Eastern Illinois University

New/Revised Course Proposal Format

(Approved by CAA on 4/3/14 and CGS on 4/15/14, Effective Fall 2014)

CGS Agenda Item: 16-54
Effective: Spring 2017

Banner/Catalog Information (Coversheet)

1. **____New Course or __X___Revision of Existing Course**
2. **Course prefix and number:** _GEO 5880_____
3. **Short title:** _____Geospatial Data Models_____
4. **Long title:** _____ Geospatial Data Models _____
5. **Hours per week:** _2_ Class _2_ Lab _3_ Credit
6. **Terms:** ___ Fall _X_ Spring ___ Summer ___ On demand
7. **Initial term**: ___ Fall _X_ Spring ___ Summer Year: _2017___
8. **Catalog course description:**

   This course explores a diverse range of geospatial data models used to represent geographic features on the earth's surface. Models of geographic objects, regions, distributions and networks will be discussed. Students will learn advanced techniques for measuring, transforming and analyzing geospatial data, with applications to both physical and human landscapes.

9. **Course attributes:**

   General education component: _____

   ___ Cultural diversity ___ Honors ___ Writing centered ___ Writing intensive ___Writing active

10. **Instructional delivery**
    Type of Course:

    ___ Lecture ___ Lab _X_ Lecture/lab combined ___ Independent study/research

    ___ Internship ___ Performance ___ Practicum/clinical ___ Other, specify: _____

    Mode(s) of Delivery:

    _X_ Face to Face _X_ Online ___ Study Abroad

    _X_ Hybrid, specify approximate amount of on-line and face-to-face instruction___75% online, 25% face-to-face_____

11. Course(s) to be deleted from the catalog once this course is approved. ___GEO 5860_____
12. **Equivalent course(s):** _____

    a. Are students allowed to take equivalent course(s) for credit? ___ Yes ___ No

13. **Prerequisite(s):**

GEO 5810 (Introduction to GIScience) or equivalent

a. Can prerequisite be taken concurrently? _X_ Yes ___ No

b. Minimum grade required for the prerequisite course(s)? _C_

c. Use Banner coding to enforce prerequisite course(s)? _X_ Yes ___ No

d. Who may waive prerequisite(s)?

___ No one ___ Chair _X_ Instructor ___ Advisor ___ Other (specify)

14. Co-requisite(s): _____

15. Enrollment restrictions

a. Degrees, colleges, majors, levels, classes which <u>may</u> take the course: _____

b. Degrees, colleges, majors, levels, classes which may <u>not</u> take the course: _____

16. Repeat status: _X_ May not be repeated ___ May be repeated once with credit

17. Enter the limit, if any, on hours which may be applied to a major or minor: ___

18. Grading methods: _X_ Standard ___ CR/NC __ Audit ___ ABC/NC

19. Special grading provisions:

___ Grade for course will <u>not</u> count in a student's grade point average.

___ Grade for course will <u>not</u> count in hours toward graduation.

___ Grade for course will be removed from GPA if student already has credit for or is registered in: _____

___ Credit hours for course will be removed from student's hours toward graduation if student already has credit for or is registered in: _____

20. Additional costs to students:
Supplemental Materials or Software_____

Course Fee _X_No ___Yes, Explain if yes_____

21. Community college transfer:

___ A community college course may be judged equivalent.

_X_ A community college may <u>not</u> be judged equivalent.

Note: Upper division credit (3000+) will <u>not</u> be granted for a community college course, even if the content is judged to be equivalent.

Rationale, Justifications, and Assurances (Part I)

1. _X_Course is required for the major(s) of _PSM in GIScience_____

   ___Course is required for the minor(s) of _____

   ___Course is required for the certificate program(s) of _GISci, _____

   ___ Course is used as an elective

2. **Rationale for proposal** :

   This course will support the new Professional Science Masters degree program in Geographic Information Science, and will serve as an elective in the discipline component for students in that program. Spatial modeling is a core component of geographical information science, which seeks methods to understand geographic patterns, processes and relationships. The course will provide students participating in the PSM program a foundation for data modeling which can be applied to a broad range of problems in physical, social, political and environmental contexts.

3. **Justifications for (answer N/A if not applicable)**

   Similarity to other courses: N/A

   Prerequisites:

   The prerequisite IS designed to ensure that students will already have familiarity with managing data and creating maps using geographic information systems software.

   Co-requisites: N/A

   Enrollment restrictions: N/A

   Writing active, intensive, centered: N/A

4. **General education assurances (answer N/A if not applicable)**

   General education component: N/A

   Curriculum: N/A

   Instruction: N/A

   Assessment: N/A

5. **Online/Hybrid delivery justification & assurances (answer N/A if not applicable)**

   Online or hybrid delivery justification:

   The purpose and rationale for revising this course is to offer it as an online or hybrid option through the School of Continuing Education for students from across the state of Illinois and beyond who desire an asynchronous learning opportunity and for whom the residential campus is not an option. The online course would not be available to on campus students.

   Instruction:

   The technology will be used to support student achievement by allowing them to access GIS software and data on an EIU server through a VMWare interface. This will allow for a standardized computing environment for all students with a minimum internet bandwidth. Students will be assigned discussions and group projects to encourage interaction, and will be able to interact with the instructor at times which are convenient

for them. The technology will be used to assess student achievement by being the vehicle through which all student work is conducted. Specific components of the learning management system (LMS) to be utilized include timed quizzes and exams, discussions (for threaded discussions over specific questions), labs and video tutorials, and Email (for answering additional questions students may have). Please note, these labels ("discussions," etc.) may change with another LMS, but the functions will remain the same.

Integrity:

The course syllabus includes a statement about academic dishonesty. Lab activities will be designed such that each individual's submission will be substantially different, for example by requiring students to find their own datasets and apply their own cartographic symbology. Tests and quizzes will be time-restricted, can only be taken once, and must be taken within a limited time frame. Discussions and major course projects require the addition of personal reflection, which discourages plagiarism. Student work can only be submitted through the provided LMS or plagiarism software such as Turnitin.

Interaction:

Instructor-student and student-student interaction will be promoted through Email, web-based discussions, and personal feedback on individual exams and discussions.

Model Syllabus (Part II)

Please include the following information:

1. **Course number and title**
   GEG 5880: Geospatial Data Models

2. **Catalog description**
   Explores the diverse range of geospatial data models used to represent geographic features on the earth's surface. Models of geographic objects, regions, distributions and networks will be discussed. Students will learn advanced techniques for measuring, transforming and analyzing geospatial data, with applications to both physical and human landscapes.

3. **Learning objectives.**
   Learning objective categories (revised University Learning Goals effective Fall 2014:
   - *Depth of content knowledge (CK)*
   - *Effective critical thinking and problem solving (CTPS)*
   - *Effective oral and written communication (OWC)*
   - *Advanced scholarship through research or creative activity (RCA)*

   1. Describe geospatial data and procedures in terms of commons conceptual models of geographic space. (CK, OWC)
   2. Measure characteristics of geospatial objects including shape, sinuosity and fractal dimension. (CK, CTPS)
   3. Define regions from spatial and attribute data using techniques including (weighted) Voronoi diagrams, Principal Components Analysis (PCA) and cluster analysis. (CK, CTPS, OWC)
   4. Distinguish between various types of point distributions and measure characteristics including spatial footprint, shape, dispersion and spatial interaction. (CK, CTPS)

5. Distinguish between hierarchical and non-hierarchical networks, and measure characteristics including branching ratio, node centrality and network distance. (CK, CTPS)
6. Process and transform data from one conceptual model to another (e.g. create a network from a set of geospatial objects), and from one software environment to another (e.g. ESRI Model Builder, QGIS and the R statistical package). (CK, CTPS)
7. Construct professional reports describing geospatial analysis procedures at the conceptual level, with reference to relevant literature. (OWC, OWC, RCA)

4. Course materials.

David O'Sullivan and David J. Unwin, 2010. Geographic Information Analysis (2nd Edition). John Wiley & Sons, Inc., Hoboken, New Jersey.

Other materials to be distributed by the instructor.

5. Weekly outline of content.

Wk	Days	Unit	Topics	Readings	Assignments
1	1/12 1/14	Intro	Introduction Conceptual models and data models	O'S&U ch. 1	Discussion 1
2	1/19 1/21	Objects	Line sinuosity, fractal dimension Introduction to Model Builder	Objects (handout)	Discussion 2
3	1/26 1/28		Polygon shape complexity, medial axis Completing a model in Model Builder	O'S&U ch. 2 Appendix A	Sinuosity
4	2/2 2/4	Regions	Spatial autocorrelation, MAUP Proximity polygons (point Voronoi, weighted point Voronoi, line Voronoi)	Rogerson Partitions (handout)	Climate PCA
5	2/9 2/11		Matrix notation, matrix multiplication Data Handling in R	Spielman & Folch 2015	Discussion 3
6	2/16 2/18		Principal Components Analysis (PCA) Hierarchical Clustering	O'S&U ch. 3	Climate Regionalization
7	2/23 2/25		K-Means Clustering, Fuzzy Set Theory PCA and Clustering in R	Walter et al. 2011	Discussion 4
8	3/1 3/3		Regionalization and spatial proximity Uncertainty, Visualization	O'S&U ch. 4	Concave Bounding Polygon
9	3/8 3/11	Distributions	Visualization of large point patterns Characterizing Point Patterns (point pattern types, interpolation)	O'S&U ch. 5	
10	3/22 3/24		Minimum Enclosing Polygons Point processes, and Monte Carlo simulation	O'S&U ch. 6	Discussion 5
11	3/29 3/31		Hot-spot analysis, clustering Spatial Interaction	Networks (handout)	Stream Bifurcation
12	4/5 4/7	Networks	Network definition and types Hierarchical networks, stream ordering and bifurcation ratios	ESRI Documentation	Discussion 6
13	4/12 4/14		Non-hierarchical networks, shortest path analysis Building networks in GIS & statistical packages		

14	4/19 4/21		Measures of connectivity and node centrality Location/Allocation Modeling (1)		
15	4/24 4/28		Location/Allocation Modeling (2) Final Project Consultations		
Ex.	5/7				**Research Presentations**

6. Assignments and evaluation, including weights for final course grade.

The course will include the following types of assignments/activities:

a) LB: Short (1-week) lab exercise with detailed instructions.
b) CP: More challenging 2-3 week class project assigned by instructor. Students must provide detailed results in the form of a professionally written report.
c) IP: Individual research project involving literature review and theoretical exploration or real-world application of technique learned in course.
d) D: Short (1-2 paragraph) discussion of a theoretical topic or question provided by the instructor.

The final course grade will be determined according to the following weights:

Assignment	Approx. Number	Total Contribution to Final Grade
Lab assignments	5-6	40%
Class projects	2	30%
Individual research project	1	20%
Discussions	5	10%
Total		100%

7. Grading scale:

A 90% or more, B 80-89%, C 70-79%, D 60-69%, F less than 60%

8. Correlation of learning objectives to assignments and evaluation.

Assignment/Activity (from #6 above)	Learning Objective (from #3 above)						
	1	2	3	4	5	6	7
LB		X	X	X	X	X	
CP	X		X		X		X
IP	X	X	X	X	X	X	X
D	X	X	X	X	X		

Date approved by the department or school: Apr 8, 2016
Date approved by the college curriculum committee: April 29, 2016
Date approved by the Honors Council *(if this is an honors course):*
Date approved by CAA: CGS: