with outside business and government partners. Although all coursework required for the degree is based on existing courses at PSU, the new degree is aimed more at enhancing the marketability of geoscientists who are either practicing in the field already or who are interested in doing so.

A market analysis was performed for Portland State, performed by Burning Glass Technologies in 2020 and updated in 2021. The updated analysis is available in the full program proposal. Also considered are data from the Bureau of Labor Statistics on Geoscience jobs throughout the country, as recently summarized by the American Geosciences Institute Workforce Report (2018).

The market analysis shows that in the Portland metro area (Portland, Hillsboro, Vancouver), 56 job postings in the selected program of study were made between 4/1/2020 and 3/31/2021. This compares to 29 MS degrees conferred in 2019 for the top four regional institutions, including 6 degrees conferred from PSU. This indicates current job demand in the program of study is twice as large as the number of MS graduates overall, and eight times larger than the number of MS graduates from PSU. The jobs are being filled by students mostly with BS degrees (58%) and MS degrees (30%), and most job postings advertised 0-2 years of required job experience. This suggests that BS graduate or post-baccalaureate students with extra skill sets and internships obtained in the proposed PSM could be very competitive in the regional job market.

The median salary in the postings is $83K, relative to an average living wage in the area of $32K. This indicates good-wage jobs in this discipline.

Beyond the local region, the analysis also indicates much larger demand for similar geoscience jobs in California (#1 in the nation for posting demand) and Texas (#2 in the nation). More generally, the Bureau of Labor Statistics (BLS) expects the number of geoscience full-time equivalents (FTE) to increase by 11% between 2016-2026. Based on retirements and current graduation rates alone, they expect a deficit of ~118,000 geoscience FTEs nationwide by 2026. According to the most recent American Geosciences Institute (AGI) Workforce Report (2018), hiring rates of geoscience master's students in the public sector (both state and federal) and in the environmental services industry have been growing nationwide.

Course of Study

Pre-requisites

- BA or BS in Geology or Earth Science

OR

- BA or BS in a physical science (e.g. Chemistry, Physics) with 5 years of experience in geoscience related industry. Taking G 434 Structure AND G 318 Surface Processes OR G 435 Sedimentology and Stratigraphy may substitute for industry experience.

Curriculum Requirements (**48 Total Credits**)

1. CORE SKILLS: these courses should be completed as a requirement within the Certificates, below.
    a. G 651 Scientific Writing (Research Methods II)
    b. G 523 Data Analysis (Research Methods III)
2. TWO CERTIFICATES FROM THE FOLLOWING LIST (**36 elective credits**) **see certificates for details.*
    a. Engineering Geology
    b. Environmental Geology
    c. Hydrogeology
3. PROFESSIONAL DEVELOPMENT **(total 4 credits)**

- ESM 551 Project Management for Scientists (4)
- ESM 555 Science Communication (1)
- ESM 556 Advanced Science Communication Skills (1)
- ESM 557 Science, Media and the Public: Working with the Media to Create Effective Scientific
- Messages (1)
- ETM 522 Communication and Team Building (4)
- ETM 545 Project Management (4)
- PA 555 Program Evaluation and Management (3)
- PA 564 Environmental Policy and Administration (3)
- PA 565 Natural Resource Policy and Administration (3)
- PA 566 Water Resources Policy and Administration (3)
- PA 567 Energy Resources Policy and Administration (3)
- ESM 517 Applied Watershed Restoration (4)
- ESM 534 Business Environmental Management Economics (4)
- ESM 535 Natural Resource Policy and Management (4)
- ESM 553 Environmental Regulation and Non-regulatory approaches (3)
- ESM 587 Environmental Justice (4)
- ESM 588 Environmental Sustainability (4)
- ESM 593 Advanced Environmental Science Lab (2)
- Geog 512 Global Climate Change Science and Socio-environmental Impact Assessment (4)

- Geog 513 Disturbance Biogeography of Pacific Northwest (4)
- Geog 540/ESM 540 The Ecology and Management of Wildfire (4)
- Geog 545 Resource Management Topic (4)
- Geog 546 Water Resource Management (4)
- Geog 567 Community Resilience in Coupled Socio-Ecological Systems (4)

4. EXPERIENTIAL COMPONENT (**total 8 credits**)

Students may complete 8 credits of an internship or project, or 4 credits of an internship or project and 4 credits of graduate-level Field Geology.

a. INTERNSHIP OR PROJECT (4-8 elective credits)

i. One to two terms of internship or project (4 – 8 credits).

ii. At the beginning of the internship the student must meet with their employer or internship/project adviser to outline internship responsibilities and identify 2 to 3 major milestones. At the halfway point of the internship the student will complete a self-assessment based on the agreed upon milestones. At this time the internship/project adviser will complete a progress report to the PSU PSM faculty.

iii. For a two-term internship or project, a second self-assessment and internship/project adviser progress report is required by the end of the first term.

iv. An end of internship or project product is determined by employer or internship/project adviser (i.e. report, presentation).

v. The student's internship/project adviser will provide a final evaluation of the student's internship/project experience.

vi. The PSU PSM faculty committee will complete a pass/no pass assessment based upon the following: 1) Original internship responsibilities and milestones, 2) Mid-internship student self-assessment and internship/project adviser progress report. 3) End of internship product, 4) Final evaluation of the student's internship/project experience by the internship/project adviser.

b. FIELD GEOLOGY (4 credits)

i. G 581 Field Geology, this course may be replaced with an equivalent graduate level field course from another institution pending faculty approval.