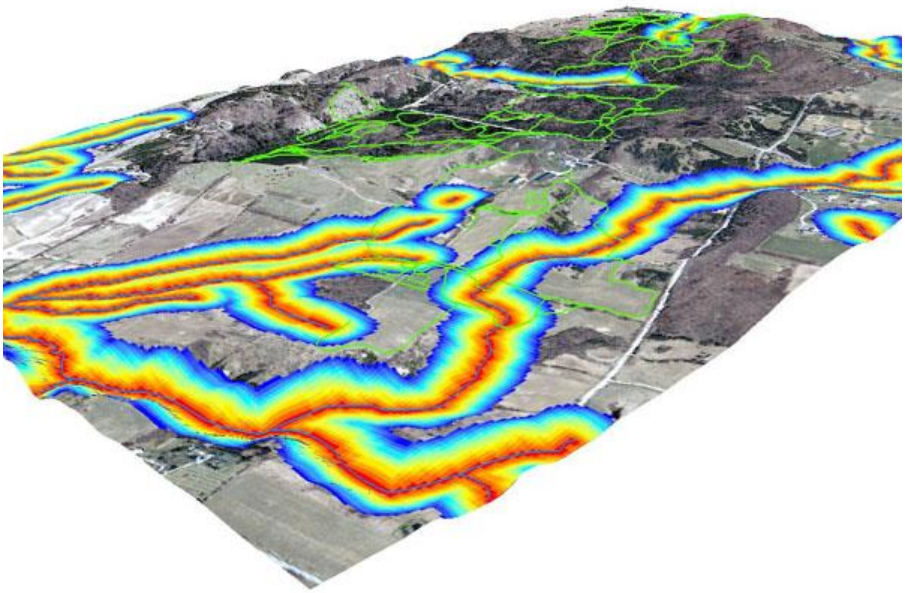

A 3D view of the Koffler Scientific Reserve at Joker's Hill, used as a case study in this course, showing a 100 m raster buffer around streams. (D. Boyes)

COURSE SYLLABUS

Instructor: Michael Govorov, PhD
Email: govorovm@viu.ca

COURSE DESCRIPTION

This online course builds on GEM 400 and covers advanced topics in spatial analysis and data modeling using geographic information systems (GIS) for environmental management. The goal of this course is to provide a comprehensive introduction to the techniques and functions used in the analysis of spatial data. The analysis functions of GIS is to help in the understanding of the patterns and processes that lie beneath the features represented in the spatial database.

Students learn how to analyze spatial patterns, such as indicators of environmental risk, amount of forest interior available for wildlife, and how to create and analyze three-dimensional surfaces, visualize geospatial data, and understand point patterns and spatial autocorrelation. The course concludes with a discussion of GIS implementation and project management.

The course material uses few case studies. One case study is the Koffler Scientific Reserve at Joker's Hill, a field research reserve owned by the University of Toronto that is the focus of a number of environmental research initiatives related to forest ecology and plant-animal interactions. Students use a variety of data, including aerial photographs, satellite imagery, and 3D elevation models to

characterize the land cover and terrain of the reserve. In geostatistical excurses, spatial data for Vancouver Island, BC is used to analyze water acidity structure.

Following the same format as GEM400, the online course notes and the textbook explain the underlying theory, and how it is implemented in GIS software. The practical assignments then give students the opportunity to learn for themselves how to put that theory into practice, gaining hands-on experience with ESRI ArcInfo 10 software, the latest version of the most popular GIS and an industry standard in many fields, and the Spatial Analyst, 3D Analyst, and Geostatistical Analyst extensions.

This course is part of the Certificate in GIS for Environmental Management offered by the Centre for Environment (CFE) and can not be applied to any degree program at the University of Toronto.

COURSE OUTCOMES

The goal of the course is to provide students with the necessary understanding of advanced GIS concepts and theory, as well as practical skills, so that they are able to make informed decisions about how to approach a GIS-related problem and transfer their understanding to any GIS software. Upon successful completion of the course, students will understand how to work with geospatial data. Students will also understand the concept of autocorrelation and how to analyze point patterns. Emphasis is on gaining experience in raster geoprocessing as well as on making decisions about which geoprocessing tools are appropriate and in what order tools should be applied. The techniques of 3D terrain analysis are to visualize surfaces and explore possible relationships between land cover type and elevation, slope, and aspect are examined. Students will also understand the concept of spatial autocorrelation and point patterns analysis.

COURSE MATERIALS

Kang-tsung Chang, **2015**, Introduction to Geographic Information Systems, 8th Edition, McGraw-Hill

Higher Education (Data set CD-ROM is not required).

This text (also used for GEM 400, GEM404) can be purchased online at http://www.amazon.ca/ or http://www.chapters.indigo.ca/ or http://www.uoftbookstore.com/.

Supplemental Readings:

The e-guides and tutorials from ESRI digital library and documentation. Additional internet resources will be recommended for particular modules during the course.

Students will be provided with a variety of supplemental study materials (PPT presentations) and handouts in digital form. These will be available on the Blackboard and GIS Server.

Online Resources:

ESRI's Virtual Campus online courses

Access to Software:

The ESRI ArcGIS 10 software runs on the Centre for Environment's GIS server. This means that students can access their coursework from any computer using a regular web browser and a high speed internet connection (i.e. DSL or cable).

Prerequisite:

GEM 400 Introduction to GIS for Environmental Management

Evaluation

Students complete five assignments designed to provide practical experience with the software while simultaneously illustrating and reinforcing theoretical concepts. Each assignment includes exercises accompanied by questions that encourage students to think about the underlying principles that affect the tasks they are performing. Quizzes will take place during week five and ten of the course, and will cover all of the material discussed in the course. Courses from the ESRI virtual campus will be assigned as additional homework. Proof (PDF copies of the certificates) of completion of these courses will be required.

Overall Assessment

This course requires that you maintain an average of 70% or greater in the course work for continuation in the course. There is an expectation for a high level of quality in the work produced by the student. For evaluation purposes, work will be graded under the following criteria:

Distance Education Certificate Program Grade Scale

Letter Grade Scale	Numerical Scale of Marks
A +	90-100%
A	85-89%
A -	80-84%
B+	77-79%
B	73-76%
B-	70-72%
FZ	0-69%

Schedule

Week	Topic	Tutorial	Lab / Assignment	Test
1	Raster Analysis	Tutorial 1	Lab 1 - Raster Analysis	
2	Raster Analysis (cont.)			
3	Raster Analysis (cont.)		Lab 2 - Raster Analysis	
4	Digital Terrain Modeling			
5	Terrain Analysis		Lab 3 - DTM	Quiz 1
6	Geostatistics			
7	Geostatistics (cont.)		Lab 4 - Geostatistics	
8	Spatial Analysis and Modeling	Tutorial 2		
9	Data Quality and Data Standards		Lab 5 - GIS Modeling	
10	GIS Implementation and Project Management			Quiz 2