

**MECH2020 Statics and Dynamics**

<b>Course Code:</b> MECH2020	<b>Course Title:</b> Statics and Dynamics
<b>Required Course Or Elective Course:</b> Required Course	<b>Terms Offered (Credits):</b> Fall 2023-24 (3 credits)
<b>Faculty In Charge:</b> Robin MA	<b>Pre/Co-Requisites:</b> MATH1013/ MATH1020/ MATH1023/ PHYS1112/ PHYS1152
<b>Course Structure:</b> Lecture: 3 hours per week; Tutorial: 1 hour per week	
<b>Textbook/Required Material:</b> Vector Mechanics for Engineers: Statics Vector Mechanics for Engineers: Dynamics Beer & Johnston, McGraw-Hill	
<b>Bulletin Course Description:</b> This is a required course for the BEng in Mechanical Engineering, focusing on fundamental analysis of the equilibrium and dynamic behavior of mechanical systems. Statics: equilibrium of particles and of rigid bodies; free body diagram; distributed forces; analysis of structures, e.g. trusses, frames and machines. Dynamics: kinematics of particles; kinetics of particles; Equations of motions; Newton's second law; Kinetics diagram; energy.	
<b>Course Topics:</b> 1 Statics of particles 2 Forces and equilibrium in space 3 Rigid bodies: Equivalent systems of forces 4 Equilibrium of rigid bodies 5 Analysis of structures 6 Frames and machines 7 Internal forces and moments 8 Kinematics of particles 9 Rectilinear and Curvilinear motions of particles 10 Path and Polar coordinates 11 Kinetics of particles: Newton's second law 12 Equations of motions 13 Kinetics diagram	
<b>Course Objectives:</b> (correlated program objectives)	<ol style="list-style-type: none"> <li>1. Study of mechanics, including both statics that investigates how structures maintain equilibrium and dynamics that describes the kinematics of dynamical systems. (P-O1, P-O3)</li> <li>2. Form the foundation in the discipline of mechanical engineering and equip the students with the basics of mechanics, which is one of the required courses for students in this area. (P-O1, P-O3)</li> <li>3. In addition to solving relevant problems, students can learn rigorously the fundamental principles of mechanics in a systematic approach. These principles will be used in subsequent classes, including Mechanism of Machinery, Solid Mechanics, Strength of Materials, Finite Elements etc. (P-O1, P-O3)</li> </ol>
<b>Course Outcomes:</b> (correlated course objectives and program)	<p>On successful completion of this course, students are expected to be able to:</p> <ol style="list-style-type: none"> <li>A. Identify the mechanics theory of equilibrium for mechanical systems. [1,2] (POC1-4, POC6)</li> </ol>

outcomes)	<p>B. Analyze and compare different static structures, such as trusses, frames and machines. [1,2] (POC1, 3, 4, 6)</p> <p>C. Identify the concepts of kinematics of particles and rigid bodies. [1,2] (POC1, 3, 6)</p> <p>D. Describe the motion for particles and associate its related equations. [1,2] (POC1, 3, 6)</p> <p>E. Evaluate kinetics of particles using energy and momentum methods. [1,2] (POC1, 4, 6)</p> <p>F. Analyze and construct simple mechanical systems. [3] (POC1, 3, 4, 6)</p>
<b>Assessment Tools:</b> (correlated course outcomes)	<p>Homework assignments – 20% (5X4%) [A-G]</p> <p>Quizzes – 45% (3X10%) [A-F]</p> <p>Final Exam – 35% [A-F]</p>

### **BEng in Mechanical Engineering (4-year program)**

#### **Program Objectives:**

- P-O1. Be able to communicate and perform as an effective engineering professional in both individual and team-based assignments environments,
- P-O2. Have an international outlook with clear perspectives on the Pearl river Delta and Greater China,
- P-O3. Be able to research, design, develop, test, evaluate and implement engineering solutions to problems that are of complexity encountered in professional practice and leadership,
- P-O4. Clearly Consider the ethical implications and societal impacts of engineering solutions,
- P-O5. Continuously improve through lifelong learning.

#### **Program Outcomes:**

- POC1. ability to identify and formulate problems in multidisciplinary environment with an understanding of engineering issues and constraints;
- POC2. ability to design and conduct experiments as well as analyze and interpret data;
- POC3. ability to apply knowledge of mathematics, science, and engineering for problem solving in mechanical engineering and related sectors or for further education in a research career;
- POC4. ability to develop specification and to design system, component, or process to meet needs;
- POC5. ability to understand the manufacturability, maintainability, and recyclability of engineering system and components;
- POC6. ability to use modern engineering tools, techniques, and skills in engineering practice;
- POC7. ability to communicate effectively;
- POC8. ability to function in multi-disciplinary teams and provide leadership;
- POC9. broadly educated with an understanding of the impact of engineering solutions on issues such as economics, business, politics, environment, health and safety, sustainability, and societal context;
- POC10. ability to understand of professional and ethical responsibilities;
- POC11. ability to recognise the need for life-long learning and continuing education.