Minutes of the Graduate Faculty Council Meeting

Tuesday, January 15, 2013

**Members** (11): Thomas Drummer (Math), Keat Ghee Ong (Biomed), Craig Friedrich (MEEM), Zhenlin Wang (CompSci), Greg Waite (Geo), Kari Henquinet (PCorps), Paul Ward (CogSci), Mi Hye Song (BioSci), Judith Perlinger (Atmos), Tom Merz (Bus), Kim Fook Lee (Phys)

**Guests** (6): Debra Charlesworth (Grad Sch), Nancy Byers-Sprague (Grad Sch), Kevin Cassell (GSG), Sarah Lucchesi (Lib), Michael Falkowski (SFRES), Heather Suokas (Grad Sch)

1) Meeting called to order at 4:05 pm.

2) Review and approval of 12/04/12 meeting minutes.

3) Committee Reports:
   - Graduate Tuition and Stipend Review Committee (Dean Huntoon): The report is almost complete. It is currently circulating among committee members who were asked to provide final feedback by 5 pm on 1/16/13. Dean Huntoon is hopeful of submitting the final report to the Executive Team by week’s end. After the Executive Team reviews the report she will share it with GFC members.

4) Old Business:
   a. ESL Services (Dean Huntoon): Dean Huntoon followed up with B. Smith after her visit to the GFC meeting on 12/5/12. Dean Huntoon and B. Smith came to the consensus that if students are being admitted with TOEFL scores below 75, they should enroll in an ESL course. Dean Huntoon is looking for feedback. Is this reasonable? Please bring back comments from your department/program to the next GFC meeting. Dean Huntoon has also been discussing creating a graduate level communication course (for example, technical writing) that would be counted towards the student’s degree. Some departments (for example Mechanical Engineering) have their own courses tailored for students who are at the proposal writing stage. Mechanical Engineering will be doing this as a special topic course so that it shows up on their transcript. Dean Huntoon says ideally it would be within the student’s home department because then it can be tailored for a specific discipline.
   b. Update on Proposal to Modify Senate Policy 418.1 (H. Suokas): The change will allow students to use up to 6 credits of BC/C grades from either inside or outside the student’s primary field of study at the discretion of a student’s graduate program. The Instruction Policy Committee has reviewed the proposal and has recommended that this proposal be introduced at the next senate meeting on 1/23/13.

5) New Business:
   a. Information Item: Graduate Research Colloquium (K. Cassell): Every year the Graduate Student Government sponsors the Graduate Research Colloquium where graduate students are invited to present research, etc. These events in the past have been quite small. This year the goal was to make this a bigger event and they have succeeded. They have gone from fifty-three presenters last year to one hundred and seven this year. K. Cassell is asking for your and your department’s support by attending (and inviting your students to attend, including undergrads) and possibly serving as a judge, considering having your department sponsor a session, and by helping to nominate people for the GSG merit awards (each faculty member can nominate one students for the exceptional student scholar and one student for the exceptional student leader awards and can also nominate a faculty colleague for exceptional graduate faculty mentor). Your attendance shows the graduate students that the faculty care and value what they are doing. For more details please refer to the email sent by Kevin Cassell to the GFC email list on 1/24/13 or contact him
directly. This will be held on February 21 and 22 at the MUB. To prepare for the event the GSG is sponsoring an “Effective Presentation Skills” lunch and learn for graduate students to attend. They have also asked the Library to sponsor a workshop on how to create posters. Alumni and people from local industry will also be invited to attend. The deadline for submitting a poster or presentation has passed. The schedule will be sent out soon (please refer to Kevin’s email sent on 1/24/13).

b. Information Item: Outstanding Graduate Student Teaching Award/Outstanding Scholarship Awards (N. Byers Sprague): Please send your nominations to Nancy by February 1. The students will be recognized at the Student Award Banquet held the night of February 22.

c. Proposal for Allowing Multiple Attempts at Exams – Qualifying/Comprehensive, Proposal Defense, Oral Defense (Dean Huntoon): Dean Huntoon will be presenting a formal proposal from the Graduate School at the next GFC meeting on multiple attempts at exams. The new policy will allow for three options, 1) pass, 2) conditional pass, 3) fail and you get to try again. The current form/procedure is pass or fail.

d. Proposal for Professional Master of Geographic Information Science (M. Falkowski): This proposal has been presented and approved by the dean’s council. This is an accelerated masters program through the School of Forestry. Rationale: there are many positions within governmental agencies as well as private organizations that require GIS skills far beyond what is currently being taught at Michigan Tech. This is designed for students looking to be GIS professionals. The curriculum will be made up of existing courses. Additional space is not needed. One faculty member will be hired. In order to meet budget requirements four and a half students will need to enroll which is a reasonable goal. The dean of Forestry is very supportive and enthusiastic about the proposed program. Please read the proposal, bring back to your department for feedback and bring comments and be prepared to vote at the next GFC meeting on 2/5/13. If while reading through the proposal, you have questions or comments please email them to Andrew Storer and carbon copy Dean Huntoon.

e. Information Item: UN5953 – Continuous Enrollment for students who are in their last semester (Dean Huntoon): From now on the Graduate School will be checking with the student’s advisor and graduate program director before we give them a “P” grade. It was brought to the Graduate School’s attention today that there are students who enroll in this course semester after semester and receive “P” grades from the Graduate School when perhaps their advisor would have given them a “Q” grade.

6) Motion to adjourn at 4:45 pm.
January 15, 2013
(Last update: 01/10/13)

Handouts of the Graduate Faculty Council

Michigan Tech
Allowing Multiple Attempts at Oral Exams

01/10/13

Graduate School

Proposal

Each graduate program should have a written policy that addresses multiple attempts at all exams (final oral defense, qualifying/comprehensive, proposal defense, etc.). This policy should contain the following:

1. Statement of a finite number of multiple attempts permitted.

2. Statement of viable options available to those students who pass or fail each attempt.

3. And, if not addressed in the above, reference to Senate proposal 2-12 and Graduate School grievance procedures.

If no policy exits in the program, any failed exam may be retaken once.
Proposal for a professional Master of Geographic Information Science (MGIS)
Submitted by the School of Forest Resources and Environmental Science

Contact: Andrew J. Storer, Associate Dean, SFRES. storer@mtu.edu

1) Description and characteristics of program
The professional Master of Geographic Information Science (GIS) program will initially be administered in the School of Forest Resources and Environmental Science (SFRES). This program builds upon the School's existing professional Master's degree in Forestry and the expertise within the School in spatial information science. Over time, the program may become non-departmental as it grows and involves students from a broad range of academic backgrounds.

This program will provide current and cutting-edge education in Geographic Information Science and related technologies, and train students to work as GIS specialists and managers. A strong foundation in core geospatial principles will be provided, as well as interdisciplinary study in statistics, communications, environmental policy, and business. It is designed as a 30 credit coursework-only degree (Plan C) and will be offered as an accelerated Master's program to Michigan Tech graduates. As interest in 4+1 programs continues to develop, this program will provide the opportunity for our graduates to complete both a bachelor’s and master’s degree in 5 years. The scheduling will allow students to complete this degree in three semesters (two semesters for students who have attended Michigan Tech and have certain prerequisites).

2) Rationale
Professional Master’s degrees are consistent with the goals of Michigan Tech's strategic plan:

Goal 1: Learning

1.3: Offer programs in new and emerging areas, particularly interdisciplinary areas (e.g. bioinformatics, information technology). Strategies: offer ...fast-track professional master's degrees.¹

Geospatial jobs are in high demand, have exhibited continued growth even during the recent recession,² and were recently listed among the 100 best careers in the United States.³ Geospatial training has been targeted by the U.S. Department of Labor for a high growth job training initiative, as it is a field that is expanding at a rate of 10% annually with a projected shortfall of skilled workers⁴. Those with geospatial skills are included in a recent McKinsey Global Institute report on workers with “big data” expertise. Both analysts and managers are identified, with a potential deficit of 190,000 workers by 2018.⁵

Uses of geospatial technology are broad and cross many disciplines, including demographics, natural resources, urban and regional planning, public health and epidemiology, law enforcement, and homeland security.⁶ The classification of geospatial jobs has been inconsistent because GIS has many applications and is utilized in multiple fields. GIS positions are often associated and combined with Information Technology because GIS deals so intimately with computers and data. Though IT experience is useful for GIS users, a wide range of skills in addition to computer literacy are required to be a successful geospatial professional.
To address these shortcomings, and with prompting from both industry and the education sector, the U.S. Department of Labor has recently developed the Geospatial Technology Competency Model. The model document outlines the knowledge and skills necessary to perform as an effective GIS professional, and was used as a guide in developing this proposal.

3) Discussion of related programs within Michigan Tech and at other universities

The most closely related program at Michigan Tech is the Master of Science in Integrated Geospatial Technology, housed in the School of Technology (program information is available at http://www.mtu.edu/technology/graduate/igt/study/). The School of Technology's IGT M.S. is primarily a research-oriented degree with a focus on geospatial data acquisition and processing. In contrast, the professional Master of GIS is designed as a terminal degree for students not planning to earn a PhD or perform research. Rather, it is designed to give students the skills to work as GIS specialists or managers. The School of Technology's Integrated Geospatial Technology degree does offer a Plan C Masters as an option; however, it has different requirements for admission and will likely attract students with a surveying or engineering degree. The Master of GIS is designed for people with limited or no background in GIS and associated tools. Furthermore, the IGT M.S. has a significant distance learning component, whereas the Master of GIS will initially be offered primarily on-Campus with traditional lectures and supervised lab sessions.

Non-research Master’s in GIS are offered at a number of universities in the U.S., either on-Campus (e.g., Michigan State), online only (Penn State), or a mixture of online and on-Campus (UMD). A professional Master of GIS at Michigan Tech will be successful because 1) many of the students enrolled in the program will be Michigan Tech graduates pursuing the accelerated Master’s degree option and 2) no similar program is offered locally.

Presently, undergraduates at Michigan Tech in the School of Forest Resources and Environmental Science and students in the Surveying Engineering program in the School of Technology have a required geospatial component in their degree programs. GIS is taken as an elective in a number of other disciplines, as from biology, computer science, environmental engineering, geology, and social science frequently enroll in existing GIS courses.

Though the use of spatial tools is necessary to be a successful student in upper division SFRES classes, only one GIS and one GPS course are required for graduation – a total of five credits. These courses are enough to grasp introductory theory and learn the basics of a tool, but not enough to develop the broad and deep understanding of spatial theory and the applications necessary to work as a geospatial professional.

4) Projected enrollment

We project an annual enrollment of at least 10-15 students in this program. While some students will be drawn from other areas of the U.S. or from professionals in the region, most students will likely be recent undergraduates from Michigan Tech. The majority of Michigan Tech graduates coming into the program will likely have degrees from the School of Forest Resources and Environmental Science, or from other majors such as Environmental Engineering, Biological Sciences, Geology, or Social Science. Students with a background in any of these disciplines would also be a good fit with the MGIS degree.

We anticipate enrollment will be more or less continuous. Because this program will draw students that are largely self-funded, enrollment should be independent of general trends at the University. Enrollment in the Master of Forestry program has averaged 5 students annually over
the last 5 years. Current enrollment in SFRES is 271 (186 undergraduate and 85 graduate students).

5) Scheduling plans
Courses will be taught during regular daytime hours or in the evening. Over time, some of the courses will be adapted for web-based delivery, and perhaps as summer courses.

6) Curriculum Design
Students admitted to this program will have a B.S. in any discipline. The professional M.S. in GIS is designed to be completed in three semesters for students entering the program without prerequisites, but can be completed in two if six credits are counted from a Michigan Tech undergraduate degree under the accelerated Master’s option. Once admitted, students must complete a minimum of thirty credits of coursework past their undergraduate degree. It is a Plan C (coursework only with required oral examination) Masters with no thesis or report options. Students will choose a faculty advisor from within the program.

General Curriculum Design

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>Introductory GIS</td>
<td>4</td>
</tr>
<tr>
<td>Advanced GIS concepts</td>
<td>3</td>
</tr>
<tr>
<td>Implementing and managing GIS projects</td>
<td>3</td>
</tr>
<tr>
<td>GPS field techniques</td>
<td>2</td>
</tr>
<tr>
<td>Remote sensing</td>
<td>3-4</td>
</tr>
<tr>
<td>Communications</td>
<td>2</td>
</tr>
<tr>
<td>Spatial Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>9-10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

The following courses are required (new courses are in **BOLD** and include the name or position of the instructor):

**Introductory GIS**
FW5550 - GIS for Resource Management (4 credits, Fall)

**Advanced Spatial Topics (GIS, GPS, cartography, data and project management)**

FW5554 – GPS field techniques (2 credits, Fall) (Professor of Practice)
FW5555 - Advanced GIS Concepts and Analysis (3 credits, Spring) (Maclean) Pre-requisite: FW5550
FW5556 - Implementing and Managing GIS Projects (3 credits, Spring) (Professor of Practice) Pre-requisite: FW5550
Spatial Statistics
FW5510 - Spatial Statistics (3 credits, Spring) (Falkowski and Professor of Practice (alternate years))

Remote Sensing
FW4540 - Remote Sensing of the Environment (3 credits - alternate Fall semesters) or
FW5540 - Advanced Terrestrial Remote Sensing (4 credits, alternate Fall semesters) or
FW5560 - Digital Image Processing: A Remote Sensing Perspective (3 credits, Spring)
Pre-requisite: FW5550 or
GE4250 - Fundamentals of Remote Sensing (3 credits, Spring) Pre-requisites: PH2200 and MA2160 or
SU4140 - Photogrammetry (3 credits, Fall) Pre-requisite: SU2260

Communications
FW5801 – Masters Seminar in GIS (1 credit, Fall and Spring) (Professor of Practice)

Electives (select 10-11 credits from the following lists)
Business
BA5650 - Project Management (3 credits, Fall, Spring, Summer) Pre-requisite: MA2710 or MA 2720 or MA 3710
BA5760 - Corporate Social Responsibility & Business Ethics (3 credits, on demand)

Cartography
SS5XXX Critical Cartography (1 credit, Summer)

Computer Science
CS4421 - Database Systems (3 credits, Spring) Pre-requisite: CS2321

Communications and writing
FW5850 - Effective Grantsmanship Workshop (2 credits, Spring)
HU5081 - Writing Applications in Technical Communication (3 credits, on demand) NOT in the current course list
HU5091 - Writing for publication (3 credits, on demand)

Geospatial applications
UN4000 - Remote Sensing Seminar (1 credit, Fall & Spring)
FW3540 - Introduction to GIS for Natural Resource Mangement (4 credits, Spring) Pre-requisite: MA 2710 (C) or MA 2720 (C) or MA 3710 (C)
FW4545 - Map Design with GIS (3 credits, alternate Spring) Pre-requisite: FW3540 or FW5550
SU3540 - Geospatial Information Technology (4 credits, Spring) Pre-requisite: MA3710
SU5003 - GIS Fundamentals (1 credit, on demand)
SU5004 - Introduction to Geospatial Image Processing (3 credits, on demand)
SU5041 - Geospatial Data Processing (3 credits, on demand)

Policy

ENG5520 - Sustainable Futures II (3 credits, Spring)
FW5111 - Advanced Natural Resource Policy (3 credits, Fall)
FW5150 - Institutions and Natural Resource Management (up to 3 credits, Fall, Spring, Summer)

Natural resources

CE5666 - Water Resources Planning and Management (3 credits, on demand) Pre-requisites CE3620 and (EC3400 or EC3402 or ENT3402)
ENVE4505 - Surface Water Quality Engineering (3 credits, Fall) Pre-requisite: ENVE3501 or ENVE3503
FW 4220 - Wetlands (4 credits, Fall)
FW4300 - Introduction to Wildland Fire (3 credits, Spring) Pre-requisite: FW3020 and (FW3010 or FW3012)
FW4370 - Forest and Landscape Hydrology (3 credits, Spring)
FW4380 - Landscape Ecology (3 credits, Spring)
FW5032 - Integrated Forest Inventory and Data Analysis (3 credits, Spring)
FW5088 - Forest Finance & Economics (3 credits, Spring)
FW5130 - Forest Vegetation Dynamics (3 credits, Fall) Pre-requisites: BL3400 or FW3010 or FW3012 or FW3020
FW5140 - Stable Isotopes in Ecology and Environmental Science (2 credits, Fall)
FW5413 - Sustainable Biomass (3 credits, Fall)
GE4150 - Natural Hazards (3 credits, Fall) Pre-requisites: (GE2000 or GE2100) and UN2002

Statistics

EC4200 - Econometrics (3 credits) Pre-requisites: (EC2001 or EC3002 or EC3003) and (BA2100 or BUS2100 or MA2710 or MA2720 or MA3710) and (MA1135 or MA1160 or MA1161)
FW5411 - Applied Regression Analysis (3 cr, alternate Spring semesters)
MA4710 - Regression Analysis (3 cr, Spring) Pre-requisites: MA2720 or MA3710
MA4740 - Sampling Methods (3 cr, on demand)
MA5701 - Statistical Methods (3 cr, Fall)
### Example MS in GIS course sequence for a Michigan Tech BS degree holder

As an undergraduate, take FW3540 - Intro to GIS for Resource Management (4 credits) and FW5111 - Advanced Natural Resource Policy (3 credits). Six of these credits may be applied.

#### Fall
- FW5550 - GIS for Resource Management (required) (4 credits)
- FW5554 - GPS Field Techniques (required) (2 credits)
- FW5801 - Masters Seminar in GIS (required) (1 credit)
- EC4300 - Econometrics (3 credits)
- GE4150 - Natural Hazards (3 credits)

**Total** 13 credits

#### Spring
- FW5555 - Advanced GIS Concepts and Analysis (required) (3 credits)
- FW5560 - Digital Image Processing (required from list) (3 credits)
- FW5565 - Implementing and Managing GIS Projects (required) (3 credits)
- FW5510 - Spatial Statistics (required) (3 credits)
- FW5801 - Masters Seminar in GIS (1 credit)

**Total** 13 credits

Accelerated Master's credits 6 credits

Fall semester 13 credits

Spring semester 13 credits

**Total** 32 credits

### Example MS in GIS course sequence for an external student

#### Spring
- SU3540 - Geospatial Info Technology (4 credits)
- FW5510 - Spatial Statistics (required) (3 credits)
- GE4250 - Fundamentals of Remote Sensing (3 credits)
- FW5801 - Masters Seminar in GIS (required) (1 credit)

**Total** 11 credits

#### Fall
- FW5550 - GIS for Resource Management (required) (4 credits)
- FW5540 – Adv. Terrestrial Remote Sensing (required from list) (4 credits)
- FW5554 - GPS Field Techniques (required) (2 credits)
- GE4150 - Natural Hazards (3 credits)

**Total** 13 credits

#### Spring
- FW5555 - Advanced GIS Concepts and Analysis (required) (3 credits)
- FW5565 - Implementing and Managing GIS Projects (required) (3 credits)
- FW5850 - Effective Grantsmanship (2 credits)
- FW5801 - Masters Seminar in GIS (1 credit)

**Total** 9 credits

Spring semester 11 credits

Fall semester 13 credits

Spring semester 9 credits

**Total** 33 credits
7) New Course descriptions

**FW5554 – GPS Field techniques.** 2 credits, offered in Fall. This course will provide hands-on experience with various types of GPS units and different applications of the technology, including planning, data collection, data processing, and management. Emphasis will be on practical applications of global positioning system technology.

**FW5555 – Advanced GIS Concepts and Analysis.** 3 credits, offered in Spring. Enrollment priority will be given to students in the professional MS in GIS degree program, but will be open to students in other programs. This course moves beyond the fundamentals of GIS to explore the application of GIS technology to environmental problems. Students review current research in the field, learn relevant modeling techniques, and utilize advanced GIS software tools such as network analysis, 3D visualization, geodatabase management and rule construction, and multivariate spatial analysis. Prerequisite: FW5550 or permission of instructor.

**FW5556 – GIS Project Management.** 3 credits, offered in Spring. Enrollment priority will be given to students in the professional MS in GIS degree program, but will be open to students in other programs. This course will provide exposure to geospatial data collection using GPS (both consumer– and resource–grade GPS), database structures and data management strategies, spatial project planning and management, and cartographic techniques, and will include discussion of geospatial ethics. Development of a project database and geospatial portfolio is required. Prerequisite: FW5550 or permission of instructor.

**FW5801 – Masters Seminar in GIS.** 1 credit, offered in Fall and Spring. This course is designed for students in the professional MS in GIS degree program, but will be open to students in other programs. Students will discuss and present current research and applications of geospatial technology.

**SS5XXX Critical Cartography.** 1 credit, offered in Summer. This course will examine: available datasets for human variables; and the interpretation of maps based on scale, boundaries, projection system, and other information that affect messages regarding power and influence, and assumed relative importance of environmental, social and economic issues.

The other classes listed without full class numbers are currently in the binder process or are offerings under existing programs.

8) Library and other learning resources

No additional library resources are requested. Interlibrary loan and existing journals are adequate, especially as this is a professional, non-research program.

9) Computing access fee

No computer access fees per centralized IT. Additional course fees may apply.

10) Faculty Résumés

Yushin Ahn, School of Technology http://www.mtu.edu/technology/school/faculty/ahn/

Michael Falkowski, School of Forest Resources and Environmental Science http://www.mtu.edu/forest/about/faculty/falkowski/
11) Description of available / needed equipment

Existing teaching laboratory computers and GPS equipment in SFRES will be utilized. We currently maintain a 26-seat main computer lab, a 16-seat spatial teaching lab, and a 6-seat graduate computing lab. These facilities will be adequate to add the necessary one lab section per semester. Michigan Tech has maintained an annual site license for ESRI products (chiefly ArcGIS software) since 1997. ArcGIS is the most widely-used GIS software and will be the primary GIS application used in labs. SFRES also maintains a number of consumer- and mapping-grade GPS units for teaching and research, which will be available for use by students enrolled in the program.

12) Program costs, years 1 through 3

Three-year costs will be $201,000, with projected tuition revenue of $509,960 during the same period. Each year thereafter we project a surplus of tuition revenue over costs of between $100,000 and $180,000 per year. The major expense to the University will be support for a Professor of Practice who will serve as both coordinator of the program and as an instructor. While there are clearly additional costs in offering an additional program, the surplus of tuition revenue over costs is clearly more than sufficient to cover those costs. The Professor of Practice will manage the program, recruit and help advise graduate students, and teach courses (FW5554 3 credits, FW5556 3 credits, and FW5801 1 credit twice (total 7 credits each year) annually and FW3540 and FW5510 every other year average 4 credits per year). This represents approximately 60% of a full teaching load. The Professor of Practice is budgeted at 80% of an academic year (9-month) position. The Professor of Practice is therefore budgeted for 20% time coordinating the program (including recruiting, advising and developing the program). No additional faculty needs are anticipated.

Based on the projected enrollment of 10 students per year at 10 credits per semester, tuition revenue would total $149,000 annually – see table below. Tuition is as posted on the sponsored programs website, with costs for the coordinator averaging $67,000 (salary and fringe) for years 1–3. Based on the graduate tuition rate and 20 credits per student per year, 4.5 students enrolled annually would support this program as proposed.
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<td><strong>Professor of Practice</strong></td>
<td>$65,000</td>
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<td>$69,000</td>
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<td>(salary and fringe)</td>
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<td><strong>Tuition revenue</strong></td>
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Note that in reality income is greater than shown in the table as students complete the remaining required credits either in a third semester (an additional 10 credits per student), or during their undergraduate degree through senior rule (an additional 4 credits per student).

### 13) Space

No additional space will be necessary. Based on projected enrollment, the existing teaching lab, open computer labs on campus, and graduate offices in SFRES will provide adequate space for the program.

### 14) Policies, regulations, and rules

No new policies or rules will be needed. All existing graduate school policies will be adhered to. Applicants must meet all requirements for admission by the Graduate School and the School of Forest Resources and Environmental Science at the time of application, and must follow specified admission procedures. For international applicants, this includes submission of TOEFL scores. Applications will be considered using the existing process in SFRES, which includes faculty review of applications. In addition, the program coordinator will review applications. A combination of academic background, professional knowledge, the applicant's statement of purpose, letters of recommendation, and test scores required by the graduate school, will be considered before making a decision to admit a student.

### 15) Accreditation requirements

None. The program is, however, designed to provide training and skills identified in the Geospatial Technology Competency Model.
We anticipate that ultimately this program will be listed as a Professional Science Master’s program with an associated advisory board of professionals in the field, and that this designation will be used when promoting the program.

16) Internal status of proposal
In development, internal to SFRES, September 2012
Submitted for comment to all units with classes listed – revised November 2012

17) Planned implementation date
Fall semester of 2013

References
1 http://www.mtu.edu/stratplan/goals.html
5 http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/
Big_data_The_next_frontier_for_innovation, page 30
6 http://americancityandcounty.com/technology/gis_gps/report_shows_trends_gis/
or http://gita.org/resources/geo_report/georeport.asp
8 http://www.geo.msu.edu/acad_prog/msgiscireq.html or
http://www.worldcampus.psu.edu/MasterinGIS.shtml and http://www.geog.umd.edu/gis/
NOTE: (all handouts connected to a single pdf file)
1. Review minutes of 12/04/12
2. Committee Reports:
   a. Graduate Tuition and Stipend Review Committee (Dean Huntoon)
3. Old Business
   a. ESL Services (Dean Huntoon)
4. New Business
   a. Information Item: Graduate Research Colloquium (K. Cassell)
   b. Proposal for Allowing Multiple Attempts at Oral Exams (Dean Huntoon)
   c. Proposal for a Professional Master of Geographic Information Science (M. Falkowski)