ADVANCED GIS & SPATIAL ANALYSIS

Geography 4211 – Fall 2014

Instruction:	**Instructor:**	**Teaching Assistant:**
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Office Hours:	*By appointment*	*TBA (posted on RC-2001, LU Geospatial Data Centre)*

Course Description:

This course covers advanced topics in spatial analysis and geographic information systems (GIS). The course will be a mix of lectures, discussions and laboratory periods that cover the following: data collection / creation; spatial analysis tools; and specific applications of GIS software. Students will develop working knowledge of ESRI's ArcGIS 10.2[1].

Course Grading:

Lab Assignments (small) (2 @ 5% ea.)	10%	
Lab Assignments (large) (2 @ 15% ea.)	30%	*(see note 2)*
Case Studies in GIS (4)		
Participation in Class Discussion	10%	
ArcGIS Modules (7 @ ≈3% ea.)	20%	
ArcGIS Lab Test	10%	
Final Exam	20%	
∑ =	**100 %**	

Notes:

1. *Alternatives for absence from assignments and exams will only be possible with provision of a medical or equivalent note.*
2. *If interested, you may propose your own project or paper on a topic in GIS or its applications in lieu of an assigned "large" lab.* ***This must be proposed by Oct. 3rd.***
3. *Late labs will be deducted 10% per academic day*

Course Organization:

Lecture:	Mondays and Wednesdays 9:30 to 10:30 in RC-2005
Lab:	lab section W1: Wednesdays 10:30 to 12:30 in AT-3009

The AT-3009 classroom is an 'open' university lab, with hardware provided and maintained by TSC. New hardware upgrades in Fall 2014 were provided through funding from the "student technology fund". The lab is open to students in any program. . As well, no beverage or food is permitted in this classroom (this is University policy for all labs). Should you abuse your privileges, the instructor has

[1] As of July 2014, Lakehead University is currently supporting ArcGIS 10.2. Course text (Chang 2014) is geared towards ArcGIS 10, so there *should* be fewer problems than encountered in previous versions of the course.

to right to restrict or remove your use of computer labs. Be report any abuses of the room either to the instructor or Lakehead University Security.

When completing assignments using GIS, storage space often becomes an issue. In trying to circumnavigate these problems, TSC has created a temporary work space (drive T) on the computers in AT-3009. This space is approximately 1 Gigabyte and is to be used when completing your assignments. It has been designed as a "thaw space" so that data can be stored here, protected from the University's "Deep Freeze" program. However, as any student logging onto the machines can have access to this drive, it is essential that you transfer your data to a USB device at the end of (or preferably during) your work sessions. A good management practice is to wipe this drive clean at the beginning of a work session, thereby avoiding complications with other students' data.

Course Resources:

- (***required text***): Chang, K., 2014[2]. *Introduction to Geographic Information Systems*, 7th Edition (New York, NY: McGraw-Hill), 425 pages with companion CD [ISBN 978-0-07-352290-6] *(You will need to bring the textbook and its companion CD to each lab period)*
- (***required***): USB device for data storage

In addition to these required readings, the following books and ***select*** articles are on reserve in the Chancellor Paterson Library. These will be used as supplementary reading for some lectures and the labs. Articles to be read for the four case studies will be circulated electronically. A lengthier list of articles of "GIS Applications" is available from Dr Randall.

books

Aronoff, S. 1989. *Geographic Information Systems: A Management Perspective*.

Burton, P.J., Messier, C., Smith, D.W., and Adamowicz, W.L. (editors) 2003. *Towards Sustainable Management of the Borest Forest*. Ottawa, ON: NRC Research Press.

Dent, B.D. 1993. *Cartography: Thematic Map Design*.

Jones, C.B. 1997. *Geographic Information Systems and Computer Cartography.*

Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W. 1999. *Geographical Information Systems*.

Monmonier, M.S. 1996. *How to lie with maps*. 2nd Edition, Chicago: University of Chicago Press.

Ormsby, T., Napoleon, E., Burke, R., Groess, C. and Feaster, L. 2004. *Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor, and ArcInfo*. 2nd Edition, Redlands, CA: ESRI Press.

Tyner, J. 1992. *Introduction to Thematic Cartography*.

[2] This is the same text as used in Geography 2232 (*formerly* Geography 3251), so you may be able to find a used copy of the text. Earlier editions published in 2012 and earlier have comparable content, so may be suitable as well.

Course Schedule (*subject to changes*) – Fall 2014

Week of	Lecture[(1)] Mon 9:30 (RC-2005)	ArcGIS Modules / GIS Case Study Wed 9:30 (AT-3009 / RC-2005)	2-hr Lab Slot (AT-3009) Wed 10:30-12:30
Sept 7	Organizational Meeting and lecture 1: Re-fresher of GIS and Cartographic Display (Chang chs. 1, 3, 4, 9) – both Monday and Wednesday class meetings		**(Module 1)** ArcGIS Intro and Data Management
Sept 14	2: Data Sources, Data Quality, Error Mgmt (Chang chs. 5, 7, 8 & Aronoff)	**(Case Study 1)** Read & prep TBA[(2)]	**(Lab 1)** CMA Data Management and Choropleth Mapping
Sept 21	3: Site Selection (Chang sections 18.2 & 18.3)	**(Module 2)** Data Display and Cartography *(in LAB)*	*Lab 1 continued …*
Sept 28	4: Terrain and Watershed Analyses (Chang chs. 13, 14)	**(Case Study 2)** Read & prep TBA[(2)]	*Lab 1 continued …*
Oct 5	5: Modeling Using a GIS (Chang ch. 18)	**(Module 3)** Vector Data Analysis *(in LAB)*	**(Lab 2)** Heads-up Digitizing: Schedule A of Lakehead Official Plan (c.1965)
Oct 12	6: Adv'd Network Analysis & Dynamic Segmentation (Chang chs. 16, 17)	**(Module 4)** Terrain Mapping and Watershed Analysis *(in LAB)*	*Lab 2 continued …*
Oct 19	**(Module 5)** Spatial Interpolation Techniques *(in LAB)*	7: Spatial Interpolation Methods (Chang ch. 15)	*Lab 2 continued …… independent period (TR absent)*
Oct 26	**(Case Study 3)** Read & prep TBA[(2)]	8: Tutorial: Spatial Correlation	**(Lab 3)** Intro to Spatial Correlation
Nov 2	9: Spatial Autocorrelation and Pattern Analysis (Chang sect. 11.4)	**(Module 6)** Network Applications *(in LAB)*	*Lab 3 continued …*
Nov 9	10: Land Use Diversity Indices (Sprawl Indices)	**(Lab 4)** Developing a Sprawl Index Model	**(Module 7)** Binary and Index Models *(in LAB)*
Nov 16	**(Case Study 4)** Read & prep TBA[(2)]	*Lab 4 continued …*	*Lab 4 continued …*
Nov 23	Flex Time	**LAB TEST**	**LAB TEST**
Nov 30	Review & Exam Hints (see note 7)	not applicable (classes ended)	not applicable (classes ended)

Notes: (1) Course readings from Chang (2014) and other reserve materials are indicated in parentheses; **(2)** Case study articles to be discussed at these classes will be e-mailed in advance of these in-class discussions; **(3)** First day of term: Mon. Sept 8th, 2014; Last day of classes is Mon. Dec. 1st, 2014; **(4)** Final date to register for a course (Fri, Sept 19th); **(5)** Last day to drop a fall-term course: Tues. Nov. 4th, 2014; **(6)** Thanksgiving holiday is Monday, Oct 13th, 2014; **(7)** **Final exams** run from Dec 4th to 17th, 2014, inclusive – there is no flexibility in changing exams to accommodate holiday travel;