COURSE CALENDAR DESCRIPTION

This course covers kinematics and kinetics of rigid body motion (2D and 3D) based on concepts of force, work, momentum and energy methods; impact; mechanical vibrations; engineering applications are emphasized. Prerequisites: SC/MATH 1013 3.00, SC/MATH 1014 3.00, and SC/PHYS 1800 3.00.

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
<th>Contact Phone</th>
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<tbody>
<tr>
<td>Melenka, Garrett</td>
<td>Sec. M / LECT / W</td>
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TOPICS AND CONCEPTS

This course covers kinematics and kinetics of rigid body motion (2D and 3D) based on concepts of force, work, momentum and energy methods; impact; mechanical vibrations; engineering applications are emphasized.

TOPICS

Part I - Introduction and Review (0.5 Week)

1st Half of Week 1:
- Definitions of terms (position, velocity, acceleration, mass, force, vector, scalar, particle and rigid body), Coordinates
- Particle Kinematics and Kinetics Review

Part II – 2D Rigid Body Dynamics (9.5 Weeks)

2D Kinematics

2nd Half of Week 1:
- Rigid body motion: Translation

Week 2:
- Rigid body motion: Rotation about a fixed axis
- Relative Motion Analysis: Velocity

Week 3:
- Relative Motion Analysis: Acceleration
- Relative Motion Analysis Using Rotating Axes

2D Kinetics

Week 4:
- Moment of inertia, Introduction to Planar Equation of Motion
- Translation: Rectilinear

Week 5:
- Quiz 1
- Translation: Curvilinear
- Equation of Motion: Rotation about a fixed axis

Week 6:
- Equation of Motion: General Plane Motion
- Kinetic energy in translation and rotation about a fixed axis

Week 7:
- Work done by a force and a couple, Potential energy
- Conservation of Energy

Week 8:
- Midterm
- Undamped free vibration
Week 9:
- Undamped forced vibration
- Damped free vibration

Week 10:
- Linear and Angular Momentum, Impulse
- Conservation of Momentum

Part III – Introduction to 3D Rigid Body Dynamics (2 Weeks)

3D Kinematics

Week 11:
- Quiz 2
- Velocity
- Acceleration

3D Kinetics

Week 12:
- Equation of Motion (Translation)
LIST OF LEARNING OUTCOMES AND EXAMPLES OF

Course Learning Outcomes
A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.

1. Analyze the linear and angular velocities and accelerations of a rigid body in planar or 3D motion using appropriate frame of references.
2. Identify planar kinetic equations of motion, translation, rotation, and general plane motion for rigid bodies.
3. 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.
4. Develop and apply the equations of motion to 3D translational problems.
5. Apply Newton 2nd law to formulate the equation of motion for damped and undamped vibrations.

GRADED ASSESSMENT

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<tr>
<th>Type</th>
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<tr>
<td>Out-of-Class Assignments</td>
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<tr>
<td>Quiz</td>
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<td>Midterm</td>
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<td>Final</td>
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ADDITIONAL INFORMATION

Textbook:

Alternative textbook:

ACADEMIC INTEGRITY LINKS
- Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
- Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS
- Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
- Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
- Counselling and Disability Services - http://cds.info.yorku.ca/
Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.

Moodle @ York University