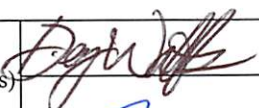
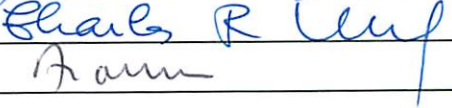
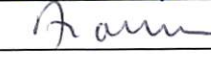
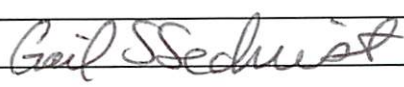


LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		05-27a	Apr 2/14/06	Apr 5/2/06

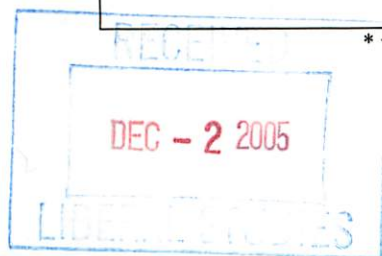
Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person John Benhart, Jr.	Email Address jbenhart@iup.edu
Proposing Department/Unit Geography & Regional Planning, CHSS	Phone 724.357.2250

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply) ☒ New Course ☐ Course Prefix Change ☐ Course Deletion ☐ Course Revision ☐ Course Number and/or Title Change ☐ Catalog Description Change		
		GEOG 421 – Enterprise GIS Management: Theory and Practice
<i>Current Course prefix, number and full title</i>		<i>Proposed course prefix, number and full title, if changing</i>
2. Additional Course Designations: check if appropriate ☐ This course is also proposed as a Liberal Studies Course. ☐ Other: (e.g., Women's Studies, Pan-African) ☐ This course is also proposed as an Honors College Course.		
3. Program Proposals ☐ New Degree Program ☐ Program Title Change ☐ Program Revision ☐ New Minor Program ☐ New Track ☐ Other		
<i>Current program name</i>		<i>Proposed program name, if changing</i>
4. Approvals		
Department Curriculum Committee Chair(s)		Date 10-14-05
Department Chair(s)		10/14/05
College Curriculum Committee Chair		11-29-05
College Dean		11/30/05
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs		2-14-06

* where applicable



Course Proposal: Enterprise GIS Management: Theory and Practice

Catalog Description

3 class hours
0 lab hours
3 credits
(3c-01-3cr)

GEOG 421 Enterprise GIS Management: Theory and Practice

Prerequisite: GEOG 417 or consent of instructor.

Principles and methods for creating, operating, maintaining, and managing data for multi-user geospatial information systems are studied. Each student will customize, document, and operate a multi-user geographic information system of their design. (Also offered as RGPL 421; may not be taken for duplicate credit.)

Course Proposal: Enterprise GIS Management: Theory and Practice**Catalog Description**

3 class hours
0 lab hours
3 credits
(3c-01-3cr)

RGPL 421 Enterprise GIS Management: Theory and Practice

Prerequisite: RGPL 417 or consent of instructor.

Principles and methods for creating, operating, maintaining, and managing data for multi-user geospatial information systems are studied. Each student will customize, document, and operate a multi-user geographic information system of their design. (Also offered as GEOG 421; may not be taken for duplicate credit.)

Part II. Description of Curricular Change

1. Syllabus of Record (Attached)
2. Course Analysis Questionnaire

Section A: Details of the Course

A1. The proposed course adds to the department's offerings in its Cartography and Geographic Information Systems Track. Existing courses deal with learning to become a GIS user (GEOG/RGPL 313), learning to create geospatially integrated data systems (GEOG/RGPL 416), and custom algorithm implementation (GEOG 618).

The proposed course will focus on principles and methods for managing, maintaining, and securing enterprise geospatial information systems. As enterprise geographic information systems have become more commonplace there is a growing demand for people capable of managing facility and enterprise data long term. Utility companies, local governments, regional authorities, state, and federal agencies each require staff members with these skills. A statement of what constitutes Enterprise GIS is included in Section D.

There is inadequate time in existing courses to cover this additional content area.

A2. We will be adding this course to the list of electives in the Cartography/GIS Tracks. As this is new material no existing courses require revision.

A3. No.

A4. Yes..

A5. This will be a three credit class

A6.

Enterprise GIS and Database Management Systems	University of Calgary
Management Issues in GIS	University of Waterloo
Spatial Database Management & GIS	MIT
GIS Management & Implementation	University of Texas
Asset Management & Data Integration using GPS/GIS	Georgia Tech
GIS Management	SUNY – Albany
GIS in Land Resource Management	University of Florida
Public Infrastructure Management	Northwestern University

A7. The GIS Certification Institute awards professional certification to individuals. The course contents are not dictated by the certifying board. The course can be used towards educational points required by the institute for subsequent individual certification.

Section B: Interdisciplinary Implications

B1. Single Instructor.

B2. There is little to no overlap with other course offerings. The course draws on knowledge of database and systems management and extends them into new dimensions. The course may be of significant interest to students in MIS, Computer Science, and Management.

B3. Not with other departments but within our own department as RGPL

B4. Yes, if prerequisite is met.

Section C: Implementation

C1. Yes, the intended instructor will, most likely, teach one fewer sections of GEOG 104 each year.

C2. Access to department computer Lab

C3. No

C4. Annually

C5. One

C6. 25 limited by lab space

C7. No.

C8. NA

Section D: Miscellaneous

Discussion of Enterprise GIS Management from ESRI **Enterprising GIS Management**

Successful GIS managers must deal with the sometimes complex interactions of the software, hardware, people, data, and applications that make up a GIS. The demands on managers have grown as the role of GIS has changed from a project-oriented application to an enterprise-wide information infrastructure.

What is an enterprise GIS? The most familiar definition is an approach for implementing GIS throughout an organization. Enterprise GIS is also an architecture that integrates geospatial data and services and shares them across the organization. In more general IT terms, it can also be viewed as an infrastructure that extends and enables existing systems using geospatial data and services.

Why would a GIS manager want to expand from the department to the enterprise level? In recent years, many organizations have become data rich while remaining information poor. Implementing GIS across the organization benefits business managers and other decision makers who can use geospatially enabled data to devise better solutions to business problems. Through enterprise GIS, IT managers have solutions for integration problems and interoperability issues and can integrate them with existing high-value systems such as SAS and SAP. Because geospatial data is accessible and usable by staff throughout an organization served by an enterprise GIS, GIS specialists can use their time more productively by focusing on analysis, application development, and other high-return activities.

When implemented on the enterprise level, GIS leverages an organization's existing resources in data, staff, and funds by eliminating redundancies and streamlining processes. It also provides qualitative improvements in operations by responding to issues of accountability and customer service.

Enterprise GIS requires planning, integration, testing, and support that is greater than traditional departmental GIS. However, its integration with mainstream IT makes it more powerful and pervasive.

ESRI has developed GIS designed for enterprise deployment. ArcGIS, the ESRI suite of GIS products, provides a generic platform for dealing with geographic information and processes from the desktop to the server to the Internet to mobile devices. This single scalable architecture encompasses multiple complementary products for both end users and developers that are built on industry standards.

Industry standards mean managers can take advantage of available expertise in mainstream development environments such as C# and Java. The integration and interoperability supplied by ArcGIS applies not only to data but also to applications and services. The ArcGIS Data Interoperability extension streamlines work flows by expanding direct read capabilities, adding robust import/export functionality, and providing custom transformation capabilities. This makes more information in the organization readily available to the GIS. It also eliminates the need for separately maintaining converted data.

ArcWeb Services use common interface standards, such as J2EE, .NET, and SOAP/XML, to provide focused cross platform functionality. With ArcGIS Engine, embedded GIS

applications can be developed that are both tailored to end users' exact needs and transparent to them. ArcGIS Server, a developer product designed specifically for the enterprise, enables more efficient centralized administration of GIS from the server side.

While the technologies associated with managing GIS have changed with the move to an enterprise environment, some of the most daunting challenges facing a GIS manager remain organizational, social, and/or political in nature. Consequently, many of the qualities required for success a decade ago also remain the same. These include leadership abilities, business management skills, and an understanding of the power of geospatial information.

GIS managers need leadership skills in addition to technical knowledge. GIS is a group activity that requires cooperation to be successful. Consensus building is critical because GIS benefits are realized through leveraging the organization's existing resources and enhancing its business processes. Resources can't be leveraged if there is no access to them. Processes cannot be improved if they are not shared. Remember that existing resources also include expertise and funds, not just data.

In the enterprise setting, training benefits both end users and GIS professionals—so make training a priority, not an afterthought. The benefits of training for GIS specialists are apparent but the need for training casual or discipline specific users may not be as well recognized. Trained casual users benefit from using geospatial information while freeing GIS specialists for other tasks. Cross training helps create buy-in for GIS by developing staff members who are well versed in GIS in addition to a specific discipline such as planning or engineering.

Offering progressive training gives users a place to start and a way to grow. Training for any group should include an understanding of the strengths and limitations of the data and how to intelligently apply it to the organization's work.

Consensus building within the GIS department is also important. GIS staff members are more motivated if they are part of a team that shares common goals. Always giving deadlines and frequently inspecting work ensures both timeliness and quality. Through understanding what motivates people, GIS managers can build loyalty and team spirit. This process takes time and patience, but a unified effort always yields superior results.

In addition to the need for leadership skills, another aspect of GIS management that hasn't changed is the need to answer those two annoying questions:

What does it cost?

What are the immediate benefits?

Although building an enterprise GIS is a long-range goal, managers who use an organized approach that initially focuses on high-benefit, low-cost projects can demonstrate the value of an enterprise GIS in the relatively short term. These initial successes can help safeguard staffing and budgets by supplying visibility and proof that GIS contributes to organizational goals. For example, deploying ArcReader gets geospatial data into the hands of users at minimal cost and requires little training, but these users soon discover that geospatial data enables them to make better decisions.

Controlling costs and optimizing the use of software, hardware, network, and staff tax the business management skills of any IT manager. Enterprise GIS is deployed and managed just like any other IT system. However, the scalable nature of ArcGIS software helps tame these aspects for the GIS manager.

Understanding the power of geospatial data has been a hallmark of successful GIS managers from the earliest project implementations. This requires a manager who not only has vision but also a willingness to upset the organizational apple cart by proposing new ways of accomplishing goals and the courage to sometimes be wrong. More is learned from failure than success, and learning speeds up in the face of adversity.

This applies not just to the manager but also to the GIS team. A manager who provides more challenging assignments and increased responsibility for junior staff members will help them grow not only in technical expertise but in leadership ability, too." (ESRI 2005)

Syllabus of Record

I. Catalog Description.

3 class hours
0 lab hours
3 credits
(3c-0l-3cr)

GEOG 421 Enterprise GIS Management: Theory and Practice

Prerequisite: GEOG 417 or consent of instructor.

Principles and methods for creating, operating, maintaining, and managing data for multi-user geospatial information systems are studied. Each student will customize, document, and operate a multi-user geographic information system of their design.

II. Course Objectives.

By the end of the semester students will be able to:

1. Integrate data from multiple sources, scales, and character into a geodatabase.
2. Use software for graphic display of information systems.
3. Develop knowledge of spatial database structures and management.
4. Design a simulated enterprise GIS to user specifications.
5. Implement, operate, and maintain a simulated enterprise GIS.
6. Evaluate "real world" enterprise GIS management needs in a variety of business, industrial, and governmental settings.

III. Detailed Course Outline.

Week	Topic	Reading	Activity
1	Introduction & GIS concepts Review		
2	Database Concepts, flat file, Relational, Hierarchical, Attribute Data Properties	<u>UsingArcCatalog.pdf</u> Chapters 1-5	Students projects selected
3	Geospatial Data Structures: Raster, Vector, TIN, TIGER	GIS_data_structures_topology.pdf, <u>Building a Geodatabase</u> Chapter 1,	
4	Designing & Evaluating Geodatabases, Geodatabase Modeling and	<u>Designing Geodatabases</u> Chapter 1 & 2,	Stream and River Networks Demonstration, MS1

	Diagramming, Using Microsoft Visio		
5	Creating a Geodatabase, Server Connectivity Issues, Importing Data	<u>Building a Geodatabase</u> Chapter 2 & 3, <u>Geodatabase Workbook</u> Chapter 2, <u>Using ArcCatalog.pdf</u> Chapter 6, <u>Designing Geodatabases</u> Chapter 3	Census Geography and data, MS2, REVIEW for TEST
6	Topological Data Structures for GIS and Metadata	<u>Building a Geodatabase</u> Chapter 4, <u>Geodatabase Workbook</u> Chapter 4, <u>Using ArcCatalog.pdf</u> Chapter <u>ExploringArcObjects.pdf</u> , Append B	Test 1
7	Attribute Domains and Metadata	<u>Building a Geodatabase</u> Chapter 5 <u>Using ArcCatalog.pdf</u> Chapters 8 & 9	MS3
8	Geospatial and Attribute Relationship Classes	<u>Building a Geodatabase</u> Chapter 6 <u>Using ArcCatalog.pdf</u> Chapters 12 & 13	MS4
9	Geometric Network Concepts	<u>Building a Geodatabase</u> Chapter 7,	MS5, REVIEW for TEST
10	Annotation and Dimensions	<u>Building a Geodatabase</u> Chapter 8 & 9	Test 2
11	Raster Geodatabase Construction	<u>Building a Geodatabase</u> Chapter 12, <u>U</u> <u>Designing Geodatabases</u> Chapter 7 <u>sing ArcCatalog.pdf</u> Chapter 14,	
12	ArcObjects and the Geodatabase	<u>ExploringArcObjects.pdf</u> , chapters 1 & 2	MS6
13	Accessing and Modifying the User Interface	<u>ExploringArcObjects.pdf</u> , chapters 3	MS7
14	<i>Student Project</i>	<i>Reports and Demonstrations</i>	Virtual Geodatabase Due
15		Final Exam	

Mile Stone Definitions

MS1 – Industry Selection and Design Diagram.

MS2 - Establish geodatabase

MS3 - Define geospatial and attribute metadata

MS4 - Define relationship classes

MS5 – Establish network relationships

MS6 – Raster integration

MS7 – Interface customization

IV. Evaluation Methods.

There will be two tests and a final exam. Students will complete a project designed to demonstrate their ability to create, document, and manage a simulated multi-user GIS. Students will demonstrate the operation of their system. There will be seven assignments associated with simulated project milestones. The presentation of individual projects at the designated time and place will be worth 6% of the total grade.

Test 1	100 points
Test 2	100 points
Final	100 points
Project	100 points
Presentation	30 points
<u>7 milestones</u>	<u>70 points</u>
TOTAL	500 points.

V. Example Grading Scale.

Letter grades (A, B, etc.) will be assigned at the end of the semester, based on a standard grade interval (90-100% = A; 80 - 89% = B; 70-79% = C; 60-69% = D; < 59% = F).

VI. Undergraduate Course Attendance Policy. The University expects all students to attend class. Each session of this class builds on the previous. Failure to attend any one session can throw you drastically behind. There will be no direct penalty for absence.

VII. Required Textbook(s), Supplemental Books and Readings.

ESRI 2004. Geodatabase Workbook. ESRI Press, Redlands, CA. ISBN: 1-58948-093-7, 266 pages. . [Available electronically free of charge to registered students.]

ESRI. 2002. Building a Geodatabase. ESRI Press, Redlands, CA. 460 pp. [Available Electronically free of charge to registered students.]

Archer, David and Michael Zeller. 2005. Designing Geodatabases: Case Studies in GIS Data Modeling. ESRI Press, Redlands, CA

ESRI . Using_ArcCatalog.pdf

ESRI. ExploringArcObjects.pdf

VIII. Special Resource Requirements.

1. Continued ESRI product license
2. Microsoft Visio.

IX. Bibliography.

- Brown, Mary Maureen. 1997. An empirical assessment of the hurdles to geographic information system success in local governments. *State and Local Government Review* 28, no. 3: 193-204.
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- Devogele, Thomas, Christine Parent, and Stefano Spaccapietra. 1998. On spatial database integration. *International Journal of Geographical Information Science* 12, no. 4: 335-52.
- Doyle, Simon, Martin Dodge, and Andy Smith. 1998. The Potential of Web-based Mapping and Virtual Reality Technologies for Modelling Urban Environments. *Computers, Environment, and Urban Systems* 22, no. 2: 137-55.
- ESRI. 2002. Building a Geodatabase. ESRI Press, Redlands, CA. 460 pp. [Available electronically free of charge to registered students.]
- ESRI. 2002. Understanding ArcSDE. ESRI Press, Redlands, CA. 53 pp. [Available electronically free of charge to registered students.]
- ESRI. 2002. Using ArcIMS. ESRI Press, Redlands, CA. 198 pp. [Available electronically free of charge to registered students.]
- Garson, G. David. 1999. Analyzing Hazardous Waste Facility Location by Racial Composition of Census Tract With LandView III: A Brief Tutorial. *Social Science Computer Review* 17(1): 64-68.
- Godin, Lisa. 2001 GIS in Telecommunications. ESRI Press. Redlands, CA. 120 pages. ISBN: 1-879102-86-2
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- Heywood, D. I., Oliver, J., and Tomlinson, S. 1995. Building an Exploratory Multicriteria Modeling Environment for Spatial Decision Support. In P. Fisher (ed.) *Innovations in GIS* 2, 127-36, Taylor & Francis, London.

- Hickey, R., and P. Jankowski. 1997. GIS and environmental decisionmaking to aid smelter reclamation planning. *Environment and Planning A* 29, no. 1: 5-19.
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- Keating, Gordon. Paul Rich, and Marc Witkowski. 2003. Challenges for Enterprise GIS.
- Lang, Laura. 1999. Transportation GIS. ESRI Press, Redlands, CA. 132 pp.
- Peng, Zhong-Ren, Jonathan N. Groff, and Kenneth J. Dueker. 1998. An Enterprise GIS Database Design for Agency-Wide Transit Applications. *URISA Journal* 10, no. 2: 46-55.
- Plangraphics, Inc. 2003. GIS Database Concepts. URISA Press. Washington D.C.
- Rigaux, Phillippe, Michel Scholl and Agnes Voisard. 2002. Spatial Databases with Application to GIS. Academic Press. San Diego. CA.
- Rosen, Howard. 2004. GIS in Public Works. URISA Press. Washington D.C.
- Sarjakoski, T. 1998. Networked GIS for Public Participation -- Emphasis on Utilizing Image Data. *Computers, Environment, and Urban Systems* 22, no. 4: 381-92.
- Von Meyer, Nancy R. and R. Scott Oppman. 2002. Enterprise GIS. URISA Books. Washington D.C.
- Zeiler, M. 1999. Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI Press, Redlands, CA. 199 pp.

Course Project

Each Student will design and create a virtual multi-user geodatabase. Achieving the scheduled milestones ON TIME will ensure your successful completion of a quality project.

The finished product will include:

Microsoft Visio diagram of the geodatabase.

System Documentation

Full Metadata compliance

Customized User Access for multiple user categories

Each student will demonstrate their geodatabase during the final week of the semester.