

09/22/2014



## Proposal to the Senate Educational Policy Committee

**PROPOSAL TITLE:** Establish a Professional Science Master's (PSM) concentration in Geographic Information Science in the MS in Geography in the Department of Geography and GIScience, College of Liberal Arts and Sciences.

**SPONSOR:** Sara L. McLafferty, Professor and Head, and Heath Robinson, Clinical Assistant Professor, Department of Geography and Geographic Information Science, [ehr@illinois.edu](mailto:ehr@illinois.edu), 217-300-1984

**COLLEGE CONTACT:** Karen Carney, Associate Dean, College of Liberal Arts and Sciences, [kmcarney@illinois.edu](mailto:kmcarney@illinois.edu), 217-333-1350

**BRIEF DESCRIPTION:** The Department of Geography and GIScience proposes establishing a self-supporting, three-semester, non-thesis Professional Science Master's (PSM) concentration that focuses on geographic information science within its existing M.S. degree program. This program will require 42 credit hours total, 32 in geography/GIScience curriculum and ten hours within the Business concentration. The PSM is specifically targeted for students who seek post-graduate degree preparation for a career that blends knowledge of geographic information science and technologies with applications in various industries. In order to provide this preparation, the PSM concentration will not only educate students in the theory and application of geographic information systems and related technologies, but will also provide education in business that is not typically included in research-oriented GIS graduate programs. In addition to this unique business concentration, the proposed PSM program will emphasize participation in a high-value internship during the summer between the students' second and third semesters at a company or agency involved with geographic information systems.

**JUSTIFICATION:** The Department of Geography and GIScience is sensitive to the changing educational requirements of a dynamic world and especially recognizes that geographic information systems (GIS) and geospatial data are becoming increasingly ubiquitous in today's society. These trends have led to the establishment of a large industry that develops and supplies the market with new GIS technologies and a dramatic increase in the number of companies that use GIS to market their products and services and conduct business. A Professional Science Masters (PSM) concentration within its existing Master's program would allow the department to respond to this changing environment and meet the educational needs of students interested in working at the intersection of GIS and business.

We anticipate that the demand for such a program is high. Many students apply for admission to our existing Master's program, but few are admitted. Each year, the department receives approximately fifty applications for the Master's program but only admits three or four students. This is because the department requires each student to have a faculty sponsor who agrees to be

the student’s research advisor and mentor. Additionally, the department fully funds almost every graduate student admitted to its research-oriented degree programs, but funding is limited. As it happens, many applicants who are interested in coming to the department to increase their technical capabilities with GIS and work in professional and business settings are unlikely to be sponsored by research-oriented faculty members. These applicants may be interested in a GIS PSM degree.

We also expect the program to be attractive to students who graduated with bachelors’ degrees in social and environmental science disciplines and want to pursue advanced training in GIS with a business emphasis. The GIS PSM will provide a clear career path to jobs in the fast-growing GIS sector for people with diverse educational backgrounds.

**BUDGETARY AND STAFF IMPLICATIONS:** Given that the GIS PSM is proposed as a concentration within the department’s existing master’s program, the PSM is not expected to dramatically increase the operational overhead of the department, especially in the short term. The PSM programs at Illinois are designed to be financially self-supporting, to cover all direct costs and to return net tuition revenue to the instructional departments and colleges.

Negotiated memoranda of agreement among the instructional colleges and the Graduate College determine the tuition distribution. From gross tuition, instructional costs for the business curriculum courses are paid to the College of Business. Next, direct personnel costs at the college level and campus holdbacks are paid. These costs include apportioned staff costs and summer support for the programs’ faculty coordinators. The remaining net tuition is then distributed and invested at the college’s discretion: 70% to the instructional colleges in proportion to enrollment and 30% to the Graduate College. Net tuition will pay all non-personnel costs such as program development and marketing.

*Impact on Faculty and Staff Needs:* The proposed program is not anticipated to have a major impact on class size, teaching loads, or student-faculty ratio, especially in the short term. Initially, we plan to limit enrollment in the program to 3-5 students per year and to rely on existing classes, so no additional faculty or staff will be necessary to offer the GIS PSM at this time. The needs of the initial PSM students (such as advisement) can be met with existing faculty resources. However, when and if the number of students enrolled in the program increases, the department will consider hiring additional faculty and staff as needed and as could be supported by the program. Additionally, hiring new faculty in GIScience is a strong priority for the department, and we will continue to push for new hires in this dynamic and critically important field.

*Impact on Course Enrollment in Other Departments:* Although the proposed GIS PSM program would provide students with the opportunity to take elective courses outside of the department and the PSM business curriculum, there are no required courses in other departments. Therefore, the GIS PSM is not expected to strain the course enrollments of other departments.

*Impact on the University Library:* The University Library reviewed this proposal and concluded that its holdings are sufficient to support the GIS PSM and that the library will not be overtaxed administratively if this program is implemented.

*Impact on Computer and Technology Resources:* Currently, the teaching laboratory used for GIS courses can seat thirty students with total enrollments for individual courses often falling slightly short of maximum capacity. Therefore, additional PSM students should not exceed the capacity of the laboratory for the required courses. Additionally, our department will move into the Natural History Building that is currently undergoing extensive renovations. These renovations include the creation of a new teaching computer laboratory that will offer expanded capacity to accommodate rising enrollment in GIS courses. The building will also house a state-of-the-art GIS Studio for lectures, short courses, and workshops.

**DESIRED EFFECTIVE DATE:** The department would like to begin enrolling students in the GIS PSM concentration as early as Fall of 2015. While there may not be time to publicize the program widely by then, the department expects that it could “soft launch” the program that semester by offering the program to applicants who were not admitted to the research-oriented Master’s degree program. This would also provide the department with an opportunity to pilot the program with a limited number of students before scaling the program up to the proposed size.

**STATEMENT FOR PROGRAMS OF STUDY CATALOG:** *(All proposals must include either a new or revised version of the entry in the Programs of Study Catalog, if applicable. Entries will be published as approved by the Senate. Future changes in the statement for Programs of Study Catalog which reflect changes in the curriculum, must go through the normal review process at the appropriate levels.)*

### **Graduate Degree Programs**

The Department of Geography and Geographic Information Science offers programs leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees in Geography. The master’s degrees include thesis and non-thesis options, and the Master of Science includes an additional non-thesis Professional Science Masters (PSM) concentration in Geographic Information Science that integrates business content. The department's specializations are organized into three programs: (1) River, Watershed and Landscape Dynamics (fluvial geomorphology, watershed science and management, and ecosystem dynamics); (2) Society, Space and Environments (political ecology, environmental policy and social vulnerability, urban analysis, health geography and geopolitical analysis); (3) Geographic Information Science (geographic information systems, dynamic modeling of ecological and social systems, geocomputation and cyber GIS, aerial photogrammetry, remote sensing, interregional input-output modeling, regional science and spatial analysis). Detailed descriptions of these programs may be obtained from the departmental web site.

### **Admission**

Students applying for admission to the master's program are expected to have a strong undergraduate background in geography and/or related disciplines. In addition to other Graduate College admission requirements, a grade point average of at least 3.0 (A = 4.0) in the undergraduate major is required. Ph.D. candidates are generally expected to have at least a 3.5 average in previous graduate work.

### **Degree Requirements**

\*For additional details and requirements refer to the department's [Graduate Programs](#) and the [Graduate College Handbook](#).

### **Master of Arts/Master of Science**

Successful candidates for the master's degree whose backgrounds are largely in physical geography or geographical information science are recommended for the Master of Science; others receive the Master of Arts.

Required Courses	Thesis Option –	Non-thesis option –	GIS-PSM Required
------------------	-----------------	---------------------	------------------

	<b>Required hours</b>	<b>Required Hours</b>	<b>Hours</b>
Familiarity with geographic information systems at a basic level (see Appendix A for criteria for meeting this requirement)			
GEOG 471 and 491	6	6	6
Each student must also fulfill program requirements specific to his/her specialty area as listed in the Geography & GIS Graduate Handbook			3 courses from the GIS core courses listed in Graduate Handbook. See Appendix C for a list of the current GIS core courses
PSM Concentration (Business courses as described by the Illinois PSM program)	N/A	N/A	10
PSM 501, 502 and 503 Seminars	N/A	N/A	0
PSM 555 Internship	N/A	N/A	0
<b>Thesis Hours Required – GEOG 599 (min/max applied toward degree)</b>	1- 8	N/A	N/A
<b>Total hours</b>	32	32	42
<b>Minimum Hours Overall Required Within the Unit</b>	16	16	16
<b>Minimum 500-level Hours Required Overall</b>	12 (8 in GEOG)	12 (8 in GEOG)	12 (8 in GEOG)
<b>Other Requirements:*</b>			
Some Geography program options do not allow the non-thesis Master's degree option. Contact the department for further details			
		Two written research papers which address substantive research questions are required along with a comprehensive exam	Two written research papers which address substantive research questions are required along with a comprehensive exam
A maximum of 2 elective courses may be taken CR/NC			
			Students must enroll full-time in the fall and spring terms (12 or more hours)
			Students are not eligible to transfer graduate credit into these programs.

<b>Minimum GPA</b>	3.0	3.0	3.0

For students in the PSM concentration, the program is completed in 16 months, consisting of 3 full-time on-campus semesters and a summer internship. The 42 credit hour curriculum requires a minimum of 32 semester hours of approved science coursework determined in consultation with the candidate's Geography and GIScience advisor. Students are encouraged to conduct non-thesis research for which they may apply GEOG 595 Advanced Studies in Geography toward their science coursework. The PSM concentration requires 10 semester hours of business courses approved by the Illinois PSM Program. PSM 555, 501, 502 and 503 are required and may be taken for 0 or 1 credit hour, but cannot be applied to credit hours required for either the science or business curriculum.

**CLEARANCES:**

Signatures:

\_\_\_\_\_  
Unit Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
College Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
Graduate College Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
Council on Teacher Education Representative:

\_\_\_\_\_  
Date:

## **Appendix A Proposed Curriculum for a Geography Masters with a Concentration in PSM**

PSM students will complete the requirements of the Research Paper Option for the Master’s degree in Geography, as detailed on the department’s web site. Current requirements are briefly described here with the understanding that requirements may change in the future, and PSM students will fulfill requirements that exist at the time of their admission to the program. Current requirements state that at least 32 credit hours of graduate course work must be completed for the degree. 12 of the 32 hours must at the 500 level, *and at least eight of these twelve must be in Geography/GIS*. An overlapping requirement is that a total of at least sixteen 400/500 level hours must be accumulated in Geography/GIS. The PSM concentration will require 10 *additional* graduate credit hours in its business curriculum, for a total of 42 credit hours.

### **Core Coursework Requirements**

As part of their core education in geography, all geography/GIScience graduate students are required to take the following course:

- GEOG 471 - Recent Trends in Geographic Thought (4 Credit Hours).
- GEOG 491 - Research Methods in Geography (2 Credit Hours).

Familiarity with geographic information systems at a basic level is also a core requirement. We expect that most students who enroll in the GIS PSM will have taken an introductory GIS course. Students with no previous experience with GIS will be required to take an introductory course in GIS during their first semester in the program. This requirement may be satisfied by taking one of the following course options:

- 1) GEOG 473, Applied GIS to Environmental Studies (3 Credit Hours), when the course is instructionally oriented toward introducing GIS,
- 2) a graduate-level independent study class that covers the content of GEOG 379, Introduction to Geographic Information Systems, along with additional graduate-level course requirements
- 3) an approved graduate-level introduction to GIS course, offered in GGIS or another department

Students who enter the program with basic experience in GIS may petition the PSM advisor to request that the experience satisfy the introductory GIS course requirement. However, a successful petition does not reduce the credit hour requirement for completion of the degree.

### **500-Level Credit Hours Requirement**

Each student must complete at least twelve credit hours at the 500-level, eight of which must be within the Department of Geography and Geographic Information Science.

### **Geography/GIScience M.S. Degree Electives**

The Department of Geography and Geographic Information Science offers a number of courses that would satisfy the elective requirement for students in the GIS PSM program, including GEOG 412 - Geospatial Technologies and Society (3 Credit Hours), GEOG 439 - Health Applications of GIS (3 Credit Hours), GEOG 460 - Analysis and Interpretation of Aerial Photography (4 Credit Hours), GEOG 473 - Map Compilation and Construction (4 Credit Hours), GEOG 476 - Applied GIS to Environmental Studies (3 Credit Hours), GEOG 477 - Introduction to Remote Sensing (3 Credit Hours), GEOG 478 - Techniques of Remote Sensing (4 Credit Hours), GEOG 479 - Advanced Geographic Information

Systems (3 Credit Hours)<sup>1</sup>, GEOG 480 - Principles of GIS (3 Credit Hours), and GEOG 489 - Programming for GIS (4 Credit Hours).

Students are also welcome to take courses outside the department for elective credit if such coursework is part of their topical interests and helps them achieve their educational and professional goals.

### **Concentration Requirements**

Ten hours of coursework in business fundamentals are required for all students in the GIS PSM, as per the campus-wide PSM initiative. Additionally, the students are required to participate in the industry seminar series as well as complete a high-value internship.

*Business curriculum (10 hours):* The PSM business curriculum is built on five themes: business fundamentals in marketing, strategy, and entrepreneurship; finance; project and/or process management; workplace dynamics in leadership, teams, and organizational behavior; and law and regulation. Content is provided through a mix of courses offered by the College of Business and through instruction delivered in the industry seminar series. The mix of courses available to meet these five themes has evolved each year that the Illinois PSM has been offered. This flexibility allows the program to (1) adapt the course offerings over time to meet student and employer interests and demand, and (2) provide a choice of courses to each student depending on his or her prior coursework and career interests. The Illinois PSM entered into a new memorandum of agreement with the College of Business in September 2013, to continue providing business courses to all Illinois PSM programs.

*Industry seminar series (0 hours):* The industry seminars provide students across the Illinois PSM programs with opportunities to engage intellectually and socially while extending the professional preparation provided in the business curriculum. Guest lectures from professionals in significant science-related leadership roles in business, industry, and governmental organizations are an important component of the seminar series and discussion often centers on the problems and challenges introduced by the guest lecturer.

*Internship (0 hours):* The internship is a necessary component of a professional graduate degree program which has as its goal, the production of graduates who are proficient in their science area of study and who possess the knowledge, skills, and abilities to apply their proficiency to the managerial and leadership challenges of business, government, and non-profit organizations. Having completed two semesters of full-time graduate study before the internship, students will have had adequate science and business coursework to make the most of their internship experience and add value to the organizations at which they intern.

### **Non-thesis Paper and Examination Requirements**

The GIS PSM requires students to complete two written research papers and complete both a written and an oral exam. Typically the two papers are based on term papers for courses taken in the Master's program or are derived from internship or field research experiences. The papers are submitted to the student's examining committee prior to the written examination. Students must also undergo written and oral examinations for the completion of a Master's degree in the Department of Geography and Geographic Information Science. To be eligible for the examinations, the student must have completed, or must be enrolled in, all courses needed to complete the degree.

---

<sup>1</sup> Advanced GIS is a repeatable course that will focus on different topics each semester, including Spatial Database Design and Mobile GIS Development.



**Appendix B**  
**Letters from Other Campus Offices**

## **Appendix C**

### **Listing of Current GIS Core Classes**

GEOG 412: GIS and Society  
GEOG 439: Health Applications of GIS  
GEOG 460: Analysis and Interpretation of Aerial Photography  
GEOG 467: Dynamic Simulation of Natural Resource Problems  
GEOG 468: Biological Modeling  
GEOG 473: Map Compilation and Construction  
GEOG 476: Applied GIS to Environmental Studies  
GEOG 477: Introduction to Remote Sensing  
GEOG 478: Techniques of Remote Sensing  
GEOG 479: Advanced GIS  
GEOG 480: Principles of Geographic Information Systems  
GEOG 481: Modeling Earth and Environmental Systems  
GEOG 489: Programming for GIS  
GEOG 556: Regional Science Methods  
GEOG 557: Seminar in Regional Science  
GEOG 570: Advanced Spatial Analysis

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

University Library  
Office of Dean of Libraries  
and University Librarian  
230 Main Library, MC-522  
1408 West Gregory Drive  
Urbana, IL 61801



November 11, 2013

Heath Robinson  
Clinical Assistant Professor  
Department of Geography and Geographic Information Systems  
School of Earth, Society, and Environment  
255 Computing Application Building, MC-150

Dear Dr. Robinson:

Thank you for giving the University Library the opportunity to review the proposal to establish a Professional Science Masters concentration within the Department of Geography and Geographic Information Systems existing Masters of Science degree. Based upon a review of the draft proposal that we received from you on November 10, 2013 (an earlier draft having been received and reviewed earlier), it is the opinion of librarians working with Geography that there will be no significant impact on our operations or collections. The courses in the program are not new, and they are already taken into consideration in what is already a fulsome area of acquisitions.

If additional services or materials are required as the program develops—particularly in response the research needs of the faculty or services necessary to support the work of your students, we will be happy to discuss those needs as they emerge.

Sincerely,

A handwritten signature in black ink, appearing to read "John P. Wilkin".

John P. Wilkin  
Juanita J. and Robert E. Simpson  
Dean of Libraries and University Librarian

c: Jenny Johnson  
Kelly McCusker  
Thomas Teper