SECTION: 17
DATE: April 22, 2016

BOARD OF REGENTS

EASTERN MICHIGAN UNIVERSITY

RECOMMENDATION

NEW ACADEMIC PROGRAMS

ACTION REQUESTED

It is recommended that the Board of Regents approve a new Academic Program: Geospatial Information Science and Technology Major.

SUMMARY

This major emphasizes the integration of geospatial information concepts and technologies with multiple disciplinary programs that are primarily offered in the Department of Geography and Geology, or in selected departments, in which GIST has well-recognized applications. The GIST program prepares students for positions that utilize geospatial technologies in a broad range of fields that are covered by the afore-mentioned programs.

FISCAL IMPLICATIONS

Program costs will be absorbed with the current Academic Affairs budget

ADMINISTRATIVE RECOMMENDATION

The proposed Board action has been reviewed and is recommended for Board approval.

[redacted]

University Executive Officer

3/31/16

Date

EASTERN MICHIGAN UNIVERSITY

DIVISION OF ACADEMIC AND STUDENT AFFAIRS
OFFICE OF THE ASSOCIATE VICE-PRESIDENT FOR ACADEMIC PROGRAMMING AND SERVICES
INTER OFFICE MEMORANDUM

TO: Chris Shell, Registrar
Richard Sambrook, Department Head, Geography and Geology

FROM: Rhonda Longworth, Interim Provost [redacted]

SUBJECT: **Geospatial Information Science and Technology Major (new program)**

DATE: March 3, 2016

The attached request from the Geography and Geology Department and the College of Arts and Sciences for a new undergraduate program, **Geospatial Information Science and Technology Major**, is approved.

The effective date will be determined following consideration by the Academic Officers Committee, Michigan Association of State Universities and the Eastern Michigan University Board of Regents.

This major includes the following concentrations:

Cultural and Economic Geography Concentration
Environmental Geoscience Concentration
Information Assurance and Security Concentration
Criminology Concentration
Urban and Regional Planning Concentration

If you have any questions, please contact Evan Finley, Course and Program Development Associate (487-8954, efinley2@emich.edu).

Attachment: New Program Proposal

cc:
Thomas Venner, Dean, College of Arts and Sciences
Sandy Norton, President, Faculty Senate
Calvin McFarland, Director, Academic and Career Planning
Pat Cygnar, Director, Community College Relations
Julie Knutson-Garcia, Director, Extended Programs
John Feldkamp, Assistant Director, Honors College
Ramona Milligan, Coordinator, Registration
Carol Evans, Transfer Equivalency Coordinator, Records & Registration
Ann Richards, Assistant Director, Admissions Processing
Mary Butkovich, Halle Library
Bin Ning, Assistant Vice President and Executive Director, IRIM
Yichun Xie, Geography and Geology
Original, Catalog Office

Geospatial Information Science and Technology Major

New Program, effective date TBD

This major emphasizes the integration of geospatial information concepts and technologies with multiple disciplinary programs that are primarily offered in the Department of Geography and Geology, or in selected departments, in which GIST has well-recognized applications. The GIST program prepares students for positions that utilize geospatial technologies in a broad range of fields that are covered by the afore-mentioned programs.

Department Information:

Geography & Geology - College of Arts & Sciences

Richard Sambrook, Ph.D.
Department Head

203 Strong Hall
(734) 487-0218
rsambroo@emich.edu

Department Website

Advisor Information:

See department for advising information

General Education Requirements:

For specific General Education requirements, click here.

Major Requirements: 63 hours

Required Core Courses: 39 hours

- ESSC 110 - The Dynamic Earth System (GEKN) 4 hrs
- ESSC 227 - Topographic Maps 2 hrs

- ESSC 303 - Field Geography 3 hrs
- ESSC 470 - Quantitative Methods in Geography and Geology 3 hrs
- ESSC 485 - Introduction to Remote Sensing 3 hrs
- GEOG 100 - Introduction to Geospatial Sciences and Technology 3 hrs
- GEOG 276 - Principles of Geographic Information Systems 3 hrs
- GEOG 376 - Spatial Analysis 3 hrs
- GEOG 405 - Aerial Photo Interpretation 3 hrs
- GEOG 476 - Geodatabases and GIS Client Applications 3 hrs
- GEOG 480 - Geographic Information Systems Projects 3 hrs
- GEOG 484 - GIS Customization and Programming 3 hrs

One course from the following

- GEOG 314W - Geography of Russia and Neighboring States (GEWI) 3 hrs
- ESSC 466W - Global Tectonics (GEWI) 3 hrs
- URP 415W - Methods of Planning Analysis (GEWI) 3 hrs

Concentration: 23-26 hours

Students must choose one of the following five concentrations

Cultural and Economic Geography Concentration: 24 hours

Choose 24 credit hours from the list of restrictive electives below. At least one course must be at the 400-level.

- GEOG 107 - Introduction to Geography (GEKS) 3 hrs
- GEOG 110 - World Regions (GEGA) 3 hrs
- GEOG 212 - Geography of Travel and Tourism 3 hrs
- GEOG 332 - Urban Geography 3 hrs
- GEOG 333 - Unsettled Geographies 3 hrs
- GEOG 335 - Economic Geography 3 hrs
- GEOG 360 - Cultural Geography 3 hrs
- GEOG 361 - Geography of Population 3 hrs
- GEOG 441 - Transportation Geography and Planning 3 hrs

Environmental Geoscience Concentration: 26 hours

Choose 26 credit hours from the list of restrictive electives below. At least one course must be at the 400-level

- ENVI 105 - Introduction to Environment and Society (GEGA) 3 hrs
- ESSC 105 - Climate Change in Human Times (GEGA) 3 hrs
- ESSC 107 - Environmental Science (GEGA) 3 hrs
- ESSC 111 - The Earth System through Time 4 hrs
- ESSC 212 - Weather, Climate and the Earth System 3 hrs
- ESSC 229 - Rocks and Minerals 3 hrs
- ESSC 300 - Introduction to Hydrology 3 hrs

- ESSC 320 - Oceanography 3 hrs
- ESSC 325 - Geomorphology 4 hrs
- ESSC 370 - Glacial and Quaternary Geology 4 hrs
- ESSC 424 - The Global Climate System 3 hrs

Information Assurance and Security Concentration: 24 hours

Choose 24 credit hours from the list of restrictive electives below. At least one course must be at the 400-level

- IA 202L4 - Risk-Vulnerability Analysis (GELB) 3 hrs
- IA 210 - Concepts of Network and Business Technology 3 hrs
- IA 212 - Open Systems Platform and Network Administration 3 hrs
- IA 213 - Privacy and Technology 3 hrs
- IA 215 - System Support and Troubleshooting 3 hrs
- IA 240 - Intelligence Analysis I 3 hrs
- IA 329W - Policy Development in Information Assurance (GEWI) 3 hrs
- IA 343 - Intelligence Analysis II 3 hrs
- IA 344 - Administration of Computer Systems 3 hrs
- IA 422 - Networks: Planning and Design 3 hrs

Criminology Concentration: 24 hours

Choose 24 credit hours from the list of restrictive electives below. At least one course must be at the 400-level

- CRM 300 - Criminal Justice 3 hrs
- CRM 301 - Criminology 3 hrs
- CRM 331 - Introduction to Corrections 3 hrs
- CRM 333 - Violence and Society 3 hrs
- CRM 338 - Women, Crime and Justice 3 hrs
- CRM 354 - Juvenile Delinquency 3 hrs
- CRM 362 - Ethics for Criminal Justice Professionals 3 hrs
- CRM 370 - White Collar Crime 3 hrs
- CRM 431 - Policing in Society 3 hrs
- SOCL 105 - Introductory Sociology (GEKS) 3 hrs

Urban and Regional Planning Concentration: 23-25 hours

Choose 23-25 credit hours from the list of restrictive electives below. At least one course must be at the 400-level

- GEOG 441 - Transportation Geography and Planning 3 hrs
- URP 215 - Introduction to Urban and Regional Planning 3 hrs
- URP 216 - Readings in Urban Planning 2 hrs
- URP 306 - Comprehensive Planning and Zoning 3 hrs
- URP 401 - Planning/Preservation Graphics 3 hrs
- URP 410L4 - Site Planning Studio (GELB) 4 hrs

or URP 459 - Planning/Preservation Studio 3 hrs

- URP 415W - Methods of Planning Analysis (GEWI) 3 hrs *
- URP 452 - Infrastructure Planning and Policy 3 hrs
- URP 495 - Environmental Assessment and Planning 3 hrs

**URP 415W can only be applied to this major once, either as a Writing Intensive or a restricted elective in this concentration.*

Minor Requirement:

This program does not require a minor.

Program Total:

Students must earn a minimum total of 124 credits at the 100-level or above.

Critical Graduation Information:

The following are minimum requirements for all bachelor's degrees awarded by Eastern Michigan University. Some majors and minors require more than the minimum in one or more of the areas below; students are urged to consult the on-line catalog for the requirements of their particular programs.

- Earn a minimum total of 124 credits at the ***100-level and above*. Courses with numbers below 100 will not be counted toward this degree requirement. At most 8 credit hours of physical education (PEGN) activity courses will be counted toward this requirement.** A Bachelor of Arts degree requires completion of one year of college credit in a world language.
- Meet the requirements of the General Education program (see information below).
- Complete a Writing Intensive (WI) Course in your major.
- Earn a minimum of 60 credits from a four-year college or university; **courses taken at community colleges cannot be used to meet this requirement.** (Some formal program-to-program articulation agreements modify this requirement. See specific agreements for details.)
- Earn a minimum of 30 credits from courses taken at EMU.
- Complete 10 of the last 30 hours for the degree from courses taken at EMU.
- Have a minimum of 30 ***unique*** credit hours in their major and 20 ***unique*** credit hours in their minor for a total of at least 50 unique credit hours between them. Some majors that require 50 or more hours themselves do not require a minor; students should check requirements of the selected major in the undergraduate catalog to see if a minor is required.
- Earn no more than 60 credit hours in one subject area (prefix). Credits in excess of the 60 maximum will not be counted toward the minimum of 124 credits required for a bachelor's degree.
- Earn the minimum number of credits in 300-level and above courses in each major and minor as specified below - these credits must be earned in distinct courses; that is, no course can be used to fulfill this requirement in more that one major or minor.
    - Earn a minimum of 6 credits in 300-level or higher courses at EMU in each minor
    - Earn a minimum of 9 credits in 300-level or higher courses at EMU in each major that requires a minor.
    - Earn a minimum of 15 credits in 300-level or higher courses at EMU in each major that does not require

a minor

- Transfer credit will be awarded for courses taken at colleges and universities that are accredited by one of the recognized regional accrediting bodies only if the courses are college-level (equated to 100-level or above at EMU) and the student earned a "C" (or 2.0 on a 4 point scale) or better. Transfer credit may be awarded on a case-by-case basis for college-level courses in which a "C" (2.0) or better was earned at institutions outside the U.S. or at non-accredited U.S. institutions; the internal review of such courses is conducted by individual departments/schools within EMU, and additional documentation may be required. *Please note:* EMU awards only credits for transferred courses; grades are not used in the calculation of an EMU GPA.
- Earn a minimum cumulative GPA of 2.0 in courses taken at EMU in order to graduate. In addition, a minimum cumulative GPA of 2.0 must be reached in each major and minor. Only courses taken at EMU and those applied to a student's major or minor, will be used in the calculation of their major and minor cumulative GPAs. (Note: some programs may require a higher GPA - check with your program advisor.)

General Education Requirements:

EMU's General Education Program requires students to choose from a menu of approved courses in several different areas; do not assume that other courses in the same department or with similar names will fulfill these requirements. A detailed description of General Education requirements is available on the General Education section of the catalog: General Education

Students who transferred to EMU may have modified general education requirements based on Michigan Transfer Agreement (MTA) or articulation agreements; consult your academic advisor for additional information.

EASTERN MICHIGAN UNIVERSITY
DIVISION OF ACADEMIC AFFAIRS

OUTLINE FOR SUBMITTING PROPOSALS FOR NEW DEGREE PROGRAMS

Use this outline to prepare proposals for new programs, including undergraduate majors and minors and graduate majors. Proposals should be submitted in narrative form, organized according to the following outline. Guidelines for submitting such proposals are on the following pages.

PROPOSED PROGRAM NAME: Geospatial Information Science and Technology (B.S. Major)

DEGREE: B.S.

REQUESTED START DATE: FALL, 2015

Department(s)/School(s): Geography and Geology

College(s): Arts and Sciences

CONTACT PERSON: Professor Yichun Xie

CONTACT PHONE: 487-7588

CONTACT EMAIL: yxie@emich.edu

I. Description:

A. Goals, Objectives, Student Learning Outcomes

The goal of the Geospatial Information Science and Technology (GIST) Major is to offer a high-quality undergraduate program that integrates widely-applicable geospatial information concepts and technologies into a solid general education with specialized, marketable student-chosen concentrations.

This new program has five specific objectives:

(1) Teach students to understand the question, "why geography matters?" "Geography matters" because Graphicacy, along with Literacy, Articulacy, and Numeracy, are the four fundamentals of education. Geography is well-placed to teach graphicacy through its varied methodological toolkits, including GIST. Geography and GIST stimulate students to think spatially, graphically, and analytically, and to apply such thinking to solve a wide range of academic and societal problems using data in the form of maps.

(2) Empower students with geospatial information technologies (including geographical information system, global positioning system, and remote sensing) for in-demand professional careers, which are among the fastest growing of all sectors of the economy (e.g., environmental management and science, homeland security and law enforcement, marketing and location-based services, telecommunications, renewable and non-renewable energy industries, and information assurance).

(3) Leverage technological changes for the benefit of society (National Research Council, 2010, *Understanding the Changing Planet: Strategic Directions for the Geographical Sciences*,) through integrating geospatial information science and technologies within the undergraduate curricula so that students grow into interdisciplinary thinkers and broadly-educated professionals with specialized intellectual abilities.

(4) Align with science, technology, engineering and mathematics (STEM) education and career goals.

(5) Promote international cooperation through an established joint international program in cooperation with Wuhan University of China.

This new program also has four student learning outcomes:

(1) Understand the spatial distributions of earth's cultural and physical features and their relationships;

(2) Apply geospatial information technology (GIS, GPS, and remote sensing) to assess human and natural induced problems in the context of sustainable societal development;

(3) Synthesize interdisciplinary recommendations pertaining to possible solutions to earth's human and natural induced problems;

(4) Help Geography students succeed in gaining employment after graduation or in obtaining admission to graduate school.

B. Program: Geospatial Information Science and Technology

This major emphasizes the integration of geospatial information concepts and technologies with multiple disciplinary programs that are primarily offered in the Department of Geography and Geology, or in selected departments, in which GIST has well-recognized applications. The GIST program prepares students for positions that utilize geospatial technologies in a broad range of fields that are covered by the afore-mentioned programs.

General Education Requirements: 40 hours
For specific requirements refer to the General Education Program.

Required Core Courses: 36-39 hours

GEOG 100 - Introduction to Geospatial Sciences and Technology: 3 hrs
ESSC 110 - The Dynamic Earth System: 4 hrs
GEOG/ESSC 227 - Topographic Maps: 2 hrs
GEOG 276 - Principles of Geographic Information Systems: 3 hrs
ESSC 303 – Field Geography: 3 hrs
GEOG 376 - Spatial Analysis: 3 hrs
GEOG 405 - Aerial Photo Interpretation: 3 hrs
ESSC 470 - Quantitative Methods in Geography and Geology: 3 hrs
GEOG 476 – Geodatabases & GIS Client Applications: 3 hrs
GEOG 480 - Geographic Information Systems Projects: 3 hrs
ESSC 485 - Introduction to Remote Sensing: 3 hrs
GEOG 584 - Visual Programming for GIS Customization: 3 hrs

Required Writing Intensive Course*: 3 hours
(Choose 3 credit hours from the list of writing intensive courses below)

GEOG 314W - Geography of Russia and Neighboring States (GEWI): 3 hrs
ESSC 466W – Global Tectonics (GEWI): 3 hrs
URP 415W - Methods of Planning Analysis (GEWI) - Credits: 3 hrs

* GEOG 480 - Geographic Information Systems Projects has been identified as a suitable course for being vetted as a writing intensive course. The GIS faculty members are developing the paper work. When GEOG 480 is approved as a GEWI course, it will be added into the list of writing intensive courses as a new option.

Choose a Concentration: 24 – 26 credit hours

The GIST Major Program recommends that a student majoring in GIST must choose one of the following five concentrations:

I. Cultural and Economic Geography Concentration
(Choose 24 credit hours from the list of restrictive electives below. At least one course must be at the 400 level).

GEOG 107 - Introduction to Geography - Credits: 3 hrs
GEOG 110 - World Regions - Credits: 3 hrs
GEOG 212 - Geography of Travel and Tourism - Credits: 3 hrs
GEOG 235 - Economic Geography - Credits: 3 hrs
GEOG 332 - Urban Geography - Credits: 3 hrs
GEOG 333 - Unsettled Geographies - Credits: 3 hrs
GEOG 360 - Cultural Geography - Credits: 3 hrs
GEOG 361 – Geography of Population – Credits: 3 hrs
GEOG 441 - Transportation Geography and Planning - Credits: 3 hrs

II. Environmental Geoscience Concentration
(Choose 26 credit hours from the list of restrictive electives below. At least one course must be at the 400 level).

ENVI 105 - Introduction to Environment and Society (GEGA) - Credits: 3 hrs
ESSC 105 - Climate Change in Human Times - Credits: 3 hrs
ESSC 107 - Introduction to Environmental Science (GEGA) – Credits: 3hrs
ESSC 111 - The Earth System through Time - Credits: 4 hrs
ESSC 212 - Weather, Climate and the Earth System - Credits: 3 hrs
ESSC 229 - Rocks and Minerals
ESSC 300 - Introduction to Hydrology - Credits: 3 hrs
ESSC 320 - Oceanography - Credits: 3 hrs
ESSC 325 - Geomorphology - Credits: 4 hrs
ESSC 370 - Glacial and Quaternary Geology - Credits: 4 hrs
ESSC 424 - The Global Climate System - Credits: 3 hrs

III. Information Assurance and Security Concentration
(Choose 24 credit hours from the list of restrictive electives below. At least one course must be at the 400 level).

IA 202L - Risk-Vulnerability Analysis (GELB) - Credit: 3hrs
IA 210 - Concepts of Network and Business Technology - Credit: 3hrs
IA 212 - Open Systems Platform and Network Administration - Credit: 3hrs
IA 213 - Privacy and Technology - Credit: 3hrs
IA 215 - System Support and Troubleshooting - Credit: 3hrs
IA 240 - Intelligence Analysis I - Credit: 3hrs
IA 329 - Policy Development in Information Assurance - Credit: 3hrs
IA 343 - Intelligence Analysis II - Credit: 3hrs
IA 344 - Administration of Computer Systems - Credit: 3hrs
IA 422 - Networks: Planning and Design - Credit: 3hrs

IV. Criminology Concentration
(Choose 24 credit hours from the list of restrictive electives below. At least one course must be at 400 level).

SOCL 105 - Introductory Sociology (GEKS) - Credit: 3hrs
CRM 300 - Criminal Justice - Credit: 3hrs
CRM 301 - Criminology - Credit: 3hrs
CRM 331 - Introduction to Corrections - Credit: 3hrs
CRM 333 - Violence and Society - Credit: 3hrs
CRM 338 - Women, Crime and Justice - Credit: 3hrs
CRM 354 - Juvenile Delinquency - Credit: 3hrs
CRM 362 - Ethics for Criminal Justice Professionals
CRM 370 - White Collar Crime - Credit: 3hrs
CRM 431 - Policing in Society - Credit: 3hrs

V. Urban and Regional Planning Concentration
(Choose 23 -25 credit hours from the list of restrictive electives below. At least one course must be at 400 level).

URP 215 - Introduction to Urban and Regional Planning - Credits: 3 hrs
URP 216 - Readings in Urban Planning - Credits: 2 hrs
URP 306 - Comprehensive Planning and Zoning - Credits: 3 hrs
URP 401 - Planning/Preservation Graphics - Credits: 3 hrs
URP 410L - Site Planning Studio (GELB) - Credits: 4 hrs
or URP 459 Planning/Preservation Studio - Credits: 3 hrs
GEOG 441 - Transportation Planning and Geography- Credits: 3 hrs
URP 415W* - Methods of Planning Analysis (GEWI) - Credits: 3 hrs
URP 452 - Infrastructure Planning and Policy - Credits: 3 hrs
URP 495 - Environmental Assessment an Planning - Credits: 3 hrs
* If you take URP 415W as the intensive writing course, it will not counted as a restrictive elective course in the Urban and Regional Planning Concentration.

Minor Requirements:
This major does not require a minor.

Program Total:
Students must earn a minimum total of 124 credits at the 100-level and above.

C. Admission

Students will follow the admission guideline of Eastern Michigan University (http://www.emich.edu/admissions/apply.php).

D. Projections

We expect to formally launch the major in Fall 2015 with an initial admission of 20 to 30 students from Michigan and Ohio. We plan to establish a 2 + 2 international agreement with Wuhan University of China in Fall 2016 when the Geospatial Information Science and Technology Major is formally running. We expect to receive 10 international students yearly beginning from 2017. During a five-year period of 2017 – 2021, the GIST program plans to recruit 30 students from Michigan and Ohio, 10-15 students across the nation, and 10-15 international students per year. During the second five-year period of 2022 – 2026, the GIST program will increase its enrollments by 25 percent across all three groups of students.

II. Justification/Rationale

1. Four Unique Contributions of the New Program

The proposed new program of Geospatial Information Science and Technology Major will have four far-reaching impacts: Making Eastern students employable; Enhancing STEM (science, technology, engineering and mathematics) education and career for underrepresented communities in SE Michigan; Internationalizing Eastern campus; and Providing students with great opportunities to participate in sponsored research grants and projects.

A. Making Eastern Students Employable

Geographic Information Science (GIS) combines geographic analysis, information science, analytical methods, geospatial technologies, and software packages with geophysical or geographic datasets to support decision making for best practices in a wide array of disciplines and industries. Because the uses for GIS are so widespread and diverse, the market is growing at an annual rate of almost 35 percent, with the commercial subsection of the market expanding at the rate of 100 percent each year. ( )

Geospatial (GIS, GPS, and RS) technology, along with nanotechnology and bio-engineering, is cited as one of three emerging industries in *Nature* (Careers and Recruitment: Mapping Opportunities, by Virginia Gewin, *Nature* 427, 376-377). The Assistant Secretary of the U.S. Department of Labor's employment and training division estimates that the worldwide market for the geospatial technology industry, defined as a cluster of commercial activities growing out of GIS, GPS (global positioning system), and RS (remote sensing) technologies, is now $5 billion per year and that it will continue to grow at an annual rate of 10 to 13 percent. (http://www.highbeam.com/doc/1P2-13166886.html)

The current programs of GIS and RS in the Department of Geography and Geology are well known for their focus on "hands-on learning" and "practical uses of geospatial technologies in societies." Our GIS and RS Program has made a significant contribution to enabling Eastern students to gain employment even at the times when economy was slowing down.

B. Enhancing STEM (science, technology, engineering and mathematics) education and career for underrepresented communities in SE Michigan

EMU is located in Southeast Michigan, a seven-county area of metropolitan Detroit with nearly five million people. This region has significant diversity as underrepresented groups make up 30% of the population (see the enclosed table). As a regional institution of higher education, this regional diversity is reflected in EMU's diversity mission statement. Moreover, the employment situation has been dreadful in the Detroit metropolitan area. "Southeast Michigan, and the State of Michigan as a whole, is currently in the midst of serious structural economic trouble. The region has lost jobs since 2000 especially in the auto manufacturing sector (SEMCOG, 2008, P.19)." Although this region is recovering from a decade-long deep recession, the recovery will be longer and slower than in the past (SEMCOG, 2012). Furthermore, the minority communities have been suffering disproportionally in job loses (Shapiro, Meschede & Osoro, 2013).

County	Total	White	Black/African American	Asian	Hispanic/Latino
Genesee	425,790	317,393	88,127	3,879	12,983
Livingston	180,967	175,015	809	1,424	3,460
Macomb	840,978	717,973	72,723	25,063	19,095
Monroe	152,021	143,476	3,237	842	4,667
Oakland	1,202,362	928,912	164,078	67,828	41,920
Washtenaw	344,791	256,880	43,767	27,109	13,860
Wayne	1,820,584	951,936	737,943	45,915	95,260
Total	4,967,493	3,491,585	1,110,684	172,060	191,245
Percentage		70%	22%	3%	4%

GIST, as a new STEM field classified by US Department of Education, will definitely contribute to EMU's efforts of advancing STEM education and increasing diversity within the labor pool of high-tech professionals. Almost all enterprises are using the Internet to disseminate location-related (geographic) data in map forms using Web GIS. With the increasing popularity of global on-line mapping web applications (e.g. Google Maps, Microsoft Virtual Earth, Yahoo Maps, ArcGIS Online), Web GIS is part of "business exchange" and there is an ever-growing number of new jobs. Therefore, there is no better time for youth to be part of GIST because the geospatial technology and information technology have been expanding at an exponential rate. Career opportunities are virtually unlimited, as is the range of businesses in which computer skills could be utilized. Banking, engineering, film production, forestry, health, homeland security, manufacturing, management consulting, and mining – practically every industry is now using computers and needing people to manage, use, network, or program them. Technical skills are also very portable, a circumstance that makes a career in geospatial information technology very attractive to people who like to experience different cultures.

In addition, GIS has long been recognized as an interdisciplinary technology supporting high-level thinking and spatial reasoning (Bednarz and Ludwig 1997; Drennon 2005; NRC 2006; Rye et al. 2012; Kulo and Bodzin 2013). GIS has been commonly regarded well suited to conduct open-ended investigations, to visualize complex real world problems, and to support multiple modes of learning (Hunter and Xie 2001; Henry and Semple 2012; Lay et al. 2013). GIS has been widely deployed by teachers and educators to teach subjects in social studies, earth science, environmental science, and, in particular, in geography. GIS, along with its related methods and data-sets, has opened the 'door' to "inquiry-based learning", "project-based learning", and "action-oriented leaning", which are important strategies of promoting and enhancing STEM education and career incentives.

C. Internationalizing Eastern Campus

The current GIS and RS Programs have been making a unique contribution to EMU's mission of expanding its international presence and cooperation. The GIS and RS Programs have established a joint GIS Master's Degree program and a joint GIS Undergraduate Minor program with Wuhan University in China – The Spatial Information and Digital Engineering Program. Started in 2008, Wuhan University has sent around 6 - 10 graduate students to EMU each year to attend the joint GIS master's program. Moreover, started in 2010, Wuhan University has been sending around 20 undergraduate students to EMU to attend the computer science major and GIS minor programs.

Furthermore, EMU is negotiating with Wuhan University for an international campus program agreement, through which EMU will send its undergraduate and graduate students in GIS, RS, computer science, and related disciplines to Wuhan University to study for a period of one or two years as part of their programs at EMU. Wuhan University will provide financial incentives, Chinese language learning, and hands-on internship opportunities for EMU students when they are studying in Wuhan. This program will help internationalize the EMU Campus and expedite the process of preparing Eastern's students to enter into and compete in the 21st Century work force.

Also it is worth pointing out that Wuhan University is very interested in establishing a joint GIS undergraduate major program with EMU. The Department of Geography and Geology, under the leadership of Dr. Sambrook, and the College of Arts and Sciences, coordinated by Dr. Elisabeth Morgan, Director of the International Initiatives, strongly support this initiative, and are planning to propose a new program soon.

D. Providing Students With Great Opportunities To Participate In Sponsored Research Grants and Projects

The Department of Geography and Geology has an important research outreach arm, Institute for Geospatial Research and Education (IGRE), which has a long history as an EMU research center (previously CEITA – the Center for Environmental Information Technology and Application) for developing innovative research methods, technologies and applications in geographic information systems (GIS) and remote sensing (RS) to address emerging societal challenges. IGRE collaborates with researchers from many universities and U.S. government agencies to develop spatial modeling, geo-computation, and GIS analytical tools and methods to support informed decision making in environmental studies, sustainable development, and land use planning. IGRE has won a number of significant grants, published extensively in peer-reviewed journals, completed many projects successfully, and developed a dozen useful software

packages (e.g., Dynamic Urban Evolutionary Modeling - DUEM, Fully Integrated Environmental Location-characterization Decision Support – FIELDS, etc.).

More importantly, IGRE provides rich research experiences and financial support to EMU's GIS master degree program. IGRE often employs 12 to 15 graduate and undergraduate students, 3 to 5 post-doctoral fellows and visiting research scholars, and 2 to 3 faculty fellows per year. IGRE also places or recommends 3 to 5 student interns in regional and local organizations and industries. In particular, IGRE has provided Eastern GIS students with great opportunities to participate in prestigious sponsored research grants. For example, IGRE has awarded graduate assistantships and student assistant awards through the following grants:

Collaborative Project: GIS/T Resources and Applications for Career Education (GRACE), 2014 – 2018, $1,568,276.00, funded by the US National Science Foundation.

Investigating Climate Change and Remote Sensing (ICCARS), 2010 – 2013, $274,586, funded by US NASA.

Hyperspectral Remote Sensing and Science-Based Management of Invasive Species in the Detroit River International Wildlife Refuge, 2010 – 2013, $500,000, funded by the National Oceanic and Atmospheric Administration.

Coupled Remote Sensing and Biological Monitoring of Invasive Plant Species and Their Impacts on the Detroit River International Wildlife Refuge (CRSBM-DRIWR), 2009-2011, $633,350, funded by the National Oceanic and Atmospheric Administration.

Grassland Ecosystems and Societal Adaptations Under Changing Grazing Intensity and Climate on the Mongolian Plateau, 2009 – 2013, $458,298, funded by US NASA Land Cover and Land Use Change Program and University of Michigan.

RAPIDS (Regional Air Pollution Inventory Data System) Web-based Development and Maintenance 2009 – 2013, $237,680, funded by Great Lakes Commission.

(City of Detroit) Mayor's Youth Technology Corps - Creating Safe Communities through Information Technology Training in Homeland Security Applications, 2008-2011, $900,000, funded by the US National Science Foundation.

References cited in this section:

- Bednarz, S. W. & Ludwig, G. (1997). Ten things higher education needs to know about GIS in primary and secondary education. Transactions in GIS, 2(2), 123-133.

- Drennon, C. (2005). Teaching geographic information systems in a problem-based learning environment. Journal of Geography in Higher Education, 29 (3), 385–402

- Henry, P. & Semple, H. 2012. Integrating online GIS into the K–12 curricula: Lessons from the development of a collaborative GIS in Michigan, Journal of Geography, 111(1), 3-14.

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2. Enrollment Statistics, Projected Growth, and Characterization of Demand

Tables Compiling GIS Program & Faculty Statistics

ACADEMIC YEAR

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
GIS Class Enrollment (Fall/Winter Only)	*a*	*a*	209	243	298	305
GIS Class Enrollment (entire year)	133 [a]	132 [a]	209 [b]	243 [b]	325	305 [b]
Service Class Enrollment [d]	81	203	98	60	63	145 [b]
GIS Majors Enrolled in Class (aggregate)	120	99	78	76	125	94 [b]
GIS Minors Enrolled in Class (aggregate) [c]	52	60	69	64	63	44 [b]
Combined GIS Majors & Minors Enrolled in Class (aggregate)	170	150	140	133	180	132 [b]
GIS Degrees Conferred	*a*	*a*	3	12	19	14

a = incomplete data b = Fall/Winter only c = Includes undergraduate GIS, CRS, ENAN minors
d = data assumed complete, but might have missed some enrollment

	2011/12	2012/13	2013/14
GIS Class Enrollment (Fall/Winter Only)	283	273	335
GIS Class Enrollment	315	311	*a*

(entire year)			
Service Class Enrollment[d]	*a*	*a*	*a*
GIS Majors Enrolled in Class (aggregate)	96	91	*a*
GIS Minors Enrolled in Class (aggregate)[c]	*a*	*a*	*a*
Combined GIS Majors & Minors Enrolled in Class (aggregate)	*a*	*a*	*a*
GIS Degrees Conferred	15	23	*a*

	Fall/Winter	Spring/Summer
Enrolled Majors Average	40.9	6.5
Enrolled Minors Average	22.3	5.8
Enrolled Combined Average	63.4	13.8

The above tables can be interpreted in a number of ways. First, the most telling trend is exhibited in the *GIS Class Enrollment (Fall/Winter Only)* entry. A rapidly progressive growth trend in the number of GIS course sections enrolled by students is occurring. This is due in part, no doubt, to the addition of Wuhan University students participating in the recently-initiated joint GIS Master of Science and joint Computer Science Bachelor of Art with a GIS Minor program. Similarly, in spite of some incomplete data, the same growth trend obtains in *GIS Class Enrollment (entire year)* statistics, also likely resulting from the addition of Wuhan students. In terms of number of classes offered, there are 17standard GIS undergraduate and graduate classes. Adding special topics classes, the total is 20. By including independent study sections, thesis and professional paper, and internships, the total number of GIS courses increases to 26.

The *GIS Majors Enrolled in Class* is also an aggregated statistic. These numbers show a downward trend in 2007/08 and 2008/09, probably resulting from the closure of the *GIS and Planning* Master's program with consequent loss of some majors to the Urban and Regional Planning Program. However, the trend for this statistic shows renewed growth with the influx of Wuhan students.

The GIS Minors Enrolled in Class is an aggregate statistic that is relatively stable and applies only to undergraduates. The GIS Minor programs represent a significant contribution to our enrollment numbers. Combining GIS majors and minors in aggregate enrollment demonstrates that a relatively large number of students are taking at least one class in at least one semester in any given academic year. Average numbers of majors and minors enrolled in at least one class are given in the sub-table below the main table, and perhaps present a better picture of the actual number of active majors (~41) and minors (~22) during the Fall/Winter terms. Many of these students enroll in internship, thesis/professional paper, and/or independent study credit during the Spring/Summer terms.

We believe the collective statistics above support the assertion that we have a robust and thriving graduate program, with the addition of a large and active undergraduate minor. Informal polling of students, plus examination of peer institutions, reveals a strong demand for the GIS undergraduate major, largely driven by the explosion in job growth nationally and worldwide for geospatial technologies and their applications.

Moreover, the national trend of job growth in GIS and GIS-related industries and businesses has been transpired on the Eastern campus. A few examples are given below as illustrations:

A. The initiation of the new IESS (Integrated Environmental Science & Studies) program. GIS courses are prominently included in this new program:
    - GEOG 276 - Principles of Geographic Information Systems (3 hrs) - required by all students as a common core class

- GEOG 376 - Spatial Analysis (3 hrs) - elective in Atmosphere & Climate/Env.Biology/Env.Hydrology tracks
- GEOG 476 - Geodatabases & GIS Client Applications (3 hrs) - elective in Atmosphere & Climate/Env.Biology tracks
- ESSC 485 - Introduction to Remote Sensing (3 hrs) - required in Atmosphere & Climate track, and elective in Env.Geo-science/Env.Hydrology tracks

B. The recently initiated College of Technology Ph.D. program with GIS concentration.

C. A joint grant proposal between College of Arts and Sciences and College of Business: Science Master's Program: Geographic Information System Entrepreneurial Innovations (see Appendix 1).

D. Discussions between the departments of Geography and Geology and Economics about joint GIS and Economics degree programs.

E. Finally, it should be noted that Eastern is in an excellent position to capture a large portion of the regional GIS education market. GIS is experiencing growth at the University of Michigan, but they serve different student demographics. Likewise, Michigan State has an excellent GIS program, but serves a different market. If Eastern does not act, other institutions such as the community colleges, will act. Eastern should move to solidify its regional position as the leader in GIS education for the non-elite university student market by establishing the new Geospatial Information Science and Technology Major.

III. Preparedness

The Department of Geography and Geology is very well positioned to capitalize on the trend of job growth for geospatial information and technologies to the benefit of our students. In addition to what described in the previous section, the Department has four unique advantages to develop and operate the new Geospatial Information Science and Technology Major.

A. A group of dedicated and distinguished faculty

- Dr. Yichun Xie, Professor of GIS and founding director of EMU Institute for Geospatial Research & Education, is an international known GIS researcher with focuses on dynamic urban modeling, environmental studies and geographic information science. He is the author of 1 book and over 100 peer-reviewed articles, and has served as principal investigators (PI) for a dozen of significant research and education projects sponsored by NSF, NASA, NOAA, USEPA, and USGS.

- Dr. Hugh Semple, Professor of Geography, Department of Geography and Geology, EMU. Dr. Semple teaches undergraduate and graduate levels courses in Introductory GIS, Spatial Analysis and Modeling, Geodatabases, and Cartography. His current research focuses on disease mapping and spatial analysis of public health data, web-based GIS tools for disease surveillance, evolution of food deserts in the US, and climate adaptation issues in urban areas of the Caribbean.

- Dr. Chris Mayda, Professor of Geography in the Department of Geography and Geology. Her research interests focus on agricultural and rural, food systems, community, cultural, GIS, and Regional US/Canada. All her research activities are incorporated within the sustainable mindset, systems thinking, and teaching in preparation for the Ecological Age.

- Dr. Tom Kovacs is a Professor of Meteorology in the Department of Geography and Geology and Coordinator of the Interdisciplinary Environmental Science and Society program. His research interests involve satellite remote sensing of the atmosphere with weather and climate applications. Dr. Kovacs was the lead of science studies for the Hampton University NASA contract for the Cloud Aerosol Lidar and Pathfinder Satellite Observations (CALIPSO) mission. He also coordinated a global network of nearly 500 ground-based remote sensing sites to provide validation data for the CALIPSO

mission. Currently, he is the EMU representative of the Michigan Science Teaching and Assessment Reform (MiSTAR) project, a $5 million 3-year study funded by the Dow Foundation.

- Dr. William Welsh, Associate Professor in the Department of Geography and Geology. Hs research and teaching interests focus on geographical information science, remote sensing, and environmental geography. His research since joining EMU in 2005 includes: evaluation of the Michigan Coastal Brownfield redevelopment program (NOAA, co-PI); mapping and analysis of invasive species within the Detroit River International Wildlife Refuge (NOAA, co-PI); Urban Tree Canopy analysis and education (USFS; co-PI); and, modeling the potential for a closed-loop biofuel system in Detroit (internal).

- Danny Bonenberger is Associate Professor of Historic Preservation in the Department of Geography and Geology. His work explores the intersection of cultural geography, digital technologies, and historic preservation, focusing on common places, buildings, people, and landscapes. Current research employs critical GIS, serious games, and virtual heritage, to explore the sensuous and emotional aspects of place revealed in the literary realism of Rebecca Harding Davis.

- Dr. Todd Grote is an Assistant Professor of Earth System Science in the Department of Geography and Geology. His research interests lie within river responses to climate change, Quaternary geology, Paleoclimatology, hydroclimatology and environmental change. Dr. Grote has considerable research experience in field-based studies of river processes, geoarchaeology and surficial geology/geomorphic mapping throughout Eastern North America, and is also skilled in GIS and Remote Sensing analyses.

B. Current library holdings in the fields of geographical information science and technology are adequate for the proposed program.

A search with the key word, "geographical information," in the EMU library system returned 960,315 results (see the screen shot below). For instance, the results include 567,496 journal articles, 135,081 dissertations, 121,568 books / eBooks and 60,083 trade publication articles. Moreover, EMU Library provides the faculty with the access to the *Science Direct*, which collects peer-reviewed science-citation-indexed publications that are most comprehensive and authoritative. A search with the key word, "GIS and global climate change," in the *Science Direct* found 15,928 results from prominent journals concerning GIS and remote sensing (see the following screen shot).

Search Results: Your search for **geographical information** returned **960,315** results

Relevance

Refine your search

- Items with full text online
- Limit to articles from scholarly publications, including peer-review
- ✔ Exclude Newspaper Articles
- Items in the library catalog
- Add results beyond your library's collection

▼ Content Type

- ✔ Any
- Journal Article (567,496)
- Dissertation (135,081)
- Book / eBook (121,568)
- Trade Publication Article (60,083)
- Book Review (33,125)

Excluded

- ~~Newspaper Article~~

more ...

▼ Subject Terms

- ✔ Any
- article (75,760)
- studies (73,035)
- social sciences (68,294)
- ecology (52,149)
- history (51,025)
- analysis (45,219)

more ...

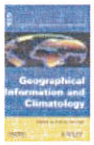
▼ Publication Date

Any

Geographical information systems

by Longley, Paul; Goodchild, Michael F.; Maguire, David J.; Rhind, David
1999, 2d. ed., ISBN 0471321826, 2 v.
Geography. Information storage and retrieval systems. Data processing
Book: Not Charged, G70.2 .M354 1999, 3rd Level ► Show 1 more ...

Geographical information and climatology



by Carrega, Pierre
2010, Geographical information systems series, ISBN 1848211856, xi, 274 p., [16] p. of plates
... geospatial climate data measurement ... spatial analysis ... mapping and climate ... **geographical information**, remote sensing and climatology ... Climatology. Geographic information systems
Book: Renewed - Due on 2014-12-18, QC871 .I4313 2010, 3rd Level

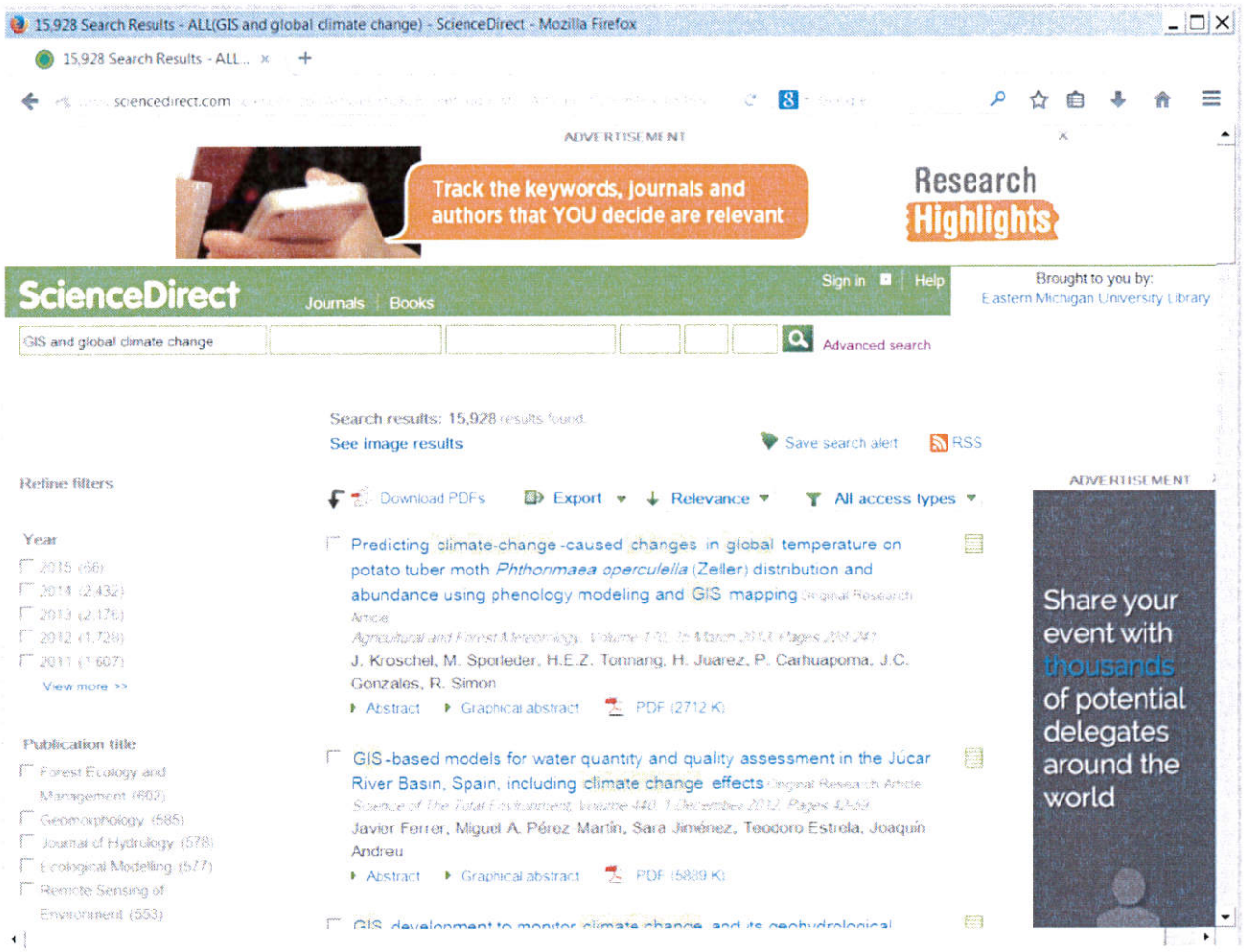
Geographical information systems: an introduction

by Delaney, Julie and Van Niel, Kimberly
2007, 2nd ed., ISBN 0195556070, xviii, 214
Computer programs. Spatial analysis (Statistics). Geographic information systems
Book: Renewed - Due on 2014-12-18, G70.212 .D45 2007, 3rd Level

Principles of **geographical information** systems

by Burrough, P. A. and McDonnell, Rachael
1998, Spatial information systems, ISBN 0198233655, xiii, 333
Geographic information systems
Book: Not Charged, G70.212 .B87 1998, 3rd Level

Geographical information systems: principles and applications



C. Several successful minor programs related to the new Geospatial Information Science and Technology Major, will provide students to the new Major,

- Geographic Information Systems Minor
- Cartography and Remote Sensing Minor
- Environmental Analysis Minor
- Coastal Environments Minor
- Sustainability in Society Minor

D. Advanced Geospatial Technology Facilities

The Department of Geography and Geology and the Institute for Geospatial Research & Education (*IGRE*) have campus-wide-access to ESRI ArcGIS, and are managing Michigan Statewide ArcGIS K12, in addition to the access to Erdas Imaging, and ITT ENVI Image Processing software licenses. The Department and IGRE also support the major GIS, remote sensing image processing and spatial analysis/spatial statistics software packages, and large number of computer workstations and peripherals, including the ASD spectroradiometer device (FieldSpec®3 (350-2500nm) / A100590), the high accuracy and precision (GeoXH Handheld with TruPulse 360B Rangefinder and integrated Zephyr Antenna Ki) sub-meter mapping grade GPS receivers and associated components, 5 high-end servers, 4 high-end image processing stations; 20 Trimble GPS receivers and Pathfinder Office software licenses, 2 large-format plotters (HP DesignJet 1055C), and scanner (Idea.com Chameleon TX36).

Moreover, the computers in two GIS/computer labs, 226 and 237 Strong Hall, were refreshed in August, 2014. The students who have been using these two labs are very happy with the powerful computers and larger monitors.

E. The inclusion of IGRE (Institute for Geospatial Research and Education)

The strength of IGRE in research, community outreach and grant writing has been described in the previous section.

IV. Assessment/Evaluation

The assessment and evaluation is concerned with three primary objectives: 1) To help the students successfully complete the new program; 2) To help ensure that the workforce needs are met; and 3) To help document learning activities for continued improvement. When the new GIST major program is in place, it will be a part of the ongoing University program review process. Departments and programs at EMU are reviewed in an online format every four years with posting of annual updates. Learning outcomes are identified, measured, and assessed as students move through to degree completion. This is in compliance with EMU's Higher Learning Commission, North Central Accreditation.

The evaluation will place all observations and findings within the contexts of workforce needs, curriculum innovations, and research experience for students. **Workforce needs** is the driving question of our new GIST major program and is the most important indicator. **Curriculum innovations** are critical measures that have to be taken to meet the needs of workforce, especially under the economic structural transformation in Southeast Michigan. **Research experiences for students** are a key milestone of the program success. If students are able to find internships when they finish course work, or work with IGRE on the funded / sponsored projects, it is preferable for them to demonstrate continued success in internship assignments.

Workforce Needs:

Evaluation Objectives: the program faculty will be learning not only how many students enroll into EMU's new GIST program, but how many successfully finish required course work, how many find internships, how many successfully complete internships, and finally how many get employment after they graduate from the program.
Instruments Developed and Used: Annual surveys, student population sample interviews (spring) each year, interviews with faculty who are teaching courses and designing and developing curriculum, and interviews with industries and organizations that hire students as interns or employees, and ultimately interviews with alumni are among the evaluation instruments.
Main Questions Asked: Is there an increase in career awareness and interest in GIST? Do the curriculum and course contents support GIST? Do the curriculum and course content reflect dynamic changes of workforce needs? Does enrollment in this program, including obtaining the graduation diploma, predict entrance into claimed career fields?

Curriculum Innovations

Evaluation Objectives: To what extent the GIST Major program is innovative will be assessed. The increase of geospatial information technology skills in sustainable community, urban, and regional development applications will be critical indicators of the program's ultimate range and impact.
Instruments Developed and Used: Analysis (content and curriculum analysis, student work analysis, activity observation, data garnered from course/activity assessments). These data will be gathered at the end of each academic year, the graduation of each student cohort, and the end of grant period.
Main Questions Asked: Are students acquiring geospatial information technology skills? Which of the critical geospatial science concepts and geospatial technology skills did students exhibit after applying them in sustainable community, urban, and regional development applications? Were these sufficient to enable them to understand the

uses of GIST in these applications? Was the integration of geospatial technology meaningful to help them solve questions and problems in sustainable community, urban, and regional development applications?

Provide research experiences for the students

Evaluation of Objectives: We want to know how (and under what conditions) students benefit from research experience by participating in internships and how the internships and research experience help students get permanent employment or get into the right career pathways.
Instruments Developed and Used: Data collected include student internship portfolios and internship project reports, and interviews with hiring organizations and students as well.
Main Questions Asked:

.i. (to students:) To what extent has this research experience helped you decide upon a future career pathway? What have been the key motivators from this experience? Is this research experience critical for you to get employed?

.ii. (to hiring organizations:) What roles did students play in the internships? Have students demonstrated sufficient preparation for internship assignments? Have these internship assignments contributed to the work load of your organization? Has working with these students changed your perception of whether you could hire them if you have openings? Is this type of internship a viable model for increasing job opportunities related to GIST? Is this type of internship contributing to the economic health of your organization?

V. Program Costs

Two GIS/computer labs were recently refreshed. The GIS faculty members have discussed and agreed to use the lab fees to accumulate funds to maintain the computer labs. Using the lab fees for maintaining and updating the computer labs is a successful solution of EMU Department of Computer Science. All GIS courses are conducted and offered in the computer labs, which is similar to the situation of EMU Department of Computer Science. Therefore, the GIS program will adopt a similar approach used by the Department of Computer Science.

As described in the section of Justification/Rationale, the GIST program expects to have a yearly increased enrollment. In addition, Professor Edwin Joseph left EMU due to his family consideration. With an increasing volume of enrollment and the loss of one faculty member, the GIST program is foreseeing to request one new faculty member immediately and another faculty member in the first five-year growth period.

Moreover, managing the GIS labs is a challenging undertaking. On one hand, the lab management involves network administration. On the other hand, it requires good knowledge and experience pertaining to the installation and configuration of GIS and remote sensing (RS) software. Since the GIS and RS software packages are increasingly becoming complex, network-based, and cloud-enabled, very few ICT technical personnel can handle the complexities and dynamic changes of GIS and RS software packages. It is critical to have a professional GIS technical staff to manage the computer labs. Therefore, the GIS faculty is requesting a professional GIS technical staff to manage the GIS labs in order to provide dependable technical support to the existing graduate GIS program and this newly proposed undergraduate GIST major program as well.

VI. Action of the Department/College

1. Department/School (Include the faculty votes signatures from all submitting departments/schools.)

Vote of faculty: For___17___ Against___1___ Abstentions___2___
(Enter the number of votes cast in each category.)

I support this proposal. The proposed program can__X___ cannot_____ be implemented without additional College or University resources.

Richard Alan Sambrook Ph.D. [redacted] 12/10/2014
Department Head/School Director Signature Date

2. College/Graduate School (Include signatures from the deans of all submitting colleges.)

A. College.

I support this proposal. The proposed program can ✓ cannot_____ be implemented within the affected College without additional University resources.

[redacted] 3/18/2015
College Dean Signature Date

B. Graduate School (new graduate programs ONLY)

_____ _____
Graduate Dean Signature Date

VII. Approval

_____ _____
Associate Vice-President for Academic Programming Signature Date

VIII. Appendices

EASTERN MICHIGAN UNIVERSITY
DIVISION OF ACADEMIC AFFAIRS

GUIDELINES FOR SUBMITTING PROPOSALS FOR NEW PROGRAMS

Note: Departments intending to submit proposals for new programs are encouraged to consult with the Course and Program Development Office and, if appropriate, the Graduate School prior to submitting such proposals.

I. Description. This section is designed to provide information regarding the proposed program. Any pertinent information beyond that covered in the following should also be included.

A. Goals, Objectives, Student Learning Outcomes

1. State the general philosophy and intent of the proposed program.
2. List the goals, objectives, and student learning outcomes as specifically as possible. These should be stated in such a way as to facilitate assessment of whether or not they are being met.
3. How do stated goals, objectives, and student learning outcomes reflect current departmental/school, college and divisional goals and university strategic planning directions?

B. Program

1. List all current courses included in the program, and indicate whether they will be required, restricted electives or electives. Include syllabi for all such courses as an appendix.. All courses should implement program goals, objectives, and student learning outcomes.
2. List all new and revised courses that will be needed for the program. A Request for a New Course or Request for Course Revision form should be completed for each one and included as an appendix. All courses should implement program goals, objectives, and student learning outcomes.
3. Describe the Program Delivery Plan, i.e. whether it will be offered on or off campus, on line, evenings and/or Saturdays. If courses are to be offered on Saturday, on line or off campus, include evidence of support from Continuing Education as an appendix.
4. Outline a typical program of study a student would follow in completing the program.

Interdisciplinary programs only:

5. In which department/school or college will the program be administered? If more than one department/school or college will be participating in the program, provide evidence of support from all participating departments/schools and/or colleges.

Undergraduate programs only:

6. Indicate the minimum number of total credit hours that students completing the program should have taken by the time they graduate.

Graduate programs only:

7. Indicate how the proposed program will assure graduate-level study (utilization of seminars, thesis, independent study, courses open only to graduate students, etc.).
8. How will the program incorporate an adequate emphasis on research?

C. Admission

Undergraduate programs only:

1. Will there be admission requirements to the program beyond those required for admission to the University? If so, what are they (e.g., admission to the College of Education or Business, GPA, national examinations, interviews, letters of recommendation, etc.)?

2. Will there be conditional admission to the program? If so, what requirements will be established that are different from those of regular admission?

Graduate programs only:

1. What admission requirements will be established for the program (GPA, national examinations, interviews, letters of recommendation, etc.)?

2. Will there be conditional admission to the program? If so, what requirements will be established that are different from those of regular admission?

D. Projections

1. Project the number of students at initial enrollment, average number of students enrolled within three years, average number of graduates per year once program is established, etc.

3. .Project scheduling needs and patterns for the next three to five years.

E. Other Pertinent Information

II. Justification/Rationale. This section is included to assure an adequate rationale for the proposed program. Any additional justification for the program beyond that covered in the following items should also be included.

A. Present evidence that there is a demand for the proposed program. This should include an indication of professional and societal need, as well as student interest. (Include any market analysis and/or needs assessment as an appendix.)

B. Indicate whether there any similar programs in Michigan. If so, how is the proposed program unique? Why is there a need for an additional program in the field?

C. Present evidence of support for the proposed program from within and outside the University. (Letters and other supporting documents should be included as an appendix.)

D. Additional justification (if appropriate).

III. Preparedness. This section attempts to determine the institution's ability to mount a program of the type proposed. Any information beyond that covered by the following questions should also be included.

A. Describe the qualifications of the faculty who will be involved in the proposed program. (Proposals for new graduate majors should include an abbreviated faculty vita for each individual as an appendix.)

B. **(Note: Proposals for new programs <u>must</u> include this information.)** Describe current library resources and analyze the adequacy of these resources for the proposed program. Include such items as books, journals, indexes, electronic resources (databases, etc.), multimedia (instructional videos, CDs, etc.) and microforms. If additional library holdings will be needed in the next three to five years, provide a plan for acquiring them.

C. Analyze the adequacy of existing facilities, laboratories, or other physical equipment applicable to the proposed program.

D. Determine the adequacy of supportive courses, faculty, and equipment outside of the department that may be important to the program (e.g., cognate courses, research assistance, computer services, facilities controlled by other departments/schools or colleges, etc.).

E. Outline a plan for marketing the proposed program and recruiting students into it.

F. Additional information (if appropriate).

IV. Assessment. Provide a plan for assessing the quality of the program, and a schedule for this assessment. The plan should assure the inclusion of objective data to determine the degree of success in reaching stated goals, objectives, and student learning outcomes..

V. Program Costs. This section attempts to establish the extent of additional funding required if the program is approved.

A. Faculty, lecturers or supportive staff required (type, level, and approximate cost).

B. Space or facilities required (type and approximate cost).

C. Equipment required (type and approximate cost).

D. Assistantships/fellowships required (number and approximate cost).

E. Library resources required (type and approximate cost of both minimal and appropriate library resources).

F. Marketing and recruiting costs

G. Other costs not covered above (type and approximate cost).

H. Total of all financial requirements for implementation of proposed degree.

I. Percentage of total cost to be borne by Continuing Education. (Provide evidence of Continuing Education's willingness to bear these costs).

Appendix 1: **Science Master's Program: Geographic Information System Entrepreneurial Innovations**

PI: Dr. Yichun Xie, Eastern Michigan University

Intellectual Merit: Eastern Michigan University (EMU) is proposing to create a new Science Master's Program in Geographic Information System (GIS) Entrepreneurial Innovations (EI). The proposed SMP GIS-EI integrates entrepreneurial innovations into an emerging occupational field, geospatial technology, and prepares workers to take advantage of new and increasing job opportunities in high-growth, high-demand, and economically vital sectors of the American economy. Geospatial technology, along with nanotechnology, is enlisted as one of two emerging industries in Career Voyages Website. Geospatial technology, financial services, information technology, and retail, which are the primary disciplines of EMU's SMP: GIS-EI, are four out of the President's 14 targeted high-growth industries identified by the Department of Labor's (DOL) Employment and Training Administration. EMU's SMP GIS-EI is a true interdisciplinary program built on Geographic Information System, Geo-Science, Environmental Science, Computer Information System, Entrepreneurship, Management, and Marketing. The proposed curriculum for this degree prepares students to work as management professionals who can analyze and resolve complex business problems utilizing spatial information and analysis. Students have the flexibility to develop their capabilities with spatial and geographic approaches to the analysis of business activities. This will be facilitated initially by a required introductory course in Business GIS that investigates the range of business-related problems that GIS can apply, e.g., customer profiling, risk assessment, facility planning and management, market segmentation, sales-territory analysis, trade-area profiling, site-selection analysis, and logistics. This will also be highlighted by a capstone course (GIS Business Internship) that provides opportunities for students to acquire practical work experience in the field of business GIS before they graduate. Moreover, the learning outcomes of EMU's SMP GIS-EI are identified, measured, and assessed as students move through to degree completion in compliance with EMU's Higher Learning Commission, North Central Accreditation.

Broader Impacts: EMU's SMP GIS-EI has two urgent goals: 1) to meet the changing workforce needs in Michigan and the nation; and 2) to provide career development opportunities for career transitions of displaced workers and for newly graduated college students as well. Southeastern Michigan, and the State of Michigan as a whole, are currently in the midst of serious structural economic trouble. The region has lost jobs since 2000 especially in the auto-manufacturing sector. Although job losses in this sector are forecast to slow down, the pace of job loss is still significant. An additional 138,000 jobs will be lost from 2005 to 2035. By 2035, there will be only 180,538 manufacturing jobs in the region; that is a loss of more than 55 percent from 2001. EMU's GIS-EI is in real demand to alleviate the dreadful employment situation in Michigan. The broader impacts of EMU's SMP GIS-EI will be realized by meeting the changing workforce needs through six primary measures: 1) a constant program review and adjustment corresponding to the employment transformation needs in southeastern Michigan; 2) an innovative curriculum; 3) a campus-wide interdisciplinary curriculum committee; 4) a board of advisors who represent broader participations of industries and communities from southeastern Michigan; 5) a group of faculty who have rich experiences in research and outreach; and 6) a strong institutional commitment to this new SMP.

Keywords: Geoscience, Computer Science/Information Technology, GIS in Business, Displaced Workers

Prefix	Code	Name	Gen Edu	Description	Credit Hour	Location	Typically offered
CRM	300	Criminal Justice		A critical view of the entire spectrum of criminal justice. The police, courts and corrections studied as interrelated institutions in the process of defining criminals.	3 hrs	On Campus	Fall, Winter, and Summer
CRM	301	Criminology		The nature, incidence and prevalence of crime. Theory of crime and delinquency causation.	3 hrs	On Campus	Fall, Winter, and Summer
CRM	331	Introduction to Corrections		An examination of corrections/punishment in contemporary society, its historical development, structural dependency, relationship to the system of justice and problems of effectiveness.	3 hrs	On Campus	Fall, Winter, and Summer
CRM	354	Juvenile Delinquency		The nature, incidence and measurement of juvenile delinquency; theories and causation; juvenile justice philosophies and treatment methods.	3 hrs	On Campus	Fall and Winter
CRM	370	White Collar Crime		An examination of the definitions, laws, causes and policy responses that shape crimes by corporations, government agencies, professionals and others engaged in legitimate occupations.	3 hrs	On Campus	Fall, Winter, and Summer
CRM	431	Policing in Society		The social and historical origin of the police; police culture, role and career; police in the legal system; police discretion; ethical development of police; police and the community; police organization and community control.	3 hrs	On Campus	Fall, Winter, and Summer
CRM	362	Ethics for Criminal Justice Professionals		This course provides the basic materials for analyzing ethical situations in criminal justice professions. Case studies of misconduct and its effects, and various policy issues, such as discretion and due process in law enforcement, the courts and corrections will be examined.	3 hrs	On Campus, Off Campus, Fully Online, or Hybrid/Web Enhanced	Fall and Winter (Odd Years)
CRM	333	Violence and Society		An introduction to and survey of the multi-disciplinary study of violence and society. Issues specifically examined are mass institutions of media, culture and identity formation.	3 hrs	On Campus	Fall and Winter
CRM	338	Women, Crime and Justice		This course will offer a critical analysis of gender and criminal justice as it relates to women as victims, offenders and agents of the criminal justice system. Additionally, the social conditions of criminality, intervention strategies as well as social action and criminal justice policy reform will be examined.	3 hrs	Online	Fall (Even Years), Winter and Summer (Odd Years)

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ENVI	105	Introduction to Environment and Society	(GEGA)	This course provides a comparative examination of the varied, complex, and evolving relationships between individuals, societies, and the environment. Consideration will be given to the way that humanities and social science disciplines treat the study of human-environmental interactions. Local, regional, national, and global environmental issues will be presented and analyzed.	3 hrs	On Campus	Fall and Winter
ESSC	110	The Dynamic Earth System	(GEKN)	An introduction to the Earth System and its components. Utilizes the scientific method to address composition of the earth system, fundamental processes within the earth system and linkages between all components of the system. Includes consideration of how humans impact and are impacted by, the Earth System.	4 hrs	On Campus	Fall, Winter, and Summer
ESSC	111	The Earth System through Time		The origin, development and succession of earth materials, surface and life forms, culminating in one present scene and organic population. Field trips and reports may be required. Required for Geology and Earth Science majors and minors.	4 hrs	On Campus	Fall and Winter
ESSC	212	Weather, Climate and the Earth System		An examination of earth-sun relationships, the nature of atmospheric processes, weather, and climate.	3 hrs	On Campus	Fall and Winter
ESSC	424	The Global Climate System		An analysis of global, regional and applied climatology. Areas of emphasis are climatic controls, classification, world climate types, relationship of climate to other physical phenomena, and importance of climate in selected aspects of human activities. Three hours of lecture per week.	3 hrs	On Campus	on an Irregular basis
ESSC	107	Environmental Science	(GEGA)	An introduction to the biological, physical and chemical processes that control today's environmental conditions. The global ecosystem is presented as a structure that includes human society. The understanding of local and global environmental problems and potential solutions is emphasized.	3 hrs	On Campus	Fall and Winter

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ESSC	466W	Global Tectonics	(GEWI)	A study of the tenets of plate tectonic theory, building on material from previous classes. Included is an investigation into the plate tectonic make-up and evolution of key aspects of the North American plate. This class is designed as a capstone course for upper-level Geology and Earth Science majors and graduate students. This class meets the requirements for a Writing Intensive course in the General Education Program.	3 hrs	On Campus	Fall
ESSC	320	Oceanography		A study of the world's oceans, including coasts, waves, currents, tides, sediments, marine geology, properties of seawater, the energy balance, oceanographic research techniques and marine resources, stressing physical oceanography.	3 hrs	Online	Fall and Winter
ESSC	105	Climate Change in Human Times	(GEGA)	An introduction to the study of climate and its' variability through time. We will discuss how the climate system works, examine past climate changes and possible causes, investigate the current global warming and its effect on the environment and human population, and analyze the predicted changes for the future and possible solutions.	3 hrs	Online	Fall, Winter, and Summer
ESSC	227	Topographic Maps		Interpretation of distances, slopes and terrain features as shown on topographic contour maps. Preparation of contour maps from numerical data and of topographic profiles from contour maps; the correlation of landforms and landform patterns with the geologic materials and processes responsible for them.	2 hrs	TBD	Winter
ESSC	229	Rocks and Minerals		The identification and classification of rocks and minerals with special emphasis on characteristics used in the field.	3 hrs	TBD	Winter
ESSC	300	Introduction to Hydrology		Study of physical, chemical and biological elements of rivers, lakes, wetlands and groundwater, and the economic, social, political and legal issues currently associated with these systems. Required for the hydrogeology major.	3 hrs	TBD	Fall, Winter, and Summer
ESSC	303	Field Geography		Techniques in the observation and analysis of geographic features in the field. Emphasizes individual and group problem formulation, problem solving of geographic questions by using the scientific method and combining traditional field exploration with the use of library aids.	3 hrs	TBD	Informaiton Not Available

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ESSC	325	Geomorphology		The study of landforms and the processes that create them. Erosional and constructional landforms are discussed in the context of prevailing surficial processes, tectonic activity, climate, and environment. Three hours lectures and two hours laboratory per week. Weekend Field trip and report required.	4 hrs	TBD	Winter
ESSC	370	Glacial and Quaternary Geology		The study of Quaternary glacial and non-glacial environments and deposits. Topics include glacial flow, melt-water production, glacial erosion and deposition, formation of landforms, causes of the ice ages, and environmental reconstructions. Three hours lecture and two hours laboratory per week. Weekend field trip and report required.	4 hrs	TBD	Fall (Even Years)
ESSC	470	Quantitative Methods in Geography and Geology		Introduction to current techniques and methods applicable to geographic and geologic problems. An applied course emphasizing statistical analyses and computer applications.	3 hrs	TBD	Informaiton Not Available
ESSC	485	Introduction to Remote Sensing		Introduction to remote sensing techniques and types of imagery, including multispectral, thermal and radar images. Emphasis on image enhancement and interpretation in regard to land-use planning and resource management.	3 hrs	TBD	Winter
GEOG	100	Introduction to Geospatial Sciences and Technology		This course is an introduction to the geospatial sciences and popular geospatial technologies that are widely used for mapping and analyzing geographic patterns of human activities and natural phenomena. Students will be exposed to basic concepts, techniques and practical skills in Cartography, Global Positioning Systems (GPS), Geographic Information Systems, and Remote Sensing. No previous exposure to GIS or mapping is necessary for enrollment in this course.	3 hrs	On Campus, Hybrid/Web Enhanced, Fully Online, or Off-Campus	Fall, Winter and Summer
GEOG	107	Introduction to Geography	(GEKS)	A survey of the major concepts and subfields in modern geography. Physical, cultural, economic, political and social geography are among the major areas explored.	3 hrs	On Campus	Fall, Winter, and Summer

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GEOG	110	World Regions	(GEGA)	Geographic evaluation of the human imprint on the world, focusing on how peoples of various societies have approached the problems of living in their natural environments and with each other. A requirement for both the major and minor in geography.	3 hrs	On Campus	Fall, Winter, and Summer
GEOG	335	Economic Geography		Systematic treatment of economic activities in select world locations. Areal factors included in the evaluation, production and distribution of goods and services.	3 hrs	On Campus	Fall
GEOG	314W	Geography of Russia and Neighboring States	(GEWI)	A systematic and regional study of physical, cultural and economic factors in Russia and other states of the former Soviet Union. Distribution of natural resources, population and ethnic questions, environmental problems and political evolution will be emphasized.	3 hrs	On Campus	Fall and Winter
GEOG	332	Urban Geography		A study of geographic principles related to distribution, function, structure and regional setting of urban centers.	3 hrs	On Campus	Fall
GEOG	333	Unsettled Geographies		This course explores human settlement patterns such as the field, streetscapes, and key house types that are associated with the rural and urban settlements of various ethnic groups and cultural hearths. Such regional patterns are examined in the context of humanistic, radical, and post-structuralist geographies, and recent geographies of place, migration, and mobility.	3 hrs	On Campus	Fall and Winter
GEOG	376	Spatial Analysis		Intermediate concepts and techniques in vector and raster GIS. Topics include thematic mapping, exploratory spatial data analysis, use of inferential statistics in GIS, point pattern analysis, regression modeling in GIS, modeling environmental and human geographic processes, surface interpolation and terrain analysis, map algebra, and network analysis.	3 hrs	On Campus	Winter
GEOG	405	Aerial Photo Interpretation		Analysis of black and white and color infrared photographs for land use planning, environmental assessment, geology and resource management. Weekly lab exercises. Optional field trip.	3 hrs	On Campus	Fall
GEOG	441	Transportation Geography and Planning		Explores the evolution of transportation in American society, with special attention paid to the impact of railroads, the automobile and the airline industry. Topics include an introduction to techniques for modeling transportation system demand.	3 hrs	On Campus	Fall

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GEOG	484	GIS Customization and Programming		This course is designed for students who are familiar with GIS software at a technical level, but who are new to programming the software. Emphasis is on learning basic programming structures, studying the object model of the GIS software, reading and writing usable code for typical GIS tasks, and adding new, simple, functionalities to out-of-the-box GIS software.	3 hrs	On Campus, Fully Online, or Hybrid/Web Enhanced	Winter
GEOG	476	Geodatabases and GIS Client Applications		This course introduces students to current technologies used to develop and manage geodatabases. Emphasis is on the conceptual, logical and physical design aspects of geodatabases; managing personal and enterprise geodatabases; and desktop and web mapping clients that utilize geodatabases.	3 hrs	On Campus; Fully Online; or Hybrid/Web Enhanced	Fall
GEOG	276	Principles of Geographic Information Systems		Introduction to the concept of computer mapping. Accessing online sources of spatial data; creating digital maps and charts using online data sources; vector and raster data models, spatial data entry and editing; coordinate systems and methods of geo-referencing digital maps; elementary database management and spatial analysis. (Required for GIS minors and Urban and Regional Planning majors. Also suggested for teachers who would like to incorporate digital mapping into their teaching. Appropriate for all other disciplines using spatial mapping.)	3 hrs	On Campus	Fall, Winter and Summer
GEOG	212	Geography of Travel and Tourism		A review of the philosophy, historical development and geographical distribution of travel and tourism. The economic, social and environmental impacts of these activities; case studies illustrating their significance from all regions of the world.	3 hrs	TBD	Winter
GEOG	360	Cultural Geography		Human landscape patterns; emphasis upon the processes concerned with their origins, locations and persistence.	3 hrs	TBD	Winter
GEOG	361	Geography of Population		An analytical study of population characteristics and growth, world patterns of fertility, mortality and migration. Major attention is given to human population problems, including ecology, resources depletion and impacts of urbanization.	3 hrs	TBD	Winter (Even Years)

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GEOG	480	Geographic Information Systems Projects		A study of different ways in which GIS is being used to resolve problems in the public and private sectors and in academia. Emphasis is on how GIS technology is being used in areas such as facility management, natural resource management, urban planning, environmental modeling, historical preservation, geology, health planning, etc. By working on a number of small, but realistic, projects students learn how to conceptualize GIS solutions to problems and how to professionally implement GIS projects.	3 hrs	TBD	Winter (Even Years)
IA	202L4	Risk-Vulnerability Analysis	(GELB)	Tools, techniques, and methodologies in performing computer system and network security vulnerability-risk analyses. "Security best practices" and audit requirements for specific environments will be studied. Topics to be covered include internal and external penetration tests, wireless security technology, risk and analysis methodology, and security audits.	3 hrs	On Campus	Fall and Winter
IA	329W	Policy Development in Information Assurance	(GEWI)	This course serves the essential aspects for developing sound information security policy. Organizational objectives,, threats, risk mitigation and cost-benefit analysis will be explored. The student will utilize industry accepted methodologies to create practical security policy that will communicate the organization's asset protection objectives.	3 hrs	On Campus	Fall and Winter
IA	210	Concepts of Network and Business Technology		The concepts and functions of networks and related business technology. The course emphasizes administration client/server and peer-to-peer networks. The course includes equipment, procedures and career opportunities.	3 hrs	On Campus	Fall and Winter
IA	212	Open Systems Platform and Network Administration		Introduction to open source client/server networking, careers and basic information security and assurance concepts. Focusing on Linux as a platform and server operating system, students learn through theory and applied work. Topics included are: file and hardware management, user account management, TCP/IP protocols and installation of the Linux client and server. Students build and administer a basic network.	3 hrs	On Campus	Fall and Winter

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IA	344	Administration of Computer Systems		Principles and practices of computer operating systems for networks in educational or small to mid-sized organizations. The course will emphasize the tasks the administrator must perform frequently.	3 hrs	On Campus	Fall and Winter
IA	422	Networks: Planning and Design		The course focuses on planning and designing networks systems that deliver information services and resources. Emphasis is on end-user needs assessment, alternative system designs, security planning, support issues, and training and development. Students will develop a proposal for a new or revised end-user system that reflects the principles covered in the course.	3 hrs	On campus	Fall
IA	343	Intelligence Analysis II		The second course in the Intelligence Analysis Series that uses technical software in the analysis of data. Material presented through analysis software, oral and written presentations and case analysis. The student will be required to understand the relationship between demographics, technology and the impacts on critical infrastructures within the assigned areas of research.	3 hrs	On Campus	Winter
IA	213	Privacy and Technology		This course prepares students to recognize, analyze, and manage privacy challenges created by technology. Both business and self regulatory efforts will be reviewed.	3 hrs	Online	Summer
IA	240	Intelligence Analysis I		An introductory intelligence analysis course designed to prepare intelligence products, hypothesis, along with collection and dissemination planning. Students will explore historical, legal, and ethical basis for intelligence collection, retention and of the analytical product.	3 hrs	Online	Fall and Winter
IA	215	System Support and Troubleshooting		IA215 maps fully to CompTIA's A+ Exam objectives. This course is focused on learning the fundamentals of supporting and troubleshooting computer hardware. At the same time, it prepares students to successfully pass the A+ 220-701 and 220-702 exams. Students will be instructed via theory and practical pedagogy in the world of PC hardware support.	3 hrs	TBD	Fall and Winter

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SOCL	105	Introductory Sociology	(GEKS)	Basic sociological concepts are used to analyze social systems, socialization, social inequality, deviance and conformity, and the process of social change with focus on family, educational, religious, governmental and economic institutions.	3 hrs	On Campus	Fall, Winter, and Summer
URP	215	Introduction to Urban and Regional Planning		An introduction to community planning at local and regional levels, including an overview of issues and techniques for land use planning. Topics include purpose of community plans, housing and community development, environmental planning, transportation, historic preservation, economic development, and urban design. Included is discussion of planning as a career.	3 hrs	On Campus	Fall and Winter
URP	216	Readings in Urban Planning		A lecture/seminar course in which students read and discuss classic readings in urban planning. This course serves as an introduction to important writers and topics in the field.	2 hrs	On Campus	Fall
URP	401	Planning/Preservation Graphics		A lecture-laboratory course in graphics techniques of mapmaking, topographic analysis, communication of data, and presentation. Media explored will include pen and ink, colored pencil and markers, and digital photography.	3 hrs	On Campus	Fall
URP	495	Environmental Assessment and Planning		An examination of the program elements of environmental impact statements. Geo-based data sources are explored and analyzed. Impact statements are prepared by the class, and existing impact statements are evaluated.	3 hrs	On Campus	Fall
URP	415W	Methods of Planning Analysis	(GEWI)	This course will help students navigate through an urban planning research project from start to finish. Students learn the basics of research design, engage actively in gathering data using several data collection techniques, develop analytical skills to interpret the collected data, and learn to communicate results graphically, orally and in writing.	3 hrs	On Campus	Fall

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URP	306	Comprehensive Planning and Zoning		A course studying issues of comprehensive planning, zoning and land-use regulation. Topics include preparation of a general development plan, current and recent zoning issues, land use legislation and the drafting and use of state and local zoning ordinances. A base course for Urban and Regional Planning students as well as a valuable perspective to anyone interested in rural, urban or regional development issues.	3 hrs	TBD	Winter
URP	410L4	Site Planning Studio	(GELB)	A studio course in urban planning, gives hands-on experience in developing a site plan. Using an actual site and client, a project will be taken through the various stages of plan development. Activities include program analysis, data collection, development of alternative solutions, and selection and presentation of a final site plan.	4 hrs	TBD	Winter
URP	452	Infrastructure Planning and Policy		This course gives students an understanding of the major urban and rural infrastructure systems, as well as the role capital budgeting plays in the financing of these systems. Students should be able to recognize and quantify municipal infrastructure needs and understanding the planner's role in the provision.	3 hrs	TBD	Fall