LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		05-276	Appr 2/14/06	Appr 5/4/06

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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

__X__ New Course _____ Course Prefix Change _____ Course Deletion

_____ Course Revision _____ Course Number and/or Title Change _____ Catalog Description Change

	RGPL 421 – Regional GIS Management: Theory & Practice
***Current* Course prefix, number and full title**	***Proposed* course prefix, number and full title, if changing**

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

_____ Catalog Description Change _____ Program Revision

_____ New Degree Program _____ Program Title Change _____ Other

_____ New Minor Program _____ New Track

***Current* program name**	***Proposed* program name, if changing**

4. Approvals		**Date**
Department Curriculum Committee Chair(s)	Roger Wright	10-14-05
Department Chair(s)	John Benhart Jr.	10/14/05
College Curriculum Committee Chair	Charles R Ump	11.29.05
College Dean	Ann	11/30/05
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail S Sechrist	2-14-06

* where applicable

DEC – 2 2005

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)

RGPL 421 Regional 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.

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	UsingArcCatalog.pdf Chapters 1-5	Students projects selected
3	Geospatial Data Structures: Raster, Vector, TIN, TIGER	GIS_data_structures_topology.pdf, Building a Geodatabase Chapter 1,	
4	Designing & Evaluating Geodatabases, Geodatabase Modeling and	Designing Geodatabases Chapter 1 & 2,	Stream and River Networks Demonstration, MS1

	Diagramming, Using Microsoft Visio		
5	Creating a Geodatabase, Server Connectivity Issues, Importing Data	Building a Geodatabase Chapter 2 & 3, Geodatabase Workbook Chapter 2, Using_ArcCatalog.pdf Chapter 6, Designing Geodatabases Chapter 3	Census Geography and data, MS2, REVIEW for TEST
6	Topological Data Structures for GIS and Metadata	Building a Geodatabase Chapter 4, Geodatabase Workbook Chapter 4, Using_ArcCatalog.pdf Chapter ExploringArcObjects.pdf, Append B	**Test 1**
7	Attribute Domains and Metadata	Building a Geodatabase Chapter 5 Using_ArcCatalog.pdf Chapters 8 & 9	MS3
8	Geospatial and Attribute Relationship Classes	Building a Geodatabase Chapter 6 Using_ArcCatalog.pdf Chapters 12 & 13	MS4
9	Geometric Network Concepts	Building a Geodatabase Chapter 7,	MS5, REVIEW for TEST
10	Annotation and Dimensions	Building a Geodatabase Chapter 8 & 9	**Test 2**
11	Raster Geodatabase Construction	Building a Geodatabase Chapter 12, U Designing Geodatabases Chapter 7 sing_ArcCatalog.pdf Chapter 14,	
12	ArcObjects and the Geodatabase	ExploringArcObjects.pdf, chapters 1 & 2	MS6
13	Accessing and Modifying the User Interface	ExploringArcObjects.pdf, chapters 3	MS7
14	*Student Project*	*Reports and Demonstrations*	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
7 milestones	70 points
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.

Campbell, Heather, and Ian Masser. 1995. *GIS and Organizations*. London: Taylor and Francis.

Clercq, F. le. 1990. Information Supply to Strategic Planning. *Environment and Planning B: Planning and Design* 17: 429-40.

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

Green, David and Terry Bossomaier. 2002. Online GIS and Spatial Metadata. Taylor and Francis, London.

Harder, Christian. 1999. Enterprise GIS for Energy Companies. ESRI Press, Redlands, CA. 120 pp.

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.

Jankowski, P. and M. Stasik. 1997. Design consideration for space and time distributed collaborative spatial decision making. *Journal of Geographic Information and Decision Analysis* 1, no 1:1-8.

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.