New York University Tandon School of Engineering
Department of Civil and Urban Engineering
CE-GY-6253: Structural Dynamics
Fall 2017
Professor Charles DeVore, PhD, PE
Monday, 6-8:30pm; Rogers Hall, Rm. 505

Contact: cdevore@nyu.edu
Phone: 347-558-6094
Office hours: By appointment

Course Pre-requisites
Proficiency with calculus, differential equations, linear algebra, and structural mechanics. If you have concerns with your preparation for this course, please contact the instructor.

Catalog Description
Dynamic response of single-degree of freedom systems; theory of vibration of finite degree of freedom systems; influence coefficient method; analytical and numerical solutions to dynamic response problems; and response of continuous systems.

Course Structure
The course will be based on weekly lectures, homework assignments, a group project, and two examinations (midterm and final).

Textbook

Course Requirements
- Lecture attendance
- Weekly homework assignments
- Midterm examination
- Final group projects
- Final examination

Attendance
Please email the instructor if you will be unable to attend a lecture. This is necessary to arrange for submitting assignments. If you have a medical, religious, or other reason for absence, please contact the Coordinator of Student Advocacy in the Office of Student Affairs and they will make the necessary arrangements with the instructor. Students will be responsible for making up any missed work.
Grading
15% -- Homework Assignments
20% -- Midterm Examination
30% -- Group Design Project
35% -- Final Examination

Homework
Homework assignments will not be graded and will simply be checked for completion. Students will be required to check their own answers based on the distributed solutions. No credit will be given for late assignments and will be penalized for unclear or messy solutions. You are required to submit solutions that are neat, clear, and easy to follow.

Midterm Examination
The midterm exam will be administered during class. The exam is closed book, except for one sheet of notes (single side only).

Group Design Project
You will be responsible for a collaborative design project that will be completed by the end of the semester. This project will consist of solving a design problem and communicating the results via a class presentation and final report. The group will be responsible for collaboratively solving the problem, which will require computer analysis, engineering calculations, and a professional presentation and report. Further details will be provided in the middle of the semester when the groups are formed and the projects are assigned.

Final Examination
The final exam is comprehensive and will be scheduled based on the course schedule. One sheet of notes (both sides) is allowed for the final exam.

Software Resources
As an engineer in training, you will be responsible to use some of the tools of the trade. The following software packages are recommended but equivalent replacements can be used at the discretion of the student and instructor.

- MATLAB -- used for simulating dynamic system response and plotting results
- MathCAD -- used for engineering calculations and presentation of results
- SAP2000 -- used for structural analysis and time history response
Course Schedule

Part I: Preliminaries

9/11 Math Background
  • Differential Equations
  • Linear Algebra

9/18 Equations of Motion
  • Newton’s Second Law
  • LaGrangian Dynamics
  • Schematic Systems

Part II: Single Degree of Freedom Systems

9/25 Free Vibration Response
  • Undamped SDOF Response
  • Damped SDOF Response

10/02 Forced Vibration Response
  • Undamped SDOF Response
  • Damped SDOF Response

10/09 Pulse Excitation
  • Unit Impulse
  • Step Response
  • Ramp Response

10/16 Numerical Response to Arbitrary Excitation
  • Duhamel Integral
  • Convolution Integral
  • Numerical Integration

10/23 Midterm

Part III: Multiple Degree of Freedom Systems

10/30 Two Degree of Freedom Systems
  • Damped 2DOF response
  • Vibration Isolation
11/6  Discrete Parameter MDOF Systems
   •  Formulation of Mass and Stiffness
   •  Modal Damping
   •  Generalized Eigenvalue Problem

11/13 Modal Response Analysis
   •  Response Equations
   •  Response Spectrum

11/20 MDOF Model Reduction
   •  Static Condensation
   •  Modal Contribution Factors

11/27 Continuous Parameter MDOF Systems
   •  Bending Beam Response
   •  Floor Vibrations

12/04 Design/Analysis Considerations
   •  Tuned Mass Dampers
   •  Design Loads
   •  Vibration Isolation

12/11 Group Project Presentations / Final Exam Review

12/18 Final Exam
Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University’s Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.

NYU School of Engineering Policies and Procedures on Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School’s rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School’s Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person’s work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one’s own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.

6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.