

Course Outline

EAS 429 – Hydrologic Modelling

Winter 2018

Instructor

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CCIS 3-027

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Office hours: immediately after class, i.e., 2:00-4:50pm Monday and 10:00-10:50am Wednesday or by appointment

Lectures

Lab work (Module I): Monday, 2:00-4:50pm, Tory 2-87

Theory class (Module II): Wednesday, 10:00-10:50am, T B 113

Course Outcomes

By the end of this course participants should be able to:

- Determine the ‘Water Scarcity’ and understand pros and cons of the existing methods in quantifying water scarcity at different geographic scales and various hydro-climatic, and economic conditions.
- Understand the blue and green water footprint, and virtual water trade strategy (VWTS) and its role in managing and balancing water resources
- Understand various aspects of climate change and the impact assessment in large-complex watersheds
- Criticize hydrological models and understand their usefulness and limitations
- Learn fundamentals in large-scale hydrological modelling from model building, calibration/validation, and uncertainty assessment
- Conduct a watershed scale hydrological modeling including data collection, processing/reformatting, model building, calibration-validation analysis, scenario analysis
- Evaluate, assess, and discuss various scenarios to design beneficial management practices.

Prerequisites

Currently not applicable.

Course Materials

For papers to be distributed to the class, I will email you the pdf document at least one week before the paper will be discussed. Therefore, you must give an email address to me that you will regularly check.

Course Description

This course will provide knowledge and tools that are used to assess water supply and demand in large scale and complex watersheds. The course is divided into two parts: **Module I** deals with understanding mechanistic concepts, assumptions behind hydrologic models, and advantages and limitations associated with using models. The course will elaborate on issues in data collection, construction, sensitivity analysis, calibration and validation of hydrologic models used to assess the dynamics of water resources in response to climate change and human activities. **Module II** aims to enhance understanding of issues such as water scarcity and water surplus under climate change and variability. It describes shortcomings of the traditional ‘blue water’ management and new concepts used to manage blue and green water resources by discussing water footprint, water productivity, and virtual water trade strategy. It develops basic knowledge and skills to manage water supply/demand with an integrated, multidisciplinary, and dynamic manner. Examples and case studies will be used to illustrate the issues surrounding model applications for water resources management, drawing on perspectives from both the natural sciences and the policy arena.

Course Expectations

Students will be evaluated on several aspects: attendance, participation in class discussion, midterm and final exams (Module II), course project progress report, and final course project package (Module I). More details about each of these components is given below:

Attendance: This course assumes an interactive approach in its structure and in its presentation, which requires engaged participation from all members of the class. Your presence is essential to the liveliness of this course and concomitantly to your individual success in it. Data processing, model building and calibration are essential features of this course. Therefore, it is mandatory to attend the lab sessions organized for this purposes. Your active participation in both modules (theory and hands-on), class discussion, reading materials, and attending the lab works will provide deep learning of the subject that will ultimately help you in building your course project, analysis of the related scenarios and developing the course required paper/report. The absences from the class have to be communicated with instructor at least 3 days before the class time. Any invalid absence will result in penalties that include missing in-class data processing, model building, writings or project deadlines. Formal class time begins promptly at 10:00am (Module II) and 2:00pm (Module I), unless otherwise indicated on the course schedule. All students are expected to be present at that time. If a student is not present when the attendance roster is signed, he or she will be marked late. Please be polite to others by arriving on time to class as you would to a job.

Final course project: Students are required to read secondary materials and come up with a research question, for which they are required to build a hydrological model of their region of interest, to

calibrate-validate their model (at least one iteration), and to report the results. At the end they are required to write a short paper which includes Introduction, Methods, Results/discussion, and Conclusion. The individual water related subjects for model applications, can be discussed with instructor by making appointments.

It is important to note that grad students are required to conduct scenario analysis (e.g. climate change impact assessment, land use change) using their calibrated models. However, conducting scenario analysis is optional for under-grad students.

Important to mention that most of the base data (e.g., GIS maps and station data) for Alberta catchments will be available for the students use in their project. This requires an initial delineation of the study region (e.g., the border of the study area) that has to be delivered to the instructor and the data will be provided by the instructor for that region. In other words, the study areas will be selected by students according to their interest, research questions, and their project objectives; and the input data will be provided by instructor.

The final project will consist of:

- A copy of the hydrological model (.zip file) submitted through a Google Drive or Dropbox folder (free web-based platform to share large datasets), that includes: hydrological model project, input data files, output data files, analysis which results in graphs and maps.
- A paper/report which includes: 1) Introduction: contains literature review and stating the significance of the research work; 2) Methods: including of study area and water challenges, model setup and data; 3) Results/discussion, 4) Conclusion. A more details about the contents of each section in the paper, formatting, etc., can be communicated with the instructor by making appointments.

Final exam: A comprehensive essay examination is required based upon material covered throughout the term.

Course Assessment/date due and time

Module I:

- Class attendance, interaction, and project progress report for midterm, 20%
- Final project package including project model and calibration files, input-output data, paper/report for final evaluation, 30%
- Due date for project progress report: March 12, 2017 (including class time 2:00-4:50 pm).
- Due date for final project package: as per University of Alberta defined last day of winter term classes (April 13).

Module II:

- Class attendance, interaction and midterm exam, 25%
- Final exam, 25%
- Midterm exam date and time: Wednesday, March 07, 2018 at 10-10:50 am, T B 113.

- Final exam date and time: "as per University of Alberta Exam Schedule"

Evaluation: All assignments in this course will be given a numerical score. A cumulative course mark will be calculated from those scores. A final letter grade will be assigned based on your cumulative mark and my analysis of the class's cumulative mark distribution. Where possible, natural breaks in the cumulative mark distribution will be used in assigning grades, but no pre-determined distribution of grades will be imposed on the class. Your grade will reflect a combination of your absolute achievement and relative standing in the class. Grades are unofficial until approved by the Department and/or Faculty offering the course.

Course Policies

Contacting instructor: students are required to make an appointment to meet the instructor. Please email if you have questions or to schedule an appointment. Please ensure to include EAS429 in subject heading of your emails.

Exam: your student photo I.D. is required at exams to verify your identity. Students will not be allowed to begin an examination after it has been in progress. Electronic equipment, other than calculators, cannot be brought into examination rooms.

Cell phones: *Cell phones are to be turned off during lectures, labs and seminars. Cell phones are not to be brought to exams.*

Plagiarism

Plagiarism is a nasty thing that is easy to do without even knowing you are doing it. Since I strongly encourage you to work together in groups for the course project you must be extremely vigilant about making sure you do not copy another's ideas. Each essay should be unique in its own way and we will be vigilant to ensure they are. Please refer to the:

<http://www.osja.ualberta.ca/Students/AvoidingPlagiarism.aspx>

<http://www.studentsuccess.ualberta.ca/en/Workshops.aspx>

<http://uofa.ualberta.ca/centre-for-teaching-and-learning/tlef/tlef-deliverables/academic-integrity>.

Soft copies of your word-processed version of the essay (via email) need also be provided to me for archiving and comparative purposes. I reserve the right to run text copies of all submitted essays through anti-plagiarism software.

Electronic devices

Electronic devices (e.g., Laptops, tablets, iPads, e-readers) are allowed only if they are used to write, collect, and capture/study notes. Proper devices are also allowed for data analysis and model building during the lab sessions.

Missed Midterm Examinations and Laboratory Assignments

Two midterm examinations will be delivered/written for Module I and II. Students who do not write a midterm exam in Module II, due to a valid absence will have the weight of the midterm added to their final examination. Without a valid excuse for absence, students will be given a mark of zero on the exam (Module II) and progress report (Module I) that is missed.

For an excused absence where the cause is religious belief, a student must contact the instructor(s) within two weeks of the start of Fall or Winter classes (within three days of the start of Spring or Summer classes) to request accommodation for the term (including the final exam, where relevant). Instructors may request adequate documentation to substantiate the student request. A student who cannot write a term examination or complete a lab assignment due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred midterm examination or laboratory assignment due date. In all cases, instructors may request adequate documentation to substantiate the reason for the absence at their discretion. Deferral of term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Misrepresentation of Facts to gain a deferral is a serious breach of the *Code of Student Behaviour*.

Registration Status

It is the student's responsibility to confirm that they are registered in the course. Students attending the course who are not properly registered for it will not receive credit for the work completed. Should you wish to withdraw from the class, it is your responsibility to ensure that you have formally withdrawn before the deadline. Failure to properly withdraw from the course may result in your grade being assigned based on partial or no coursework.

Deferred Final Examination

The final exam will be held "as per University of Alberta Exam Schedule". Mutually agreeable arrangements must be made with students eligible for deferred exam to be held prior to May 18. These dates cannot be changed. A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. Students who failed at the start of term to request exam accommodations for religious beliefs are expected to follow the normal deferred final examination process. Such an application must be made to the student's Faculty office within two working days of the missed examination and must be supported by a Statutory Declaration or other appropriate documentation (Calendar section 23.5.6). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresentation of Facts to gain a deferred examination is a serious breach of the *Code of Student Behaviour*.

Academic Integrity

"The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts

and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University."

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for cheating on any examination will include a disciplinary failing grade (NO EXCEPTIONS) and senior students should expect a period of suspension or expulsion from the University of Alberta.

Students Eligible for Accessibility-Related Accommodations (SSDS)

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SSDS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SSDS (<http://www.ssd.ualberta.ca/>) for further information.

Student Success Centre

Students who require additional help in developing strategies for better time management, study skills or examination skills should contact the Student Success Centre (2-300 Students' Union Building).

Recording and/or Distribution of Course Materials

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).