CE 321: Water Resources Engineering

(3 credits)

Lectures	Tuesday 6:00pm-8:50pm Hybrid, GITC 1400	
Instructor	**Wassim Y. Nader, PE** Colton, Room 205 Wyn2@njit.edu	Office Hours: Thursdays, 6:00-7:00pm
Prerequisite	CE 200, CE 200A, MATH 279, MATH 305	

Required Textbook

Water Resources Engineering by David Chin, 4th edition, Pearson Publishing. Access Card, 4/e 9780135357705; available from NJIT bookstore or online at the **MyPearsonStore.**

Other Recommended Texts & Reading

Additional class resources (Required): NJDEP Stormwater regulations and Best Management Practices (BMP) manual; HEC-RAS programs; Hydraflow Hydrographs and Storm sewer design software imbedded in Civil 3D 2021 or later date (educational version that is available to all students at no charge) (Required for each student)

Course Description

Training in methods of developing water supplies and the means to treat supplies for consumptive use. Covers hydrologic techniques such as surface and ground water yield, hydrograph and routing analyses, and probabilistic methods related to hydrologic studies.

Course Objectives (General)

Engineering analysis of:

1. Development of surface water analysis.
2. Drought management.
3. Flood protection according to New Jersey Department of Environmental Protection (NJDEP), referencing also US Army Corps of Engineers (USACE) standards.
4. Storm water Management (flowrate, volume, groundwater recharge, water quality enhancement and storm sewer design) according to current and future NJDEP standards.
5. Groundwater mounding analysis.

The techniques utilized in the course will include statistical analysis, hydrograph development and the use of available design software that is common in the consulting engineering field. Students are required to have Civil 3D downloads to access design software in order to do the class project (which requires a serious effort).

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations.

https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Communication: You can reach me via email or canvas outside of class. Email is preferred.

Lectures/Class: Attendance at class is mandatory. Missing more than two classes can result in a loss in attendance grade. You are also expected to be actively engaged during class with discussions and group assignments. If you are absent, please email me immediately.

Handouts: All handouts will be available on Canvas.

Homework/Reading Assignments: Homework will be assigned as per the syllabus. Homework is a mix of individual and group assignments. You will have the same group for all group assignments.

Homework Format: Homework should always include the title of the assignment, the student(s) name and date.

Late Homework: Unexcused late homework will be reduced by one whole letter grade.

Homework Solutions: Homework and other assignments will be discussed in class after the due date.

Exams: You will have two quizzes, one midterm exam and one final exam. These are closed books and not use of electronics is allowed during quizzes or exams.

Final Project: Final projects are submitted individually and involve the preparation of a site plan. Description and details of the final project will be posted on Canvas and discussed in class.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework/Assignments	10%
Midterm Exam	20%
Quizzes	15%
Final Exam	20%
Final Project	25%
Attendance & Participation	10%

The minimum requirements for final letter grades are as follows:

A = 90%, B+ = 85%, B = 80%, C+ = 70%, C = 60%, D = 50%, F < 50%

Instructor Commitment: You can expect the Instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 5963414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Course Schedule: See next page. Items in **RED** are graded assignments.

Wk	Date	Contents	Homework / Assignments Due
1	9/2 In-Person	Course Introduction & Overview *Introduction to Water Resources*	Reading Assignment: Chapter 1-All
2	9/9	Group Assignment Work Session No Class	**Submit Synopsis** of Chin, Chapter 1 by class (Canvas)
3	9/16 In-Person	Group Presentations --- Urban Hydrology for Small Watersheds-TR55	**Group Project Due In-Class** Reading Assignment Chin, 2.1, 2.2, 2.4 and 4.1, 4.2.
4	9/23 Online	Urban Hydrology for Small Watersheds-TR55 --- **Quiz-In Class**	**Submit Synopsis** – Chin, 2.1, 2.2, 2.4 and 4.1, 4.2 by class (Canvas) Reading Assignment TR55 Chapters, 1, 2, 3 & 4.
5	9/30 In-Person	In-Class Exercise – Develop Drainage Area Develop CN Values, Develop Time of Concentration	**Submit Synopsis** – TR55, Ch. 1,2,3&4 by class (Canvas)

6	10/7 Online	Design of Drainage Channels Design of Sanitary Sewers	Reading Assignment Chin, 5.1, 5.2, Chapter 6-All.
7	10/14 In-Person	Analysis of Hydrologic Data Midterm Prep	**Submit Synopsis** – Chin, 5.1, 5.2, Chapter 6-All by class (Canvas)
8	10/21	**MIDTERM EXAM ONLINE**	
9	10/28 In-Person	Fundamentals of Hydraulics Discuss Final Project	Reading assignment (handout to be provided)
10	11/4 Online	Fundamentals of Stormwater Management NJDEP Criteria -- -	**Submit Synopsis** – handout by class
		Quiz-In Class	Reading assignment (handout to be provided)
11	11/11 In-Person	Design of Detention Basins, BMP Solutions, Water Quality Analysis-NJDEP Requirements	**Submit Synopsis** – handout by class
12	11/18 Online	Site Plan Design Integrating All Criteria	
13	11/25	**NO CLASSES – THURSDAY CLASSES MEET**	
14	12/2 In-Person	Final Project Assignment – Work Session	
15	12/9 In-Person	**Final Class – Presentation TBD**	**Final Project DUE (Canvas)**
16	12/16 Online	**Final Exam ONLINE**	

Course Objectives Matrix – CE 321

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Identify how water supply needs are quantified and how water resources are developed.			
Discuss sources of information and time horizons utilized for water resource planning.	1, 2, 7	1,2	Discussions, homework, and quizzes. NJDEP website
Discuss various options associated with developing water resources.	1, 2, 7	1, 2, 3	Discussions, homework, and quizzes. Software analysis
Student Learning Outcome 2: Demonstrate how the potential for extreme hydrologic events (e.g. floods and droughts) are analyzed and quantified.			
Discuss floods and droughts as well as data sources.	1, 2, 4	1, 2, 3	Discussions and quizzes. NJDEP website; Army Corps of Engineers flood control projects
Discuss methodologies for assessing return periods associated with droughts and floods of interests	1, 2	1	Homework and quizzes; project
Student Learning Outcome 3: Demonstrate the importance of insuring water resources that are adequate from both a quantitative and qualitative standpoint.			
Discuss the importance of water quality from a safety and aesthetic standpoint.	2, 4	1, 2, 3	Discussions and quizzes, project.
Provide examples of water quality standards and their rationale	4, 7	1, 2, 3	Discussions and quizzes.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

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