Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: SPRING
Year: 2025
Course Prefix: ENGR 2030
Course and Section #: 002
Course Title: DYNAMICS
Credits: 3

Course Description

This course provides the fundamental concepts of particle kinematics, including the study of translating and rotating coordinate systems. It also covers the kinematics of rigid bodies, the dynamics of particle and rigid body systems, as well as the principles of energy and momentum. Through a combination of theoretical understanding and applied methods, students will explore key concepts in motion and forces affecting systems of particles and rigid bodies.

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Amal Saeed Yagub, PhD

Student Learning Outcomes

- Describe in mathematical terms the rectilinear motion of a particle under constant or variable acceleration.
- Use normal and tangential coordinates to mathematically describe the curvilinear motion of a particle and calculate the motion of a system of particles in a dependent motion system. Compute the relative motion of particles in an inertial frame of reference.
- Apply Newton`s laws of motion to describe the interaction of forces upon particles and particle systems.
- Apply the work-energy principle to describe the motion of particles and particle systems.
- Use the conservation of energy theorem to describe the motion of particles and particle systems.
- Evaluate the use of the impulse-momentum principle in particle dynamics.
- Adapt the conservation of momentum principle to impact and recoil problems involving particles.
- Describe the various types of motions of a rigid body in a three-dimensional space.
- Apply Newton`s 2nd law to describe the motion of rigid bodies under the action of forces and moments.
- Use the work-energy principle to describe the motion of a rigid body in a 2D space.

- Apply the impulse-momentum principle to describe the motion of a rigid body in a 2D space.
- Adapt the conservation of momentum principle to describe the motion of a rigid body in a 2D space.

Course Materials and Texts

Engineering Mechanics: Dynamics, R. C. Hibbeler, 14th Edition, 2015 – Pearson

Engineering Mechanics: Dynamics, Gary Gray, Francesco Costanzo, Robert J. Witt and Michael Plesha 3rd Edition, 2023 - McGraw Hill

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Course Requirements

Course Assignments, Assessments, and Grading Policy

Generally, there will be several quizzes throughout the semester. Quizzes will be administered at the beginning of class and the time allocated to complete a quiz will be based on the complexity of the material on the quiz. There will be a total of three exams administered for this course. All assignments are considered due on or before the due date. Late assignments will not be accepted. If a student has a severe hardship, consideration may be given at the discretion of the course instructor.

If you are unable to attend class, please email the professor in advance to request an excused absence, which will allow you to make up any missed work.

An unexcused absence from a quiz/an exam will result in a grade of zero for that quiz/exam. If absence from a quiz/an exam is excused, it is the responsibility of the student to make IMMEDIATE arrangements to make up the quiz/exam. In general, those arrangements should be made PRIOR to the scheduled quiz/exam date.

Leaving the classroom while an exam is on-going signifies that you have completed your work on the exam – please plan any trip to the restroom accordingly.

If you are experiencing any difficulties, please feel free to schedule a one-on-one meeting with the instructor to discuss potential solutions.

- Homework: Weekly practice problems related to topics under study. (20%)
- Quizzes: Short assessments administered periodically in class that include problem-solving questions on material covered in the course. (20%)
- Exams: There will be a total of three exams administered for this course that are similar to problems from homework or discussed in class. Exams are closed book, closed notes, and taken in class. (60%)

Final grades are rounded to the nearest tenth and assigned the corresponding letter grade:

A = 93-100	B - = 80-82.9	D+ = 67-69.9
A - = 90-92.9	C+ = 77-79.9	D = 63-66.9
B+ = 87-89.9	C = 73-76.9	D - = 60-62.9
B = 83-86.9	C - = 70-72.9	F = 0-59.9

Required or Recommended Reading Assignments

To prepare effectively for each quiz and exam, ensure you thoroughly study the lectures, assignments, and practice problems provided during the course.

General Description of the Subject Matter of Each Lecture or Discussion
Classes will be taught in a lecture format and student participation during class is expected. Extra "help" sessions will be offered when requested by students and these sessions will be dedicated to reviewing course material and discussing homework problems.

Kinematics of a Particle: Introduce the concepts of position, displacement, velocity, and acceleration.

Kinetics of a Particle: Force and Acceleration:

State Newton's Second Law of Motion and to define mass and weight. Analyze the accelerated motion of a particle using the equation of motion with different coordinate systems.

Kinetics of a Particle: Work and Energy: Develop the principle of work and energy and apply it to solve problems that involve force, velocity, and displacement. Introduce the concept of a conservative force and apply the theorem of conservation of energy to solve kinetic problems.

Kinetics of a Particle: Impulse and Momentum: Introduce the concept of angular impulse and momentum. Study the conservation of linear momentum for particles.

Planar Kinematics of a Rigid Body: Classify the various types of rigid-body planar motion.

Investigate rigid-body translation and angular motion about a fixed axis. Study planar motion using an absolute motion analysis.

Planar Kinetics of a Rigid Body: Force and Acceleration: Introduce the methods used to determine the mass moment of inertia of a body. Develop the planar kinetic equations of motion for a symmetric rigid body.

Planar Kinetics of a Rigid Body: Work and Energy: Develop formulations for the kinetic energy of a body and define the various ways a force and couple do work.

Apply the principle of work and energy to solve rigid–body planar kinetic problems that involve force, velocity, and displacement.

Planar Kinetics of a Rigid Body: Impulse and Momentum: Develop formulations for the linear and angular momentum of a body. Apply the principles of linear and angular impulse and momentum to solve rigid-body planar kinetic problems that involve force, velocity, and time.

Required Course Syllabus Statements
Generative AI
This course requires you to complete assignments that assess your understanding and application of the material. You are expected to do your own work, and the use of artificial intelligence (AI) tools, such as chatbots, text generators, paraphrasers, summarizers, or solvers, is strictly prohibited for any part of your assignments. Using these tools will be considered academic dishonesty and will be handled according to the university's policy. If you have questions about acceptable use of AI tools, please consult the instructor before submitting your work

Using Remote Testing Software
☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities
Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity
At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.