9/15/2022 DATE

☑ REQUIRED COURSE
☐ ELECTIVE COURSE

MSD  DIVISION
☐ NEW COURSE
☑ REVISION

# Lake Land College
## Course Information Form

| COURSE NUMBER: | PHY-240 | | TITLE: *(30 Characters Max)* | | Mechanics II (Dynamics) | | | |
|---|---|---|---|---|---|---|---|---|
| SEM CR HRS: | 3 | Lecture: | | 3 | | Lab: | 0 | | ECH: | 3 |

| Course Level: | ☐ Gen Ed / IAI  ☑ Baccalaureate /Non-IAI | ☐ Career/Technical  ☐ Dev Ed/ Not in Degree Audit | Clinical Practicum: | 0 | SOE/ Internship: | 0 | SOE ECH: | 0 |
|---|---|---|---|---|---|---|---|---|

| COURSE PCS # | 11 - 14.1101 | IAI Code | | | | Contact Hours (Minutes Per Week) | | |
|---|---|---|---|---|---|---|---|---|
| Repeatable (Y/N): | N | Pass/Fail (Y/N): | N | Variable Credit (Y/N): | N | Min: | Max: | 16 Wks | 150 | 8 wks | 300 |

| Prerequisites: | PHY-239 with a grade of 'C' or higher and Co-requisites MAT-243 and MAT-245 |
|---|---|
| Catalog Description: (40 Word Limit) | This course is a study of the motion of rigid bodies and system of particles for engineering students. |

| List the Major Course Segments (Units) | Contact Lecture Hours | Contact Lab Hours | Clinical Practicum | Non-Clinical Internship/ SOE |
|---|---|---|---|---|
| Kinematics of Particles | 8 | | | |
| Kinetics of Particles: Newton's Second Law and Application | 4 | | | |
| Kinetics of Particles: Work and Energy Methods | 4 | | | |
| Kinetics of Particles: Impulse and Momentum Methods | 5 | | | |
| Kinematics of Rigid Bodies | 5 | | | |
| Kinetics of Rigid Bodies: Force and Acceleration of Rigid Bodies | 4 | | | |
| Kinetics of Rigid Bodies: Energy and Momentum (Linear, and Angular) Methods | 6 | | | |
| Mechanical Vibrations | 3 | | | |
| Quizzes and Exams | 6 | | | |
| TOTAL | 45 | 0 | 0 | 0 |

## EVALUTION

| QUIZZES ☑ | EXAMS ☑ | ORAL PRES ☐ | PAPERS ☐ |
|---|---|---|---|
| LAB WORK ☐ | PROJECTS ☐ | COMP FINAL ☐ | OTHER ☑ homework |

## COURSE MATERIALS

| TITLE: | Engineering Mechanics - Dynamics |
|---|---|
| AUTHOR: | R. C. Hibbeler |
| PUBLISHER: | Pearson, Prentice Hall |
| VOLUME/EDITION/URL: | 13th |
| COPYRIGHT DATE: | 2013 |

| MAJOR COURSE SEGMENT | HOURS | LEARNING OUTCOMES |
|---|---|---|
| | | *The student will be able to:* |
| Kinematics of Particles<br><br>Introduction<br>Rectilinear Motion<br>Rectilinear Kinematics<br>Curvilinear Motion<br>Projectile Motion<br>Dependent Motion Analysis<br>Relative Motion | 8 | • Express and analyze motion of particles in various coordinate systems using kinematical equations and graphs.<br>• Analyze the dependent motion of two particles. |
| Kinetics of Particles: Application of Newton's 2nd Law<br><br>Equations of Motions<br>Rectangular Coordinates<br>Normal and Tangential Coordinates<br>Cylindrical Coordinates | 4 | • Apply Newton's 2nd Law to particles in various coordinate system.<br>• Write and solve the equations of Motion for unknown quantities.<br>• Analyze the accelerated motion of a particle using the equations of motion. |

| Topic | Hours | Outcomes |
|---|---|---|
| **Kinetics of Particles: Work & Energy Methods**<br><br>Principle of Work and Energy<br>Power and Efficiency<br>Conservative Forces and Potential Energy<br>Conservation of Energy | 4 | • Apply principle of work and energy to solve problems involving force, velocity, and displacement.<br>• Apply the theorem of conservation of energy to solve kinetic problems. |
| **Kinetics of Particles: Impulse & Momentum Methods**<br><br>Principle of Impulse and Linear Momentum<br>Conservation of Linear Momentum<br>Impact<br>Angular Momentum<br>Principle of Angular Impulse and Momentum | 5 | • Apply the principle of linear and angular impulse and momentum to analyze and solve problems that involve, force, velocity, and time.<br>• Analyze the impact of objects |
| **Kinematics of Rigid Bodies**<br><br>Planar Motion<br>Rotation about a Fixed Axis<br>Relative Motion Analysis: Velocity<br>Instantaneous Center of Zero Velocity<br>Relative Motion Analysis: Acceleration | 5 | • Analyze the motion of a rigid body in general planar motion using kinematical variables.<br>• Determine velocities and accelerations of individual points on the objects. |
| **Kinetics of Rigid Bodies: Force and Acceleration of Rigid Bodies**<br><br>Equations of Motion<br>Moment of Inertia<br>Translation<br>Rotation About a Fixed Axis | 4 | • Apply Newton's 2nd law in order to calculate the acceleration of a rigid body's center of mass and its angular acceleration due to external forces and moments. |
| **Kinetics of Rigid Bodies: Energy and Momentum Methods**<br><br>Principle of Work and Energy<br>Conservation of Energy<br>Linear and Angular Momentum<br>Principle of Impulse and Momentum<br>Conservation of Momentum<br>Eccentric Impact | 6 | • Utilize the principle of work and energy to solve rigid-body planar kinetic problems that involve force, velocity and displacement.<br>• Apply the conservation of energy to solve rigid-body planar kinetic problems.<br>• Apply the principle of linear and angular impulse and momentum to solve rigid-body problems that involve force, velocity, and time. |
| **Mechanical Vibrations**<br><br>Vibration of Systems<br>Damped Vibration<br>Forced Vibration | 3 | • Determine the equations of motion and analyze the motion of one-degree-of-freedom systems in vibration. |
| **Quizzes and Exams** | 6 | |
| Insert New Line Above this Line | | |
| | 45 | |

| COURSE OUTCOMES* | At the successful completion of this course, students will be able to: |
|---|---|
| | • Use calculus and graphical techniques to determine kinematical variables such as acceleration, velocity, and displacement of a particle in motion. |
| | • Determine the equations of motions in various coordinate systems for system of particles and rigid bodies. |
| | • Analyze the behavior of various points on rigid bodies in motion. |
| | • Use energy methods to analyze the motion of a system of particles and rigid bodies. |

| | • Use momentum methods to analyze impacts between particles and rigid bodies. |
| --- | --- |
| | • Determine the equation of motion of an object undergoing vibrational motion and utilize the equation to describe its behavior. |

*\* Course Outcomes will be used in the Assessment Software for Outcomes Assessment. Limit to 3 - 5.*