CIV ENG 4L04: Design of Water Resources Systems

Course Outline

<table>
<thead>
<tr>
<th>Lectures:</th>
<th>Mondays &amp; Thursdays</th>
<th>12:30 – 13:20</th>
<th>BSB 119</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory:</td>
<td>Tuesdays/Thursdays</td>
<td>8:30 – 11:20</td>
<td>JHE 201</td>
</tr>
</tbody>
</table>

Instructor: Dr. Sonia Hassini  Office: TBD  E-mail: hassins@mcmaster.ca

Teaching Assistants: Robert Rawlins  Email: rawlinrj@mcmaster.ca
Qianqian Zhang  Email: zhangq94@mcmaster.ca

Prerequisite: Credit or registration in CIV ENG 3M03 Municipal Hydraulics

Course Description:
This is a four-credit undergraduate/graduate course in civil engineering. The main purpose of the course is to apply the principles of hydrology and hydraulics to the design and analyses of water resources systems. Theoretical and empirical methods used in hydrologic, hydraulic and frequency analyses are discussed using example problems and computer packages. Practical application is emphasized through the assignments, the peer-led problem-solving sessions and the project.

Course Assessment:
Assignments 40%
Tutorial & Lab Presentations 10%
Major Project 50%

Late assignments will NOT be accepted. Accommodation will only be given to missed assignments with a proper McMaster Student Absence Form (MSAF). Each assignment may be followed by a personal interview which may affect the assignment’s mark.

The marks on different components of the course will be maintained according to the percentage scale and only the final mark will be converted to a letter grade.

Communication, Attendance & Course notes:
The major form of communication in this course will be the classroom. Therefore, course attendance is expected. There is also an avenue to learn (A2L) site, where course notes, lab manuals and supplemental information will be posted. Please do not use A2L to email the instructor or TA(s), all email communication should be sent from your @mcmaster.ca address to the @mcmaster.ca addresses listed above.

Course Textbook:
Any Water Resources Engineering textbook.
Recommended References:

Course and learning objectives
The objective of this course is to help students learn various aspects of the design of water resources systems. This involves learning and applying advanced hydrologic, hydraulic and optimization models to watershed and floodplain analysis, including storm event analysis, effects of urbanization, flood control (structural and non-structural measures), and water resources systems analysis. The impact, adaptation and mitigation of climate change on water resources design will also be discussed.

Lecture Tentative Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Tentative Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Introduction</strong>&lt;br&gt;floods, floodplain mapping procedure, sustainability, flood damage reduction program</td>
</tr>
<tr>
<td>2 - 4</td>
<td><strong>Hydrologic analysis using watershed models</strong>&lt;br&gt;Review of hydrologic processes&lt;br&gt;Surface runoff hydrograph&lt;br&gt;Reach routing and Reservoir routing&lt;br&gt;Hydrologic modelling and HEC-HMS overview</td>
</tr>
<tr>
<td>5 - 6</td>
<td><strong>Hydraulic analysis</strong>&lt;br&gt;Review of hydraulic processes: Open channel flow and Pipe flow&lt;br&gt;Hydraulic modelling and HEC-RAS overview</td>
</tr>
<tr>
<td>7 (Feb 18)</td>
<td>mid-term recess, no classes</td>
</tr>
<tr>
<td>8</td>
<td><strong>Statistical methods in water resources</strong>&lt;br&gt;Single station flood frequency analysis&lt;br&gt;Regional flood frequency analysis&lt;br&gt;Flood elevation analysis&lt;br&gt;HEC-SSP overview</td>
</tr>
<tr>
<td>9</td>
<td><strong>Climate change</strong></td>
</tr>
<tr>
<td>10</td>
<td><strong>Flood control</strong></td>
</tr>
<tr>
<td>11</td>
<td><strong>Urban drainage analysis</strong></td>
</tr>
<tr>
<td>12</td>
<td><strong>Water resources systems analysis</strong></td>
</tr>
<tr>
<td>13</td>
<td><strong>Project Presentations</strong></td>
</tr>
</tbody>
</table>

Lecture topics and dates are subject to change, depending on time constraints.

Learning Outcomes:
The students are expected to gain the following learning outcomes after taking this course:

- Competence in Specialized Engineering Knowledge (1.4)
• Ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed (2.1).
• Ability to identify a range of suitable engineering fundamentals (including mathematical techniques) that would be potentially useful for analyzing a technical problem (2.2).
• Ability to obtain substantiated conclusions as a result of a problem solution including recognizing the limitations of the solutions (2.3).
• Able to recognize and discuss applicable theory knowledge base (3.1).
• Capable of selecting appropriate model and methods and identify assumptions and constraints (3.2).
• Can estimate outcomes, uncertainties and determine appropriate data to collect (3.3)
• Recognizes and follows an engineering design process and principles (4.1 & 4.2)
• The ability to use of modern/state of the art tools (5.2).
• Be able to critically evaluate and apply knowledge, methods and skills procured through self directed and self identified sources, including those that lie outside the nominal course curriculum (12.1).

POLICY REMINDERS

• Academic Integrity
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: Grade of F assigned for academic dishonesty), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity. The following illustrates only three forms of academic dishonesty:
  o Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
  o Improper collaboration in group work.
  o Copying or using unauthorized aids in tests and examinations.

• Authenticity / Plagiarism Detection
All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). To see the Policy, please go to www.mcmaster.ca/academicintegrity.

• Online Access
In this course we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

• Academic Accommodation of Students with Disabilities
Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140x28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster
University’s Academic Accommodation of Students with Disabilities policy.

- **Academic Accommodation for Religious, Indigenous or Spiritual Observances**
  Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar’s Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

- **Extreme Circumstances**
  The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

- **University Statement on Changes to the Course**
  The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

- **Adverse Discrimination**
  The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons involved, individuals are reminded that they should contact their Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.