GEOG/ENST 2232 – INTRODUCTION TO GEOMATICS AND GEOGRAPHIC INFORMATION SYSTEMS (F21)

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Course Description:

Introduction to Geomatics and Geographic Information Systems (GIS) is an introduction to applied mapping and GIS theory and applications. Emphasis will be placed on understanding how geospatial features are represented and captured as data and how these data can be managed, analyzed and presented using state-of-the-art GIS tools. The course will also be focused on introducing basic uses of remotely sensed imagery and exploring applied mapping technologies, including Google Earth and Internet Mapping websites. Hands-on expertise will be developed with ESRI's ArcGIS desktop software.

Learning Outcomes:

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

- interpret basic remote sensing imagery data to answer questions related to natural resource management, including an assessment of accuracy and error;
- create, import, manage, explore, analyze and display geospatial data using ESRI's ArcGIS desktop software;
- apply GIS theory and concepts to answer spatial questions;
- describe the essential components and architecture of a commonly used commercial GIS software;
- create maps and reports which clearly communicate thematic information, applying basic cartographic principles to improve map layouts;
- identify and compare different GIS data models, and convert between vector data models as needed; and
- identify and compare coordinate system and datum used in geographic data, set and convert spatial reference systems, and correctly utilize project-on-the-fly to represent your data on a map layout.

Teaching and Learning approach:

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

Learning Resources:

Required: 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

Hardware requirements:

Lab exercises are based on ESRI ArcGIS software package that requires certain hardware. Students have two options here:

(1) The university provides ArcGIS software (Student licenses) for one years' period and students should have access to one of the following WINDOWS OPERATING SYSTEMS to install the software;

- Windows 10 Home, Professional, Enterprise, and Educational (64 bit [EM64T])
- Windows 8.1 Basic, Pro, and Enterprise (64 bit [EM64T])
- Windows 7 SP1 Ultimate, Enterprise, Professional, and Home Premium (64 bit [EM64T])

Check this link for hardware requirements: https://doc.arcgis.com/en/arcgis-earth/get-started/system-requirement.htm

(2) The university provides "Virtual Desktop Infrastructure" for those who are using other operating systems than WINDOWS. Instructions will be provided during the first lab session.

Assessment:

Task 1: Lab exercises ……	45%
Task 2: Individual/group online discussions …….	10%
Task 3: Quizzes …….	5%
Task 4: Two midterm exams…….	20%
Task 5: Final exam…….	15%
Task 6: GIS Data/File management strategy…….	5%

Course Expectations/Student Responsibilities:

1. **Attendance** is expected for each lecture and lab unless communicated with the instructor ahead of time. At the end of each lecture, there will be a quiz worth 5% of total course marks.
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** (a) absences from illness, compassionate reasons or representing the university off-campus, supported by written documentation will be accepted as sufficient evidence to allow a rewrite of a missed test.

   (b) If you miss an exam for any reason other than those deemed acceptable in Lakehead University calendar, then you will be given the opportunity of an essay-based makeup exam that is significantly longer and more difficult.

Course Schedule:

Week	Wednesday	Friday	Lab exercise (Friday)	Reading schedule
Sept 6	Introduction to the Course and GIS Introduction to group assignment 01	GIS Data management Internet Map Services (IMS)	Lab1: Exploring various web mapping applications and geospatial data sources Create a data management plan for the course	Chapter 1
13	Intro to GIS Theory, terms and concepts	Introduction to GIS data models and software: ArcGIS & ArcCatalog – terms and interfaces, GIS file management	Lab 2: GIS file management, introduction to ArcMap and ArcCatalog	Chapter 1
20	Introduction to Remote Sensing – aerial photographs, satellite images	Raster data model, image interpretation, raster data catalogues	Lab 3: Working with raster data and image interpretation	Chapter 3 & 4
27	Introduction to Cartography, basic map elements, create a simple map	Spatial reference systems	Lab 4: Datums, map projections and coordinate systems	Chapter 2& 4
Oct 4	Midterm test 1 review	**Midterm test 1**	Discussion – group assignment 01 & 02	Chapter 2 & 9
11	***Fall Study Break (no classes)***			
18	Cartography – typography/ Vector and raster data display – qualitative and quantitative	Georeferencing raster images	Lab 5: Qualitative and quantitative data display methods and map making	Chapter 9 & 6
25	GIS Data capture and working with tabular data	Introduction to GPS– GIS/GPS integration	Lab 6: Georeference an image, add vector data and create a map	Chapter 5
Nov. 1	Data exploration – joins and relates	Data exploration – select by attributes, select by location etc.	Lab 7: Working with GIS/GPS data – on screen digitizing, editing, map making	Chapter 8& 10
8	Spatial data quality and spatial analysis	**Midterm test 2**	Lab 8: Joins and relates, attribute queries, summery tables	Chapter 7 & 11
15	Spatial analysis tools – overlay, buffer, intersect	Raster data analysis – simple operations (extract, resample)	Lab 9: Spatial data analysis (GIS case study)	Chapter 11 & 12
22	Raster data analysis - interpolation	Mobile data acquisition	Lab 10: Raster data analysis for problem solving	Chapter 12
29	Lab 11: Mobile data capture using GIS apps	Lab 11: Mobile data capture using GIS apps	Lab 11: Mobile data capture using GIS apps	
Dec. 6	Final exam Review	No class	**No Class**	

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