AE 2220 – Dynamics

Summer 2018

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Office Hours: By appointment

Class Schedule: Lectures: TTh 10:05a – 11:55a, Guggenheim 246

Textbook: Required: An Introduction to Dynamics, 4th Ed., by D.J. McGill and W.W. King

Course TAs: None

Course Web Site: Canvas AE-2220-A, AE-3801-A (combined sections)

Overview: AE 2220 introduces the theoretical foundation of dynamics, the study of the motion of bodies due to forces and moments. In the 10-week summer term, we will derive and apply equations governing the kinematics and kinetics of particles and rigid bodies. Work-energy principles will be introduced for solving rigid-body dynamics problems. Principles of impulse and momentum will be developed for both translational and rotational motion. Moments and products of inertia will be discussed, and coordinate systems will be utilized throughout the semester.

This will be a fast-paced course during the summer term. Students are encouraged to read the appropriate sections in the text prior to coming to lecture, and begin work on the homework problems as soon as they are assigned. In addition to the homework sets, there will be a series of in-class quizzes and a comprehensive final exam.

Course Grade: The overall grade in the course will be determined using the following percentages.

Quizzes:	70%
Final:	30%

Academic Conduct: Academic conduct is governed by the Georgia Tech Honor Code (http://www.policylibrary.gatech.edu/student-affairs/academic-honor-code). The intent of the Honor Code is to prevent any student from gaining an unfair advantage over other students through academic misconduct. Students should review the Honor Code and be familiar with its expectations regarding cheating, misrepresentation of student work, and plagiarism. Students found in violation of the Honor Code will be referred to the Office of Student Affairs for disciplinary action.

Important Dates:

May 15	First lecture
May 18	Last day to register or change schedule
May 28	Memorial Day Holiday
June 30	Last day to drop with a 'W'
July 3-4	Independence Day Holiday
July 24	Last day of class
July 26-Aug 2	Final exams period

Exams/Quizzes: Exam/quiz solutions should be legible, include units, and sufficiently describe all important steps in a solution. Use only one side of each page, put your name and page number on each page, and 'box' your final answer for each problem. Deductions will be made for incomplete solutions and improper formats. Additional instructions and restrictions for each exam will be discussed in class and will be clearly identified on the exam coversheet. In general, exams are closed-book, meaning that you are to complete the exam without the aid of textbooks, hand-outs, notes, cellular telephones, personal digital devices, or computers/software. Use of a pocket (non-programmable) calculator is allowed.

Make-up Policy: Under special circumstances and *at least two weeks* of advance coordination with the professor, exams/quizzes may be rescheduled for an individual. Exams missed due to illness or other emergencies can be made up, but must be supported by appropriate documentation (contact Dean of Students). The professor reserves the right to grant special dispensations when deemed appropriate.

Tentative Lecture Plan:
A tentative lecture plan is summarized below. With the exceptions of holidays, all of the items listed are subject to change. The instructor reserves the right to make changes to the projected lecture plan, including topics, reading chapters, homework assigned/due dates, and mid-term exam dates.

Dates:	Articles Covered: (Scope of quizzes in parenthesis)	Topics covered:	Problems:
15-May	1.2, 1.3	Kinematics of material points or particles (KmMPP): reference frames and vector derivatives; position, velocity, and acceleration; kinematics of a point in rectilinear motion; rectangular Cartesian coordinates	
17	1.4, 1.5	KmMPP: cylindrical coordinates; tangential and normal components	
22	1.6, 1.7; 3.2	Kinematics of a rigid body in plane motion (KmRB): velocity/angular velocity for two points of one rigid body	Art. 1.2 – 1.5 problems due
24	3.3	KmRB: translation	Art. 1.6, 1.7 problems due
29	Quiz 1 (1.1-7); 3.4	KmRB: instantaneous center of zero velocity	Art. 3.2, 3.3 problems due
31	3.5	KmRB: acceleration/angular acceleration for two points of one rigid body	Art. 3.4 problems due
5	Quiz 2 (3.1-4); 3.6	KmRB: rolling	Art. 3.5 problems due
7	3.6; 2.1-2.3	Review: kinetics of particles and mass centers of bodies	Art. 3.6 problems due
12	4.2, 4.3	Kinetics of a rigid body in plane motion (KnRB): rigid bodies in translation; moment of momentum (angular momentum)	Chapter 2 problems due
14	Quiz 3 (3.5,6); 4.4	KnRB: moments and products of inertia / the parallel-axis theorems	Art. 4.2 problems due
19	4.4	KnRB: moments and products of inertia / the parallel-axis theorems	Prof. Hodges for second half
21	4.5	KnRB: mass-center form of the moment equation of motion	Art. 4.4 problems due

26	Quiz 4 (4.4); 4.6, 5.2	KnRB: other forms of the moment equation of motion; Special planar equation of motion integrals: the principle of work and kinetic energy	Art. 4.5 problems due
28	5.3	Special planar equation of motion integrals: the principle of impulse and momentum	Art. 4.6 problems due
3-Jul	Semester break	No class	–
5	Quiz 5 (4.5, 4.6); 6.1, 6.2	Kinematics of a rigid body in three-dimensional motion (KmRB3): relation between derivatives and the angular velocity vector	Chapters 2 and 5 problems due
10	6.3, 6.4	KmRB3: properties of angular velocity; the angular acceleration vector	
12	Quiz 6 (5.2); 6.5, 6.6	KmRB3: velocity and acceleration in moving frames of reference; the earth as a moving frame	Art. 6.3, 6.4 problems due
17	6.7	KmRB3: velocity and acceleration equations for two points of the same rigid body	Art. 6.5, 6.6 problems due
19	6.8	KmRB3: describing the orientation of a rigid body; rotation matrices	Art. 6.7 problems due
24	Quiz 7 (6.1-6.7); 6.9		Art. 6.8, 6.9 problems due
Aug. 1	Final exam (comprehensive)	Wednesday, 8:00 – 10:50 a.m.	

Problems (for due dates by article see above):

1.19, 33, 43, 63, 73, 91, 101, 107, 131, 133, 135, 145
2.3, 5, 7, 37, 49, 113, 125
3.3, 5, 7, 13, 15, 17, 33, 39, 43, 53, 55, 57, 59, 71, 73, 79, 85, 87, 89, 93, 97, 99, 107, 123
4.1, 5, 11, 13, 17, 27, 31, 41, 49, 53, 55, 56, 65, 71, 83, 87, 99, 123, 127, 167, 171, 173
5.1, 9, 13, 15, 17, 49, 55, 65, 69, 101, 115, 119
6.3, 7, 9, 17, 19, 23, 25, 31, 43, 45, 49, 57, 69, 87, 89