School of Planning

Faculty of Environmental Studies

University of Waterloo

**PLAN 416/674**

**Modeling the city**

Winter, 2013

Lecture: Wed. 1:30-3:20, EV3 4412

Lab: Thursday 12:30-1:20 or 1:30-2:20 EV2 1014

(Magellan lab code: 2,  3,  5,  1/4)

Instructor: Dr. Dawn C. Parker

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Office Hours: Tuesday 12-1; Wednesday 11-12 (or by appointment)

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Teaching Assistant: Jason Neudorf

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**COURSE OUTLINE**

**Course Description**

This course examines the use of computer modeling and simulation in the realm of urban analysis and forecasting, with the goal of understanding urban land-use change trajectories. Topics include an overview of the drivers and consequences in urban land-use change, the role of models, an overview of current methodological approaches, and an examination of urban simulation models as used in the development of urban policies and official plans. This course provides an applied learning environment in which students will gain experience in the use of spatial (GIS) modeling approaches.

**Prerequisite**: PLAN 255, ENV 178, and ENV 278 or equivalent.

**Introduction**

From local (municipality-level) to global scales, planners wish to understand likely trajectories, patterns, and impacts of land-use change in urban areas. Planners use such information to evaluate the likely social and environmental impacts of current growth trends, to conduct scenario analysis to understand hypothetical future growth trajectories, and to design policy interventions to steer urban areas towards desired change trajectories. A variety of fine-scale spatial modeling methods have been developed to support these goals. This course provides an introduction to such models and their application to planning and policy analysis. This is a one term course with credit weight 0.5. Course meetings include 2 hours of lecture and 1 hour of GIS/spatial modeling lab per week.

**Course Objectives:** Having completed the course, students should be able to critically review and interpret an urban simulation model, whether presented in a report or scholarly article.  They should have an understanding of the input data requirements, the ways in which the model output can support planning and policy analysis, the spatial, temporal, and human scale over which the model operates, the disciplinary scope of the model, and the strengths, weaknesses, and limitations of the modeling technique used.   Students should also be able to discuss and analyze applications of urban simulation models to particular planning case studies. Students should have an understanding of what empirical modeling techniques can be applied to a given data set.  Finally, they should have an understanding of what urban simulation techniques are appropriate for particular research questions, planning applications, and policy analysis scenarios.

**Learning Modes:** Course format includes lecture, discussion, and lab sections. The format of the class will consist of both lecture and discussion, with substantial emphasis on student participation.  Because this course draws students with a broad range of backgrounds, you and your fellow students will have diverse knowledge, experiences, and expertise, and I expect that you will learn at least as much from one another as you will from me.  Thus, substantial class time will be devoted to interactive discussions, and lectures will be interactive.  You are expected to complete required course readings and a related short writing assignment before the lecture portion of the class, and a discussion of these short writing assignments will be incorporated into lecture hours. Students are also expected to communicate any areas of confusion or points where additional clarification is needed to me, either through the course on-line forum, to me directly, or anonymously by leaving a note in my mailbox. If you have a question, it is very likely others in the class have the same question!

Although it does not always feel positive, there is substantial evidence that humans learn more from making mistakes than by completing all tasks correctly the first time. So remember—you lose none of my respect by making a guess that proves to be wrong, or by asking a question that you don’t know the answer to.

**Caution**

Since there is no standard text in this field as of yet, many of the course readings will come directly from published journal articles and reports. Since the field is highly interdisciplinary, you are likely (in fact, based on previous experience with the course, guaranteed) to feel that you are lacking expertise in some disciplinary aspect of the course material. Being a survey course, the class is also designed to provide you with a broad range of information, with relatively little depth in each topic. Thus, do not worry if you feel challenged! It is expected, and again, your fellow students are likely to be feeling the same way. Again, you can help each other by sharing your specific disciplinary expertise.

**Communication**

I will primarily use LEARN notes and e-mail to communicate with you. Users can login to LEARN via:

<http://learn.uwaterloo.ca/>

Use your WatIAM/Quest username and password.

*The best way to reach me is via e-mail*. Unfortunately you can no longer e-mail me through the course management system. Therefore PLEASE put 416 in the subject header, and use your UW e-mail. I will get back to you as soon as I can, but I do not always get through all e-mails every day. I will be holding regular office hours as well, and you are always welcome then. If your schedule prevents your from attending office hours, we can try to schedule an appointment at another time, by phone or skype if needed.

**Sequence of Course Topics**

# Introduction:  Urban Simulation Concepts

**Week 1** (Wednesday, Jan 9) General introduction to course, trends in urban land use, and concept and model definitions. Brainstorming on drivers of urban land-use change.

Required readings

Briassoulis:  Chapter 1 (Introduction) and Sections 4.1 and 4.2 (Modeling section introduction and classifications) [http://www.rri.wvu.edu/WebBook/Briassoulis/chapter1(introduction).htm](http://www.rri.wvu.edu/WebBook/Briassoulis/chapter1%28introduction%29.htm)

[http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter4(Models1).htm#4.1](http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter4%28Models1%29.htm#4.1)

http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter4(Models1).htm#4.2

Optional reading: Zhang, Ying , Guindon, Bert and Sun, Krista (2010) 'Measuring Canadian urban expansion and impacts on work-related travel distance: 1966-2001', Journal of Land Use Science, 5: 3, 217 — 235.

Lab session (Thursday, Jan. 10) Brainstorming/discussion—exciting urban land-use change issues in Waterloo Region (really!!!!) If you are enrolled, you must attend and participate to get credit. If you add late, you can post your own response to the forum for credit.

**Week 2**   (Wed. Jan. 16) Intro to drivers of land-use change at different scale Overviews of land-use change/urban simulation models.  Required readings (read all):

Verburg, P., K. Kok, R. G. Pontius, A. Veldkamp, A. Angelsen, B. Eickhout, T. Kram, S. J. Walsh, D. C. Parker, K. Clarke, D. Brown, K. P. Overmars, and F. Bousquet. 2006. Modelling land-use and land-cover change in E. Lambin and H. Geist, eds. Land-use and Land-cover Change: Local Processes, Global Impacts. Springer Berlin Heidelberg, New York.

Koomen, E., Rietveld, P., & Nijs, T. d. (2008). Modelling land-use change for spatial planning support. The Annals of Regional Science, 42(1), 1-10.

Benenson, I., & Torrens, P. (2004). Introduction to urban geosimulation. In Geosimulation: Automata-Based Modeling of Urban Phenomena (pp. 1-18). London: John Wiley & Sons.

Optional reading: Briassoulis:  Chapter 2 (Historical Overview of Studies of LUC)

[http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter2(Histoverview).htm](http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter2%28Histoverview%29.htm)

Lab section: (Thursday, Jan. 17) Introduction to IDRISI (Easy and fun! Really!)

**Week 3** (Wednesday, Jan. 23)Drivers of change in urban areas continued (sources of spatial, temporal, and behavioral complexity in urban areas).

Readings: (Read at least 1 of 3)

Seto, K., Sanchez-Rodriguez, R., and Fragkias, M. (2010) The New Geography of Contemporary Urbanization. Annual Review of Environment and Resources, 35 (4) 1-28. (Sections 2 and 3 most important)

Irwin, E. G., and N. Bockstael. 2006. The Spatial Pattern of Land Use in the U.S. in R. Arnott and D. McMillen, eds. *A Companion to Urban Economics*

Anas, A., R. Arnott, and K. A. Small. 1998. Urban Spatial Structure. *Journal of Economic Literature* 36 (3): 1426-1464. (Selected sections, see reading guide on LEARN)

Lab session: (Thursday, Jan 24th) Von Thuenen model.

# Evaluating model performance

**Week 4** (Wednesday, Jan. 30) Model verification and validation and map comparison. Required readings (read all, Visser is needed for the lab):

Turner, M. G., R. Costanza, and F. Sklar. 1989. Methods to evaluate the performance of spatial simulation models. *Ecological Modelling* 48 (1/2): 1-18.

Oreskes, N., K. Shrader-Frechette, and K. Belitz. 1994. Verification, validation, and confirmation of numerical models in the earth sciences. *Science* 263: 641-646.

Visser, H., and T. d. Nijs. 2006. The Map Comparison Kit. Environmental Modelling and Software 21 (3): 346-358.

Lab section: (Thursday, Jan. 31) Map comparison kit lab: <http://www.riks.nl/mck/>.

# Cellular Automata Models

**Week 5** (Wednesday, Feb. 6) Introduction to cellular automata modeling.

Required Readings (read all):

Batty, M. 1997. Cellular automata and urban form: A primer. *Journal of the American Planning Association* 63 (2): 266-274.

Benenson, I., & Torrens, P. (2004). Modeling urban land use with cellular automata. In Geosimulation: Automata-Based Modeling of Urban Phenomena (pp. 91-150). London: John Wiley & Sons.

Batty, M. 2005. Urban Growth Models in D. J. Maguire, M. F. Goodchild, and M. Batty, eds. *GIS, Spatial Analysis and Modeling*. ESRI Press, Redlands, CA.

Lab: (Thursday Feb. 7) IDRISI lab 3-6 “Using Markov-Cellular Automata for Land-use Change Modeling” Von Thunen lab due.

**Week 6**: (Wednesday Feb. 13) ***Graduate students extended abstracts due!*** CA models, week 2;

**Standard format weekly SWAs start from this week**

Readings: (Read one of three for standard SWA):

Van Vliet, J., Hurkens, J., White, R., Van Delden, H. (in press). An activity based cellular automaton model to simulate land use dynamics. Environment and Planning B, doi:10.1068/b36015.

Jantz, C. A., S. J. Goetz, and M. K. Shelley. 2004. Using the SLEUTH Urban Growth Model to Simulate the Impacts of Future Policy Scenarios on Urban Land Use in the Baltimore-Washington Metropolitan Area. Environment and Planning B 30: 251 - 271.

Moreno, N., Wanga, F. Marceau, D. J. Implementation of a dynamic neighborhood in a land-use vector-based cellular automata model. 2009. Computers, Environment and Urban Systems 33 (2009) 44–54

Lab: (Thursday, Feb. 14) IDRISI CA continued. Map comparison lab due.

**Week 7**  (Feb. 18-22) Reading week

# Statistical Models

**Week 8** (Wednesday, Feb. 27) Technical introduction to statistical models (Continuous, limited dependent variable, and spatial econometric models)

Required readings:

Read one of two: Anselin, L. 2002. Under the hood: Issues in the specification and interpretation of spatial regression models. *Agricultural Economics* 27 (3): 247-267. **OR** Briassolis, Chapter 4.3, Statistical and Econometric Models: [http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter4(models2).htm#4.5](http://www.rri.wvu.edu/WebBook/Briassoulis/Chapter4%28Models1%29.htm#4.3)

Read also: Bell, K. P., and E. G. Irwin. 2002. Spatially explicit micro-level modelling of land use change at the rural-urban interface. *Agricultural Economics* 27 (3): 217-232.

LAB: (Thursday, Feb. 28th) IDRISI lab: Tutorial 3-3 (Multiple regression and GIS) (May be updated with a new lab from the SLUCE2 project) (Dr. Parker out of town) CA lab due

**Week 9 (**Wednesday, Mar. 6) Applied urban and ex-urban statistical models Readings:

Read one of three for standard format SWA: (Note the last article is very good but does not fit the standard format SWA):

Lynch, L., and S. Lovell. 2003. Combining Spatial and Survey Data to Explain Participation in Agricultural Land Preservation Programs. *Land Economics* 79 (2): 259-276.

Mueller, J. M., and J. B. Loomis. 2008. Spatial Dependence in Hedonic Property Models: Do Different Corrections For Spatial Dependence Result in Economically Significant Differences in Estimated Implicit Prices? *Journal of Agricultural and Resource Economics* 33 (2): 212-231. http://purl.umn.edu/42459.

Plantinga, A. J., and D. J. Lewis. In Press. Landscape simulations with econometric-based land-use models. In *Oxford Handbook of Land Economics*, eds. J. Duke and J. Wu. Oxford: Oxford University Press. (Note: For course use only. Do not further distribute.

Lab: (Thursday, Mar. 7) Stats lab continued.

# Multi-Agent System Models

**Week 10** (Wednesday, Mar. 13) Introduction to agent-based models

Required readings (read both)

Parker, D. C., S. M. Manson, M. A. Janssen, M. Hoffmann, and P. Deadman. 2003. Multi-agent systems for the simulation of land-use and land-cover change: A review. *Annals of the Association of American Geographers* 93 (2): 314–337.

Huang, Q., D. Parker, T. Filatova, and S. Sun. In Review. A Review of Urban Residential Choice Models Using Agent-based Modeling. *Environment and Planning B*. *Note: For class use only. Do not distribute this manuscript.*

Lab: (Thursday, Mar. 14th) Stats lab due.

**Week 11** (Wednesday, Mar. 20) Urban applications of MAS. Readings:

Read one of three for standard format SWA:

Torrens, P. M. (2007). A geographic automata model of residential mobility. Environment and Planning B: Planning and Design, 34, 200-222.

Filatova, T., D. Parker, and A. van der Veen. 2009. Agent-Based Urban Land Markets: Agent’s Pricing Behavior, Land Prices and Urban Land Use Change. Journal of Artificial Societies and Social Simulation. http://jasss.soc.surrey.ac.uk/12/1/3.html

Jin, X. and White, R. (2012) An agent-based model of the influence of neighbourhood design on daily trip patterns. Computers, Environment, and Urban Systems. 36, 398–411.

Lab: (Thursday, Mar. 21) LMM ABM model lab.

# Planning applications

**Week 12** (Wednesday, Mar. 27)RIKS applications, grad student term paper presentation.***Graduate student term papers due!*** Readings:

Read one of two for standard format SWA (note they don’t quite fit the format):

Van Delden, H., Vanhout, R., Te Brömmelstroet, M., and White, R. (2009). Design and development of Integrated Spatial Decision Support Systems: applying lessons learnt to support new town planning. In: Stolk, E. and Te Brömmelstroet, M. (Eds), Model Town: Using Urban Simulation in New Town Planning. SUN, Amsterdam, The Netherlands.

Van Delden, H., & Engelen, G. (2006). Combining participatory approaches and modelling: lessons from two practical cases of policy support. Paper presented at the iEMSs Third Biennial Meeting: "Summit on Environmental Modelling and Software", Burlington, VT.

*Supplementary/optional:*

Engelen, G., R. White, and A. C. M. de Nijs. 2003. Environment Explorer: a Spatial Policy Support Framework for the Integrated Assessment of Socio-Economic and Environmental Policies in the Netherlands. *Integrated Assessment* 4 (2): 97-105.

Engelen, G. (2003). Development of a decision support system for the integrated assessment of policies related to desertification and land degradation in the Mediterranean. In C. Giupponi & M. Shechter (Eds.), Climate change in the Mediterranean: Socio-economic perspectives of impacts, vulnerability, and adaptation (pp. 159-195). Cheltenham, UK: Edward Elgar.

Lab: (Thursday, Mar. 28) ABM lab continued.

**Week 13** (Wednesday, April 3)ILUTE, grad student term paper presentation

Read one of two for standard format SWA (note they don’t quite fit the format):

Miller E, Douglas Hunt J, Abraham J E, Salvini P A (2008). Microsimulating urban systems. Computers, Environment and Urban Systems, 28 9-44.

Chingcuanco F, Miller E J (2012) "A microsimulation model of urban energy use: Modelling residential space heating demand in ILUTE" Computers, Environment and Urban Systems, 36 186-194.

Lab (Thursday, April 4) Review for take-home exam, go over any outstanding questions. ABM lab due.

**Examinations**

There is a take-home final exam. The take-home final exam will be distributed the last day of class (April 4th, after lab) and will be due April 15 at 1:30 PM, electronically in the LEARN dropbox AND in hard copy to a planning dropbox.  This exam will test your ability to meet the stated course objectives, working alone, but using any and all materials available to you. You must follow all standard citation conventions, and your exam will be checked using software to check for plagiarism*.* Late final exams will not be accepted.

**Assignments**

**Short writing assignments:** Most weeks you are required to complete a short writing assignment. For the first three weeks, the writing assignments will invite you to brainstorm on an application of urban simulation of your choosing, drawing on class lectures and course readings. Starting in week 6, for most weeks, your SWAs will follow a standard format that is designed to help you learn to read and synthesize applied journal articles. These questions will be posted on LEARN. There will be a final SWA at the end of the semester, which asks you to provide feedback on the course, for which any student who completes the assignment will receive full credit.

Each week, there will be a LEARN forum on which you should post your SWA. It will have specific instructions for that week. If you have any questions, please ask me. *To speed marking, please post as plain text in the forum, rather than attaching a file. If you need to attach a file, try to use pdf.* If I don’t have a forum and post the instructions, there is no assignment due! SWAs must be posted by midnight on Tuesdays. Because we discuss these in class, *late SWAs will not be accepted*. However, *your lowest SWA mark for the course will be dropped*. You are strongly encouraged to read others’ short writing assignments, comment on them in class, and incorporate them in your final exam.

Either myself or the TA will mark these SWA and provide comments and feedback. Your marks on the SWAs will be based both on the content and analysis and on the progress you make during the term in increasing your understanding of the material.

**Lab reports:** You will receive questions for lab reports at the beginning of each lab section, on LEARN. Your written report is due in two weeks (usually) at the next lab section, both in the LEARN dropbox and in hard copy. You are welcome to work on labs in groups, but each student must write up his/her own report. The TA will mark your lab reports. *Late lab reports will be penalized ten points per day*.  *Provided that you complete all labs with a passing mark (50% or higher), your lowest lab grade will also be dropped.*

**Article Presentations:** Each student will be part of a group responsible to present the applied articles in the topic weeks (the ones labeled “For SWA”) to the class. You will have a chance to request your most preferred weeks/articles, and detailed guidelines will be provided for your presentations. I will mark your presentations based on the materials prepared for the class and your in-class presentations. I strongly encourage your group to review the presentation content with me beforehand, to make sure you have the details correct. *You must present on your assigned day, so please be sure it fits your schedule.*

**Class participation:** You will be graded on your participation in class, your posting to the web site and your participation in discussions. You can participate on-line by posting items of interest and commenting on other students’ SWAs. Class participation includes questions, comments, and other constructive participation in class discussion. I will also track attendance.

**Term papers/projects:** *Graduate students only* will write and present a short term paper or project, on any topic of interest reasonably related to urban land-use change (LUC). For the term paper, students may complete a targeted literature review, focusing either on application of a particular technique to specific phenomena, or on LUC models of a particular geographic region.  Ideally, the relevant literature for the paper should encompass no more than 10-15 articles.  (In other words – choose a well-focused topic!)  Students with the requisite technical background and interest may undertake a simple LUC modeling project using one of the techniques that we review. The final paper should be 20-30 pages in length, double spaced 12 point font, including tables, figures, and bibliography.  An extended abstract (750-1000 words) and paper bibliography will be due in the middle of the term, and final papers will be presented during the last two weeks of the class.  Late abstracts papers will be penalized 10% of total marks per day. Please review your potential paper topic with me before getting started.

**Student Evaluation**

For undergraduates, your final grade is based on the following:

|  |  |
| --- | --- |
| Course component | Percentage |
| Short writing assignments | 25% |
| Lab reports | 25% |
| Article/weekly topic presentations | 10% |
| Participation | 10% |
| Take-home final exam | 30% |

Graduate students are also required to complete and present a term project or paper. Additional details for the term projects will be provided in the graduate folder. Graduates grades will be calculated as follows:

|  |  |
| --- | --- |
| Course component | Percentage |
| Short writing assignments | 20% |
| Lab reports | 20% |
| Article/weekly topic presentations | 10% |
| Participation | 5% |
| Take-home final exam | 25% |
| Term paper (abstract 20%, presentation 30%, text 50%) | 20% |

**Texts**

In addition to the readings specified above, we will use excerpts from the following text, available at the bookstore (required chapters only), or on Amazon, both hard copy and electronic.

Benenson, I., & Torrens, P. (2004). Geosimulation: Automata-Based Modeling of Urban Phenomena. London: John Wiley & Sons.

*Please check before class to ensure that cell phones and pagers are turned off.  You are welcome to use a laptop to take notes, but not for non-course related activities.*

**Avoidance of Academic Offences**

***Students are expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for their actions.  Students who are unsure whether an action constitutes an offense, or who need help in learning how to avoid offenses (e.g., plagiarism, cheating) or about rules for group work / collaboration should seek guidance from the course professor, TA, academic advisor, or the Undergraduate Associate Dean.  For information on categories of offenses and types of penalties, students should refer to Policy #71, Student Academic Discipline,*** [***http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm***](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm)***Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy #70, Student Grievance,*** [***http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm***](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm)

**Referencing / Citation**

The School of Planning has adopted a single standard referencing system for all papers and assignments submitted in Planning courses. The format is the APA (American Psychological Association) style. The complete style outline can be found in the *Publication Manual of the American Psychological Association*, located in the reference section in Dana Porter Library, call number BF76.7.P83 1994, or on sale in the Book Store for $32.95. A brief summary of the citation style can also be found in Section VII of *The Ready Reference Handbook.* On the web you can find some other quick references at the following URLs.

APA Essentials - <http://www.vanguard.edu/psychology/apa.html>

Format - <http://www.english.uiuc.edu/cws/wworkshop/bibliography/apa/apamenu.htm>

APA Crib Sheet - <http://www.wooster.edu/psychology/apa-crib.html>

Citing Electronic References - <http://www.apa.org/journals/webref.html#Email>

Frequently asked Questions - <http://www.apa.org/journals/faq.html>

* + **Academic Integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.
	+ **Research Ethics:** Please also note that the ‘University of Waterloo requires all research conducted by its students, staff, and faculty which involves humans as participants to undergo prior ethics review and clearance through the Director, Office of Human Research and Animal Care (Office). The ethics review and clearance processes are intended to ensure that projects comply with the Office’s Guidelines for Research with Human Participants (Guidelines) as well as those of provincial and federal agencies, and that the safety, rights and welfare of participants are adequately protected. The Guidelines inform researchers about ethical issues and procedures which are of concern when conducting research with humans (e.g. confidentiality, risks and benefits, informed consent process, etc.). If the development of your research proposal consists of research that involves humans as participants, the please contact the course instructor for guidance and see <http://www.research.uwaterloo.ca/ethics/human/>
	+ **Note for students with disabilities:** The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term. Once registered with OPD, please meet with the professor, in confidence, during my office hours to discuss your needs
	+ **Religious Observances : Please inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.**
	+ **Grievance:**  A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/policies/policy70.html>
	+ **Discipline *(as noted above under 2a)*:** A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.html>
	+ **Appeals:** A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.html>
	+ **Turnitin** Plagiarism detection software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.