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>
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ADDITIONAL INFORMATION

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:
• 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:
• Velocity
• Acceleration

3D Kinetics
Week 12:
• Equation of Motion (Translation)

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.

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
• Academic Accommodation for Students with Disabilities - http://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-with-disabilities-policy/
• Counselling and Disability Services - http://cds.info.yorku.ca/
• York University’s Policies on Sexual Violence - http://secretariat-policies.info.yorku.ca/policies/sexual-violence-policy-on/
• York University’s Policies on Gender/LGBTQ*/Positive Space - http://rights.info.yorku.ca/lgbtq/

LAND ACKNOWLEDGEMENT
• We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.
• The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
• Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements

Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.

Moodle @ York University