TRANSMITTAL for UNDERGRADUATE PROGRAMS:
Changes or Proposals

I. INFORMATION:

1. Program Title: Geographic Information Science
2. Department(s): Geography and Geographic Information Science
3. College(s): Arts and Sciences
5. Check all that apply
   - [ ] New program
   - [ ] Change in course name
   - [ ] Change in number of credits
   - [ ] Change in major
   - [ ] Change in minor
   - [ ] Change in course content
   - [ ] Change in emphasis/option

6. Other Programs/Departments Consulted (Requires letters of comment from all Departments or Programs substantially affected):
   a.) Computer Sci
   b.) Art
   c.) PES
   d.

7. Catalog year (and semester) of Implementation:
   Semester Fall Year 2016
8. Have all courses in this program been approved? Yes [ ] No [ ]
   If "No" which courses have not been approved?

9. Attach Request Narrative
   Include in narrative on attached pages a rationale for the requested changes or creation of program.
   Include clarification concerning any courses that have not yet been approved. If requesting a
   program change also include a listing of course array for both the current and proposed program?

10. UNIT APPROVALS: Requires signatures of all Department Chairs and Deans whose programs will
    be substantially affected by the changes or proposal. Signature lines for the affected Departments and
    Colleges (noted in "6" above), are on the addendum to this form. These signatures should be obtained
    prior to review by all other shared governance levels.

<table>
<thead>
<tr>
<th>Department Curriculum Committee Chair (optional)</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department/Program Chair</td>
<td></td>
<td>3-25-16</td>
</tr>
<tr>
<td>College Curriculum Committee Chair</td>
<td></td>
<td>1/20/16</td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td>4/20/16</td>
</tr>
<tr>
<td>University Curriculum Cmmt. Chair</td>
<td></td>
<td>4/22/16</td>
</tr>
<tr>
<td>Academic Policy &amp; Program Cmmt. Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Senate Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provost / Vice Chancellor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chancellor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*NOTE: The master copy of this transmittal & accompanying documents must be filed in the Provost's office upon
final approval. The Provost's office will notify all appropriate administrative offices [Registrar, Dean(s), Department
Chair(s)] of approvals & necessary actions to implement changes.
Hi John,

Thanks for the message. I have read the proposal for the BS in Geographic Information Science, and I am in full support of the inclusion of the art courses listed within the plan.

Sincere best,
Kaylee

On Thu, Mar 24, 2016 at 11:24 AM, John Heppen <john.heppen@uwrf.edu> wrote:

We in geography are asking you to look this proposal over and please let us know if you have any objections and if you do not could you please express your support for this. We are proposing a BS in Geographic Information Science which would fit our strengths and allow us to better fit in with the direction of the University.

We are attaching our proposal and the market analysis.

Thank you.

John

--
Kaylee Spencer, Ph.D.
Chair, Art Department
Associate Professor of Art History
University of Wisconsin-River Falls
410 S. Third Street
River Falls, WI 54022
715.425.3266
Hi John,

At this point, we have some additional capacity in CSIS 161, CSIS 162 and CSIS 235. The CSIS department has no objections to this request. Depending on the growth of your GIS programs, and as we reach our full capacity, we may have to revisit this issue.

Thank you,

“hossein

Hossein Najafi, PhD
Computer Science and Information Systems Department, Chair
University of Wisconsin, River Falls
410 S. 3rd St.
River Falls, WI 54022
715-425-4456

From: John Heppen <john.heppen@uwrf.edu>
Date: Thursday, March 24, 2016 at 11:24 AM
To: Hossein Najafi <hossein.najafi@uwrf.edu>, Donavon Taylor <donavon.h.taylor@uwrf.edu>, Kaylee Spencer <kaylee.spencer@uwrf.edu>
Cc: Charles Rader <charles.p.rader@uwrf.edu>, Mathew Dooley <mathew.dooley@uwrf.edu>
Subject: Request from Geography and Geographic Information Science

We in geography are asking you to look this proposal over and please let us know if you have any objections and if you do not could you please express your support for this. We are proposing a BS in Geographic Information Science which would fit our strengths and allow us to better fit in with the direction of the University.

We are attaching our proposal and the market analysis.

Thank you.

John
Hi John,
The Plant and Earth Science Department has no objections to the proposed BS in Geographic Information Science. It looks like an excellent opportunity for interested students. We suggest that in addition to ESM 333, ESM 363 - GIS Applications in Resource Management would be appropriate for inclusion in the list of elective courses.
Thanks,
Donavon Taylor, Chair
Department of Plant and Earth Science

From: John Heppen
Sent: Thursday, March 24, 2016 11:24 AM
To: Hossein Najafi <hossein.najafi@uwrf.edu>; Donavon Taylor <donavon.h.taylor@uwrf.edu>; Kaylee Spencer <kaylee.spencer@uwrf.edu>
Cc: Charles Rader <charles.p.rader@uwrf.edu>; Mathew Dooley <mathew.dooley@uwrf.edu>
Subject: Request from Geography and Geographic Information Science

We in geography are asking you to look this proposal over and please let us know if you have any objections and if you do not could you please express your support for this. We are proposing a BS in Geographic Information Science which would fit our strengths and allow us to better fit in with the direction of the University.

We are attaching our proposal and the market analysis.

Thank you.

John
### Signatures of Additional Department & Colleges Affected

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair</td>
<td>Donovan Taylor (Platz-Sci.) 6 Apr 2016</td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair</td>
<td>Hossein Najafi 4/6/2016</td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair</td>
<td></td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
</tr>
</tbody>
</table>

Revised December 2012
<table>
<thead>
<tr>
<th>Position</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair</td>
<td>[Signature]</td>
<td>4/8/2016</td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Revised December 2012
Minutes Department of Geography and Geographic Information Science Department Meeting
Friday 1-29-16 9:04 am 364 KFA Geography Seminar Room
Present: John Heppen, Charlies Rader, Matt Millett, Matt Dooley

1. Discussion of Hanover Report
2. Department response to the Report in light GIS BS and other potential avenues.
Motion to vote to propose BS in GIS by Matt Dooley, Seconded by Charlies Rader. Vote passes unanimously.

3. Program Associate Search
Adjourned at 9:41am by unanimous consent.
Notice of Intent – New Degree Program

Bachelor of Science in Geographic Information Science (GISci)
Department of Geography and Geographic Information Science
University of Wisconsin – River Falls

Institutional Contacts:
Ms. Ruth Baker, Assistant Professor
Dr. Mathew Dooley, Associate Professor - GIS Faculty
Dr. John Heppen, Professor (Chair)
Dr. Charles Rader, Professor - GIS Faculty

Overview and Mode of Delivery
The Department of Geography and Geographic Information Science proposes to create a Bachelor of Science in Geographic Information Sciences (GISci) that is an expansion of our current GIS and Cartography Minor. The purpose of this degree program is to develop graduates with expertise in GIS that are able to work with advanced database applications, analysis, and visualization of geospatial data. Geospatial data is used in a wide variety of fields from precision agriculture, logistics, transportation, planning, conservation, health, and demography. Furthermore, employment in core geospatial technology development such as global positioning systems (GPS), mapping (e.g., Google Maps), location based services (e.g., Smart Phone Apps), and data mining are current areas of employment for people with education in GIScience.

This degree program is designed for “traditional” undergraduate students. The GISci Major is to be offered as an on-campus experience that can lead to a completed degree along with the general education program, a minor, and other university requirements in 120 credit hours over a four year time-frame. Depending on course array, students will have options for on-line course offerings; however, the primary mode of delivery for the major will be in a classroom setting due to needs for advanced computational resources, data, and specialized GIS software.

Institutional Mission
The University of Wisconsin – River Falls has the focused mission “to help prepare students to be productive, creative, ethical, engaged citizens and leaders with an informed global perspective.” The GISci Major will prepare students directly in the areas of productivity, creativity, and global perspectives through engagement with the curriculum. The UWRF select mission includes “faculty-student interaction in classrooms” and “degrees to meet regional needs”. Students will engage directly with faculty through the coursework, projects, and internships. Historically, our students have done very well in job placement in GIS positions and we anticipate that students will be able to better service regional needs for specialist in this area. A core mission of the University Cluster is to “meet educational and personal needs of students”
and this major builds on existing demand for increased level GIS education and training for students. UWRF has a strong program in Computer Science and Information Science and the three courses required by the BS in GIS are offered each semester. UWRF has a strong reputation in STEM disciplines. The skills associated with a degree in Geographic Information Science are immediately marketable and meet a demand that is increasing nationally and will remain steady regionally and within the UW System mission of preparing students for the workforce with skills in STEM fields.

GIS is a STEM discipline.
The US Immigration and Customs Enforcement lists Geographic Information Science and Technology as a STEM eligible degree for immigration purposes with CIP Codes 29.0203 Signal/Geospatial Intelligence and CIP code 45.0702 Geographic Information Science and Cartography (http://www.ice.gov/doclib/sevis/pdf/stem-list.pdf). These degrees are listed on the STEM-Designated Degree Program List. Holders of degrees in Geographic Information Science are qualified for jobs and careers in industries that will expect employment growth. The Bureau of Labor Statistics lists the following careers with holders of degrees in Geography with significant GIS coursework. The Bureau of Labor Statistics predicts that job growth for the field of Cartographers and Photogrammetrists (SOC Code 17-1021) to grow by 20 percent from 2012 to 2022 which is faster than average.¹ The Bureau expects that jobs for Surveying and Mapping Technicians to grow by 14 percent from 2012 to 2022.² The United States Bureau of Labor Statistics regards geospatial technologies to be a high growth industry.³

Program Description
UWRF has over thirty years of experience in cartography and GIS since the development of the Cartography Minor in 1983 and the development of the GIS and Cartography Minor in 1993. The GI/Sci-BS will build upon teaching and research expertise within the department and will complement the existing GIS and Cartography Minor, Geographic Information Science-Bachelor of Applied Science (BAS), Geographic Information Science Certificate, and Geography Major. Courses in Computer Science and Information Systems, Environmental Sciences and Management, General Engineering, Mathematics, and Art (Graphic Design) will be an integral part of the new major and draw on expertise related to GIS in these fields.

Building on the existing minor, expansion to a full major will allow students to personally tailor their programs toward specific goals. A core of common coursework, based on the existing GIS

³ http://www.doleta.gov/brg/indprof/geospatial_profile.cfm
and Cartography Minor with the addition of three critical computer science courses will serve as the basis for the major. Through interdisciplinary electives in the GISci Major students will be able to further focus their education on information sciences by taking additional computer science and information systems courses or on data visualization through the integration of cartography, GIS, web design, and graphic design courses. Students will be advised to develop expertise along one of these directions depending on their interests. Building on a long success with internship placements in GIS positions, most students would undertake one as part of their requirements.

Students will also be advised to minor or second major in complementary disciplines, such as Computer Science and Information Systems or other discipline where they hope to apply their GISci education (e.g., Biology, Environmental Science, Conservation, Business Administration, Geography, etc.). Students could also minor in Geography to further enhance their spatial understanding skills as Geographic Information Scientists. Since there is only one common course, GEOG 250 – Introduction to Geographic Information Science- the addition of the Geography Minor and very little overlap with the Geography Major, these would serve as a complementary expansion in areas that meet different educational outcomes.

The major will be supported by an existing state-of-the-art GIS Laboratory. All department faculty have experience with Geographic Information Science and two have specific teaching and research specializations in GIS, spatial analysis, and mapping, and will serve as the core faculty and academic advisors for the GISci Major.

**Need for Program**

Over the past decade, many of our GIS and Cartography minors have expressed an interest in a GISci major as part of our annual departmental self-study. The development of the UWRF - GIS-Bachelor of Applied Science (BAS) for Associate of Science (AS) graduates wishing to complete a 4-year program has led to our traditional students expressing a desire for a complementary GIS-Bachelor of Science. In addition to the GIS-BAS, only four other UW campuses (Madison, Milwaukee, La Crosse, and Stevens Point) offer major emphases in GIS and Cartography. Four other UW campuses, offer GIS related minors (Stout, Superior, Platteville, and Stevens Point) and four other UW campuses, offer GIS certificates (Madison, Milwaukee, Oshkosh, and Parkside.)⁴ UW-Eau Claire does not currently offer a major in GIS. They do offer a certificate in geospatial science (http://www.uwec.edu/Geography/academics/index.htm).

Criticism of the current state and structure of GIS education is documented in white-paper by the Association of American Geographers⁵. This report recommends the incorporation of “advanced

---

⁴ Based on programs listed through UW Major Mania (http://majormaniacwex.edu/).
knowledge and skills in computer and information sciences” in order to create rigorous undergraduate programs. Most current GIS programs still do not require extensive knowledge in computer and information sciences. The certificates, while meeting needs for job skill credentials in the workforce, typically range between 12 and 15 credits, of basic training in GIS. This GISci Major is designed to address deficiencies in the current structure of GIS education. Finally, this would be a regionally significant program since only two other schools within West Central and Northwest Wisconsin only offer GIS minors.

Market Analysis
According to Hanover Research of the 275 Geography programs only 30 offered awards in Geographic Information Science in 2014. The research found that jobs in Geographic Information Science are growing nationally. An executive summary of the key findings are included in Appendix A.

Refocusing our department’s mission on Geographic Information Science and Geography will be a better use of the faculty’s specializations and be in line with employment trends and the strengths of the college and University. Currently two of the four faculty members have degrees and research experience in GISCiences and the other faculty members currently utilize GIS in their curriculum and research.

Competing Programs
The BS in GISci would be unique in the region since it would offer a degree focused on Geographic Information Science instead of just offering an emphasis. In addition, it will require core coursework in Computer and Information Science that other programs do not.

UW Lacrosse B.S. Geography, GIS Concentration
UW Madison B.S. Cartography and GIS
UW Stevens Point BS/BA Geography, GISc option
UofM-Twin Cities B.S. Geography, GIS option
Bemidji State B.S. Geography, GIS emphasis
Gustavus Adolphus BA Geography, GIS concentration
UM-Duluth BA Geographic Information Science
U of St. Thomas BA Geography, GIS Concentration

University of Wisconsin Eau Claire offers an 18 credit geospatial certificate and was awarded a University of Wisconsin System "Growth Agenda-Institutional Change Grant" for their Geospatial Education Initiative. The award was for $418,829 for three years with a start date of July 1, 2014. Our proposed BS in Geographic Information Science is ready to be implemented with no need for grants and without delay. It will be a cost effective degree offering in a field with a demonstrated need.
The only direct competition in the Twin Cities metropolitan area are the University of Minnesota, the University of St. Thomas, and Macalester University. Macalester has Geography degree with a GIS emphasis. St. Thomas has a Geography – GIS degree and the University of Minnesota has a GIS emphasis. UW-Stout does not have a geography degree offering and neither does UW-Superior.

**Resources and Curriculum**

No new courses will need to be added to the curriculum and no new faculty or staff will be needed. Based on our current course offerings a student could earn the BS in GISci. Additionally, no new resources will be required for the GIS Lab 301 KFA. The GISci Major would be viable with the present personnel and level of resources including budgets for GIS LAB and S&E. Currently we have two tenured faculty who primarily teach the GIS curriculum. One faculty member who primarily teaches courses in Human and Regional geography teaches a required courses in spatial statistics and analysis and we will take up courses in Human and Regional Geography to free up teaching capacity in the GIS curriculum. We have attached a four-year plan of geography courses for incoming freshman and a two-year plan for transfer students with an Associate of Arts Degree who have not taken any GIS courses.

The existing program array will continue to be offered by the department, including the BS and BA in Geography, Geography Minor, GIS and Cartography Minor, BAS in Geographic Information Sciences, and the GIS Certificate. If necessary the department can begin to phase out some of these if demand merits more resources to the GIS program. The course array is listed below in Table 1.

**Conclusion**

The market analysis shows that there will be an increase in demand for GIS degrees nationally and consistent demand in Wisconsin and Minnesota. The GIS workforce will grow 30 percent from 2014 to 2014 and there will be faster than average growth for GIS-related employment according to the Hanover Research market analysis using Bureau of Labor Statistics. A report by the Bureau of Labor Statistics states that the median salary for geographers was above $74, 744 annually in 2012.6

Based on job prospects, demand for people with education in GISciences, student interest in STEM fields, current faculty expertise and course array, a GISci Major could be effectively implemented on this campus with existing resources on the UWRF campus.

---

Table 1. BS in Geographic Information Science Courses (36 Credits)

**Required Core Courses Geography (18 credits)**

- GEOG 250 Introduction to Geographic Information Science (GiSci) (3 credits) (F-S)
- GEOG 351 Map Design (3 credits) (F-S)
- GEOG 360 Geographic Information Systems: Theory and Methods (3 credits) (F-S)
- GEOG 365 Quantitative Techniques for Geographers (3 credits) (S)
- GEOG 401 Senior Colloquium in Geography (3 credits) (S)
- GEOG 460 Geographic Information Systems: Analysis and Modeling (3 credits) (S)

**Required Courses Computer Science (9 credits)**

- CSIS 161 Programming I (3 credits)* (F-S)
- CSIS 162 Programming II (3 credits) (F-S)
- CSIS 235 Object Oriented Programming (3 Credits) (F-S)

**Required Supporting Courses (3 credits)**

- MATH 146 College Algebra (3 credits) (F-S)

*Note: CSIS 161 requires Math 146 College Algebra or higher, course may count as general education

**Elective Courses Choose (9 credits)**

- Art 121 2D Design Foundation (3 credits)
- Art 131: Drawing I (3 credits)
- Art 241: Graphic Design I (3 credits)
- CSIS 225 Web Development I (3 credits)
- CSIS 237 Data Structure and Algorithm (3 credits)
- CSIS 247 Introduction to Computer Networks (3 credits)
- CSIS 248 Operating Systems Programming (3 credits)
- CSIS 333 Data Base Management Systems (3 credits)
- ESM 333 Remote Sensing of Natural Resources (3 credits)
- GEOG 366 Field Methods & GPS (3 credits)
- GEOG 368 Digital Image Processing (3 credits)
EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION
Of the 275 colleges and universities with geography programs in the United States in 2014, only 30 reported awards specifically in geographic information sciences (GIS). At the same time, employers in a variety of fields are increasingly relying on trained GIS technicians and analysts. At the professional level, the GIS Certification Institute’s certification program has emerged as a leading program for existing GIS professionals to further develop their skill sets to help meet employer demand for trained professionals. In addition, an increasing number of colleges and universities have launched GIS programs, including one-year certificate programs at the undergraduate and graduate levels.

While GIS bachelor’s degree programs account for a smaller percentage of GIS programs, many of these programs are new, making degree completion trends difficult to interpret. Regardless, evidence exists that programs conferring degrees specifically in GIS are growing significantly faster than the general geography degree major. Demand indicators also show optimistic outlooks for GIS-related professions.
In this report, Hanover Research assesses the potential viability of a bachelor’s degree in GIS at the University of Wisconsin-River Falls. The report draws upon degree completions data and occupational employment projections, among other sources, and incorporates a review of programs offered by 20 undergraduate geography departments in Minnesota, Wisconsin, and Iowa.

The report includes three sections:

**Section I: Student Demand** examines the demand for degrees in GIS, including a comparison of completions trends for general geography and specific GIS degrees and certificate programs.

**Section II: Labor Market** looks at the demand in the labor market for employees with GIS training. It includes a review of the projected demand nationally and regionally, as well as of current trends in the marketplace.

**Section III: Competitive Landscape** reviews 20 identified offerings at undergraduate geography departments in the states of Minnesota, Wisconsin, and Iowa and provides detailed profiles of GIS offerings at three institutions.

KEY FINDINGS
National labor market demand for GIS trained workers is strong. The Bureau of Labor Statistics (BLS) lists GIS professions among the top 15 fastest growing occupations and projects...
that the GIS workforce will grow by nearly 30 percent between 2014 and 2024. Other sources also indicate faster than average growth for GIS-related occupations. Although projected growth for relevant occupations is more muted for Wisconsin and Minnesota, these projections are from 2012-2022 and may not fully represent demand for GIS professionals in these states.

**Employers struggle to find well-trained GIS workers.** Some sources indicate that demand for trained GIS employees exceeds supply and employers are frustrated with the lack of adequate GIS training in many of their hires. As a result, employers have increasingly had to look to non-traditional sources to fill staffing needs, and professional certification programs and shorter-term academic programs have been developed.

**Student demand for GIS degrees is increasing nationally, while demand for general geography degrees has stayed flat.** Bachelor’s degree completions for degrees specifically reported as GIS grew by 17.4 percent per year nationally, while the number of geography completions showed little change. Student demand for certificates and master’s degrees grew even faster, suggesting especially strong demand for these types of awards.

**Regional student demand is less conclusive.** In Minnesota and Wisconsin, the number of geography degree completions fell between 2010 and 2014, and there was not an increase in the number of GIS-specific degrees awarded. Of the two identified institutions offering dedicated GIS bachelor’s degrees, one is new and has not yet begun to report degree completions, and the other’s degree conferrals have remained flat over the five-year period. However, the number of completions in these three states for certificates and master’s degrees grew considerably, suggesting growing demand for GIS training in the region at these levels.

**Given the importance of work experience, a strong GIS undergraduate program should incorporate research opportunities or internships as a key part of the academic program.** One student who interned in multiple GIS roles listed not only the skills gained in an internship as important to their career, but the networking benefits as well.