

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

**CEE 4429 A/B/L - GIS APPLICATIONS TO WATER RESOURCES MANAGEMENT
Course Outline Fall 2017/2018**

- 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:** Completion of 3rd year engineering program, or by special permission.
- 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 mandatory).
Lab sessions will be held in the TEB 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:

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|-------------------|---|-----------------|---|----------------------------------|---|
| 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)
 Participation: 5%
 Course Project: 30%
 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.

PARTICIPATION: Student participation will be evaluated based on the quantity and quality of contributions to the class, field trip(s) (if applicable), and forum discussions.

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 at the beginning of the term.

FINAL EXAMINATION: Final Exam for undergraduate students 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>).

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC RELIEF WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC RELIEF WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. PLEASE READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2017 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or exam that is worth MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097. Otherwise, you will report to your department office to request relief.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your Department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM TESTS

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request relief. Otherwise, you will report to your department office to request relief.
3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. It is the student's responsibility to check the date, time and location of the Special Examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
 - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
 - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or Ms. Karen Murray in the Undergraduate Services Office, if you are in first year.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2017 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness: <http://westerncalendar.uwo.ca/2017/pg117.html>

Academic Accommodations for Students with Disabilities: <http://westerncalendar.uwo.ca/2017/pg118.html>

Academic Accommodations for Religious or Holy Days: <http://westerncalendar.uwo.ca/2017/pg119.html>

Course Withdrawals: <http://westerncalendar.uwo.ca/2017/pg157.html>

Examinations: <http://westerncalendar.uwo.ca/2017/pg129.html>

Scheduling of Term Assignments: <http://westerncalendar.uwo.ca/2017/pg135.html>

Scholastic Offences: <http://www.westerncalendar.uwo.ca/2017/pg111.html>

Student Medical Certificate: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Engineering Academic Regulations: <http://www.westerncalendar.uwo.ca/2017/pg1442.html>

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Drop Deadlines:

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|---|-------------------|
| First term half course (i.e. "A" or "F"): | November 5, 2017 |
| Full courses and full-year half courses (i.e. "E", "Y" or no suffix): | November 30, 2017 |
| Second term half or second term full course (i.e. "B" or "G"): | March 7, 2017 |

Contact Information:

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| Undergraduate Services Office: | SEB 2097 | Telephone: (519) 661-2130 | E-mail: engugrad@uwo.ca |
| Dept. of Chemical and Biochemical Engineering & Green Process Engineering: | TEB 477 | Telephone: (519) 661-2131 | E-mail: cbeugrad@uwo.ca |
| Dept. of Civil and Environmental Engineering: | SEB 3005 | Telephone: (519) 661-2139 | E-mail: civil@uwo.ca |
| Dept. of Electrical and Computer Engineering, Software Engineering & Mechatronics Engineering: | TEB 279 | Telephone: (519) 661-3758 | E-mail: eceugrad@uwo.ca |
| Dept. of Mechanical and Materials Engineering: | SEB 3002 | Telephone: (519) 661-4122 | E-mail: mmeundergraduate@uwo.ca |