

ASEN 5022: DYNAMICS OF AEROSPACE STRUCTURES

SPRING 2026

Class meetings: Tue/Thr 1:00 PM - 2:15 PM at AERO N250

Class mode: In person + Classroom Capture (not live) for ASEN 5022-001B section

Instructor:

Alireza Doostan

Class Zoom link:

Prerequisite: ASEN 5012, 5227 or equivalent. Recommended: MATH 313

Textbook: M. G´eradin and D. Rixen, Mechanical Vibrations: Theory And Application To Structural Dynamics, 3rd edition, 2015.

Reference book: R. Craig and A. Kurdila, Fundamentals of structural dynamics, 2nd edition, 2011.

Grading: Homework (20%), two in-class mid-term exams (50%), and an in-class final exam or final project (30%)

Exam dates (tentative):

- Mid-term Exam 1: TBD
- Mid-term Exam 2: TBD
- Final Exam: TBD

Course content:

1. Review of dynamics of single-degree-of-freedom systems
2. Analytical dynamics of discrete systems
 - (a) Principle of virtual work
 - (b) Hamilton’s principle for conservative systems
 - (c) Lagrange equations of motion
3. Undamped vibration of n-degree-of-freedom systems
 - (a) Linear vibration about an equilibrium configuration

- (b) Normal modes of vibration
- (c) Free vibration and analysis under forced harmonic and external loadings
- 4. Damped vibration of n-degree-of-freedom systems
 - (a) Normal eigensolutions
 - (b) Forced harmonic response for lightly damped systems
 - (c) State-space formulation of viscously damped systems
- 5. Dynamics of continuous systems
 - (a) Formulation of 1D continuous systems
 - (b) Continuous eigenproblem
- 6. Numerical methods in dynamical systems
 - (a) Displacement, Rayleigh-Ritz, and Finite Element methods
 - (b) Direct time integration methods
 - (c) Numerical solution of eigenvalue problems
- 7. Introduction to random vibration (if time permits)

SOME UNIVERSITY POLICIES

HONOR CODE

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the [Honor Code](#). Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. Understanding the course's syllabus is a vital part of adhering to the Honor Code.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the Honor Code will be assigned resolution outcomes from Student Conduct & Conflict Resolution and will be subject to academic sanctions from the faculty member. Visit [Honor Code](#) for more information on the academic integrity policy.

ACCOMMODATION FOR DISABILITIES, TEMPORARY MEDICAL CONDITIONS, AND MEDICAL ISOLATION

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671

or DSinfo@colorado.edu for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

If you have a temporary illness, injury or required medical isolation for which you require adjustment, please reach out to the instructor by email no later than 24 hours after the due date of the adjustment subject.

ACCOMMODATION FOR RELIGIOUS OBLIGATIONS

Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments, or required attendance. Please communicate the need for a religious accommodation in a timely manner. In this class, the instructor requires an email no later than one week prior to the start of the obligation. See the [campus policy regarding religious observances](#) for full details.

PREFERRED STUDENT NAMES AND PRONOUNS

CU Boulder recognizes that students' legal information does not always align with how they identify. If you wish to have your preferred name (rather than your legal name) and/or your preferred pronouns appear on your instructors' class rosters and in Canvas, visit the [Registrar's website](#) for instructions on how to change your personal information in university systems.

CLASSROOM BEHAVIOR

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, marital status, political affiliation, or political philosophy.

ADDITIONAL CLASSROOM BEHAVIOR INFORMATION

- [Student Classroom and Course-Related Behavior Policy](#).
- [Student Code of Conduct](#).
- [Office of Institutional Equity and Compliance](#).
- [Student Code of Conduct](#).
- [Office of Institutional Equity and Compliance](#).

SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits [protected-class](#) discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email OIEC@colorado.edu. Information about university policies, [reporting options](#), and [OIEC support resources](#) including confidential services can be found on the [OIEC website](#).

Please know that faculty and graduate instructors are required to inform OIEC when they are made aware of incidents related to these concerns regardless of when or where something occurred. This is to ensure the person impacted receives outreach from OIEC about resolution options and support resources. To learn more about reporting and support a variety of concerns, visit the [Don't Ignore It page](#).

MENTAL HEALTH AND WELLNESS

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact [Counseling and Psychiatric Services \(CAPS\)](#), located in C4C, or call (303) 492-2277, 24/7.

ACCEPTABLE USE OF AI IN THIS CLASS

Use of any AI tools, such as LLMs, for code-based assignments is NOT allowed.