Course Number and Title: MET 243 Dynamics

Campus Location:
Stanton

Effective Date:
2019-51

Prerequisite:
MET 132, PHY 205

Co-Requisites:
None

Course Credits and Hours:
3.00 credits
3.00 lecture hours/week
1.00 lab hours/week

Course Description:
The motion of particles and rigid bodies is illustrated using linear, rotational, and plane motion. These concepts are used to determine the forces and torques required to change motion through inertia, work-energy, and impulse-momentum approaches. Other important concepts include elastic and inelastic impact, power, and the coefficient of restitution.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Identify the relationships among linear displacement, velocity, and acceleration by calculating appropriate parameters, including the construction and interpretation of graphical representations. (CCC 2, 5, 6; PGC 1)
2. Calculate various parameters such as angular displacement, velocity, and accelerations involved in curvilinear motion, including the construction and interpretation of graphical representations. (CCC 2, 5, 6; PGC 1)
3. Interpret the relationships between linear and angular motion by determining the linear motion of a point on a rotating body and vice-versa. (CCC 2, 6; PGC 1)
4. Determine various parameters for a system in plane motion using the principles of relative motion, instant centers, graphical solutions for linkages, tangential, normal, and Coriolis accelerations. (CCC 2, 5, 6; PGC 1)
5. Determine the moment of inertia and radius of gyration for irregular bodies about any given axis. (CCC 2, 6; PGC 1)
6. Interpret Newton's second law of motion by calculating unknown accelerations and inertial forces in systems involving linear, angular, and plane motion. (CCC 2, 5, 6; PGC 1)
7. Determine the work done, resulting change in energy, and required power for bodies and systems under various force and torque configurations in linear, angular, and plane motion. (CCC 2, 5, 6; PGC 1)
8. Calculate the appropriate parameters involved in linear, angular, and plane motion as well as elastic and inelastic collisions using the concepts of impulse and momentum. (CCC 2, 5, 6; PGC 1)
9. Apply the principle of coefficient of restitution to determine energy loss on impact of two solid bodies. (CCC 2, 5, 6; PGC 1)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Identify the relationships among linear displacement, velocity, and acceleration by calculating appropriate parameters, including the construction and interpretation of graphical representations.
    1. Identify the appropriate equations required to solve kinematic problems in dynamics.
2. Calculate various parameters such as angular displacement, velocity, and accelerations involved in curvilinear motion, including the construction and interpretation of graphical representations.
    1. Calculate the tangential and normal components as well as the rectangular components of rotational acceleration in curvilinear motion.
    2. Solve problems involving angular displacement, velocity, and acceleration, including the construction and interpretation of graphical representations.
3. Interpret the relationships between linear and angular motion by determining the linear motion of a point on a rotating body and vice-versa.
    1. Examine the kinematic equations of linear and angular motions and how they are related.
4. Determine various parameters for a system in plane motion using the principles of relative motion, instant centers, graphical solutions for linkages, tangential, normal, and Coriolis accelerations.
    1. Calculate parameters involved in plane motion using the concepts of relative motion.
    2. Calculate parameters involved in plane motion using the concepts of instant centers, including graphical solutions for linkages.
    3. Identify the Coriolis acceleration by solving problems that include tangential, normal, Coriolis, and radial components of acceleration.
5. Determine the moment of inertia and radius of gyration for irregular bodies about any given axis.
    1. Use the parallel axis theorem to calculate the moment of inertia of composite structures.
6. Interpret Newton's second law of motion by calculating unknown accelerations and inertial forces in systems involving linear, angular, and plane motion.
    1. Use the principles of dynamic equilibrium to solve kinetic problems in dynamics.
7. Determine the work done, resulting change in energy, and required power for bodies and systems under various force and torque configurations in linear, angular, and plane motion.
    1. Determine the amount of work done on a body or system by various force and torque configurations, including the construction and interpretation of graphical representations.
    2. Calculate the change in energy and associated power required resulting from work done on or by a body in linear, rotational, and plane motion.
    3. Determine the efficiency of various mechanical systems.
8. Calculate the appropriate parameters involved in linear, angular, and plane motion as well as elastic and inelastic collisions using the concepts of impulse and momentum.
    1. Use the principle of conservation of momentum to solve problems of a rigid body in linear, angular, and plane motion.
9. Apply the principle of coefficient of restitution to determine energy loss on impact of two solid bodies.
    1. Use the principle of coefficient of restitution to calculate the energy loss on elastic impact of solid bodies.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	**–**	**100**	**=**	**A**
83	**–**	**91**	**=**	**B**
75	**–**	**82**	**=**	**C**
0	**–**	**74**	**=**	**F**

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Exam 1 (summative)	20%
Exam 2 (summative)	20%
Exam 3 (summative)	20%
Homework (8 assignments) (formative)	40%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Use effective problem-solving skills and make appropriate decisions relative to the technical field.
2. Design basic mechanical systems with the use of computer-aided drafting equipment.
3. Demonstrate basic computer literacy and knowledge of computer software applications in both the business and technical fields.
4. Use hand and power tools for standard manufacturing operations.
5. Conduct basic machining and welding operations; and perform basic programming of computer/numerically-controlled machines.
6. Calculate forces, properly size structures and mechanical components, and perform standard materials testing procedures.
7. Demonstrate an understanding of basic AC and DC electrical control circuits.
8. Select appropriate materials for basic mechanical applications.
9. Review and/or design basic hydraulic/pneumatic power systems.
10. Select basic machine components for mechanical systems.
11. Exhibit professional traits, including the ability to work with minimal supervision, willingness to learn new skills and contributing to team project efforts.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.