

Description

Want to understand the performance of a car or send a rocket to Mars? Your intro into these skills is dynamics.

Prerequisites

EM 222 with minimum grade of C
MATH 331 (pre or co)
PHYS 255 with minimum grade of C

Text

**Vector Mechanics for Engineers:
Dynamics, 12th Edition or later by Beer J.**
ISBN 978-1-259-97730-5

Instructor

Warren Campbell, Ph.D., P.E., CFM
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Office Hours Via Zoom (links will be provided)
MW 1:00 – 2:30
Tues 1:00 – 2:00

Before Class

Watch the video lecture for that day's class and answer learning checks.

Zoom

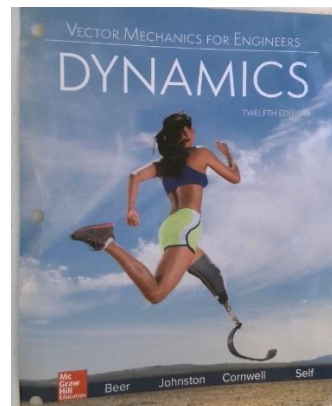
Depending on University guidance, office hours may be via Zoom.

Grading

This course is run like a game. You accumulate eXperience Points (XPs) and level up to improve your grade. Mess up on an exam? All is not lost. You can perform optional quests to recover. See below for more information. Turn in your optional quests before class on Tuesday, November 11 to receive your extra credit. Any electronic submission must have your name first in the file name. Failure to do this will result in a 5% deduction.



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Typical Class

1. Solutions to previous class learning check
2. Answer questions
3. In-class learning check
4. Follow up questions and discussion

Type	Quests	Max XPs
Required	Exam 1	400
	Exam 2	400
	Final Exam	600
	Attendance	100
	Pre-class Learning Checks	50
	Professionalism	200
	In-class learning checks	250
Optional	Select your avatar (Geezer is taken)	20
	Read <i>Humble Pi: When Math Goes Wrong in the Real World</i> and take quiz	100
	Attend Bell Lecture	20
	Attend ASCE, IEEE, or ASME meeting	10
	Read an approved book and write a book report	TBA
	Bonus Points for whole class - Everyone makes a C or better on Exam 1	100
	Bonus Points for whole class - Everyone makes a C or better on Exam 2	100
	Bonus Points for whole class - Everyone makes a C or better on the Final Exam	200

Deadline for Optional Quests

So that I have time to grade your optional quests, I must have your submissions prior to class on April 14.

Grading System

Percentages do not matter. Sums of XPs determine your grade.

Levels	Min XP	Grade
Level 5 - Dynamics Demigod	3000	A+
Level 4 - Dynamics Wizard	1850	A
Level 3 - Dynamics Warrior	1650	B
Level 2 - Dynamics Journeyman	1450	C
Level 1 - Dynamics Wannabe	1250	D
Level 0 - Dynamics Potential so far unrealized	0	F

Course Outcomes

1. Derive, understand, and convert expressions for position, velocity, and acceleration in appropriate coordinate systems.
2. Find velocities and accelerations using translating and rotating reference frames.
3. Solve particle motion problems using Newton's 2nd law, work-energy, and impulse-momentum.
4. Express kinematic relations between translational and angular quantities for rigid bodies.
5. Analyze the motion of translating and rotating rigid bodies using Euler's equations and work-energy.

6. Analyze particle and rigid body free and damped vibration.

Special Assistance

In compliance with University policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Student Accessibility Resource Center located in Downing Student Union, room 1074 of the Student Success Center. The phone number is 270.745.5004. or email at sarc.connect@wku.edu. Please do not request accommodations directly from the professor or instructor without a letter of accommodation from The Student Accessibility Resource Center.

About Me

I began my professional life as a co-op at Marshall Space Flight Center during the Apollo Program. There I worked on the Space Shuttle environmental impact statement, microgravity fluids experiments and the Space Shuttle Main Engine redesign. Later I was the City Hydrologist for Huntsville, Alabama. When I am not working, I am likely to be gaming with my son and grandson.



Title IX Discrimination and Harassment

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's [Title IX Sexual Misconduct/Assault Policy](#) (#0.2070) and [Discrimination and Harassment Policy](#) (#0.2040). Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator, Andrea Anderson, 270-745-5398 or Title IX Investigators, Michael Crowe, 270-745-5429 or Joshua Hayes, 270-5121. Please note that while you may report an incident of sex/gender based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are "Responsible Employees" of the University and MUST report what you share to WKU's Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU's [Counseling and Testing Center](#) at 270-745-3159.

Covid 19 Statement

All students are strongly encouraged to [get the COVID-19 vaccine](#). Out of respect for the health and safety of the WKU community and in adherence with CDC guidelines and practices of all public universities and colleges in [Kentucky](#), the University requires that a cloth face covering (reusable or disposable) that covers both the nose and mouth must be worn at all times when in public areas within all buildings. Students must properly wear face coverings while in class regardless of the room size or the nature of the classroom activities. Students who fail to wear a face covering as required will be in violation of the WKU Student Code of Conduct and will be asked to comply or will face disciplinary action, including possible dismissal from the University. Accommodations can be requested in special cases through the Student Accessibility and Resource Center ([SARC](#)): [270-745-5004](#) (voice), [270-745-3030](#) (TTY), or [270-288-0597](#) (video).

All students must immediately report a positive Covid-19 test result or close contact with a person who has tested positive to the Covid-19 Assistance Line at 270-745-2019. The assistance line is available to answer questions regarding any Covid-19 related issue. This guidance is subject to change based on requirements set forth by public health agencies or the office of the governor. Please refer to the Healthy on the Hill website for the most current information. www.wku.edu/healthyonthehill

Tentative Schedule – Firm but may be changed for snow days or other unforeseen events

Date	Day	Lessons	Video Lecture	Reading
18-Jan	Tues	0, 1	Syllabus, rectilinear motion	11.1
20 Jan	Thurs	2	Relative motion	11.2
25 Jan	Tues	3	Curvilinear motion	11.4
27 Jan	Thurs	4	Nonrectangular components	11.5
1-Feb	Tues	5	Newton' 2 nd Law	12.1
3-Feb	Thurs	6	Angular momentum and orbits	12.2
8-Feb	Tues	7	Work and energy	13.1
10-Feb	Thurs	8	Conservation of Energy	13.2
15-Feb	Tues	9	Impulse and momentum	13.3
17-Feb	Thurs	10	Impacts	13.4
22-Feb	Tues	11	Newton's 2 nd law for systems of particles	14.1
24-Feb	Thurs	12	Energy and momentum for systems of particles	14.2
1-Mar	Tues		Exam 1 Review	
3-Mar	Thurs		Exam 1	
8-Mar	Tues	13	Rigid body kinematics, translation & rotation	15.1
10-Mar	Thurs	14	General plane motion	15.2
15-Mar	Tues		Spring Break	
17-Mar	Thurs		Spring Break	
22-Mar	Tues	15	Instantaneous center of rotation	15.3
24-Mar	Thurs	16	General plane motion: acceleration	15.4
29-Mar	Tues	17	Motion relative to a rotating frame	15.5
31-Mar	Thurs	18	Kinetics of a rigid body	16.1
5-Apr	Tues	19	Constrained plane motion	16.2
7-Apr	Thurs	20	Rigid body energy methods	17.1
12-Apr	Tues	21	Rigid body momentum methods	17.2
14-Apr	Thurs	22	Vibrations	19.1
19-Apr	Tues		Exam 2 Review	
21-Apr	Thurs		Exam 2	
26-Apr	Tues	23	3D Energy and Momentum	18.1
28-Apr	Thurs	24	Euler Equations of Motion	18.2
2-May	Mon		Final Exam 8:00 AM – 10:00 AM	