JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING
NJIT New Jersey Institute of Technology

# CE 495 – 104 Civil Engineering Design 2 – Spring 2024

Instructor: Joseph Baladi, P.E., P.P., CME, CPWM.

Contact Information:

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Schedule: Wednesdays, Central King Building Room 310, Time: 6:00 PM – 8:50 PM

Prerequisites: CE 333, CE 432, CE 443, CE 494

Texts: No textbook. Handout materials only.

Outline: Provides students with the type of design experience they would receive if engaged in civil and environmental engineering design practice. Course will focus on one or more of these design areas: structural, geotechnical, transportation and planning, and sanitary and environmental engineering.

| Sessions | Lecture Topic |
|---|---|
| Week1 &2 | Introduction to Capital Projects and NJTPA. |
| | Federal Capital Projects overview, delivery, phases and procedures. |
| | Project specifics: Location, significance, jurisdictions, problem statement. |
| Week 3&4 | Existing and proposed circulation options, preferred alternatives. |
| | Engineering design standards. Manuals and software required. |
| Week 5&6 | Engineering plans layout. Review discussion on initial submittals for all groups. |
| | Construction drawings and details. |
| Week 7 & 8 | Signing & striping plans. Utility and pavement plans. Signal and electrical plans. |
| | Cost estimate, detail sheets, cross sections and profiles. |
| Week 9 & 10 | Site Visit (Weather Permitting) – Review progress group work and guidance |
| Week 11 & 12 | Final Project due – Addressing individual group specific design situations. |
| Week 13 &14+ | Presentations and project discussions. Closing remarks and comments. |

## Academic Integrity:

*"Academic integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.*

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"

Attendance: Students are required to attend all lectures. Class recordings are not permitted without instructor permission.

**Outcomes Course Matrix – CE 495 Civil Engineering Design II**

| Strategies, Actions and Assignments | ABET Student Outcomes (1-7) | Program Educational Objectives | Assessment Measures |
|---|---|---|---|
| **Student Learning Outcome 1: Apply a simulated submission and acceptance process normally associated with the initial design phases for a civil engineering project. Prepare sketch plats, preliminary engineering design, and a related environmental assessment.** | | | |
| Present an innovative transportation management plan that saves time and money while minimizing impacts to a real-world situation. | 1, 2, 7 | 1, 2 | Final Report & Plans |
| Understanding impact assessment criteria and measures of effectiveness. | 2, 4 | 1, 2 | Final Report & Plans |
| Work individually and within multi-disciplinary design teams. | 3, 5 | 1, 2 | Final Report & Plans |

## 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 scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward safe, practical, resilient, 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 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 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.

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 and inclusive 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 conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

## Course Materials

A. Site base maps including boundary and topography data (CAD data).
B. Regulatory code as required.

1. NJ Stormwater Management Rules www.state.nj.us/dep/watershedmgt/rules.htm

2. NJDEP Stormwater Best Management Practices Manual and Rules www.njstormwater.org/bmp_manual2.htm

C. Reference Materials

1. Bergen County Soil Survey http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

2. Design software and manuals for stormwater management design.

3. NJDEP Nonstructural Stormwater Points System (NSPS) http://www.njstormwater.org/index.html

4. Supplementary materials for student review

5. MUTCD, MLUL, RSIS, AASHTO and other State and Federal Manuals

6. Additional online data and mapping resources, i.e. Google Earth, Flash Earth, NJ IMap, etc.

7. Textbooks from previous preparatory courses as well as other related references as required.

8. Reports and materials handed by Instructor

## Course and Project Report Requirements

**Project Plans:** Utilizing the above mentioned material each team (5 student's max. per team) will prepare plans for roadway improvements.

**Oral Presentation:** For the final oral presentations, each team member will present their work to the class by discipline, i.e., transportation/planning, geotechnical, hydraulics/water resources, and environment. You are expected to dress and present yourself in a professional manner. Presentations shall be direct and comprehensive. Each team will be allotted 15 minutes to present their project.

**NJTPA Board Summary**: Students are also required to attend one NJTPA board meeting and prepare a summary report. This shall be one to two pages documenting and discussing the student's findings and opinions on the public meeting and the actions of the Board.

**Computer Data and Computations:** Students are required to use available computer applications for required computations in support of the information shown on the plans, profiles

and in the reports. Several applications will be available at the NJIT computer facility and outside sources may be used.

**Teams:** The class will be divided into multiple teams. Each team will use a multidisciplinary approach. That means that each team member will assume a discipline-specific role on the project.

**Team Leader:** You will also designate a team leader. The team leader is the project manager and shall coordinate and manage the project. The team leader will assign discipline-specific roles to team members. Teams are expected to take the project from preliminary design through to the final design report and oral presentation. This discipline-specific approach should not prevent one member of the team from helping out another member of the team. In fact, with four disciplines and three members to a team, all team members will collaborate on one of the four disciplines. Each student is responsible for the work in one discipline and must work with his/her team members on a second discipline. The division of project work among the four disciplines is as follows:

- Transportation and planning – Horizontal and vertical road design, traffic analysis.
- Geotechnical – Lot grading, pavement design and soil erosion control and soil movement (cut/fill) volumes.
- Water resources engineer – storm sewers, water quality devices, detention basin.
- Environmental – Project report editor, cost estimate, environmental impact statement and wetland delineation (Transition areas if required).

**Cost Estimate:** You are to use the resources in the library, online or whatever resources are available and prepare a cost estimate of the public site improvements only (stormwater management system, roadway, etc.)

**Reports:** Reports shall include appendices that include **all** calculations for the storm water management system, traffic, and environmental assessments.

**All calculations are to be initialed by the designer and the person who checked the calculations**. Credit will not be given for unsigned calculations. All your reports are to be concise, well-thought-out and presented in a professional format. The report should explain what you are constructing, where you are constructing it and how these new improvements meet the governing codes.

Please remember there will be **no extensions granted** so use the semester time wisely. Many students underestimate the time required to learn the software, design, organize, publish and present the subdivision design. Students are asked to consider carefully the time required to learn the design process and all of the software required to publish this data. Make copies of your submission as the projects submitted will not be returned.

## Minimum Requirements for Maps and Reports

**Drawing Standards:**

1. All existing and proposed property line print black with varying widths.
2. All existing features and contours print in shades of gray with varying widths.
3. All proposed conditions are to print bold black or in color with varying widths.
4. All printed plan labels shall be legible with the naked eye and shall be submitted in an ordered stapled set. The following shall appear on all maps.

**Unit Precision and Format – All plans:**

1. Contours, P=0.
2. Distances, P=0.01.
3. Elevations, P=0.01.
4. Radii, P=0.01.
5. Angles, DMS to one second (N 90d 45’ 33” E).
6. Stations, P=0 for centerline markers at 100’, P=0.01 for location.
7. Area, P=0 for square feet, P=0.001 for acres.
8. Volume, P=0 for cubic feet and cubic yards.

**Content and Format**

All reports shall be typed and presented as a professional report with a cover sheet, table of contents and letter of transmittal. The group number shall be included on the first page or cover of all documents.

Reports shall document how the project design conforms to the code and defend any design exceptions. All groups must attempt to design without design exceptions. Any request for design exceptions must be presented to the course instructor for preliminary approval at least two (2) weeks prior to the final submission date. No design exceptions will be granted after this date.

## Final Submittal

A. Report

1- Introduction: corridor description, towns, aerial, general location, history, and overall outlook for the area.
2- Purpose and need statement.
3- Existing conditions: Description and problem statement
4- Proposal description: Number of lanes, roadway widening, circulation….
5- Team strategy: Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives.
6- HCS or other software analysis for existing and proposed traffic and lane configuration, LOS.
7- Cost estimate for your project.
8- References: List of all references you used: RSIS, AASHTO, MUTCD, reports,…

B. Plans: Final Submittal.

1. Cover sheet: North arrow, keymap, address, scale, date, a place holder chart for properties owners within 200 ft (you do not to have actually list the individual owners for the sake of time limitation), utilities list, project name, block and lot. Quantity chart, and units (no pricing). List of all drawings in the set with page number.
2. Existing plan
3. Proposed corridor: Lane configuration, signage, ADA, elevation, access, traffic control devices, parking, road, mandatory road widening.
4. Construction drawings: Cross sections, longitudinal profile, quantity calculation, show all of the work that will be done in the field, include ADA Ramps. Basic drainage coponents.
5. Pavement plans: Maybe also included with construction drawings.
6. Utility plans, drainage, relocation of utilities….
7. Signing and striping plans, ADA, crosswalks, stop bars, lane striping, arrows, paint quantities.
8. Detail Sheet: shows all details that are used, such as curb, manhole, inlets, plantations….
9. HCS analysis
10. Cost estimate (all of thr above items combined in one file)

*Refer to sample Essex Street drawings in your package for more details indicated on each sheet.

**One combined PDF file, named by the class – section - group individual name Last name first: CE495-SectionXXX_Brown Tom - Smith Eric - _____.pdf**
**PDF file includes your report, a set of plans, and presentation materials. USE PDF Pro to combine everything into ONE PDF document.**

Instructions for printing to PDF

1. Set Name to DWG to PDF.pc3
    a. Properties
        i. Custom properties
            1. Additional output setting
                a. Uncheck “Include layer information”

Adobe full version is recommended to use but you can use any software to combine the files.

The presentation of the project will utilize PowerPoint or PDF. The presentation will be due no later than the due date of the project (See above).

The NJTPA Committee/Board meeting is mandated but no grades will be assigned to attendance.

Additional Notes:

1. Attendance will be taken at the beginning of the class and may affect your final grade.
2. In case of any student misses a class, or fail to submit assignment or presentation on time, the Office of the Dean of Students is the only entity that would determine the legitimacy of the absence or the situation via a written email addressed to the course instructor.
3. It is the student's responsibility to contact the office mentioned above and make his/her case with proper documentations.
4. Students within the same group, may get different grade based on class & group participation.

Spring Recess Sunday March 10 – Saturday March 16

Due date: Wednesday April 10, 2024

Plan Submittal Presentation: Elaboration on your plans, traffic and drainage calculation no additional materials is required during the presentation date, you simply have to hand the project by the due date if you choose to present early.

Revised: 02/20/2024