ORIGINAL COURSE IMPLEMENTATION DATE: January 2001
REVISED COURSE IMPLEMENTATION DATE: September 2017
COURSE TO BE REVIEWED: (six years after UEC approval) September 2022
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: GEOG 253	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Introduction to Geographic Information Systems **Course Short Title (if title exceeds 30 characters):** Introduction to GIS	
Faculty: Faculty of Social Sciences	**Department (or program if no department):** Geography and the Environment

Calendar Description:

This course explores how to manage, map, and analyze information related to our world using a geographic information system (GIS). Emphasis is on concepts and software techniques used to manipulate data and examine problems from a variety of subject areas.

Prerequisites (or NONE):	None.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	

Equivalent Courses (cannot be taken for additional credit)
Former course code/number:
Cross-listed with:
Equivalent course(s):
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☒ Yes ☐ No
Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☒ No (if yes, fill in transfer credit form)
Resubmit revised outline for articulation: ☐ Yes ☒ No
To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 90
Typical structure of instructional hours:

Lecture hours	25
Seminars/tutorials/workshops	
Laboratory hours	65
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	90

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No
If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit
Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 25

Expected frequency of course offerings (every semester, annually, every other year, etc.): Every semester

Department / Program Head or Director: Steven Marsh	**Date approved:**	December 2016
Faculty Council approval	**Date approved:**	January 2017
Campus-Wide Consultation (CWC)	**Date of posting:**	March 17, 2017
Dean/Associate VP: Dr. Jacqueline Nolte	**Date approved:**	January 2017
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	March 24, 2017

Learning Outcomes

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

1. Describe how geographic information is represented and managed on computers as GIS data.
2. Identify the role and appropriateness of existing GIS vector and raster data for analyzing, managing and communicating geographic information.
3. Convert geographic information into GIS Data that has location and attribute characteristics.
4. Use spatial analysis techniques to solve geographic problems and generate map and tabular data.
5. Create and interpret maps and graphics that communicate spatial information and results of analyses.
6. Manage spatial and non-spatial geographic information using GIS databases.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

The course will be offered in a lecture/lab format.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☒

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Chang, Kang-tsung	Introduction to geographic information systems, 8th edition, (or latest edition)	☐	McGraw-Hill	2016
2.	Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W	Geographic information systems and science, 4th edition (or latest edition)	☐	Wiley	2016
3.			☐		
4.			☐		
5.			☐		

Required Additional Supplies and Materials (software, hardware, tools, specialized clothing, etc.)

Use this section for supplies and materials for all sections of this course.

Typical Evaluation Methods and Weighting

Exam:	%	Written Assignments:	15%	Midterm exam:	15%	Practicum:	%
Quizzes:	40%	Lab Assignments:	30%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary):

Lab assignments (4-5) 25-35%

Written assignments (1-2) 10-20%

Quizzes (5-6) 25-35% Lab test (1) 10-15%

Midterm exam (1) 10-20%

Exam (1) 25-35%

Typical Course Content and Topics

1. *Introduction to geographic information systems (GIS)*. Explains how a GIS is used to work with information about the world (geographic information), using local, regional, and global examples. Introduces broad concepts of visualization, mapping and analysis of geographic information. Key aspects of GIS are introduced, including capturing, storing, querying, analyzing, and displaying geographic information.
   Lab 1 - Introduction to ArcGIS: the software used in the course, ArcGIS, is introduced with students learning how to do basic data input and manipulation of line, polygon, and raster data related to physical and cultural features of the Earth.

2. *Data Models: the vector data model.* The representation of geographic information using traditional (hardcopy) maps is compared to representation of geographic information using GIS data. The GIS georelational vector data model is introduced, using examples of cultural features which are represented by point, line, and polygon shapefiles.
   Lab 2 – Introduction to the vector data model: components of point, line, and polygon shapefiles representing features of the world (e.g. roads, streams, cities, watersheds) are analyzed within ArcMap. Scale related effects of data representation are introduced.

3. *Data Models: the raster data model.* The GIS raster data model is introduced. Representation of geographic information using continuous and thematic rasters are compared to representation of similar information using the vector data model. Examples of the pros and cons of using the raster vs the vector data model are given in the context of various physical and cultural features of the Earth.
   Lab 3 – Introduction to the raster data model: Satellite imagery and thematic land cover rasters are imported and compared within ArcMap. Vector street data is converted into a raster format and used to analyze the differences between vector and raster data models.

4. *Coordinate Systems and Map projections.* The concepts of geographic and projected coordinate systems are explored in a GIS context as is as the importance of using the appropriate coordinate system in various contexts.
   Lab 4 – Working with coordinate systems in ArcGIS: GIS tools for repairing, viewing, and changing coordinate systems of GIS data layers are introduced using British Columbia GIS data.

5. *GIS Database Management.* Data tables containing attributes of GIS data are examined, including types of attribute tables, attribute data types, fields, and the relational database model. Data manipulation techniques including joining and relating database tables are introduced using demographics and water sampling examples.
   Lab 5 – Working with attribute tables in ArcGIS: Join, relate, and selection database techniques are introduced using soil and census data examples.

6. *GIS Data Input.* Sources of existing GIS data are introduced, including important Canadian and British Columbia data sources. Main methods of creating new data via remote sensing, field work, digitizing, and scanning are introduced.
   Lab 6 – Creating GIS data. Point, line, and polygon vector data representing street, urban, and water features in British Columbia are digitized from satellite imagery. An Earthquake GIS data layer is created from a text file.

7. *GIS Data Quality.* Aspects of GIS data quality which can impact problem solving are introduced, including micro and macro scale aspects of data quality and major components of GIS data error.
   Lab 7 – Editing GIS data. Techniques for editing (modifying) GIS vector data are introduced.

8. *Data Models: the object data model.* The advanced object-oriented GIS model is introduced and contrasted to vector and raster data models. The concept of topology is discussed and how it is implemented in the ArcGIS geodatabase format. Use of geodatabase topology is illustrated with examples of advanced data editing techniques and analysis using linear networks.
   Lab 8 – Introduction to working with geodatabases: a file geodatabase is created. Stream and elevation zone vector data are imported into the geodatabase. Geodatabase domains are created and populated with data to explore geodatabase management techniques.

9. *Spatial Analysis.* The foundation of spatial analysis techniques that pre-date computers are discussed and then extended into a GIS context with a focus on problem solving. Techniques of GIS data exploration, attribute quer, and spatial query are discussed. Examples include map comparison of watersheds in the lower mainland, and Dr John Snow's map based spatial analysis of cholera incidents and well location in 19th Century London.
   Lab 9 - Spatial Analysis: attribute and spatial queries are used to analyze the distribution of thermal springs and wells, using various distance and well temperature criteria.

10. *Geoprocessing.* Spatial analysis using various geoprocessing techniques is discussed, with an emphasis on buffer, dissolve and overlay techniques.
    Lab 10 – Geoprocessing: geoprocessing and spatial analysis techniques are used to identify the most appropriate site for a new building based upon distance from roads, land use, and soil criteria.

11. *Map Display.* The concept of a map as a communication tool is introduced using demographic and political examples. Types of maps and how they are made in ArcGIS are introduced as are quantitative data classification techniques used in making choropleth maps. Elements of map design and layout are explained.
    Lab 11 – Using ArcGIS for creating maps: quantitative classification techniques are used to show population change across the United States and a population density map of the world.

12. *Future Trends in GIS.* Trends in GIS on the web and mobile devices are discussed as well as the role of volunteered geographic information (VGI) in various GIS applications and decision making.
    Lab 12 – Spatial Analysis II: attribute and spatial queries are used to analyze the distribution of people within the Lower Mainland, with quantitative-based maps produced to display analysis results.