

**Western University – Faculty of Engineering
Departments of Civil and Environmental Engineering**

**CEE 9567 A/B/L - GIS APPLICATIONS TO WATER RESOURCES MANAGEMENT
Course Outline Winter 2016/2017**

- OBJECTIVES:** This course introduces students to the concepts, techniques and applications of Geographic Information Systems (GIS) to water resources management. Students will learn the applications of GIS to hydrologic and hydraulic issues. This course will add insight to a number of hydrologic and hydraulic problems using computer packages such as HEC-HMS, HEC-GeoHMS, HEC-RAS, HEC-GeoRAS and ArcGIS modules. By the end of this course, students should be able to:
- Identify, describe, and convert between common geospatial data types in a GIS;
 - Explain, transform and manipulate map projections and coordinate systems;
 - Identify, describe and perform various kinds of basic spatial analyses;
 - Accurately digitize riverine features in a GIS for use in hydrologic and hydraulic modeling software;
 - Competently use spatial modeling, hydrologic and hydraulic software tools for water resources applications;
 - Apply fundamental principles of hydrology and hydraulics for river network analysis;
 - Apply knowledge of spatial data, processes, and analysis combined with hydrologic and hydraulic tools to find solutions to common water resources management problems;
 - Effectively present results of analyses in both oral and written formats.
- PREREQUISITES:** None, however knowledge of basic hydrology, hydraulics and familiarity with MS Office are definite assets
- TOPICS:**
1. Introduction to GIS applications in water resources management
 2. Fundamentals of vector and raster data types and GIS modeling in water resources management
 3. Development and editing TIN and DEM terrain
 4. Understanding basic hydrology functionality within ArcMap
 5. Terrain processing, watershed delineation and stream network analysis
 6. Hydrologic modeling using HEC-HMS and HEC-GeoHMS
 7. Hydraulic Modeling and floodplain mapping using HEC-RAS and HEC-GeoRAS
 8. Term project presentations and discussions
- HOURS:** One 2-hr lecture per week (attendance mandatory)
One 2-hr lab session per week (attendance optional).
Lab sessions will be held in the SEB computer labs.
- INSTRUCTOR:** Angela Peck, Spencer Engineering Building (SEB) Rm 3111
Email: apeck4@uwo.ca

Consultation: Students are encouraged to speak with the instructor during tutorial hours. Weekly office hours will also be arranged at the beginning of the course to provide students with an additional opportunity to meet with the instructor. These consultations will likely be in a virtual environment (such as Skype) for convenience's sake. Otherwise, individual consultations can be arranged with the instructor by setting up an appointment via email.

ADMINISTRATIVE SUPPORT: Civil and Environmental Engineering Graduate Coordinator, SEB Rm. 3009

MATERIALS: CLASS NOTES: Available on OWL WebCT (<http://owl.uwo.ca>)

TEXTBOOK (optional): GIS Fundamentals: A first text on Geographic Information Systems, 4th (or 3rd) Edition; Paul Bolstad, Eider Press, 2012 (2008).

OTHER REFERENCE MATERIALS (most of these are available free-of-charge online):

1. Maidment, David R., Arc Hydro: GIS for Water Resources, ESRI Press, 2002.
2. HEC-GeoHMS Geospatial Hydrologic Modeling Extension, User's Manual, Hydrologic Engineering Center, 2009.
3. HEC-GeoRAS GIS Tools for Support of HEC RAS, User's Manual, Hydrologic Engineering Center, 2009.
4. HEC-RAS River Analysis System, User's Manual, Hydrologic Engineering Center, 2010.
5. HEC-HMS Hydrologic Modeling System, User's Manual, Hydrologic Engineering Center, 2013.

GENERAL LEARNING OBJECTIVES:

Knowledge Base	x	Individual Work	x	Ethics and Equity	
Problem Analysis	x	Team Work	x	Economics and Project Management	
Investigation		Communication		Life-Long Learning	x
Design	x	Professionalism		Engineering Tools	x
Impact on Society					

EVALUATION: Assignments: 40% (8% each)
 Course Project: 35%
 Final Examination: 25%

 Total 100%

Notes:

- Students must pass the final examination (at least 50%) to pass this course.
- Students are responsible for regularly checking their email and course website.

ASSIGNMENTS: Five assignments for the entire course. Each assignment must be completed and submitted every two weeks. Assignments will require the use of different software such as GIS and hydrology and hydraulic software.

TUTORIALS/LABORATORY/COMPUTING: Tutorial sessions will be held in on-campus computer laboratories with time for students to work on problems related to assignments using GIS, hydrologic, and hydraulic modeling software. Students may be required to submit printed copies or screenshots of their work together with submitted assignments.

COURSE PROJECT: Students will select a project case study approved by the instructor. The project assessment will be based on submission of calculations, a project presentation and a final report. Project will be based on the application of fundamental principles presented in class and the use of GIS, hydrologic and hydraulic software. Additional details on the group project will be provided to students in January.

FINAL EXAMINATION: Final Exam will be take home.

ATTENDANCE: Any students who, in the opinion of the instructor, is absent too frequently from class or tutorial/laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

ACCESSIBILITY: Please contact the course instructor if you require materials in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific questions regarding an accommodation.

CONDUCT: Students are expected to arrive at lectures and tutorials on time and to conduct themselves in a professional and respectful manner. Students are also requested to turn off all cell phone devices, so as to not disturb the class. If students must accept a phone call, please leave the classroom and speak outside.

ILLNESS: Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented. The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, please see:
http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf

CHEATING: University policy states that cheating is a scholastic offense. The commission of a scholastic offense is attended by academic penalties which might include

expulsion from the program. If you are caught cheating, there will be no second warning.

**PLAGIARISM
CHECKING:**

The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their Assignments and/or project report in electronic form to Turnitin.com for plagiarism checking.

ENGLISH:

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

If you require assistance with reading, writing, or speaking in English, there is support available through Western's Writing Support Centre at the Student Development Centre (<http://www.sdc.uwo.ca/writing/>), the Teaching Support Centre (http://www.uwo.ca/tsc/graduate_student_programs/), or even through some of Western's International Students Clubs (<http://westernusc.ca/clubs>).