CEE 615 – 851: Infrastructure and Facilities Remediation

(3 credits)

Lectures Wednesday(s)
Online

Instructor Instructor Name: Giri Venkiteela, PhD Office Hours: By email appointments
Instructor E-Mail: venkitee@njit.edu
Instruction office Location: Zoom

Prerequisite Graduate standing in Civil Engineering and basic knowledge of structures, and material science

Required Textbook

Class lectures and other related resources provided during lectures

Other Recommended Texts & Reading

None

Course Description *(from NJIT's course catalog)*

Infrastructure materials characteristics and degradation mechanisms. Examine the methodology of inspection, field testing, evaluation and remediation of existing infrastructure and facilities, which include pipelines, tunnels, bridges, roadways, dams and buildings. Typical material distress and failure scenarios will be covered with remediation options through the use of case studies.

Course Objectives (General)
By the end of this course, the student will be able to:

Course Topic 1: Understand the infrastructure materials characteristics and degradation mechanisms
Course Topic 2: Identify the typical failures in infrastructures and facilities
Course Topic 3: Knowledge of tools and technologies used in infrastructure remediation
Course Topic 4: Writing a research paper based on technical journal format

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: Email communication is preferred

Lectures/Class: Participation in online discussion is a must.

Handouts: Handouts will be made available online thru Canvas.

Homework: Individual assignments and they will be assigned weekly

Homework Format: Please follow the instructions provided during lectures to complete homework.

Late Homework: Late homework will not be accepted and graded

Homework Solutions: Homework solutions are made available upon request.

Exams: Midterm exam and Research paper.

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

Homework	12.5%
Research Paper/ Presentation	30%
Research articles review	10%
Midterm Exam	35%
Class discussions	12.5%

The minimum requirements for final letter grades are as follows:

A = 90-100%, B+ = 85-89%, B = 80-84%, C+ = 75-79%, C = 70-74%, D = 65-70%, F < 65.0%

Final grades are curved based on the highest points acquired in the class.

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.

AI statement: Student use of artificial intelligence (AI) is permitted in this course for certain assignments and activities. It is permitted to be used in the following assignments, as doing so would undermine student learning and achievement of course learning outcomes. Additionally, if and when students use AI in this course, the AI must be cited as is shown within the **NJIT Library AI Citation page** for AI. If you have any questions or concerns about AI technology use in this class, please reach out to your instructor prior to submitting any assignments. Assignments that can be performed using AI: HW#4. Please use your own understanding when replying peer discussions. AI is allowed certain parts of the research paper include outline and general introduction sections. Incase if it is determined that more than 30% of paper was based on AI, the research paper will not be graded.

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) 596-3414. 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)

Course Schedule:

Week-1	Introduction, Concrete material properties	**Research project topics assignment**
Week-2	Concrete testing and repair	**HW#1**
Week-3	Structural Steel	**RA1 (Research Article)**
Week-4	Timber and Masonry	**HW#2**
Week-5	Infrastructure condition assessment tools	**RA2**
Week-6	Midterm Exam	
Week-7	Dams, Bridges, Tunnels Pavements, Foundations, Pipelines and Infrastructure failures during construction	**RA3**
Week-8	Resilience and Sustainability into Civil Engineering Projects, Value engineering	**HW#3**
Week-9	Case studies/guest lecture	**HW#4**
Week-10	Term paper presentations	**TBD**
Week-11	Research project report due	**TBD**

Course Objectives Matrix - 615 – 850

Strategies and Actions	Course Student Learning Outcomes	**Student Outcomes (1-7)**	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1:				
Emphasis on learning various materials	Understand the infrastructure materials characteristics and degradation mechanisms	1,2,3	Engineering Practice	HW, Class discussion and Midterm exam
Course Objective 2:				
Emphasis on understanding the failure mechanism of structural members	Identify the typical failures in infrastructures and facilities	1,2,3,4	Engineering Practice	HW, Class discussion and Midterm exam
Course Objective 3:				
Emphasis on the latest tools and technologies	Knowledge of tools and technologies used in infrastructure remediation	1,2,3,4	Engineering Practice	HW, Class discussion and Midterm exam
Course Objective 4:				
Emphasis on critical thinking and scientific writing	Writing a research paper based on technical journal format	5,6 7	Engineering Practice and Professional Growth	Research paper and presentation

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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