Course Syllabus for
North Carolina State University
Department of Civil, Construction, and Environmental Engineering
CE 403 / 503, Highway Design - Summer 2024 (3 Credit Hours)

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Class Time: Pre-recorded Lectures (with live introduction session)

Office Hours: Appointments available through instructor via Zoom

Course Goal: After completing this course, students will be able to identify relevant design controls for highway design aspects. With these design controls, students will be able to specify a desirable horizontal alignment, vertical alignment, and cross-section for a highway or a street on new or existing right-of-way. Microscopic design features and elements (such as lane widths, curve characteristics, etc.) and macroscopic design principles/concepts are covered.

Prerequisites: A grade of C- or better in CE 305. Credit will not be given for both CE 403 and CE 503.

Text: AASHTO, "A Policy on the Geometric Design of Highways and Streets," Seventh Ed., 2018. *Note: Students are eligible to purchase the text at the AASHTO member price.*

Supplemental, Optional Resources (each are available for free):
- Highway Engineering: Planning, Design, and Operations. Findley et al. (digital version available for free through NCSU Library)
- NCEES Civil Engineering PE Reference Handbook
- NCDOT Roadway Design Manual

Evaluation[1]:

	CE 403	CE 503	Due Date/ Exam Date	Deadline For Questions
Team Project	20 %	20 %	July 14	July 12
Peer Evaluation	5 %	5 %	July 21	July 19
Homework 1	5%	5 %	June 9	June 7
Homework 2	10 %	5 %	June 30	June 28
Homework 3	10 %	10 %	July 21	July 19
Midterm Exam	25 %	25 %	June 26 (5PM-6:15PM)	
Research paper	N/A	5 %	July 28	July 26
Final exam	25 %	25 %	July 29 (4PM-6:30PM)	

Review your final exam schedule and let me know by the end of the 2nd week of the semester if you want to request any adjustments to the exam time for this course.

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[1] For all assignments/exams, you should show your process for deriving answers. Make sure to include intermediate calculations and steps and include all relevant information/data in your submission.

Grading Scale:

$97 \leq$ A+ ≤ 100	$80 \leq$ B- < 83	$63 \leq$ D < 67
$93 \leq$ A < 97	$77 \leq$ C+ < 80	$60 \leq$ D- < 63
$90 \leq$ A- < 93	$73 \leq$ C < 77	$0 \leq$ F < 60
$87 \leq$ B+ < 90	$70 \leq$ C- < 73	
$83 \leq$ B < 87	$67 \leq$ D+ < 70	

Professional Development Support for Graduate Students: http://go.ncsu.edu/ccee-profdev

Projects:
The projects will be conducted in teams of approximately four students. Teams will turn in one set of deliverables and receive one grade. To encourage equitable participation in the group, each student will complete an evaluation for their group. Students must complete the evaluation to receive a grade for this element.

The list of team members must be sent to the instructor by **June 1** (to set up the peer evaluation in CATME). One team member should email the instructor with the list of team members and cc the other group members. Students who do not provide the instructor with the list of team members by June 1 or who fail to complete the peer evaluation will receive a score of zero for the peer evaluation.

Midterm Exam:
The midterm exam will be open-book and open-notes. Laptop computers are allowed for the exam, but internet access is NOT allowed except when explicitly approved by the instructor. Access is limited to materials provided by the instructor and any materials developed by the student in advance of the exam (i.e., excel files for calculations). The exam will follow the course objectives listed above, emphasizing open-ended problems and deep thinking. The exam will be given at the time identified in the course schedule. The exam is typically 7 to 12 questions with a mixture of short answer and computational problems.

Final Exam:
The comprehensive final exam will be open-book and open-notes. Laptop computers are allowed for the exam, but internet access is NOT allowed except when explicitly approved by the instructor. Access is limited to materials provided by the instructor and any materials developed by the student in advance of the exam (i.e., excel files for calculations). The exam will follow the course objectives listed above, emphasizing open-ended problems and deep thinking. The final exam will be given at the time identified in the course schedule below. The exam is typically 10 to 18 questions with a mixture of short answer and computational problems.

Research Paper:
Students enrolled in the graduate version of the class, CE 503, will prepare a term research paper on a highway design topic of their own choosing. The topic needs to be discussed with and approved by the instructor.

Requirements for credit-only grading (S/U):
In order to receive a grade of S, students are required to complete all exams and assignments and earn a grade of C- or better. The conversion from "letter grading" to "credit only (S/U) grading" is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to: http://policies.ncsu.edu/regulation/reg-02-20-15

Requirements for audit grading (AU):
In order to receive a grade of AU, students must attend all classes and complete and turn in all homework assignments. For more details refer to: http://policies.ncsu.edu/regulation/reg-02-20-04

Incomplete grades (IN):
Incomplete grades will be given only under extenuating circumstances, in accordance with NCSU policy as described at the website below. If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. For more details refer to: http://policies.ncsu.edu/regulation/reg-02-50-03

Late Assignments:
Late assignments will be accepted through the third day following stated date and time of the assignment deadline. Assigned grades for late submissions will be subject to a 10 point deduction for each 24-hour period following the due date. This deduction is not prorated. For example assignments turned in anytime during the 24-hour period following the deadline will receive the full deduction and so on. No assignments will be accepted beyond 72 hours after the original deadline.

A variety of methods (cloud-based and physical) are available to store and back-up your computer files. Computers seem to crash at the most inopportune times (near the completion of your assignments), so I highly recommend that you have a system in place to back-up and store your files beyond your local machine.

Academic Integrity:
Violations of academic integrity will be handled in accordance with the Student Discipline Procedures (NCSU REG 11.35.02).

Students are responsible for reviewing the NC State University Policies, Rules, and Regulations (PRRs) which pertain to their course rights and responsibilities, including those referenced both below and above in this syllabus:
- Equal Opportunity and Non-Discrimination Policy Statement https://policies.ncsu.edu/policy/pol-04-25-05 with additional references at https://oied.ncsu.edu/divweb/policies/
- Code of Student Conduct https://policies.ncsu.edu/policy/pol-11-35-01.

Students with Disabilities:
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, 2751 Cates Avenue, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (NCSU REG 02.20.01).

Safety and Risk Assumption:
Students may occasionally have to collect data in the field during the project. This may involve crossing or standing beside roadways. Students standing in the roadway right-of-way to collect data should wear appropriate reflective safety vests—see the instructor to borrow a vest before field data collection. Students should take all other normal safety precautions during these activities. Otherwise there should not be any additional risk experienced during this course.

Class Evaluations:
Online class evaluations will be available for students to complete during the last 2 weeks of the term. You will receive an email message directing you to a website where you can login using your Unity ID and complete your evaluation.

All evaluations are confidential. Instructors will not know how any one student responded to any question, and students will not know the ratings for any instructors.

Evaluation website: https://classeval.ncsu.edu/
Student help desk: classeval@ncsu.edu
More information about ClassEval: http://www.ncsu.edu/UPA/classeval/

Web Resources:
A Wolfware course locker will be maintained for this course.

Extra Expenses:
Students should expect no additional required charges during this course.

Transportation:
Students may have to provide their own transportation to a field trip or project site.

Attendance:
Attendance is expected for all classes. Unless otherwise impractical/impossible, you should notify the instructor of any absences in advance of the absence. If advanced notification is not possible, you should notify the instructor of your absence as soon as possible.

Supporting Fellow Students in Distress:
As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a healthy and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's well-being or yours. When this is the case, I would encourage you to report this behavior to the NC State's Students of Concern website: http://go.ncsu.edu/NCSUcares. Although you can report anonymously, it is preferred that you share your contact information so they can follow-up with you personally.

Course Schedule (Panopto Recordings)

Topic [Assigned Panopto Recording]

1	Course Introduction and Project Development
	• 01/09/24
	• 01/11/24
2	Design Controls & Corridor Selection/Traverses
	• 01/16/24
	• 01/18/24
	• 01/23/24
3	Horizontal Alignment, Vertical Alignment, & Sight Distance
	• 01/25/24
	• 01/30/24
	• 02/01/24
4	Complete Streets/Team Project
	• 02/06/24
	• 02/08/24
5	Cross Section
	• 02/15/24
	• 02/20/24
	• 02/22/24
6	Freeway Design
	• 02/27/24
	• 02/29/24
	• 03/19/24
7	Midterm Exam Review
	• 03/05/24
8	Intersection Design
	• 03/21/24
	• 03/26/24
	• 03/28/24
	• 04/11/24
	• 04/18/24
	• Supplemental information on QEM:
	o https://youtu.be/Pgd4fraeEsM
	o https://youtu.be/_p-rkbCGOPY
	o https://youtu.be/woQXRuiU6zg
	o https://youtu.be/ph5yp6ATd5g
	o https://youtu.be/BI7Fx1hfIFw
9	Complete any remaining videos from Week 8
10	Traffic Calming & Local Street Design
	• 04/04/24
	• 04/09/24
11	TIAs in Highway Design
	• 04/16/24

Supplemental Videos

https://sites.google.com/ncsu.edu/daniel-findley/educational-resources

Topic	YouTube Playlist
Course Introduction	https://youtube.com/playlist?list=PLQ2tBMRKXROaG6k5_UQPB8rrJtQbp9lPh
Project Development	https://youtube.com/playlist?list=PLQ2tBMRKXROZ5xvonpOnrb8bcTW9ilwd2
Design Controls	https://youtube.com/playlist?list=PLQ2tBMRKXROYkFFdYU-1MiigmNmhMuRS_
Corridor Selection / Traverses	https://youtube.com/playlist?list=PLQ2tBMRKXROaJkazMR93knNtQhbdeloXJ
Horizontal Alignment	https://youtube.com/playlist?list=PLQ2tBMRKXRObHBBdCcN_5naxb4wwSfTf8
Sight Distance	https://youtube.com/playlist?list=PLQ2tBMRKXROYD2xjdf0zfFGe1RVYugroX
Vertical Alignment	https://youtube.com/playlist?list=PLQ2tBMRKXROZsDv_W9Ax-ytgp5x3y2BQX
Reading Design Plans	https://youtube.com/playlist?list=PLQ2tBMRKXROa0r88neHQUMKJCLqeqrTGG
Cross Section	https://youtube.com/playlist?list=PLQ2tBMRKXRObJ7PehzzY1YqLPAXNJm1Y2
Roadside Design	https://youtube.com/playlist?list=PLQ2tBMRKXRObvEb-GPvYkGakbr-1GstSX
Freeway Design	https://youtube.com/playlist?list=PLQ2tBMRKXROaxye4gOXXxfg9qpxV9WD1o
Intersection Design	https://youtube.com/playlist?list=PLQ2tBMRKXROZibUu3CasPEcotkis9HPTE
Interchange Design	https://youtube.com/playlist?list=PLQ2tBMRKXROaXpkvtUWrL3xAKGxDlMn2J
Unconventional Arterials	https://youtube.com/playlist?list=PLQ2tBMRKXROb7ZG0p3RFHU1f8Cp5q0GBj
Local Streets	https://youtube.com/playlist?list=PLQ2tBMRKXROaMxjwT0QBFr4a1DptPhECE
Traffic Calming	https://youtube.com/playlist?list=PLQ2tBMRKXRObM8mg7FNiDwcOXgvXByw4V
Complete Streets	https://youtube.com/playlist?list=PLQ2tBMRKXROZbV9XDGuQs6rMoqEdLo_2O
Human Factors	https://youtube.com/playlist?list=PLQ2tBMRKXROZQ65pa8a18BHclp7OH3KNA
Roads Near Campus	https://youtube.com/playlist?list=PLQ2tBMRKXROYMwR4-T0owvn6THyrvtRkU
Excel/Word/PowerPoint	https://youtube.com/playlist?list=PLQ2tBMRKXROY5O2b4qZ3f5cT4iKIiE0Sg
Statistics in Excel	https://youtube.com/playlist?list=PLQ2tBMRKXROZpIaUvJ8FpMcGKnJpc50wR
PE Exam NCEES Equations	https://youtube.com/playlist?list=PLQ2tBMRKXROYAW4OnuL0GjVgfdrtBp9Pp

Appendix A: Helpful Email Tips for Academic and Professional Communication

To assist me with answering your questions, please consider the following suggestions for email (many other sources exist with information, so consider searching for more guidance, if needed). The content and style of an email (particularly in an academic or professional setting) represents you and should receive some thought and attention.

There is often a blurry line between our various forms of communication (from text messaging to social media to email), because we can access all forms from the same device - however, in an academic and professional setting, brevity and informality may be interpreted differently by different individuals depending on their relationship with you and communication preferences.

This guidance (primarily based on an academic setting with a professor) isn't meant to imply that all emails must be completely formal, but that you should consider the audience and subject matter in your preparation of an email. Writing effectively does not simply mean following all the rules. Writing effectively means using writing as an act of human communication and your words should be shaped in light of whom you are writing to and why.

1. Include relevant individuals - Depending on the content of the email, it may be appropriate to CC the course teaching assistant, your study group members, or your project team.

2. Use a relevant and clear subject line - The subject "CE403 Homework #2 - Radius Measurement" works better than "heeeeelp!" or "question" and infinitely better than a blank subject line. Including the course number in your subject also helps me find your email later if I can't immediately respond and then try to find your email later (if I only have a few minutes to respond before another commitment and I spend that time trying to find the email again, it delays my response).

3. Use a salutation and signature - Instead of jumping right into your message or saying "hey," begin with a greeting like "Hello" or "Good afternoon," and then address your professor by appropriate title and last name, such as "Prof. Xavier" or "Dr. Octavius." (Though this can be tricky, depending on your teacher's gender, rank, and level of education, "Professor" is usually a safe bet for addressing a college teacher - "Dr." can be appropriate for instructors with a PhD) Similarly, instead of concluding with "Sent from my iPhone" or nothing at all, include a signature, such as "Best" or "Sincerely," followed by your name.

4. Use standard punctuation, capitalization, spelling and grammar - Instead of writing "idk what 2 rite about in my paper can you help??" try something more like, "I am writing to ask about the topics you suggested in class yesterday."

5. Do your part in solving what you need to solve - If you email to ask something you could look up yourself, you risk presenting yourself as less resourceful than you ought to be. But if you mention that you've already checked the syllabus, asked classmates and looked through old emails from the professor, then you present yourself as responsible and taking initiative. So, instead of asking, "What's our homework for tonight?" you might write, "I looked through the syllabus and course website for this weekend's assigned homework, but unfortunately, I am unable to locate it."

6. Be aware of concerns about making assumptions - Rightly or wrongly, many professors feel that students make assumptions about flexibility with assignment deadlines and other aspects of courses. If you appear to demand help, shrug off absences or assume late work will be accepted without penalty because you have a good reason, your professors may see you as irresponsible or presumptuous. Even if it is true that "the printer wasn't printing" and you "really need an A in this class," your email will be more effective if you to take responsibility: "I didn't plan ahead well enough, and I accept whatever policies you have for late work." In the professional world, the concerns about assumptions/entitlement might also be present and deadlines will be expected to be met whether or not any hurdles are in the way (such as malfunctioning printers or crashed computers).

7. Clearly organize your thoughts/questions - Your email will be most effective if you can clearly communicate your specific question(s). If you have similar questions, you should group them and consider numbering the questions (which will also help in the response).

Some of this content is from or adapted from: https://www.insidehighered.com/views/2015/04/16/advice-students-so-they-dont-sound-silly-emails-essay

Appendix B: Helpful Tips for Group Work

1. Choose group members wisely - Your choice of team members should revolve less around who you are friends with than who has the right skills and motivation to excel in the team assignment.

2. Figure out the best means of communication - The group has been assembled. There are a myriad of ways to communicate and, as a team, it needs to be determined which ways work best for your particular group. Emails, phone calls, Facebook groups, and Google Documents are all possibilities. With Google Documents, all group members are able to collaborate on the same document simultaneously, which may even eliminate the need for some group meetings. No matter which means your group chooses, make sure to have a list of everyone's name, email and phone number sent out to each member. You will regret not doing this if, while struggling to put the project together the night before it's due, you realize nobody wrote the conclusion.

3. Set check-ins and deadlines - Assign each group member tasks they are responsible to complete. If you create periodic check-ins throughout the project, you will be able to ensure every member is contributing – or not contributing. These check-ins let the group come together, share their findings and discuss any problems or new ideas. Deadlines are meant to establish priorities for what needs to get done first and help eliminate panic caused by leaving work for the last minute. Always have everything in writing to avoid confusion or the frantic, "I didn't know that was my job," conversation.

4. Take the lead - Don't fear stepping up and being the team coordinator or leader. If you get stuck with a group full of slackers, this is the perfect opportunity to expand your leadership skills and take control. This doesn't mean being the person who does all the work, but ensuring everything gets done on time. Leaders also facilitate communication between members and help keep members on track. If you find yourself in the leadership role, keep an open mind and listen to everyone's opinions. The best leaders can find a compromise that all group members can agree with. Take the time in an early team meeting to identify and choose a team leader (or leaders). Regardless of the size or composition of the team, every team needs a leader to make certain the things that need to get done get completed.

5. Give a time cushion at the end of the project - People get sick, documents get deleted, group members are irresponsible. For the unexpected and unaccounted for issues, set an earlier date than the actual due date for the project to be completed. By giving the team a few extra days as a time cushion, catastrophes and dilemmas can be solved by the time of the due date.

6. Don't be afraid to ask your professor or TA for help - Asking for help does not show weakness – it proves to professors that you care about the outcome of the project and are willing to try alternative solutions to achieve success. If your research hypothesis is failing or someone is not pulling their weight, have the courage to ask your teacher for help with the next steps.

7. Stay positive - Although time consuming and at times, stressful, group projects are beneficial for providing realistic examples of what your future internship or career may entail. By focusing on the positives instead of the negatives, you give yourself the chance to learn the most out of each project and apply it to the real world.

8. Don't retreat when your ideas are not chosen - Group projects are ALWAYS a compromise of ideas, so you should go into these situations with the notion that even if you have a brilliant idea for the project, it might not be chosen by your teammates. Be flexible and open to compromise. The key here is accepting the idea and moving forward with whatever decisions the team makes -- and fully supporting those efforts.

9. Monitor Team Progress - Sadly, almost all teams have so-called slackers that will not complete their tasks, or not complete them well. Certainly if you are the team leader, one of your key roles is making certain everyone in the team is completing their assigned tasks. But there is no reason for you not to check in on the progress of the team when you are not the leader; remember, it's your grade at stake, so request the team leader keep the entire team abreast of every member's progress.

Information sources: http://college.usatoday.com/2012/05/20/seven-tips-for-surviving-a-group-project/ and
http://www.mycollegesuccessstory.com/academic-success-tools/student-team-tips.html