Spring 2020

FED 101-008: Fundamentals of Engineering Design for Civil Engineers

Frank L. Golon

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FED 101 – Fundamentals of Engineering Design (CE), Section 008

Spring 2020

Corequisites: HUM 101 and (ENGR 101 and MATH 110) or MATH 111. Teams of students work on open-ended engineering projects. Sections are offered to represent an introduction to real-world engineering design problems in a specific engineering discipline. Topics covered include introduction to basic engineering design elements, processes, measurements, product and project design and development, with hands-on experiments in a specific major area. Students also learn to use engineering tools for computer-aided design and simulation. Technical writing and oral presentation along with project management skills are emphasized. Students are required to take an FED section corresponding to their declared major. Undecided students will be placed in FED sections which best correspond to their interests according to space availability.

OUTLINE OF COURSE
1. Course Description
2. Required Texts
3. Lecture Classroom
4. Attendance Policy
5. Grading Policy
6. Withdrawals and NJIT Honor Code
7. Class Requirements
8. CEE Mission, Program Objective and Student Outcomes
9. Lecture Topics – Engineering and Technology
10. Lecture Dates

1. COURSE DESCRIPTION
Main Topics: Civil infrastructure – bridges, dams, roads & highways, tunnels, canals, sewer & water systems, and buildings of all types, along with engineering economics

Fundamentals of Engineering Design (FED) is a two-credit course that will introduce students to the basics of Civil Engineering construction, design, and inspection. This course will provide an overview of the different disciplines within Civil Engineering, including structures, geotechnical, infrastructure, water resources, engineer economics environmental, transportation, construction engineering and construction management.
FED will facilitate, through class lecture, demonstrations and student participation, a blending of engineering science and technology.

- Guest lecturers may come to class and share their experience working in the field.
- Student organizations and department personnel will be introduced.
- Students will be required to complete a team technical project and make an oral presentation on their project to the class.
- All homework assignments will be due the following week unless otherwise specified by the instructor.

**Moodle**

Assignments and materials for this course will be posted on Moodle. Students must use their UCID to sign in at [http://www.moodle.njit.edu](http://www.moodle.njit.edu)

**Course Instructors:** Frank L. Golon, Ph.D., P.E.  
**Professor**

*Office:* 300 Wilson Avenue  
*Office Hours:* By appointment

**E-mail:** [Frank.L.Golon@njit.edu](mailto:Frank.L.Golon@njit.edu)

2. **REQUIRED TEXTS:** NONE REQUIRED  
One Architectural Scale & One Engineering Scale (book store carries)

3. **LECTURE CLASSROOM**

    Colton Hall 416  
    Tuesday and Thursday: 8:30am – 9:50am

4. **ATTENDANCE POLICY**

   Students must sign in for every class. You are required to attend every lecture class. If a class is missed, it is the student’s responsibility to submit the homework on the assigned submission date. If you miss more than one (1) class lecture without excuse/prior permission, each subsequent class missed will result in loss of up to 5% of the overall grade. Five (5) or more total missed classes will result in an F grade.

**NJIT FRESHMAN ATTENDANCE POLICY**

All freshmen are required to attend every class.

Late arrival to class is not permitted. It is the decision of the instructor to admit you to the class late. Approval for late arrival will be considered by the instructor prior to the class. Request for late arrival must be sent via e-mail to the instructor. Students will not be
admitted to class if they overslept or forgot they had a class or if they provide some other similar explanation.
5. GRADING POLICY

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework Assignments (5)</td>
<td>20%</td>
</tr>
<tr>
<td>Technology Special Topic</td>
<td>15%</td>
</tr>
<tr>
<td>Saturday site visit Job Site or Dam.</td>
<td></td>
</tr>
<tr>
<td>Quizzes and/or Project Assignments</td>
<td>30%</td>
</tr>
<tr>
<td>1. Site Civil</td>
<td>10%</td>
</tr>
<tr>
<td>2. Critical Infrastructure</td>
<td>10%</td>
</tr>
<tr>
<td>3. Building Inspection &amp; Design</td>
<td>10%</td>
</tr>
<tr>
<td>Project Report – Oral Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Topic: Civil Engineering</td>
<td></td>
</tr>
<tr>
<td>(presentation will be evaluated based on the following traits): Nonverbal Skills, Verbal Skills and Content</td>
<td></td>
</tr>
<tr>
<td>Class attendance &amp; Participation</td>
<td>20%</td>
</tr>
<tr>
<td>Plan reading, scales, code evaluation, Etc.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

EXTRA CREDIT: problems to be assigned Structural, geotechnical, site civil, 10 points

Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100-90</td>
</tr>
<tr>
<td>B+</td>
<td>89-85</td>
</tr>
<tr>
<td>B</td>
<td>84-80</td>
</tr>
<tr>
<td>C+</td>
<td>79-75</td>
</tr>
<tr>
<td>C</td>
<td>74-70</td>
</tr>
<tr>
<td>D</td>
<td>69-60</td>
</tr>
<tr>
<td>F</td>
<td>Below 60</td>
</tr>
</tbody>
</table>
6. WITHDRAWALS AND NJIT HONOR CODE
In order to insure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline will not be permitted unless extenuating circumstances (e.g., major family emergency or substantial medical difficulty) are documented. The course Professors and the Dean of Students are the principal points of contact for students considering withdrawals.

The NJIT honor code will be upheld and any violations will be brought to the immediate attention of the Dean of Students. http://www.njit.edu/academics/pdf/academic-integrity-code.pdf.

All students are responsible for upholding the integrity of NJIT by reporting any violation of academic integrity to the Office of the Dean of Students. http://www.njit.edu/doss. The identity of the student filing the report remains anonymous.

7. CLASS REQUIREMENTS
• Homework must be handed to the instructor in the class. Homework will not be accepted thru e-mail or Moodle posting. Homework will not be accepted after the due date. Hand written assignments will not be accepted.

• Each assignment must include the following information on the upper right corner of each page.
  o Your name
  o Date
  o Learning Communities ID (if applicable)
  o Number of pages
  o Assignment Number and/or Assignment Name

• Homework must be stapled if more than two (2) pages. Loose page assignments will not be accepted.

• Cite your references when writing your individual and group reports. Use the format identified in your HUM 101 course.

• Each person will contribute to and be responsible for the team technical report, the presentation slides, and participation in making the presentation.

• At the end of the course, each student will be required to submit an evaluation of the performance of their project team members.
The schedule is not absolutely fixed. It is prepared only to give students the topics to be covered in the course. Schedule is subject to change as per the availability and convenience of guest lecturers and that of the field visit site personnel.

Students will be informed of all changes in advance and any changes to the syllabus will be discussed in class.

Students are encouraged to back up their work on a personal flash drive or compatible media. You are required to save your homework assignments.

Cell phones/tablets/laptops, etc. must be turned off in class. Electronic devices can be used when it is necessary for the class when directed by the instructor.

Remove hats, sunglasses, ear buds.

Leaving the room for any reason is permissible at any time. Please do so quietly.

8. CEE MISSION, PROGRAM 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 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 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

Revised: 2/13/18

<table>
<thead>
<tr>
<th>Outcomes Course Matrix – FED 101 – Fundamentals of Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategies, Actions and Assignments</strong></td>
</tr>
<tr>
<td><strong>Student Learning Outcome 1:</strong> Work on engineering design problems at the start of their education to stimulate their interest in engineering.</td>
</tr>
<tr>
<td><strong>Student Learning Outcome 2:</strong> Use the team approach to problem solving.</td>
</tr>
<tr>
<td><strong>Student Learning Outcome 3:</strong> Practice oral and written communication skills.</td>
</tr>
</tbody>
</table>
9. LECTURE TOPICS – ENGINEERING AND TECHNOLOGY

Lectures may include, but not limited, to the following topics.

**Introduction to Technology**

a. Design/Build/Inspections/Budget/Analyze  
b. Drone/Bluetooth Technology  
c. Materials Science/Protective Technologies

**Civil Engineering – Discipline Specific**

a. Structural Engineering  
b. Geotechnical Engineering  
c. Construction Engineering/Management  
d. Engineering Economics  
e. Environmental Engineering  
f. Contract Law  
g. Site Engineering

**Engineering Topics**

a. “The Soft Skills” – Engineers and Writing  
b. Engineering cost estimating & scheduling  
c. Spreadsheets (EXCEL)  
d. PennAve vs. Newark Water Authority–Contract Case Study  
e. Basics of Engineering Mechanics  
f. Data Presentation–Dr. Hsu testing  
g. OSHA & Safety Engineering  
h. Life Cycle Assessment

**Video Discussion Topics**

a. Construction & Inspection Engineering

**Project Report** (topics suggested by the Professor or other topics as approved by the Professor)
FED 101. Fundamentals of Engineering Design. 2 credits, 3 contact hours (2;1;0).

Corequisite: HUM 101 and MATH 110 or MATH 131 or MATH 111. Teams of students work on open-ended engineering projects. Sections are offered to represent an introduction to real-world engineering design problems in a specific engineering discipline. Topics covered include introduction to basic engineering design elements, processes, measurements, product and project design and development, with hands-on experiments in a specific major area. Students also learn to use engineering tools for computer-aided design and simulation. Technical writing and oral presentation along with project management skills are emphasized. Students are required to take an FED section corresponding to their declared major. Undecided students will be placed in FED sections which best correspond to their interests according to space availability.
Course Objectives
FED 101 – Fundamentals of Engineering Design

10. LECTURE TOPICS – ENGINEERING AND TECHNOLOGY

Lectures may include, but not limited, to the following topics.

**Introduction to Technology**
- d. Design/Build/Inspections/Budget/Analyze
- e. Drone/Bluetooth Technology
- f. Materials Science/Protective Technologies

**Civil Engineering – Discipline Specific**
- h. Structural Engineering
- i. Geotechnical Engineering
- j. Construction Engineering/Management
- k. Engineering Economics
- l. Environmental Engineering
- m. Contract Law
- n. Site Engineering

**Engineering Topics**
- b. “The Soft Skills” – Engineers and Writing
- b. Engineering cost estimating & scheduling
- c. Spreadsheets (EXCEL)
- d. PennAve vs. Newark Water Authority–Contract Case Study
- e. Basics of Engineering Mechanics
- f. Data Presentation-Dr. Hsu testing
- g. OSHA & Safety Engineering
- h. Life Cycle Assessment

**Video Discussion Topics**
- b. Construction & Inspection Engineering

**Project Report** (topics suggested by the Professor or other topics as approved by the Professor)
COURSE OUTLINE (Subject to updating throughout semester)

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Textbook/Reading</th>
<th>Assignment (*)</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21 &amp; 23 Jan</td>
<td>To be assigned or hand-outs</td>
<td>Syllabus Review &amp; Intro Student presentation for ASCE &amp; AWWA</td>
<td>Overview of Civil Engg Industry; ASCE &amp; AWWA presentation</td>
</tr>
<tr>
<td>2</td>
<td>28 &amp; 30 Jan</td>
<td>Financial Analysis &amp; Money Mgmt</td>
<td>Engg Economics Assignment #1</td>
<td>Loans &amp; time value of money</td>
</tr>
<tr>
<td>3</td>
<td>4 &amp; 6 Feb</td>
<td>Plan reading &amp; scales Buildings-Arch &amp; Engg</td>
<td>Assignment #2</td>
<td>Arch &amp; Engg Plans</td>
</tr>
<tr>
<td>4</td>
<td>11 &amp; 13 Feb</td>
<td>Plan reading &amp; scales Site/Infrastructure and handout</td>
<td></td>
<td>Dams &amp; Bridges</td>
</tr>
<tr>
<td>4a</td>
<td>15 Feb</td>
<td>Cushetunk Lake Dam Field Trip</td>
<td>Inspection report</td>
<td>Dam Inspection</td>
</tr>
<tr>
<td>5</td>
<td>18 &amp; 20 Feb</td>
<td>Lake Cushman Dam Restoration</td>
<td>Original repairs 1994 Inspections Present Assignment #3</td>
<td>Gunite Repairs 2008</td>
</tr>
<tr>
<td>5a</td>
<td>22 Feb</td>
<td>Cushetunk Lake Dam Field Trip</td>
<td>Inspection report</td>
<td>Dam Inspection</td>
</tr>
<tr>
<td>6</td>
<td>25 &amp; 27 Feb</td>
<td>Wreak Lead bridge MTA Al Mellini</td>
<td>Bascule bridge Cable Presentation</td>
<td>Repairs after hurricane Bus Communication</td>
</tr>
<tr>
<td>7</td>
<td>3 &amp; 5 Mar</td>
<td>Geotechnical Engg &amp; site evaluation</td>
<td>Borings and test pits Assignment #4</td>
<td>PennAve Quiz/Project</td>
</tr>
<tr>
<td>8</td>
<td>10 &amp; 12 Mar</td>
<td>IAB -Building design &amp; construction foundations</td>
<td>IAB - Codes deep foundations &amp; bldg. foundation</td>
<td>IAB Presentation Local sites</td>
</tr>
<tr>
<td>9</td>
<td>17 &amp; 19 Mar</td>
<td>Spring Break</td>
<td>Spring Break</td>
<td>Sunday 15 – Sunday 22</td>
</tr>
<tr>
<td>10</td>
<td>24 &amp; 26 Mar</td>
<td>Building design superstructure</td>
<td>Handout class projects</td>
<td>Quiz/Project</td>
</tr>
<tr>
<td>11</td>
<td>5 &amp; 8 Nov</td>
<td>Building design Materials</td>
<td>Assignment #5 handout, Testing materials</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>31 Mar &amp; 2 April</td>
<td>Fast track case study South Street Urban Renewal</td>
<td>MS schedule &amp; presentation with problems</td>
<td>Practical Case Studies-Newark &amp; Elizabeth Projects</td>
</tr>
<tr>
<td>13</td>
<td>7 &amp; 9 April</td>
<td>Design requirements</td>
<td>Wind &amp; Earthquakes</td>
<td>Building and structures</td>
</tr>
<tr>
<td>14</td>
<td>14 &amp; 16 April</td>
<td>Class presentations</td>
<td>Student Presentations</td>
<td>Student Presentations</td>
</tr>
<tr>
<td>15</td>
<td>21 &amp; 23 April</td>
<td>Class presentations</td>
<td>Student Presentations</td>
<td>Student Presentations</td>
</tr>
<tr>
<td>16</td>
<td>28 &amp; 30 April</td>
<td>Class presentations</td>
<td>Student Presentations</td>
<td>Student Presentations</td>
</tr>
<tr>
<td>17</td>
<td>5 May</td>
<td>Class presentations</td>
<td>Class presentations</td>
<td>Review Materials</td>
</tr>
<tr>
<td>17</td>
<td>8 May</td>
<td>Finals week</td>
<td>TBD</td>
<td>Final cover entire semester</td>
</tr>
</tbody>
</table>

Reading day 1 & 2 May 6 & 7 - Final Exam Period begins: May 8. Ends May 14

OSHA & Ethics will be covered each week specific to the topics
Assignment sheet will be handed out in class and/or found in Moodle with due dates
*Actual Assignments may differ from list and can be changed by Instructor during Semester.
**Fall 2019 Academic Calendar** (refer to NJIT Registrar for specific details)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 21, 2020</td>
<td>First Day of Classes</td>
</tr>
<tr>
<td>January 31, 2020</td>
<td>Last Day to Add/Drop Classes</td>
</tr>
<tr>
<td>April 6, 2020</td>
<td>Last Day to Withdraw</td>
</tr>
<tr>
<td>March 15–22, 2020</td>
<td>Spring Break</td>
</tr>
<tr>
<td>May 5, 2020</td>
<td>Last Day of Classes</td>
</tr>
<tr>
<td>May 8, 2020</td>
<td>Final Exam Begin</td>
</tr>
<tr>
<td>May 14, 2020</td>
<td>Final Exams End</td>
</tr>
</tbody>
</table>