CE 461 Hydrology

Spring 2021

Description

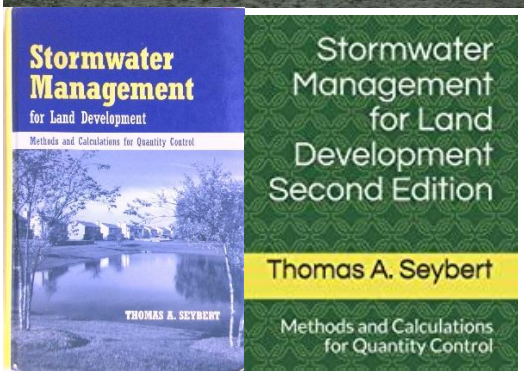
Want to build a bridge? You will need to know how much water goes under it. Design a culvert? You need to know how much goes through it. This course will teach you the basic skills that will allow you to design stormwater control and drainage systems.

Textbook

Stormwater Management for Land Development by Thomas A. Seybert. 1st or later editions. This is a very applied book with practical applications.

ISBN-13: 9780471721772

ISBN-10: 1724064711



Instructor

Warren Campbell, Ph.D., P.E., CFM
warren.campbell@wku.edu

Office Hours Via Zoom (links will be provided)
MW 1:00 – 2:30
Tues 1:00 – 2:00

Typical Class

1. **Call roll**
2. **Answer questions**
3. **Go over the quiz for the last class**
4. **Follow up questions and discussion**

Before Class

Watch the video lecture for that day's class and formulate a question(s) that was (were) triggered by watching the video. Questions are due at the beginning of class.

Prerequisites

MATH 331 Differential Equations
CE 160 Surveying
CE 342 Fluid Thermal Science

Corequisite

STAT 301 Statistics or CE 305 Risk Analysis

Questions

Submit group questions before class (the sooner the better) via Blackboard assignments along with the names of individuals formulating the questions. HOT (Higher Order Thinking) questions are preferred and encouraged.

During class, questions and discussion are encouraged at any time. Unmute in Zoom and fire away.

Zoom

I will always have my video on. Please turn yours on if you have a computer camera. You do not have to go out and buy one if you do not.

Grading

This course is run like a game. You accumulate eXperience Points (XPs) and level up to improve your grade. Mess up on an exam? All is not lost. You can perform optional quests to recover. See below for more information. Turn in your optional quests before class on Monday, April 12 to receive your extra credit.

Type	Quests	Max XPs
Required	Exam 1	200
	Exam 2	200
	Final Exam	400
	Attendance	200
	Questions	200
	Quizzes	300
	Design Project	500
Optional	Select your avatar (Geezer is taken)	20
	Determine flood elevations for a sinkhole	50
	Determine stage-discharge relationship for a given stream gage	20
	Estimate 100-yr flood for a local watershed using HEC-SSP	30
	Develop the hydraulic design of a 3-storm detention pond for a local development	200
	Develop the hydraulic design of a culvert	30
	Bonus Points for whole class - Everyone makes a C or better on Exam 1	100
	Bonus Points for whole class - Everyone makes a C or better on Exam 2	100
	Bonus Points for whole class - Everyone makes a C or better on the Final Exam	200

Levels	Min XP	Grade
Level 5 - Hydrology Demigod	3000	A+
Level 4 - Hydrology Wizard	1800	A
Level 3 - Hydrology Warrior	1600	B
Level 2 - Hydrology Journeyman	1400	C
Level 1 - Hydrology Wannabe	1200	D
Level 0 - Hydrology Potential so far unrealized	0	F

Course Objectives

At the end of the course, each student should be able to:

1. **Develop synthetic storm rainfall distributions (hyetographs) and generate intensity-duration-frequency curves for any location in the U.S.**
2. **Estimate the amount of runoff and infiltration for a given soil and rainfall event.**
3. **Delineate a watershed from a contour map.**
4. **Calculate the response time (time of concentration) of a watershed to rainfall.**
5. **Perform hydrologic design of a storm water collection system and detention basin for a given watershed and rainfall event.**
6. **Given historical stream gage data, estimate flood return periods, event magnitudes, and the likelihood of a given event over any period of time.**
7. **Create a watershed model for a basin of moderate complexity and estimate flood flows for theoretical and real storm events.**
8. **Given appropriate survey, topographic, land use, and soil information calculate flood elevations in sinkholes.**
9. **Work effectively within a team on a hydrologic design project.**

Electronic Submissions

All electronic submissions should have the names of the individual or individuals in the file name. For example, Sheldon Cooper Exam 1.xlsx. However, this does not apply to questions because all of your names will appear in the submission on Blackboard. It does apply to Exam 1, Exam 2, the Final Exam, and your project. In the file name, your names come 1st. The penalty for not following the format is 5%.

Questions

When you submit questions through a Blackboard assignment, you do not have to give me group names. However, you do need to give me the name of the person or persons who submitted the question or questions. Give me the name of the formulator, then the question. Do not number the questions or write Question 1, Question 2, etc. Just the formulator and the question. All of these rules will make my job easier and will be less likely to cause grading errors.

Project

A project will be assigned involving the effects of stormwater policy on development. This assignment will be placed on Blackboard early in the semester. Your project will be done in groups. You will have the opportunity to score yourself and other members of the group regarding their participation in the project. Be fully engaged. The project is due the last Monday of class and includes electronic deliverables. Any file submitted must have the name of each group member in the file name. For example, Penny Sheldon Leonard Howard Final Project.docx. Score yourself and other members of the group regarding their participation in the project. Be fully engaged. The project is due the last Monday of class and includes electronic deliverables. Any file submitted must have the name of each group member in the file name. For example, Penny Sheldon Leonard Howard Final Project.docx.

The final project report must be in Microsoft Word format and written clearly without the use of jargon. The report must be single spaced. All equations must be in Microsoft equation editor or MathType format. Do not use 3 syllables when one will do (use means the same as utilize). Do not say "due to the fact that." Replace this with "because." Use correct grammar. Deductions will be made for the use of jargon or for poor grammar.

If English is a 2nd language for you or you are uncomfortable with your writing skills, consider asking for help from the WKU Writing Center (http://www.wku.edu/writingcenter/). Their help is offered free of charge. The Writing Center is located in Cherry Hall and in Cravens Library.

This will be a group project. Your peers will evaluate your contribution to the project. Your project grade will be based on the overall quality of the project submission, your peer review, and observations of your contribution by the instructor.

All elements of the project must be submitted by 11:30 AM Central time on April 19. No submissions will be accepted after this deadline.

Special Assistance:

In compliance with University policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Student Accessibility Resource Center located in Downing Student Union, room 1074 of the Student Success Center. The phone number is 270.745.5004. or email at sarc.connect@wku.edu. Please do not request accommodations directly from the professor or instructor without a letter of accommodation from The Student Accessibility Resource Center.

Title IX/Discrimination & Harassment

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's Title IX Sexual Misconduct/Assault Policy (#0.2070) and Discrimination and Harassment Policy (#0.2040). Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator, Andrea Anderson, 270-745-5398 or Title IX Investigators, Michael Crowe, 270-745-5429 or Joshua Hayes, 270-745-5121.Please note that while you may report an incident of sex/gender based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are "Responsible Employees" of the University and MUST report what you share to WKU's Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU's Counseling and Testing Center at 270-745-3159.

Healthy on the Hill

Out of respect for the health and safety of the WKU community and in adherence with the CDC guidelines, the University requires that a cloth face covering (reusable or disposable) that covers both the nose and mouth must be worn at all times when in public areas within all buildings. Students must properly wear face coverings while in class regardless of the room size or the nature of the classroom activities. Students who fail to wear a face covering as required will be in violation of the WKU Student Code of Conduct and will be asked to comply or will face disciplinary action, including possible dismissal from the University. Accommodations to face coverings must be determined by the Student Accessibility Resource Center and documented before a student may attend class.

Tentative Schedule – Firm but may be changed for snow days or other unforeseen events

Date	Day	Video Lecture
20-Jan	Wed	Syllabus, Intro
22-Jan	Fri	Rainfall: Atlas 14 and NRCS Rainfall
25-Jan	Mon	Rainfall: Huff Synthetic Rainfall
27-Jan	Wed	Balanced Storms
29-Jan	Fri	NRCS Runoff
1-Feb	Mon	Darcy's Law
3-Feb	Wed	Green Ampt Method
5-Feb	Fri	Sheet Flow Time of Travel
8-Feb	Mon	Time of Concentration
10-Feb	Wed	Unit Hydrograph
12-Feb	Fri	NRCS Unit Hydrograph
15-Feb	Mon	Gamma Unit Hydrograph
17-Feb	Wed	Watershed Delineation
19-Feb	Fri	GIS Delineation
22-Feb	Mon	Delineation with Sub-basins
24-Feb	Wed	Exam 1
26-Feb	Fri	Routing: Muskingum Method
1-Mar	Mon	Routing: Muskingum-Cunge Method
3-Mar	Wed	HEC-HMS Setup
5-Mar	Fri	HEC-HMS Basin Model
8-Mar	Mon	HEC-HMS Rainfall
10-Mar	Wed	Detention Pond Outlet Works
12-Mar	Fri	Inlet Controlled Culverts
15-Mar	Mon	HEC-HMS Reservoirs
17-Mar	Wed	Exam 2 Review
19-Mar	Fri	Exam 2
22-Mar	Mon	Trapezoidal Ponds and the Rational Method
24-Mar	Wed	Detention Pond Single Storm Design
26-Mar	Fri	Frequency Analysis 1
29-Mar	Mon	Frequency Analysis 2
31-Mar	Wed	Frequency Analysis 3
2-Apr	Fri	Radar Rainfall
5-Apr	Mon	Detention Pond Optimization
7-Apr	Wed	Multiple Storm Design 1
9-Apr	Fri	Multiple Storm Design 2
12-Apr	Mon	Multiple Storm Design 3
14-Apr	Wed	Evapotranspiration – Thornthwaite Method
16-Apr	Fri	Project
19-Apr	Mon	Project

Date	Mon	Activity
21-Apr	Wed	Project
23-Apr	Fri	Final Review
27-Apr	Tues	Final Exam 10:30 AM - 12:30 PM

About Me

I began my professional life as a co-op at Marshall Space Flight Center during the Apollo Program. There I worked on the Space Shuttle environmental impact statement, microgravity fluids experiments, and the Space Shuttle Main Engine redesign. Later I was the City Hydrologist for Huntsville, Alabama. When I am not working, I am likely to be gaming with my son and grandson.