

# Engineering Mechanics - Dynamics

EGM 3401

Academic Term: Spring 2020

## Instructor:

Jonathan Brooks

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Office Hours (MAE-B 214): M 7; W 3-4, 7; R 6-8; F 3-4

Connect 4 Office Hours (MAE-B 214): F 4:00-4:30; R 12:15-12:45

## Teaching Assistants:

- Alex Benvenuti: [abenvenuti@ufl.edu](mailto:abenvenuti@ufl.edu), M 4, MAE-B 211
- Jhon Ibanez: [jibanez@ufl.edu](mailto:jibanez@ufl.edu), W 5, MAE-B 211
- Andrew Ouellette: [andrew.ouellette@ufl.edu](mailto:andrew.ouellette@ufl.edu), T 3, MAE-B 211
- Andrew Tumlin: [a.tumlin@ufl.edu](mailto:a.tumlin@ufl.edu), F 7, MAE-B 234

## Course Description

Continues the dynamics sequence begun in EGM3400 plus extended coverage of three-dimensional rigid-body dynamics and orbital motion.

Credits: 3

## Course Pre-Requisites / Co-Requisites

Pre-requisites: EGM 2511 or EGM 2500  
MAC 2313

Engineering Mechanics - Statics  
Analytic Geometry and Calculus 3

## Course Objectives

To provide a thorough and systematic introduction to the subject of dynamics of particles and rigid bodies using a Newton-Euler approach. To develop a deep understanding of the kinematics of particles and rigid bodies, the kinetics of a particle, the kinetics of a system of particles, and the kinetics of a rigid body. Many examples will provide insight into the underlying physical processes.

## Materials and Supply Fees

None

## Relation to Program Outcomes (ABET):

Outcome	Coverage*
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Low
3) An ability to communicate effectively with a range of audiences	Low
4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Low
7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome significantly addressed by this course.

### **Required Textbooks and Software**

- Title: *Dynamics of Particles and Rigid Bodies: A Systematic Approach*
- Author: Anil Rao
- Publisher and publication date: Cambridge University Press, 2006
- ISBN number: 978-0-07-339796-2

### **Recommended Reading**

- The book

### **Tentative Course Schedule (Subject to Brooksing)**

- Week 1: Scalars, vectors, tensors, matrices (Rao Ch. 1)
- Weeks 2-6: Kinematics of particles and rigid bodies (Rao Ch. 2)
- Weeks 7-10: Kinetics of particles (Rao Ch. 3)
- Weeks 11-13: Kinetics of a system of particles (Rao Ch. 4)
- Weeks 14-16: Kinetics of rigid bodies (Rao Ch. 5)

### **Attendance Policy, Class Expectations, and Make-Up Policy**

#### *Attendance*

- Regular class attendance is expected although not explicitly included in the grade evaluation.

#### *Homework*

- HW will be posted on Canvas along with its due date.
- Some or all assigned problems will be graded for each assignment. You are required to complete all assigned problems.
- HW will be turned in on Canvas.
- Hardship cases for late HW will be considered on an individual basis and only if the instructor has been contacted before the due date of the assignment. Students with hardship cases (e.g., due to medical problems) will be referred to the Dean of Students office, which will perform a background investigation to determine if the hardship is legitimate.
- If you do not agree with the grading of a HW problem, you will have one week from the date the HW is returned to submit a written argument of why you think the grade should be higher. However, the final decision will remain the instructor's.

#### *Exams*

- Exams will be closed-book and closed notes. The instructor will announce, in class, any allowed formula sheets at least one week before the exam.
- No cell phones or calculators (or anything that can store formulae) are allowed during exams. An abacus is allowed if desired.
- Exam problems may be taken directly from the homework problems or from lecture discussions with some modifications. Thus, in addition to the weight placed on homework in the final grade, it is to your advantage to understand as many of the homework problems as possible. The emphasis of the exams will be to test your understanding, not on formulaic repetition, so expect the exam problems to be challenging and to test your grasp of the material taught in the class.
- Makeup exams are only allowed for students with extreme, documented circumstances. Students must contact the instructor as soon as possible to provide documentation and request a make-up exam. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>).
- If you do not agree with the grading of a particular exam problem, you will have one week from the date the exam is returned to submit a written argument of why you think the grade should be higher. However, the final decision will remain the instructor's.

E-learning course web site (Canvas)

- Students are expected to check Canvas on a regular basis for up-to-date course information. This may include changes to the syllabus, homework assignment due dates, and exam schedules.

### **Evaluation of Grades**

<b>Assignment</b>	<b>Percentage of Final Grade</b>
<b>Homework</b>	<b>20%</b>
<b>Midterm Exam 1 (Time and date: TBA)</b>	<b>20%</b>
<b>Midterm Exam 2 (Time and date: TBA)</b>	<b>20%</b>
<b>Final Exam (Time and date: TBA)</b>	<b>40%</b>
	<b>100%</b>

**Tentative Exam Weeks: February 20<sup>th</sup>, April 2<sup>nd</sup>, Finals week**

### **Grading Policy**

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
93.4–100	A	4.00
90.0–93.3	A-	3.67
86.7–89.9	B+	3.33
83.4–86.6	B	3.00
80.0–83.3	B-	2.67
76.7–79.9	C+	2.33
73.4–76.6	C	2.00
70.0–73.3	C-	1.67
66.7–69.9	D+	1.33
63.4–66.6	D	1.00
60.0–63.3	D-	0.67
00.0–59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### **Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that

facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

### ***Campus Resources:***

#### *Health and Wellness*

#### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

#### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### *Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio**, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

