George Mason University  
Department of Civil, Environmental and Infrastructure Engineering  

CEIE 690: Flood Hazards Engineering  
*Fall 2014*  

**INSTRUCTOR:**  
Dr. Celso Ferreira  
*Office location:* Nguyen Engineering Building, Room 1411  
*Office Hours:* Tuesday 3:00 – 6:00 p.m. or by appointment  
*Email:* cferrei3@gmu.edu  
*Phone number:* 703 993 1782  

**COURSE SCHEDULE**  
Lecture: R / 4:30 – 7:10 pm / Nguyen Engineering Building, Room 1110  

**WEB PAGE**  
Materials for this course are available on GMU Blackboard  
https://mymasonportal.gmu.edu/webapps/portal/execute/tabs/tabAction?tab_tab_group_id=_66_1  

**COURSE DESCRIPTION & PREREQUISITES**  
Introduction to the principles of flood hazards engineering. Theory and practice of the application of hydrology and hydraulics to flood hazards delineation. Theory and practice of the application of geospatial analyses to support flood hazards modeling. Application of computational methods to support planning, design and management of flood hazards.  
Prerequisite(s): Graduate standing in CEIE; CEIE 340 or equivalent. Prerequisite enforced by registration system.  

**COURSE RATIONALE**  
Welcome to Flood Hazards Engineering! This is where we try to build upon your previous knowledge in hydrology, hydraulics, geospatial analyses and coastal engineering towards identifying and quantifying flood hazards. This class is computationally oriented and therefore I strongly recommend that you bring your laptop to class and install all the necessary software. We will learn and use several industry standard modeling applications and constantly use GIS in class. I will perform several in-class software demonstrations and we will regularly work in groups for in-class exercises.  

**LEARNING OUTCOMES (ABET)**  
- Ability to apply knowledge of mathematics, science, and engineering.
• Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
• Ability to identify, formulate, and solve engineering problems.
• The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
• Recognition of the need for, and an ability to engage in life-long learning.
• Knowledge of contemporary issues.
• Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

COURSE OBJECTIVES
• Apply fundamental concepts (Fluid Dynamics) to practical applications of water resources engineering.
• Have a broader overview of flood hazards engineering.
• Apply the principles of conservation of mass, momentum and energy to solve water resources problems.
• Understand basic principles of GIS applications to water resources and use GIS technology to solve water resources problems.
• Became familiar with relevant data sources and datasets for water resources engineering.
• Apply fundamental concepts of hydrology, hydraulics and watershed modeling to support flood hazards identification.
• Apply fundamental concepts of coastal engineering to support flood hazards identification.
• Use geospatial analyses to support flood hazards mapping and perform flood damage analyses.
• Became familiar and comfortable using industry standard modeling software to support flood hazards identification.

TEXTBOOK AND/OR RESOURCE MATERIALS

Required text book:
No textbook required.
• Reading material will be suggested during the semester.
• Class notes and power point slides will be provided on black board.
• Strongly suggested that you read and become familiar with the software manuals.

Additional text books:
• Water Resources Engineering, by Ralph Wurbs and Wesley James, PHI, ISBN-10: 0130812935
• Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications, by Loucks, Daniel P.; van Beek, Eelco; Stedinger, Jery R.; Dijkman, Jozef P.M.; Villars, Monique T. UNESCO. Free online version at: http://ecommons.cornell.edu/handle/1813/2804
• Water Resources Engineering (2\textsuperscript{nd} Edition), by Larry W. Mays, Wiley. ISBN 978-0-470-46064-1
• Waves, tides and shallow water processes. Edited by Dave Park. The open University.
• Design for flooding: Architecture, landscape and urban design for resilience and climate change. Donald Watson and Michele Adams. Wiley Press.
• Floodplain modeling using HEC-RAS. Haestad Methods Water Solutions. Bentley Institute Press.

\textit{Software & Manuals:}

• We will rely on Geographic Information Systems (GIS) to perform spatial analysis and to support hydrologic and hydraulic modeling. We will use the ESRI computer software ArcGIS 10.2 (Student version DVD provided by instructor).

• We will use computer software developed by the Hydrologic Engineering Center (HEC) from the US Army Corps of Engineers (USACE) that are public available and free of cost. (http://www.hec.usace.army.mil/software/)
  \begin{itemize}
  \item The Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) http://www.hec.usace.army.mil/software/hec-hms/
  \item The Hydrologic Engineering Center GEO-HMS http://www.hec.usace.army.mil/software/hec-geohms/
  \item The Hydrologic Engineering Center River Analysis System (HEC-RAS) http://www.hec.usace.army.mil/software/hec-ras/
  \item The Hydrologic Engineering Center GEO-RAS http://www.hec.usace.army.mil/software/hec-georas/
  \end{itemize}

• AQUAVEO Surface-water model SMS. Download Trial Version and request student authorization code from instructor. http://www.aquaveo.com/software/sms-surface-water-modeling-system-introduction

• HydroDesktop from CUASHI http://hydrodesktop.codeplex.com/

* If you are using ArcGIS 10.2 please check blackboard for ArcHYDRO, GEO-HMS and GEO-RAS extensions.
The listing of this sites and products does not imply any endorsement of the products by George Mason University.

The software is also available at the Volgenau School of Engineering (VSE) Labs. http://labs.ite.gmu.edu/

Some related technical journals

- Journal of Hydrologic Engineering (ASCE)
- Journal of Hydraulic Engineering (ASCE)
- Journal of Water Resources Planning and Management (ASCE)
- Journal of Hydrology
- Water Resources Research (AGU)

GRADING POLICIES

Homework: 10%
Project: 85%
Class attendance and participation: 5%

Letter grades will be assigned according to:

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<thead>
<tr>
<th>Letter</th>
<th>Points</th>
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<tr>
<td>A+</td>
<td>&gt; 97</td>
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<tr>
<td>A</td>
<td>93 ~ 96</td>
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<tr>
<td>A-</td>
<td>90 ~ 92</td>
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<td>B+</td>
<td>87 ~ 89</td>
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<td>B</td>
<td>83 ~ 86</td>
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<tr>
<td>B-</td>
<td>80 ~ 82</td>
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<td>C+</td>
<td>77 ~ 79</td>
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<td>C</td>
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<td>C-</td>
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<td>D</td>
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<td>F</td>
<td>&lt;60</td>
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Numeric grades will be rounded to the nearest integer. The instructor reserves the right to adjust letter grades, upward only, based on individual attendance and class participation.

Student responsibilities:

- Actively participate in the classes.
- Read carefully the class material.
- Approximately weekly/bi-weekly homework.
- Final project.
**Homework:**
Home works are due at the end of the semester.
Each student is responsible for developing and turning in ONE solution for one of the home works during the semester. The solution is due one week after the homework is posted. I will post the solution to be reviewed by the class. We will have a sign-up sheet for homework selection based on a first come first served basis. The objective of the homework is to provide a learning platform for each student and to create a collaborative learning environment. Group work is highly encouraged for this class.
Work submitted for grading in this class must be written clearly and shows all analyses steps, equations, and calculations. Credit will be reduced if calculations are not logical and neatly presented.

**Project:**

**Objective:**
The objective of the final project is to identify a relevant topic related to the class, carry on research about this topic, perform technical work, synthetize it and present the project to the classroom. Please provide background, why is this important, problems it might cause, possible solutions and your impressions as civil engineering’s about the topic you selected. The project will be composed of three phases:

1. **Title and abstract:** maximum of 300 words describing your project. Reference on how to write an abstract [http://www.asce.org/Audience/Authors.--Editors/Journals/General-Journal-Information/Abstract/](http://www.asce.org/Audience/Authors.--Editors/Journals/General-Journal-Information/Abstract/)

2. **Written project:** Please include a complete written report of your project. Make sure to include at a minimum an introduction, literature review, methods, results, discussion, conclusions, and references sections.

3. **Oral presentation:** Prepare a power point and present your work to your colleagues. Presentations durations will be define during the semester according to the number of students in the class room.

The grading policy is described below. Additional instructions on the oral presentation and topic selection will be provided during the semester.

**Grades and due dates:**
- **Title and abstract (10%)**: October 2\textsuperscript{nd}
- **Written project (50%)**: December 4\textsuperscript{th}
- **Oral presentation (40%)**: November 20\textsuperscript{th} and December 4\textsuperscript{th}

**Participation:**
Attendance is expected and will count towards your participation grade. Students are expected to actively participate in the classroom discussions and presentations.

**COURSE TOPICS**
This is a TENTATIVE schedule. The course schedule is subject to changes. Please always check on Blackboard for more updated information.

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<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Home work</th>
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<tbody>
<tr>
<td>1</td>
<td>Class does not meet – Software installation on your own</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduction to flood hazards engineering</td>
<td>1</td>
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<tr>
<td></td>
<td>GIS and Water Resources Engineering</td>
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<td>3</td>
<td>Arc Hydro</td>
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<td>4</td>
<td>Hydrology and HEC-HMS</td>
<td>3</td>
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<td>5</td>
<td>HEC-Geo-HMS</td>
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<tr>
<td>6</td>
<td>Open channel hydraulics and HEC-RAS</td>
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<tr>
<td>7</td>
<td>HEC-Geo-RAS</td>
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<tr>
<td>8</td>
<td>Riverine floodplain mapping</td>
<td>7</td>
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<tr>
<td>9</td>
<td>Storm surge modeling and SMS</td>
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<tr>
<td>10</td>
<td>Storm surge modeling and SMS</td>
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<tr>
<td>11</td>
<td>Flood hazards and damage analyses</td>
<td>10</td>
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<td>12</td>
<td>Model sensitivity and calibration</td>
<td>11</td>
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<tr>
<td>13</td>
<td>Project presentations 1</td>
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<td>14</td>
<td>Thanksgiving</td>
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ADDITIONAL INFORMATION

Technology Policy
Regarding electronic devices (such as laptops, cell phones, etc.), please be respectful of your peers and your instructor and do not engage in activities that are unrelated to class. Such disruptions show a lack of professionalism and may affect your participation grade.

Honor System
The integrity of the University community is affected by the individual choices made by each of us. GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

Americans with Disabilities Act (ADA) Policy Statement
If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm.
4205; 993-2474; http://ods.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Diversity
George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth. An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected. The reflection of Mason’s commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach. Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.

How to succeed in this course:

- Make sure you read the assigned text book chapter before the classes.
- Ask often and early. If something is not clear to you, let me know.

Your classmate name and email:

Name: __________________________________________

Contact info: ___________________________________