Spring 2021

CE 307-102: Geometric Design for Highways

Joyoung Lee

NJIT New Jersey's Science & Technology University

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CE 307-101 Geometric Design for Highways Spring 2021

Course Description:

This course will discuss the basic principles and techniques of highway geometric design, including: route layout, alignment, earthwork, and safety considerations. Students should be able to understand and apply these principles to highway geometric design problems. Students also use computer-aided design tools to develop and analyze highway horizontal and vertical alignments. Example problems that typically be appeared in FE/PE exams will be introduced in the course.

Canvas:

https://njit.instructure.com/courses/15641

Instructor: Joyoung Lee

Office: Room #274 Tiernan Hall

Office Hours: 3~5 PM Wednesday, 10~11AM Friday, Anytime by appointment

Email: jo.y.lee@njit.edu

Suggested Text:

F.L. Mannering and S.S. Washburn. Principles of Highway Engineering and Traffic Analysis, **6th (or 7th) Edition**, John Wiley & Sons, Inc., ISBN 978-1-1193-8558-5

Reference Texts:

Garber, Nicholas, and Hoel, Lester, Traffic and Highway Engineering,
5th Edition, Cengage Learning, 2015, 2009, ISBN-13: 978-1-133-60515-7

American Association of State Highway Officials A Policy on Geometric Design of Highways and Streets, 4th Edition, (AASHTO) 2001
ISBN# 1-56051-156-7

NJDOT Design Manual-Roadway,
http://www.state.nj.us/transportation/eng/documents/RDM/

Course Sections:

Meeting	Section Dates	Topic/*Assignment*
1	1/20	- Course Overview & Introduction to Highway Geometric Design **- Assignment #1**
2	1/27	- Highway Functional Classification & Grade Effects - Highway Design Controls and Criteria **- Assignment #2**
3	2/3	- Geometric Design of Highways – Horizontal Alignments **- Assignment #3**
4	2/10	- Geometric Design of Highways – Horizontal Alignments **- Assignment #4**
5	2/17	- Geometric Design of Highways – Horizontal Alignments - Geometric Design of Highways – Vertical Alignments **- Assignment #5**
6	2/24	- Geometric Design of Highways – Vertical Alignments **- Assignment #6**
7	3/3	- Geometric Design of Highways – Vertical Alignments **- Assignment #7**
8	3/10	- Exam 1
9	3/17	Spring Recess. No Class
10	3/24	- Cross-Section and Earthwork **- Assignment #8**
11	3/31	- Cross-Section and Earthwork **- Assignment #9**
12	4/7	- Highway Design Lab: AutoCAD Civil 3D
-	4/14	- Highway Design Lab: AutoCAD Civil 3D **- Assignment #10**
13	4/21	- Intersection Design, Interchange Design
14	4/28	- Course Wrap-up
15	TBD	-Exam 2

Grading Policy:

- Assignment: 30%
- Exam 1: 20%
- Exam 2: 20%
- Project: 30%
- Extra Credit: up to 5%

Grading Scale:

A: 100-90
B+: 89-85

B: **84-80**
C+: **79-75**
C: **74-70**
D: **69-60**
F: **Below 60**

Attendance Policy:

- Each student will be excused to miss up to two classes with prior permission/VALID reason. Each subsequent class absence will be reported to the Dean of Students and may affect student's standing and grade.
- Five (5) or more missed classes may result in an F grade.

Withdrawals:

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.

NJIT Honor Code:

The NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students. The Honor Code can be found at (http://www5.njit.edu/doss/policies/honorcode/index.php).

Assignment Policy:

- The assignments will be targeted to provide practice for methods that may be included in course exams. There will be approximately seven homework assignments during the semester. Homework should be turned in at the start of the class period identified by the instructor. **No late homework will be accepted.**
- Collaborating, sharing, and/or copying of exam/homework is **NOT** allowed. Credit will not be given to individuals who either initiated, allowed, or participated in such behaviors. The NJIT honor code will be upheld and any violation will be brought to the immediate attention of the Dean of Students.

Syllabus Information:

The dates and topics of the syllabus are subject to change; however, students will be consulted with and must agree to any modifications or deviations from the syllabus throughout the course of the semester.

Email Policy:

N/A

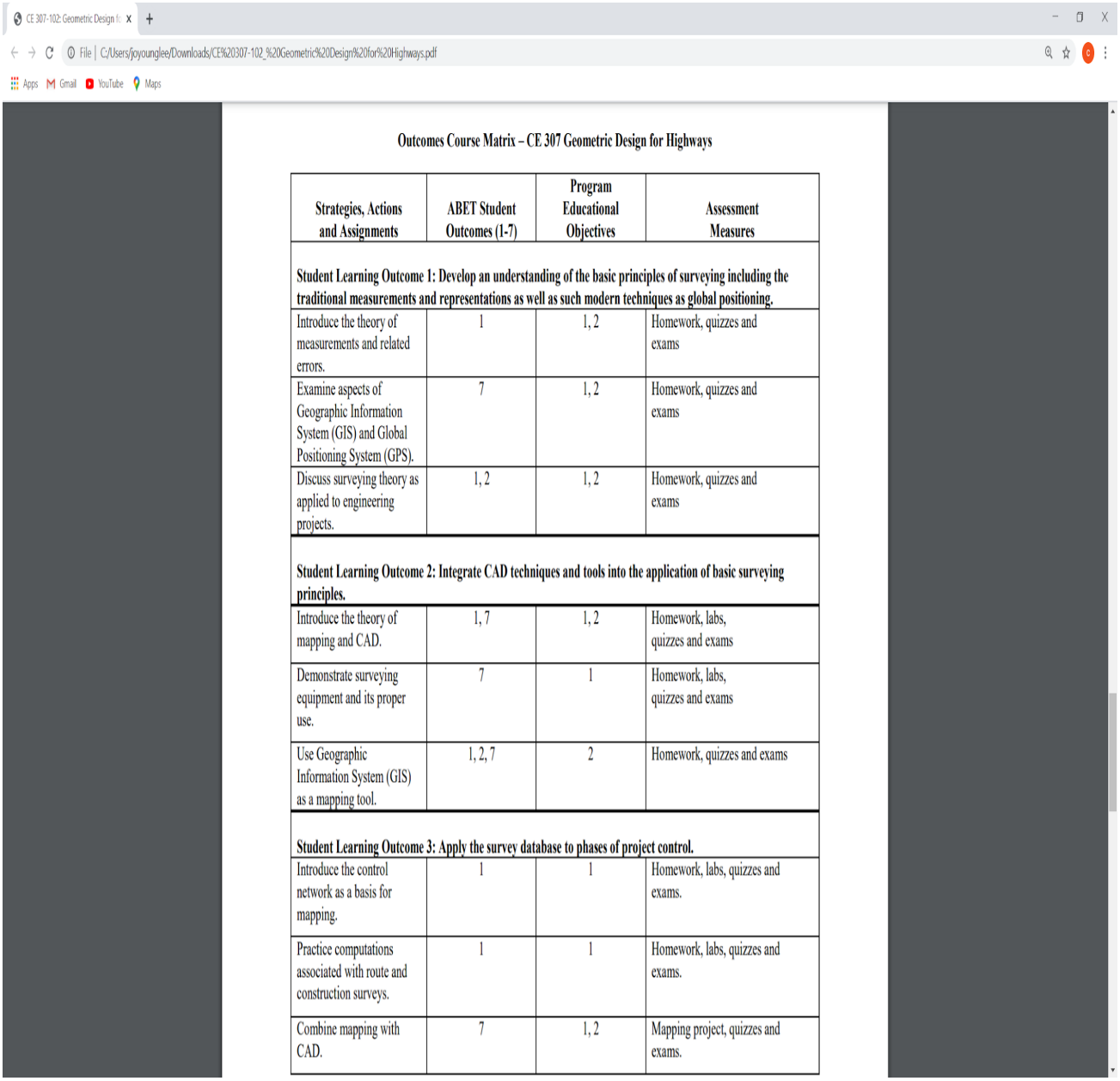
Items Required for this Course:

1. Scratch Paper
2. Engineering Scientific Calculator
3. Pencil and Eraser
4. Ruler

Dress Policy:

N/A

Outcomes Course Matrix – CE 307-101 Geometric Designs for Highways



Outcomes Course Matrix – CE 307 Geometric Design for Highways

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Develop an understanding of the basic principles of surveying including the traditional measurements and representations as well as such modern techniques as global positioning.			
Introduce the theory of measurements and related errors.	1	1, 2	Homework, quizzes and exams
Examine aspects of Geographic Information System (GIS) and Global Positioning System (GPS).	7	1, 2	Homework, quizzes and exams
Discuss surveying theory as applied to engineering projects.	1, 2	1, 2	Homework, quizzes and exams
Student Learning Outcome 2: Integrate CAD techniques and tools into the application of basic surveying principles.			
Introduce the theory of mapping and CAD.	1, 7	1, 2	Homework, labs, quizzes and exams
Demonstrate surveying equipment and its proper use.	7	1	Homework, labs, quizzes and exams
Use Geographic Information System (GIS) as a mapping tool.	1, 2, 7	2	Homework, quizzes and exams
Student Learning Outcome 3: Apply the survey database to phases of project control.			
Introduce the control network as a basis for mapping.	1	1	Homework, labs, quizzes and exams.
Practice computations associated with route and construction surveys.	1	1	Homework, labs, quizzes and exams.
Combine mapping with CAD.	7	1, 2	Mapping project, quizzes and exams.

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 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: 9/3/19