HONR 401: GIS and Modeling
Minnesota State University, Mankato

Course Syllabus

Course Meetings: TBD
Classroom: TBD
Credits: 3
Prerequisite: None

Professor: Rama Prasada Mohapatra, Ph. D., Associate Professor of Geography
Office: 222F Morris Hall
Email: rama.mohapatra@mnsu.edu
Phone: (507) 389 6223
Office Hours: TBD

Course Description:
This is an advanced seminar course in geographic information systems (GIS) and modeling designed specifically for honors students. The objectives of this course is to provide foundational knowledge in concepts, theories, techniques, and tools in the context of modeling geographical data. This application-oriented course will take students beyond the basic understanding of geospatial analysis and introduce them to a range of spatio-temporal modeling approaches. In addition, the course will provide students the skills necessary to investigate spatio-temporal patterns that result from human environment interactions. Emphasis will be on vector and raster based models in Geography, Demography, Urban Studies, Social Sciences, Business, Environment, Health, Engineering, Recreation, Resource Management etc. Furthermore, as part of the class project, students will have opportunities to design and implement geographical data driven models. In this course, GIS modeling theories and techniques will be introduced through a combination of lectures, hands-on exercises, and individual or team projects. The primary software package that will be used for the hands-on activities is ArcGIS. Students with exposure to statistical and modeling software are encouraged to use them but it is not required.

Student Learning Outcomes: After successfully finishing the course students will be able to:

- Explain the concepts of GIS data formats, geodatabase, geographical data exploration, and spatio-temporal modeling of geographical data.
- Compare, contrast and implement various modeling approaches learned in the class to solve complex societal issues.
- Plan, design and develop innovative spatio-temporal models to model geographical information.
- Collaborate with professionals from other disciplines to obtain data and jointly develop spatio-temporal models.

Readings: Copies of these books are available at Memorial Library

- Introduction to Geographic Information Systems, by Kang-tsung Chang, McGraw-Hill, 8th Edition, 2016
- Getting To Know ArcGIS Desktop for ArcGIS 10.3.1, by Michael Law and Amy Collins, ESRI Press, 4th Edition, 2015
- Getting To Know ArcGIS ModelBuilder, by David W. Allen, ESRI Press, 2011
- GIS Tutorial 1: Basic Workbook, by Wilpen L. Gorr and Kristen S. Kurland, ESRI Press, 4th Edition, 2011
- GIS Tutorial 2: Spatial Analysis Workbook, by David W. Allen, ESRI Press, 2nd Edition, 2011
- GIS Tutorial 3: Advanced Workbook, by David W. Allen and Jeffery M. Coffey, 2011

Learning Outcomes	Activities	Honors Competencies
Explain the concepts of GIS data formats, geodatabase, geographical data exploration, and spatio-temporal modeling of geographical data.	Participate in weekly lecture and lab assignments on geographical data and models. Critically analyze the study materials provided in the class and complete hands-on activities.	**Research: Exhibit Information Literacy Skills** Emerging Level One Develops the ability to describe various techniques, analytical methods and models related to geographical information.
Compare, contrast and implement various modeling approaches learned in the class to solve complex societal issues.	Analyze readings and other materials to identify appropriate models. Through labs and hands-on activities, compare various modeling approaches.	**Research: Synthesize and Integrate Ideas** Developing Level Two Develops the ability to evaluate various perspectives of spatio-temporal modeling and integrate them.
Plan, design and develop innovative spatio-temporal models to model geographical information.	Complete in-class research project and build saptio-temporal models that solves complex social and environmental issues.	**Research: Produce Original Research or Creative Works** Developing Level Three Investigates complex issues, constructs models, and produces creative maps.
Collaborate with professionals from other disciplines to obtain data and jointly develop spatio-temporal models.	Participate in group discussions and assignments. Complete research project in a group or collaborate with local agencies for projects.	**Leadership:** Emerging Level One Exhibits ability to collaborate with other professionals for data and domain knowledge to build spatio-temporal models.

Course Evaluation:

In this course, students will be evaluated both on their theoretical understanding of the GIS topics covered and their ability to analyze geospatial issues by employing ArcGIS 10.3 and its modeling capabilities. Test materials will come directly from lectures and labs, as well as from websites and other visual presentations (if) provided in class. Apart from theoretical questions, the tests could include lab related questions on ArcGIS 10.3 and Modelbuilder. The lab related questions in the test would be time bound and needs to be finished using the lab computer and data provided by the Professor. Various evaluation components of the course and the respective percentages/points are outlined below.

Components	Percentages	Points
Exam1	15%	75
Exam2	15%	75
Exam3	15%	75
Final Project	15%	75
Labs	30%	150
Class Participation*	10%	50

*** Class participation includes: Attendance, Quizzes, In-class assignments etc.**

Grading Scale:

A fixed grading scale will be used in this course as mentioned below.

A+ (97%-100%)	A (94%-96%)	A- (90%-93%)
B+ (87%-89%)	B (84%-86%)	B- (80%-83%)
C+ (77%-79%)	C (74%-76%)	C- (70%-73%)
D+ (67%-69%)	D (64%-66%)	D- (60%-63%)
F (<60%)	**I (Incomplete)***	

Incomplete grade

- Is reserved for special cases and means that, because of extenuating circumstances, the student failed to meet a specific need and an important requirement of the course, but in other respects has done passing work for the semester.
- According to the university policy, **incomplete grade** is only allowed when the student has finished two thirds of the course work. The student should seek help from the instructor as soon as possible when the emergency occurs.
- The incomplete work must be made up in the next semester in which the student is enrolled, unless other arrangements have been made between the student and instructor who assigned the grade.

In-Progress grade is not applied in this course since this course is designed to be done by the end of the term.

The Final Project:

The final project will be a GIS modeling project defined by the instructor or student. The final project indicates that you have used your GIS modeling skills learned in the class to investigate geospatial issues. Projects need to **be done individually or as a group of two students**. I will discuss more about the project in the class. The project will include:

- A professional project paper (A 6-8 page, double spaced, font size 12, excluding models, maps, charts, tables and images report submitted in D2L.)
- A project presentation (10 minutes – one presenter, 15 minutes – 2 presenters)
- An ArcGIS 10.3 project including your models, data, maps, tables etc.

Course Policies

Student Responsibilities:

- Students should hand in all assignments and labs on time. Late submission leads to 1**0% deduction per day**.
- Students are expected to attend the weekly lectures and labs. Missing more than 5 weeks class leads to a **fail (F) grade**.
- In accordance with University Policy, students who engage in disruptive classroom activities will be disenrolled from the course. **Checking emails, reading news over Internet, doing homework for other classes, doing old lab assignment during the lecture, or any other disruptive classroom activities will lead to 2% deduction of the final course grade each time.**
- **Students are required to take the midterm and final examination at the scheduled time.** Exceptions will be granted only in special cases (e.g., illness, family emergency) and only if documentation is provided. For absences due to religious observances or scheduled activities of official University student organizations, students must inform the instructor at the beginning of the semester.
- **Students are also expected to take a proactive role by seeking assistance from the instructor when problems arise.**

Students with Disability:

- Students with disability that affect their ability to participate in class or meet all course requirements are encouraged to bring this to the attention of the Instructor during the first week of class. They are also encouraged to use university disability service for professional help.

Academic Misconduct:

- Students are expected to do their own labs, assignments and exams. Students should refer to the Student Handbook for information on definitions of academic misconduct and relevant procedures.

- **Cheating of any kind**, including **plagiarism and self-plagiarism** will not be tolerated and will result in a **fail (F) grade** for the course; expulsion from the University is possible. Relevant polices are listed at following website:
  http://www.mnsu.edu/supersite/administration/basic-stuff/policies.html#honesty

Important Safety Information:

- Minnesota State University, Mankato values the safety of all individuals on campus. You are encouraged to review the campus Emergency Response Guide online (http://www.mnsu.edu/security/emergencies) or in your classroom. This information will help you create a personal safety plan and consider your options in the event of an emergency.

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Tentative Schedule

Week	Lecture Topics	Lab Topics
1	Course introduction	Introduction to labs, Assignment 1
2	GIS fundamentals	Lab1: Introduction to digital mapping and coordinate systems.
3	Vector and raster data	Lab2: Geographical data visualization, Assignment 2
4	Geospatial data models, geodatabase	Lab3: Geodatabase and geographical data management
5	Geographical data exploration	Lab4: Data exploration, Assignment 3
6	GeoAnalytics, **Exam1 Review**	Lab5: Vector and raster data analysis **Project proposal due**
7	**Exam1**	**Project proposal discussion**
8	GIS models and modeling	Lab 6: ModelBuilder, Assignment 4
9	Raster data models	Lab 7: Modeling raster data
10	Vector data models	Lab 8: Modeling vector data, Assignment 5
11	Network models	Lab 9: Modeling transportation networks
12	Temporal models	Lab 10: Modeling temporal data, Assignment 6
13	Time to work on projects, **Exam2 and 3 Review**	Time to work on projects
14	Time to work on projects, **Exam2**	Time to work on projects
15	Project presentation	Project presentation
16	**Exam3**	

Important information:

I may not remain perfectly on track with the syllabus (which is a general outline for what we will cover) and I reserve the right to alter the syllabus. As we proceed through the class, any changes will be announced in class. Students are responsible for being aware of any and all changes to the syllabus, including any announcements made while the student was absent or tardy. Students agree to accept and comply with these requirements by choosing to remain enrolled after learning of these course conditions. If you have any problems in class feel free to contact me.