Engineering Mechanics II: Dynamics – ENGR 2302.001 (F2F)

Course Syllabus: Spring 2025

"Northeast Texas Community College exists to provide personal, dynamic learning experiences empowering students to succeed."

Instructor: Mr. Kenny Irizarry, PE, REM

Office: MS 126
Phone: 903-434-8275
Email: kirizarry@ntcc.edu

Office Hours	Monday	Tuesday	Wednesday	Thursday	Friday
	Via email	Via email	Via email	Via email	Via email

This syllabus serves as the documentation for all course policies and requirements, assignments, and instructor/student responsibilities.

Information relative to the delivery of the content contained in this syllabus is subject to change. Should that happen, the student will be notified.

Course Description: 3 credit hours
Lecture/Lab/Clinical: Three hours of lecture each week.

Basic theory of engineering mechanics, using calculus, involving the motion of particles, rigid bodies, and systems of particles; Newton's Laws; work and energy relationships; principles of impulse and momentum; application of kinetics and kinematics to the solution of engineering problems. Note: This is a required course for the THECB Engineering Compact Agreement.

Prerequisite(s): ENGR 3201.

Student Learning Outcomes:
Upon successful completion of this course, students will be able to:

2302.1 – Express dynamic quantities as vectors in terms of Cartesian components, polar coordinates, and normal-tangential coordinates.
2302.2 – Compute mass moments of inertia for systems of particles and rigid bodies.
2302.3 – Solve kinematic problems involving rectilinear and curvilinear motion of particles.
2302.4 – Solve kinetic problems involving a system of particles using Newton's Second Law.
2302.5 – Apply the principles of work and energy, conservation of energy, impulse and momentum, and conservation of momentum to the solution of engineering problems involving particles and systems of particles.
2302.6 – Solve kinematic problems involving the translation and rotation of a rigid body.
2302.7 – Solve kinetic problems involving planar translation and rotation of rigid bodies.
2302.8 – Apply the principles of work and energy, conservation of energy, impulse and momentum, and conservation of momentum to the solution of engineering problems involving rigid bodies in planar motion.

Evaluation/Grading Policy:

Exam 1	12%
Exam 2	12%
Exam 3	16%
Final Exam	20%
Homework	40%
Total	100%

The letter grading system is:

A	(90% - 100%)
B	(80% - 89%)
C	(70% - 79%)
D	(60% - 69%)
F	(< 60%)

Required Instructional Materials: ***Engineering Mechanics: Statics & Dynamics*** (14th Ed.), R. C. Hibbeler, 2012

Publisher: Pearson **ISBN Number:** 978-0132915489

Optional Instructional Materials: None

Minimum Technology Requirements:
You will need a scientific calculator or graphing calculator for this class. A TI-Nspire CX is recommended but not required. All homework shall be turned in on quad-ruled engineering paper.

Required Computer Literacy Skills:
N/A

Course Structure and Overview:
This is a 16-week face-to-face course consisting of lecture and textbook assignments. A typical lecture will cover a Powerpoint with example problems included, with 5 problems assigned as homework.

Communications:
Email will be responded to within 24 hours IF SENT SUNDAY-THURSDAY. Due to the lack of internet availability at my home, I cannot guarantee responses over the weekend, though I will do my best. You can also call my office during office hours if you need to speak with me but can't make it to campus. However, I prefer face-to-face discussions, especially if you have a question about a homework problem. Any information that I send out will be done in class, via Blackboard, or via NTCC email. I will NOT email sensitive information to email addresses that are not "@ntcc.edu".

Institutional/Course Policy:
Late work will not be accepted without prior approval by the instructor. Students and instructor are expected to treat each other with respect in and out of the classroom. Prompt attendance is expected for all class meetings. Missing lecture means missing discussion and important notes. During lecture, students are expected to be attentive to the topic discussed. Students found being consistently inattentive will be asked to leave.

NTCC Academic Honesty/Ethics Statement:
NTCC upholds the highest standards of academic integrity. The college expects all students to engage in their academic pursuits in an honest manner that is beyond reproach using their intellect and resources designated as allowable by the course instructor. Students are responsible for addressing questions about allowable resources with the course instructor. Academic dishonesty such as cheating, plagiarism, and collusion is unacceptable and may result in disciplinary action. This course will follow the NTCC Academic Honesty and Academic Ethics policies stated in the Student Handbook. Refer to the student handbook for more information on these subjects.

ADA Statement:
It is the policy of NTCC to provide reasonable accommodations for qualified individuals who are students with disabilities. This College will adhere to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to request accommodations. An appointment can be made with the Academic Advisor/Coordinator of Special Populations located in Student Services and can be reached at 903-434-8264. For more information and to obtain a copy of the Request for Accommodations, please refer to the special populations page on the NTCC website.

Family Educational Rights and Privacy Act (FERPA):
The Family Educational Rights and Privacy Act (FERPA) is a federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education. FERPA gives parents certain rights with respect to their children's educational records. These rights transfer to the student when he or she attends a school beyond the high school level. Students to whom the rights have transferred are considered "eligible students." In essence, a parent has no legal right to obtain information concerning the child's college records without the written consent of the student. In compliance with FERPA, information classified as "directory information" may be released to the general public without the written consent of the student unless the student makes a request in writing. Directory information is defined as: the student's name, permanent address and/or local address, telephone listing, dates of attendance, most recent previous education institution attended, other information including major, field of study, degrees, awards received, and participation in officially recognized activities/sports.

Tentative Course Timeline (*note* instructor reserves the right to make adjustments to this timeline at any point in the term):

Chap.	Title	*Week*	*Key Dates*
12	Course Overview / Kinematics of a Particle	*1, 2 & 3*	
13	Kinetics of a Particle: Force and Acceleration	*4 & 5*	
	Exam 1	***6***	***2/17***
14	Kinetics of a Particle: Work and Energy	*6 & 7*	
15	Kinetics of a Particle: Impulse and Momentum	*7, 8*	
	Spring Break		
15	Kinetics of a Particle: Impulse and Momentum (cont.)	*9*	
	Exam 2	***10***	***3/24***
16	Planar Kinematics of a Rigid Body	*10 & 11*	
17	Planar Kinetics of a Rigid Body: Force and Acceleration	*12 & 13*	
	Exam 3	***14***	***4/30***
18	Planar Kinetics of a Rigid Body: Work and Energy	*14*	
19	Planar Kinetics of a Rigid Body: Impulse and Momentum / Review for Final Exam	*15*	
	Final Exam	***16***	***5/12***

**This calendar will be adjusted to the needs of the course. Changes will be based on the course progress. The in-class exam dates could be moved one or two days up or down. The Final Exam date is fixed and will not change*

Topic	Reading	Focus Examples	Homework	Special Notes	Due Date
Physics Review	**12.1-12.6**	**F12-6, F12-9, F12-17**	**12-3, 12-12, 12-16, 12-21, 12-36, 12-42, 12-48, 12-49, 12-57, 12-71, 12-85, 12-92, 12-94, 12-95**	**A dot above a variable means 'time derivative'**	**1/27**
The *n-t* coordinate system	**12.7**	**Ex 12.14, Ex 12.15, Ex 12.16, F12-29, F12-30**	**12-116, 12-123, 12-136, 12-138, 12-142**	**The *n-t* coordinate system makes the physics more convenient**	**1/29**
Polar coordinates	**12.8**	**Ex 12.17, Ex 12.18, F12-33, F12-36**	**12-156, 12-160, 12-168, 12-169, 12-175**	**Remember the Chain Rule**	**2/3**
Motion with position restraints	**12.9**	**Ex 12.21, Ex 12.23, Ex 12.25, Ex 12.27, F12-39, F12-48**	**12-195, 12-201, 12-208, 12-212, 12-215**		**2/5**
Forces	**13.1-13.4**	**Ex 13.3, Ex 13.4, Ex 13.5, F13-5**	**13-4, 13-5, 13-7, 13-11, 13-12**	**Remember how to do dry friction**	**2/10**
Equations of Motion: *n-t*	**13.5**	**Ex 13.6, Ex 13.8, F13-8**	**13-54, 13-56, 13-65, 13-74, 13-81**		**2/12**
EoM: Cylindrical Coordinates	**13.6**	**Ex 13.10, Ex 13.11, Ex 13.12, F13-16**	**13-88, 13-89, 13-91, 13-92, 13-104**	**Don't forget the relationship between the dot notations and velocity/acceleration**	**2/17**
Test 1 – Ch 12, 13					**2/17**
Work and Energy	**14.1-14.3**	**Ex 14.1, Ex 14.14.3, Ex 14.6, F14-5**	**14-1, 14-4, 14-5, 14-8, 14-25**	**Don't forget the 'Beautiful Equation'**	**2/24**
Power and Efficiency	**14.4**	**Ex 14.7, Ex 14.8**	**14-42, 14-48, 14-50, 14-51, 14-52**		**2/26**
Conservation Laws	**14.5-14.6**	**Ex 14.9, Ex 14.11, F14-15**	**14-69, 14-71, 14-72, 14-74, 14-80**	**If a force does not do mechanical work, you must use a FBD.**	**3/3**
Linear Impulse and Momentum	**15.1-15.2**	**Ex 15.2, Ex 15.3, F15-4**	**15-4, 15-5, 15-8, 15-9, 15-11**	**Pay special attention to Eq 15-6 on p. 240**	**3/5**
Conservation of Linear Momentum	**15.3**	**Ex 15.4, Ex 15.6, F15-11**	**15-35, 15-36, 15-37, 15-39, 15-44**		**3/10**

Impact	**15.4**	**Ex 15.9, Ex 15.11, F15-17**	**15-59, 15-60, 15-64, 15-68, 15-69**	**This is different from elastic/plastic collisions in Physics I. Pay attention to the coefficient of restitution, *e*. (Eq 15-11, p. 267)**	**3/12**
Angular Impulse & Angular Momentum	**15.5 – 15.7**	**Ex 15.14, Ex 15.15**	**15-96, 15-104, 15-105, 15-107**	**Pay attention to what equations are used fundamentally, and try to work these equations into forms that are more familiar.**	**3/24**
Test 2 – Ch 14, 15					
Rigid Body Motion: Rotation	**16.1 – 16.3**	**Ex. 16.1, Ex 16.2, F16-6**	**16-12, 16-13, 16-31, 16-32**	**Remember that rigid objects sharing a contact on the outside will have the same *v* on that surface, while objects sharing the same axle will have the same *ω* on that axle.**	**3/31**
Rigid Body: Absolute Motion (Rotation & Translation)	**16.4**	**Ex 16.3, Ex 16.4, Ex 16.5**	**16-41, 16-43, 16-44, 16-52, 16-56**	**Conversions between linear and angular are key to solving these problems. Make sure you know how linear motion and rotation connect for rigid objects. (Sec 16.1-16.3)**	**4/7**
Rigid Body: Relative Motion	**16.5**	**Ex 16.6, Ex 16.7, Ex 16.8**	**16-58, 16-59, 16-60, 16-62, 16-64**	**Logically, this is not much different from Sec 16.4, adding in Eq. 16-16.**	**4/9**
Rigid Body: Instantaneous Center of Zero Velocity	**16.6**	**Ex 16.11, Ex 16.12**	**16-84, 16-88, 16-92, 16-96, 16-100**	**The IC is a trick used to find velocities of a rigid body, NOT ACCELERATIONS.**	**4/14**
Rigid Body: Relative Acceleration	**16.7**	**Ex 16.15, Ex 16.16**	**16-103, 16-112, 16-116,**		**4/16**
Rigid Body Force & Acceleration: Mass Moment	**17.1**	**Ex 17.1, Ex 17.2, Ex 17.3, Ex 17.4**	**17-5, 17-10, 17-13, 17-22**	**Pay close attention to the examples**	**4/21**
Rigid Body Force & Acceleration: Equations of Motion	**17.2-17.3**	**Ex 17.6, Ex 17.7, F17-3**	**17-25, 17-26, 17-29, 17-30, 17-46**	**This section uses a lot from last semester. You may want to review Sec 7.1**	**4/23**

Rigid Body Force & Acceleration: Rotation	**17.4**	**Ex 17.8, Ex 17.9, Ex 17.10**	**17-57, 17-58, 17-59, 17-60, 17-61**		**4/28**
Rigid Body Force & Acceleration: General Motion	**17.5**		**17-91, 17-92, 17-93, 17-98, 17-105**		**4/30**
Planar Kinetics: Work and Energy	**18.1-18.5**	**Ex 18.1, Ex 18.2, Ex 18.4**	**18-11, 18-15, 18-42, 18-46**		**5/5**
Planar Kinetics: Impulse and Momentum	**19.1-19.3**	**Ex 19.2, Ex 19.5, Ex 19.7**	**19-11, 19-13, 19-29, 19-31**		**5/7**