# GEOG 2232 – INTRODUCTION TO GEOMATICS AND GEOGRAPHIC INFORMATION SYSTEMS

Instructor: Dr. Muditha Heenkenda
Office location: RC 2006E
Office hours: Mon – 10.00 am to 12.00 pm
               Wed – 10.00 am to 12.00 pm

Email: muditha.heenkenda@lakeheadu.ca

Lab Instructor: Jason Freeburn
Office location: RC 2004

Email: jason.freeburn@lakeheadu.ca

## 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 (9<sup>th</sup> 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 ……………………………………… 60%

Task 2: Two midterm exams………………………………. 20%

Task 3: Final exam………………………………………. 15%

Task 4: 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.
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 | Monday | Wednesday | Lab exercise | Reading schedule |
|---|---|---|---|---|
| Jan. 6 | Introduction to the Course and GIS | 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, vector data model | Introduction to ArcGIS, ArcCatalog – terms and interfaces, GIS file management | Lab 2: GIS file management, introduction to ArcMap and ArcCatalog | Chapter 3 |
| 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 4 |
| 27 | Spatial reference systems | **Midterm test 1** | Lab 4: Datums, map projections and coordinate systems | Chapter 2 |
| Feb. 3 | Introduction to Cartography, basic map elements, create a simple map | Georeferencing raster images | Lab 5: Georeference an image, add vector data and create a simple map | Chapter 6 |
| 10 | GIS Data capture and working with tabular data | Introduction to GPS– GIS/GPS integration | Lab 6: Working with GIS/GPS data – on screen digitizing, editing, map making | Chapter 5 |
| 17 | *February Break (no classes)* | | | |
| 24 | Data exploration – joins and relates | **Midterm test 2** | Lab 7: Joins and relates, attribute queries, summery tables | Chapter 7 |
| Mar. 2 | Data exploration – select by attributes, select by location etc. | Vector and raster data display – qualitative and quantitative | Lab 8: Qualitative and quantitative data display methods | Chapter 9 and 10 |
| 9 | Spatial data quality and spatial analysis | Spatial analysis tools – overlay, buffer, intersect, web mapping | Lab 9: Spatial data analysis and publish results on ArcGIS Online | Chapter 8 |
| 16 | Raster data analysis – simple operations (extract, resample) | Raster data analysis - interpolation | Lab 10: Raster data analysis for problem solving | Chapter 12 |
| 23 | Mobile data acquisition | Lab 11: Mobile data capture using GIS apps | Lab 11: Mobile data capture using GIS apps | Chapter 11 |
| 30 | Mapping/publishing captured data | Final exam Review | **Final exam (lab exam)** | |

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