ENGR 2302 – Engineering Mechanics II: Dynamics

Course Syllabus: Spring 2021

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

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Office Hours	Monday	Tuesday	Wednesday	Thursday	Friday	Online
	By email	By email	By email	By email	By email	By 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: Basic theory of engineering mechanics, using calculus, involving the description of forces, moments, and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; and moments of inertia. Three hours of college credit.

Prerequisite(s): ENGR 2301

Student Learning Outcomes:

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.

Program Student Learning Outcomes:

Critical Thinking Skills

CT.1 Students will demonstrate the ability to 1) analyze complex issues, 2) synthesize information, and 3) evaluate the logic, validity, and relevance of data.

Communication Skills

CS.1 Students will effectively develop, interpret and express ideas through written communication.

Empirical and Quantitative Skills

EQS.1 Students will manipulate numerical data or observable facts by organizing and converting relevant information into mathematical or empirical form

EQS.2 Students will analyze numerical data or observable facts by processing information with correct calculations, explicit notations, and appropriate technology.

EQS.3 Students will draw informed conclusions from numerical data or observable facts that are accurate, complete, and relevant to the investigation.

Teamwork

TW.2 Students will work with others to support and accomplish a shared goal.

Evaluation/Grading Policy: In class and Final exam, Homework and Quizzes,
A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F = 0-59%

Required Textbook: Engineering Mechanics: Statics & Dynamics (14th Ed.), R. C. Hibbeler, 2016

Publisher: Pearson

ISBN Number: 9780133915426

Optional Instructional Materials: None.

Minimum Technology Requirements: A scientific graphing calculator is required for this course.

Required Computer Literacy Skills: Should be able to use online instruction material.

Course Structure and Overview:

Chapter 12: Kinematics of a Particle
12.1 Introduction
12.2 Rectilinear Kinematics: Continuous Motion
~~**12.3** Rectilinear Kinematics: Erratic Motion~~
12.4 General Curvilinear Motion
12.5 Curvilinear Motion: Rectangular Components
12.6 Motion of a Projectile
12.7 Curvilinear Motion: Normal and Tangential Components
12.8 Curvilinear Motion: Cylindrical Components
12.9 Absolute Dependent Motion Analysis of Two Particles
12.10 Relative-Motion of Two Particles Using Translating Axes

Chapter 13 Kinetics of a Particle: Force and Acceleration

13.1 Newton's Second Law of Motion
13.2 The Equation of Motion
13.3 Equation of Motion for a System of Particles
13.4 Equations of Motion: Rectangular Coordinates
13.5 Equations of Motion: Normal and Tangential Coordinates
13.6 Equations of Motion: Cylindrical Coordinates
~~**13.7** Central-Force Motion and Space Mechanics~~

First In Class Exam (Chapters 12 & 13)

Chapter 14 Kinetics of a Particle: Work and Energy

14.1 The Work of a Force
14.2 Principle of Work and Energy
14.3 Principle of Work and Energy for a System of Particles
14.4 Power and Efficiency
14.5 Conservative Forces and Potential Energy
14.6 Conservation of Energy

Chapter 15 Kinetics of a Particle: Impulse and Momentum

15.1 Principle of Linear Impulse and Momentum
15.2 Principle of Linear Impulse and Momentum for a System of Particles
15.3 Conservation of Linear Momentum for a System of Particles
15.4 Impact
15.5 Angular Momentum
15.6 Relation Between Moment of a Force and Angular Momentum
15.7 Principle of Angular Impulse and Momentum
~~**15.8** Steady Flow of a Fluid Stream 295~~
~~**15.9** Propulsion with Variable Mass 300~~

Chapter 16 Planar Kinematics of a Rigid Body

16.1 Planar Rigid-Body Motion
16.2 Translation
16.3 Rotation about a Fixed Axis
~~**16.4** Absolute Motion Analysis~~

Second In Class Exam (Chapters 14,15, & 16)

16.5 Relative-Motion Analysis: Velocity
16.6 Instantaneous Center of Zero Velocity
16.7 Relative-Motion Analysis: Acceleration
16.8 Relative-Motion Analysis using Rotating Axes

Chapter 17 Planar Kinematics of a Rigid Body: Force and Acceleration

17.1 Mass Moment of Inertia
17.2 Planar Kinetic Equations of Motion
17.3 Equations of Motion: Translation
17.4 Equations of Motion: Rotation about a Fixed Axis
17.5 Equations of Motion: General Plane Motion 456

Chapter 18 Planar Kinematics of a Rigid Body: Work and Energy

18.1 Kinetic Energy
18.2 The Work of a Force
18.3 The Work of a Couple Moment
18.4 Principle of Work and Energy
18.5 Conservation of Energy

Chapter 19 Planar Kinematics of a Rigid Body: Impulse and Momentum

19.1 Linear and Angular Momentum
19.2 Principle of Impulse and Momentum
19.3 Conservation of Momentum
19.4 Eccentric Impact

Final Exam (Chapters 16, 17,18, & 19)

Communications: By email

Institutional/Course Policy: All lectures will be online. The exams will be arranged by NTCC.

Alternate Operations During Campus Closure and/or Alternate Course Delivery Requirements
In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Northeast Texas Community College to move to altered operations. During this time, Northeast Texas Community College may opt to continue delivery of instruction through methods that include, but are not limited to, online through the Blackboard Learning Management System, online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor NTCC's website (http://www.ntcc.edu/) for instructions about continuing courses remotely, Blackboard for each class for course-specific communication, and NTCC email for important general information.

Additionally, there may be instances where a course may not be able to be continued in the same delivery format as it originates (face-to-face, fully online, live remote, or hybrid). Should this be the case, every effort will be made to continue instruction in an alternative delivery format. Students will be informed of any changes of this nature through email messaging and/or the Blackboard course site.

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):