Cleveland State University
Washkewicz College of Engineering
Department of Mechanical Engineering

Course: ESC-202-001 Dynamics (3 credits)

Spring Semester 2020-21
Mon., Wed., Fri. 9:10 am - 10:00 am
Remote

Professor: Mina Dimov, Ph.D.
Email: m.dimov@csuohio.edu
Office: 245 Fenn Hall, (216)687-5174
Office Hours: Zoom: Mondays 10:30 am-11:30 am

Text (required): *Engineering Mechanics DYNAMICS* Fourteenth Edition, by R.C. Hibbler (ISBN 0-13: 978-0-13-391538-9).

Course Description: Dynamics is the science of motion. It can be divided into two categories: *Kinematics*, the geometry of motion and *Kinetics*, how the geometry of motion is affected by forces. Dynamics is the next step beyond Statics, where not only forces are analyzed, but also their effect on motion.

Catalog Description:
ESC 202 Dynamics Prerequisite: ESC 201. Motion of particles and rigid bodies subjected to unbalanced force systems; the kinematics of plane motion, relative motion, the concept of force, mass and acceleration; work and energy, and impulse and momentum.

Course Objectives: Upon successful completion of this course, students will be expected to:
1. Understand the concept of particle and rigid body dynamics.
2. Apply force - acceleration methods to solve dynamic problems.
3. Apply work - energy methods to solve dynamic problems.
4. Apply impulse - momentum methods to solve dynamic problems.

Outcomes: Student Outcome – An ability to demonstrate the principles of engineering science, college level mathematics, and the basic sciences.

This course prepares students to demonstrate the following outcomes of the students engineering program:
- Kinematics of Particles,
- Kinetics of Particles,
- Work-Energy of Particles,
- Impulse and Momentum of Particles
- Kinematics of Rigid Bodies,
- Kinetics of Rigid Bodies

Lectures: Lectures will meet M W F. We will follow the textbook as outlined in the schedule below. The course content is defined by the material presented in lectures, so regular attendance is advisable.

Homework: Homework problems will be assigned throughout the semester. They are not collected nor graded, they are for the student to practice learning the course material.

Tests and Exam: There will be three tests and one final exam. The tests and exam dates are listed in the tentative schedule below.

Grades: Test #1 (25%),
Test #2 (25%),
Test #3 (25%),
Final Exam (25%).

A: 92 to 100; A-: 90 to <92; B+: 88 to <90; B: 82 to <88; B-: 80 to <82; C+: 78 to <80; C: 70 to <78; D: 60 to <70 F: 0 to <60

Policies: It is the student's responsibility to obtain lecture notes for missed classes. Every student enrolled in this section, their grade, is made up of only the three tests and one final exam. There is no extra credit in this class.

Missed tests or final exam will receive 0 grade (in case of emergency inform the professor before or no later than day of test, only if there is proper notification, the missed test or exam **may** be arranged with point deductions. Each situation will be reviewed on an individual case by case basis). **In case of emergency cancellation of this class**, it will be communicated to the students in the class via CSU blackboard.

The tests and exam will cover computations, theories and ideas covered in class.

Collaboration: Submitting information copied by any means (visual, cut and paste, etc.) from another student's work, **pirated author's solutions**, or any other source is unacceptable. Enough physical similarity between submitted assignments and any other source to create the suspicion that copying has occurred will result in loss of credit for all involved and possible academic discipline. Please abide by the Cleveland State University policy regarding academic misconduct.

Academic misconduct

You are expected to practice academic integrity in every aspect of this course and all other courses. Familiarize yourself with the CSU Student Conduct Code and the policies around academic misconduct, view at https://www.csuohio.edu/sites/default/files/3344-21-02_0.pdf. Students who engage in academic misconduct are subject to university disciplinary procedures, as well as consequences with regard to this course.

Some forms of academic dishonesty:

Obtaining unauthorized information. Information is obtained dishonestly, for example, by copying graded homework assignments from another student, by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, by looking at your notes or other written work during an examination when not specifically permitted to do so, or obtaining work from an online homework or exam warehouse.

Tendering of information. Students may not give or sell their work to another person who plans to submit it as his or her own. This includes giving their work to another student to be copied, sharing work when the instructor's directions were that work be completed independently, giving someone answers to exam questions during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.

Misrepresentation. Students misrepresent their work by handing in the work of someone else. Examples include: purchasing a paper from a term paper service; reproducing another person's paper, project, research, or examination (even with modifications) and submitting it as their own; having another student do their computer program, complete their design project, or complete their online quiz.

Bribery. Offering money or any item or service to a faculty member or any other person to gain academic advantage for yourself or another is dishonest.

Plagiarism. Unacknowledged use of the information, ideas, or phrasing of other writers is an offense comparable with theft and fraud, and it is so recognized by the copyright and intellectual work laws. Offenses of this kind are known as plagiarism.

Copying. Looking at someone else's test, or exam and copying their work and the solution (s).

Students are required to **pull back all head coverings to display their ears during exams (tests)** to prevent academic misconduct:

As part of the University's ongoing efforts to prevent cheating, and based on evidence of increased use of headphones and ear piece devices to permit cheating on exams, all students are required to display their ears for the duration of any exam (test). This policy may require students to tuck long hair behind ears or pull it into a ponytail or hair clip; remove hoods, caps or hats, or pull hats and caps up above ears; pull back headbands, beanies, hijabs, bandanas or other head coverings to display the student's ears). Any student not complying with this policy will, after a warning, be issued a zero on the exam (test). Students with concerns about their compliance with this policy please contact the Office of Institutional Equity at OIE@csuohio.edu or 216-687-2223.

Academic Honesty. "Cheating" means intentionally misrepresenting the source, nature, or other conditions of academic work to receive undeserved credit. Cleveland State University affirms that acts of cheating debase the academic degree awarded, have no place in the University, and are severe offenses to academic goals, objectives and the rights of fellow students. CSU does not tolerate any type of cheating and will take disciplinary action up to and including expulsion.

Once you log into Blackboard, you are agreeing to follow the Cleveland State University Academic Integrity Policy.

			Lecture and Reading Schedule (tentative)	
	Date-Class	Day	Brief Outline of Topics	Textbook
Wk 01	Jan 18	-	Holiday – Martin Luther King	
	Jan 20	1	Course Overview, Rectilinear Kinematics: Continuous Motion	Ch. 12.1 - 12.2
	Jan 22	2	Rectilinear Kinematics: Continuous Motion	12.2
Wk 02	Jan 25	3	Motion of a Projectile	12.6
	Jan 27	4	Curvilinear Motion: Normal & Tangential Components	12.7
	Jan 29	5	Curvilinear Motion: Normal & Tangential Components	12.7
Wk 03	Feb 01	6	Relative-Motion of Two Particles	12.10
	Feb 03	7	Newton's Second Law of Motion, Equation of Motion	13.1 – 13.2
	Feb 05	8	EoM: Rectangular Coordinates	13.4
Wk 04	Feb 08	9	EoM: Rectangular Coordinates	13.4
	Feb 10	10	EoM: Rectangular Coordinates / Normal & Tangential Coordinates	13.5
	Feb 12	11	EoM: Normal & Tangential Coordinates	13.5
Wk 05	Feb 15	-	Holiday – President's Day	
	Feb 17	12	**Test No. 01 (Chapter 12 & 13 material)**	
	Feb 19	13	The Work of a Force, Principle of Work & Energy	14.1-14.2
Wk 06	Feb 22	14	Principle of Work & Energy for a System of Particles	14.3
	Feb 24	15	Power & Efficiency	14.4
	Feb 26	16	Conservative Forces & Potential Energy	14.5
Wk 07	Mar 01	17	Conservation of Energy	14.6
	Mar 03	18	Principle of Linear Impulse & Momentum	15.1
	Mar 05	19	Principle of Linear Impulse & Momentum, System of Particles	15.1 – 15.2
Wk 08	Mar 08	20	Conservation of Linear Momentum for a System of Particles	15.3
	Mar 10	-	Reading Day	
	Mar 12	21	Impact	15.4
Wk 09	Mar 15	22	Impact	15.4
	Mar 17	23	Angular Momentum	15.5
	Mar 19	24	Relation Between Moment of Force & Ang Moment	15.6
Wk 10	Mar 22	25	Principle of Angular Impulse and Momentum	15.7
	Mar 24	26	Principle of Angular Impulse and Momentum	15.7
	Mar 26	27	Principle of Angular Impulse and Momentum	15.7
Wk 11	Mar 29	28	Planar Rigid-Body Motion, Translation	16.1 – 16.2
	Mar 31	29	Rotation about a Fixed Axis	16.3
	Apr 02	30	**Test No. 02 (Chapter 14 & 15 material)**	
Wk 12	Apr 05	31	Rotation about a Fixed Axis	16.3
	Apr 07	32	Instantaneous Center of Zero Velocity	16.6
	Apr 09	33	Instantaneous Center of Zero Velocity	16.6
Wk 13	Apr 12	34	Instantaneous Center of Zero Velocity	16.6
	Apr 14	35	Mass Moment of Inertia, Planar Kinetic Equations of Motion	17.1
	Apr 16	36	**Test No. 03 (Chapter 16 material)**	
Wk 14	Apr 19	37	Planar Kinetic Equations of Motion	17.2
	Apr 21	38	Equation of Motion: Translation	17.3
	Apr 23	39	Equation of Motion: Translation / E of M: Rotation Fixed Axis	17.3 – 17.4
Wk 15	Apr 26	40	Equation of Motion: Rotation about a Fixed Axis	17.4
	Apr 28	41	Equation of Motion: General Plane Motion	17.5
	Apr 30	42	Equation of Motion: General Plane Motion	17.5
	May 07		**FINAL EXAM 8:00 am – 10:00 am (Chapter 17 material)**	