CGS Agenda Item: 08-01
Proposal Effective Date: Fall 2008

Eastern Illinois University
NEW COURSE PROPOSAL

GEG 5810 Geographic Information Systems I

Please check one: **X** New course ☐ Revised course

PART I: CATALOG DESCRIPTION

1. **Course prefix and number:** GEG 5810
2. **Title :** Geographic Info Systems I
3. **Long title:** Geographic Information Systems I
4. **Class hours per week, lab hours per week, and credit:** 2-2-3
5. **Term(s) to be offered:** X Fall ☐ Spring ☐ Summer ☐ On demand
6. **Initial term of offering:** X Fall ☐ Spring ☐ Summer ☐ Year **2008**
7. **Course description:** An Advanced Introduction to Geographic Information Systems (GIS) using ESRI ArcGIS to attain a level of proficiency to merge into the mainstream GIS community. Students will learn how to create, manage, edit, query, analyze and georeference spatial and attribute data and produce informative, functional cartographic output in a variety of formats. Supplemental to this course, students may optionally work towards and obtain the ESRI Introduction to ArcGIS I Certificate.
8. **Registration restrictions:**
   a. **Identify any equivalent courses:** None

   b. **Prerequisite(s):** None
   c. **Who can waive the prerequisite(s)?**
      ☐ No one ☐ Chair ☐ Instructor ☐ Advisor ☐ Other (Please specify)
   d. **Co-requisites** (course(s) which MUST be taken concurrently with this one):
   e. **Repeat status:** X Course may not be repeated.
      ☐ Course may be repeated to a maximum of hours or times.
   f. **Degree, college, major(s), level, or class** to which registration in the course is restricted, if any: None
   g. **Degree, college, major(s), level, or class** to be excluded from the course, if any: None
9. **Special course attributes** [cultural diversity, general education (indicate component), honors, remedial, writing centered or writing intensive] None
10. **Grading methods** (check all that apply): X Standard letter ☐ C/NC ☐ Audit ☐ ABC/NC
    ("Standard letter"—i.e., ABCDF--is assumed to be the default grading method unless the course description indicates otherwise.)
11. **Instructional delivery method:** lecture lab combined

PART TWO: ASSURANCE OF STUDENT LEARNING

1. List the student learning objectives of this course:

   Students will be provided an opportunity to gain knowledge of advanced GIS theory and applications by learning how to:

   - Display Geographic and Tabular data
   - Work with Georeferenced Spatial Data and Photogrammetry
   - Work with Geographic Coordinate Systems, Datum's, Projections & Grid Systems (Effective critical thinking and problem solving)
   - Query features and Tables using simple and complex SQL Expressions (Effective critical thinking and problem solving)
   - Find features using complex Spatial Relationships (Advanced scholarship through research or creative activity)
   - Edit many different Spatial and tabular Attribute Data formats
   - Perform Joins & Relates using advanced cardinality
   - Produce detailed Maps, Reports, and Graphs using ESRI Report Writer & crystal Reports (Effective oral and written communication)

2. Assignments/activities the instructor will use to determine how well students attained the learning objectives:
   - Mid-term Examination 30%
   - Laboratory Exercises 30%
   - Oral Presentation 10%
   - Final Examination 30%

3. Explain how the instructor will determine students' grades for the course:

   Graduate students will demonstrate advanced knowledge and comprehension in GIS theory and application through completion and submittal of laboratory assignments and written reports. Students are expected to organize and analyze spatial and tabular data, compare and contrast varying methodologies, explain and discuss their methods, derive detailed conclusions from their analysis, and evaluate the outcome of geoprocessing techniques. Students will produce and use maps, graphs, charts, and reports providing support to a number of proposed problems, scenarios, and theoretical events thereby applying their cartographic skills and ability to use GIS as a problem-solving tool through often complex spatial analyses. Laboratory exercises 30%, Mid-term examination 30%, 10% Oral Presentation, Final examination 30%

Learning Objectives	**30% Mid-Term Exam**	**30% Final Exam**	**40% Lab Exercises**
Display Geographic and Tabular data	X	X	X
Work with Georeferenced Spatial Data and Photogrammetry	X	X	X
Work with Geographic Coordinate Systems,	X	X	X

Datum's, Projections & Grid Systems			
Query features and Tables using simple and complex SQL Expressions	X	X	X
Find features using complex Spatial Relationships	X	X	X
Edit many different Spatial and tabular Attribute Data formats			X
Perform Joins and Relates using Advanced Cardinality	X	X	X
Produce detailed Maps, Reports, and Graphs using ESRI Report Writer & crystal Reports	X	X	X

4. Not technology delivered.

5. For courses numbered 4750-4999, specify additional or more stringent requirements for students enrolling for graduate credit. Not Applicable.

   Graduate students will demonstrate advanced proficiency in GIS theory and application through completion and submittal of all class requirements including tests, laboratory assignments and written reports. Graduate students will additionally be required to present an oral presentation supplemented with maps, graphs, and charts using ArcGIS on an appropriate research project in their field of study. Additional meetings will be scheduled with the graduate student to assist with mapping endeavors related to their individual theses. Laboratory exercises 30%, Mid-term examination 30%, Oral presentation 10%, Final examination 30%.

6. If applicable, indicate whether this course is writing-active, writing-intensive, or writing-centered, and describe how the course satisfies the criteria for the type of writing course identified. (See Appendix *.)

   Not applicable

PART III: OUTLINE OF THE COURSE

The course will meet 30 times during the semester (two 100 minute periods per week)

Week 1
INTRODUCTION, EXPLORING GIS CONCEPTS

An Introduction to GIS, Applications in GIS, and the ArcGIS suite of products. Introduction to ArcMap, ArcCatalog, & Arc Toolbox. Introduction to support resources and the ESRI website. Review: *ArcGIS News* & *ArcGIS Use* online.

Week 2
DISPLAYING MAP DATA

Introduction to the ArcGIS Interface. ESRI Object Data, Adding & Displaying Map Data. Layer symbology in ArcMap, Managing the Table of Contents, the Layer Properties Dialog. Working with Shapefiles, tables and Raster Data.

Week 3
QUERYING A DATABASE, WORKING WITH SPATIAL DATA

Identifying, Measuring, Finding, Map Tips & Hyperlinks, Selection Tools, Selection Layers & Selection Methods, Select by Location, (spatial query), Generating Summary Statistics.

Week 4
THE ESRI GEODATABASE, EDITING TABULAR DATA

Introduction to the Personal Geodatabase; Working with Feature Classes and Tables in the Geodatabase. Adding Tabular Data, Creating Tables, Adding Fields & Records, Field Calculations, Querying Tables, Joins and Relates, Charts. .TXT, .XLS, .DBF, INFO, .CSV, .MDF files, importing. Joins and Relates; One to One, One to Many & Many to Many Tabular Relationships in GIS.

Week 5
PRESENTING MAP DATA

Cartographic Cosmetics and Aesthetic Map Making. Map Elements; Textual Attributes, North Arrows, Scales, Neat lines. Legend Properties Dialog. Using Map Templates. Creating a Custom Map Template.

Week 6
WORKING WITH ANNOTATION AND LABELS

Annotation and Labeling in ArcMap, Label Visibility & Placement, Setting a Reference Scale, Creating Annotation. Working with the Labels Overflow Window.

Week 7
ADVANCED LABELS & ANNOTATION

Adding New Annotation Groups, Labels Toolbar, Draw Tool Bar; Advanced Annotation Editing

Week 8
GEOPROCESSING

Overview of Geoprocessing Using ArcTools to Process GIS Data, Extract, Overlay & Proximity Toolsets, Creating a New Toolbox and Automating Geoprocessing Tools using the ESRI Model Builder.

MIDTERM EXAM

Week 9
GEOCODING

An introduction to Geocoding and the Geocoding Process including Geocoding Tables, Finding an , and using the Find Tool.

Week 10
SPATIAL ADJUSTMENT & ANALYSIS FUNCTIONS, GEOREFERENCING

Overview of Spatial Adjustment; Transformation, Displacement Links, RMS error, Rubber-Sheeting, Aggregating Spatial Data, Spatial Analysis techniques

Week 11
ELLIPSIODS, DATUMS, GEOGRAPHIC COORDINATE SYSTEMS, AND PROJECTIONS

Using and Defining Spheres, Spheroids, Geoids & Datum's. Understanding Map Projections. Understanding Map Distortion. Setting Projection Properties. Storing Projection Information, Assigning Changing Projections.

Week 12
PROJECTED COORDINATE SYSTEMS

The Public Land Survey System, Universal Transverse Mercator, and State Plane Coordinate Systems.

Week 13
EDITING GIS SPATIAL AND TABULAR DATA

Simple Editing Functions; Working with Sketches, Edit Tasks, Editing Tools & the Editor Toolbar

Week 14
SETTING GEODATABASE VALIDATION RULES

Introduction to Subtypes and Domains, Topologies: Concept & Design. Three States of a Topology

Week 15
CUSTOMIZING THE ARCGIS INTERFACE
Data View Options, Layout View Options, Table of Contents Options, Quantitative Displays, Choosing a Classification Method, Stylesheets, Advanced Drawing Options, Exporting Maps, Symbol Selector (more symbols), Saving Symbols

FINAL EXAM

PART IV: PURPOSE AND NEED

1. Explain the department's rationale for developing and proposing the course.

   Geography Matters; Students in any discipline will benefit by taking this course. For Geography Majors, the course will directly address Goals 1 through 5 in the Geography Program Student Learning Assessment Plan. Geographic Information Systems allow us to see patterns, relationships and trends in physical, cultural and economic variables in ways that charts, graphs, and tabular datasets cannot present. This course provides the framework upon which students will develop basic ArcView, ArcEditor, and ArcInfo skills and is designed for those who are new to ESRI ArcGIS and new to Geographic Information Systems in general. The course offers the basic ArcGIS knowledge and experience needed to enroll in *Geographic Information Systems 2*. Whether mapping how, when, where or why, GIS has become mainstream practice. GIS is both tool and science and imparts the framework with which geographic data is organized, analyzed and disseminated.

2. Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.

   The course has no prerequisites. However, the level of the course is set quite high to allow ~~juniors, seniors and~~ graduate students, those who have learned the systematic of their disciplines, to apply analytical mapping techniques to assist in queries and displays of data that has a spatial component.

3. If the course is similar to an existing course or courses, justify its development and offering.

   The course will replace GEG 4890 Geographic Information Systems. As mapping software becomes more sophisticated and complex, it takes additional class time to introduce the basics and then move on to higher order functionality of the software. We are setting up the proposed GEG 5810 and GEG 5860 courses to extend the instruction time spent on the GIS software and replace the one semester long GEG 4890 course.

4. Impact on Program(s):
   It will provide graduate students throughout the university to be versed in Geographic Information Systems theory and practical applications in their home departments.

PART V: IMPLEMENTATION

1. Faculty member(s) to whom the course may be assigned:

   This course will initially be delivered by Mr. Steven Di Naso, FA, under the guidance, direction, and supervision of Dr. Vincent P. Gutowski, Professor of Geography. Later, any qualified Geography faculty may teach this course.

   If this is a graduate course and the department does not currently offer a graduate program, it must document that it employs faculty qualified to teach graduate courses.

   Dr. Gutowski is a member of the EIU Graduate faculty.

2. Additional costs to students:

   $30 course fee for use of the Geology/Geography Department computer lab.

3. Text and supplementary materials to be used (Include publication dates):

   Getting to Know ArcGIS Desktop, Second Edition: Tim Ormsby, Eileen Napoleon, Robert Burke, Laura Feaster, and Carolyn Groessl, *ESRI Press, 2004, 588 pp.*
   ISBN: 158948083X

PART VI: COMMUNITY COLLEGE TRANSFER

A community college course will not be judged equivalent to this course

PART VII: APPROVALS

Date approved by the Department of Geology/Geography __29 October 2007_____

Date approved by the College of Sciences Curriculum Committee _30 November 2007_____

Date approved by CGS _____