GEOG 4211 – ADVANCED GIS AND SPATIAL ANALYSIS

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Course Description:

Advanced GIS and Spatial Analysis is an advanced course in applications of Geographic Information Systems (GIS) and spatial analysis. The first part of the course will introduce advanced spatial analysis techniques. The second part provides an opportunity for students to undertake a GIS project of their choice. Students apply the GIS skills acquired in previous courses (GEOG 2232, GEOG 2215 and GEOG 4231) to a real-world project. A range of GIS methods and data sources will be used, depending on student project selection, but all will include as deliverables a project proposal and a poster, a spatial analysis of some kind, and a documented geodatabase. Both GIS and project management skills will be developed by completing the steps required to take a GIS project from initial proposal to final map production and poster generation.

Learning Outcomes:

Upon successful completion of this course, students will be able to:

- understand advanced spatial analysis techniques: spatial interpolation, network analysis, spatial statistics etc.;
- identify key concepts related to GIS/Remote Sensing and explore how to apply them to solve real world problems;
- select a research problem, background information and scope project objectives;
- identify required data sources, design data preparation and advanced techniques in order to achieve a geospatial solution;
- effectively work independently to fulfil project requirements and to meet deadlines; and
- develop perspectives on GIS, including the pros and cons, as both a decision support technology and a research tool.

Pre-requisites:

GEOG 2232, GEOG 2215 and GEOG 4231

Teaching and Learning approach:

The course will include a mix of theory, discussion, demonstration, guided application, and independent lab time.

Learning Resources:

Recommended: Chang, Kang-tsung. 2019. Introduction to Geographic Information Systems (9th edition). McGraw Hill Education.

Available for a 6 month rental period:
https://www.mheducation.com/highered/product/introduction-geographic-information-systems-chang/M9781259929649.html

Assessment:

Task 1: Lab exercises ……	40%
Task 2: Term project ……	60%

Course Expectations/Student Responsibilities:

1. **Attendance** is expected for each lecture and lab including individual lab time unless communicated with the instructor ahead of time.
2. **Late Assignments** receive a deduction of 10% per day unless an extension is agreed to with the instructor prior to the due date. After class assignments are graded and returned, late assignments receive a zero grade **but must be satisfactorily completed to receive credit in the course.**
3. **Participation** is expected in all class discussions, group work and collaborative efforts.
4. **Exams - t**his is mainly a project-based course and no exams are designed. However, students must pass the term project to be successful in the course. Students receiving a final mark less than 50 in a course must review their situation with the instructor within two weeks of receiving their marks to identify possible means of improving. The maximum mark the student can achieve through supplemental work is 60.

Course Schedule:

Week	Monday	Wednesday	Lab exercise
Jan. 6	Course introduction including term project and Introduction to ArcGIS Pro	Spatial interpolation and raster operations	**Lab1 & 2:** A case study – vector/raster analysis in ArcGIS Pro
13	Terrain and Watershed analysis	Spatial statistics (pattern, cluster/outlier, hot spots analysis)	**Lab1 & 2:** A case study – vector/raster analysis in ArcGIS Pro
20	Spatial statics – modelling spatial relationships	Network analysis	**Lab 3**: A case study for spatial pattern analysis
27	Network Analysis	Introduction to Term Project – proposal writing	**Lab 4**: A case study to find optimal solution for a real-world problem using network analysis
Feb. 3	Term project – proposal writing Literature review	Term project – proposal writing Decide on individual topics	Term project – proposal writing Check data availability
10	Work on term project proposal	Work on term project proposal	**Term project proposal due today before end of the day**
17	***February Break (no classes)***		
24	Discuss proposals in class	Start working on the term project – search for data	Term project – data management and pre-processing
Mar. 2	Term project – data analysis	Term project – data analysis	Term project – data analysis
9	Term project – data analysis	Term project – data analysis	**Progress report 1 due today**
16	Discuss progress report 1 and project deliverables in class – poster template	Term project – poster	**Progress report 2 (draft poster) due today**
23	Feedback for the draft poster – discuss in class Presentation template	Term project – poster amendments and prepare presentations	Term project – poster amendments and prepare presentations
30	Print final posters	Finalize presentations	**Project poster display and presentations**

Note that this document is subjected to change pending unforeseen circumstances.