ASEN 2003 Summer 2022 Syllabus
INTRODUCTION TO DYNAMICS AND SYSTEMS

Lecture: M, T, Th, F 1:00-2:15 PM, AERO 111

Lab: M, T, Th, F 2:30-4:20 PM, AERO 141

Final exam: Friday, July 22nd, 1:00-3:30 PM, AERO 111

Class Website: http://canvas.colorado.edu

Instructor

Professor Cody Allard
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Textbook

Required: *Engineering Mechanics: Dynamics,* by Bedford and Fowler, Fifth Edition, 2008.
ISBN VP ISBN-10: *0-13-612916-1*

Overview

The study of dynamics is a key component of every undergraduate engineering major, and is especially relevant to Aerospace Engineering. In the upper division you will begin taking courses dealing with the dynamics of air and space vehicles building upon the fundamentals presented in this class. Structures, fluids, controls, and orbital mechanics all have roots in this material, so it is critical that you build this technical base carefully.

In this class the fundamentals of two-dimensional motion of particles and rigid bodies are presented from both a theoretical and practical point of view. In addition to deriving and using first principles of dynamics, we will do experiments, designs, and hands-on work that are intended to help students develop an intuition or feel for dynamics. Furthermore, we take the study of simple motions one step further by introducing the fundamental concepts of vibrations and control into this course. Vibration analysis is critical to aerospace vehicle design, and as engineers we must both understand the motion of vehicles and learn how to modify the vehicle to suit mission requirements. This course will give you a flavor of these advanced topics, laying the groundwork for more advanced studies in your junior and senior years.

Course Outline

1. Particle Kinematics and Kinetics
2. Particle Energy and Momentum Methods
3. Planar Rigid Body Kinematics and Kinetics
4. Rigid Body Energy and Momentum Methods
5. Vibrations
6. Systems and Control

Prerequisites
Physics 1, ASEN2001, and ASEN2012, APPRM2350 are prerequisites for this course. APPM2360 is a pre or co-requisite. Much of the material covered in this class has been introduced in your freshman physics class. It also depends heavily on a solid understanding of statics. Students are expected to have a working knowledge of vector operations and vector calculus. Assignments regularly require the use of MATLAB; students are expected to be proficient in the use of MATLAB for problem solving.

Course Components
Material and concepts are introduced, and student mastery is evaluated using several mechanisms throughout the course:

Reading Assignments - The primary means for conveying factual information, techniques, and examples is reading assignments in the textbook and course notes. The textbook is excellent, providing clear explanations and numerous examples of varying difficulty - take advantage of this outstanding resource. Reading assignments are to be completed prior to the class lecture period.

Lecture & Discussion* – We typically start a new topic in each lecture session. For the Summer 2022 session, we will work in a flipped lecture mode. Students are expected to watch the recorded lectures from Spring 2022, and then to actively participate in an in-person working session with the instructor during the schedule lecture periods. In the working lecture sessions we will discuss any questions about the lecture material and work through homework and additional examples. Zoom access will be available for students who are unable to attend in-person. All students (including those participating remotely) will be asked to present a problem to the class once a week. Attendance and engagement in the working sessions and labs will be the basis for the class participation component of the individual grade.

Homework – Homework problems are generally assigned twice per week. They provide practice in solving problems of varying difficulty and sometimes will also involve computing. Collaboration on homework is allowed (copying from others or solution manuals is not); however, students are encouraged to use homework as a means to ensure their individual mastery of the subject. In-class group problem solving and labs will allow for considerable collaborative problem solving.

Labs - There are a variety of experimental and design labs in this course that offer a different perspective on the material. They vary in duration and requirements. Each lab handout will state the objectives of the assignment, the report requirements, and the weighting (number of points) in the overall lab grade. In some cases, students will observe dynamic phenomena in the lab before we formally discuss the theory and do practice problems. Why do it in this order? The idea behind this type of "discovery learning" is that it helps you develop a concrete mental picture to connect to abstract mathematical concepts; and, it allows the student to formulate the questions that need to be answered to fully understand the experiment. In particular, we have tried to avoid making the labs "canned" or "turn-key"; that is, you should **not** expect to be able to walk into the lab, collect some data, and crank out a fill-in-the-blank answer to the lab questions.

The labs are designed so that you **should** expect to have to try out several different approaches or ideas, puzzle over and discuss surprising results, debug and adjust models, and ultimately demonstrate a clear understanding of the material. We encourage you to work with your team to figure things out, ask questions

of the instructors and TA's when you are stuck, make some calculations, and maybe redo the experiment based on what you observed. The final result of the lab is not a "right" answer, but rather a set of answers and a solid explanation, based on correct mathematical theory and good experimental practice, of why such results were obtained.

In some laboratory exercises, we will stress data analysis skills. This includes extensive usage of computer programming and statistics taught in ASEN2012. In these examples, we expect students to follow directions from the instructor and provide a lab write-up that demonstrates that students understood the key concepts of the lab. Presentation of results will be stressed and students are expected to properly describe what was measured, what was modeled, and whether discrepancies between observations and models are significant. Although the computer programs written for this class will not be graded, students are required to turn them in. Students will also be required to follow programming instructions made by the instructor. Our purpose in making these programming requirements is to teach students new and efficient methods for conducting engineering analyses. Proper presentation of laboratory results is important throughout the ASEN curriculum.

Exams – Three *unit exams* will be conducted at ~2 week intervals, on Thursday or Friday during the regular class lecture period. Exams will include both conceptual questions and more detailed problems similar to homework or lab analysis.

The final exam will be held during the regular lab period on Friday July 22. It covers material from the entire course, with extra emphasis on material from the last section of the course for which there is not a unit exam.

Important Notes

1. **Questions**

   Questions about course content including lectures, homework, labs should be asked in lecture, lab, or office hours, or posted to the ASEN2003 Summer Slack workspace. All other questions, concerns, or issues not regarding course content should be e-mailed to the instructor with subject line beginning with ASEN2003. The instructor will respond as promptly as possible M-F, 8am-8pm. Responses at other times may be delayed.

2. **Unit exams and comprehensive final exam**

   Exam dates are provided on the class schedule and will be held in-person in the regular lecture room. Accommodations will be made for synchronous remote exams for students who are unable to attend in-person. If you cannot take an exam due to illness or other emergency situation occurring on the exam date, notify the instructor as soon as possible so that an appropriate course of action can be arranged.

   In this class, any type of collaboration, copying, or use of unauthorized materials on a unit exam or on the final exam constitutes cheating and will result in an F for the course. An honor code violation report will be filed with the honor code board; this may result in additional non-academic sanctions.

3. **Assignments, announcements, and submissions**

   Canvas will be used to send out announcements, to provide comments to you daily on class activities, and to provide general information about course assignments. All assignments are to be submitted in Gradescope with Canvas as a backup if you run into difficulties uploading to Gradescope.

4. **Assignment grading**

   Graded assignments and rubrics will be available through Gradescope. Please take the time to review your graded assignments and posted solutions. If you notice an error in grading of your assignment, you may use the regrade request function in Gradescope to briefly describe the error. Regrade requests for any exam or assignment must be submitted within 1 week of the grade posting to Canvas.

5. **Attendance**

   Attendance in lecture and labs in-person or on zoom is required. Students may miss up to 4 days during the summer term without penalty, but they are still responsible for the course material covered on those days. Each additional unexcused absence will result in a 2 point deduction from the participation grade.

6. **Lab Reports**

   Experimental and design lab exercises are conducted and submitted together with your team. Contributions of each team member will be identified for each exercise. Collaborations with other teams, including shared diagrams or extensive discussion of results must be acknowledged. Use of report materials from prior semesters must be treated and cited as a reference. A grading rubric is provided with each lab.

   Late lab submissions are not accepted, except under extenuating circumstances such as a school closure or sudden illness. If such an event occurs, you are expected to contact the instructor immediately by phone or email. A hectic schedule or crashed computer is not an acceptable reason for a late lab submission.

7. Grading

Grades on individual assignments and for the overall course are set based on the following criteria. Final grades will be assigned based on standard thresholds, with minor adjustments based on instructor judgement. There is no intent to achieve a specific distribution of grades, so curving is NOT generally applied.

A, A- Demonstrates superior understanding of the material beyond the course requirements, excellent technical work
B+, B Demonstrates comprehensive understanding of the material, very strong technical work
B-, C+ Demonstrates good understanding of the material, complete technical work
C Demonstrates adequate understanding of the material to proceed to the next level; sufficient technical work
C- Does not demonstrate adequate understanding of the material to proceed to the next level
D Poor technical work
F Unsatisfactory performance

To receive a course grade of C or better, a student must earn a C or better on the individual grade in this class. A C is the minimum grade that allows you to proceed to a course for which this is a prerequisite. If the weighted exam and final score is below a C, the student's individual score will be assigned as their final grade in the course. In this case the group assignments will not contribute to the final grade. See the grading table below for specific weightings.

Grading

Type	Description	Percentage
Individual Grade	Unit Exams (3)	45%
	Final Exam	45%
	Participation	10%
	Individual Total	100%
Group Grade	Labs	60%
	Homework	40%
	Group Total	100%
Final Grade	If individual grade >= C*	Final = 0.6*Individual + 0.4*Group
	If individual grade < C*	Final = Individual

*The threshold individual grade for a C will not be higher than 70.

Aerospace Engineering Sciences & University Policies Summer 2021

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail 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, political affiliation or political philosophy. For more information, see the policies on classroom behavior and the Student Code of Conduct.

Requirements for COVID-19 and other illnesses

As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Check here for current status of campus requirements https://www.colorado.edu/covid-19.

As of the start of the summer session masks or face coverings are required in the building and classrooms, but are not required outdoors. Room capacities are back to pre-COVID status. Eating and drinking inside the building is not permitted, except in private offices.

If you are sick, please do not attend class in-person. We will have a zoom session open for all classes, so please join us remotely if you are slightly ill, but feel well enough to participate. If you are unable to participate in class activities at all, please inform the instructor and your lab partners of the dates/times when you cannot attend either in-person or remotely and when you expect to return to class. There is no need to share any details about your illness.

Accommodation for Disabilities

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.

Preferred Student Names and Pronouns

CU Boulder recognizes that a student's legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

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 policy may include: plagiarism, 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. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website.

In this class, any type of collaboration, copying, or use of unauthorized materials on an exam or final constitutes cheating and will result in an F for the course. Academic sanctions for other types of honor code violations will be determined on a case-by-case basis, but in all cases an honor code violation report will be filed.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. For each class, check with your faculty member in advance so that you are aware of their specific requirements for accommodating religious observances.
See the campus policy regarding religious observances for full details.