B.Tech (Mechanical Engineering)

Course Title: Machine Design-I

1**. Design and Analysis of Riveted and Welded Joints in Pressure Vessels**

This project involves designing and comparing the efficiency and failure modes of riveted and welded joints in pressure vessels. Using ANSYS, students will design various riveted joints (e.g., single-riveted, double-riveted) and welded joints (e.g., butt welds, fillet welds), create 3D models, and simulate the stress distribution under static and fluctuating loads. The project includes performing failure analysis and optimizing the joint designs for maximum efficiency. Through this project, students will gain practical experience with ANSYS in analyzing stress concentration effects, understanding joint design principles, and enhancing their skills in simulation and optimization.

2. **Design of a Mechanical Spring for Automotive Suspension Systems**

In this project, students will design helical and leaf springs for automotive suspension systems using ANSYS. The project starts with material selection and designing the springs to meet specified load requirements. Students will perform static and fatigue analyses to evaluate stress distribution and spring performance under various loading conditions. They will create 3D models, set up boundary conditions, and interpret simulation results to optimize the spring design for durability and performance. This project provides hands-on experience with ANSYS, improving skills in simulation, analysis, and optimization of mechanical components.

3**. Design and Optimization of Shafts and Couplings for a Mechanical Drive System**

This project focuses on designing and optimizing a shaft and coupling system subjected to combine twisting and bending moments. Using ANSYS, students will select materials, design the shaft, and choose suitable rigid and flexible couplings. They will perform stress analysis on the shaft and coupling, considering fatigue loads, and optimize the design for weight, cost, and performance. The project includes creating 3D models, setting up simulations, and interpreting results to ensure the system's durability and efficiency. This project enhances students' understanding of shaft and coupling design principles and their proficiency with ANSYS.

4. Development of a Screw Jack with High Efficiency and Load-Bearing Capacity

In this project, students will design a screw jack with high efficiency and load-bearing capacity using ANSYS. The project involves studying different thread forms (square, trapezoidal) and their efficiencies, designing the screw jack to meet load requirements, and analyzing stresses in the screw. Students will create 3D models, simulate the efficiency of single-threaded and multi-threaded screw designs, and conduct failure analysis to optimize the design. This project provides practical experience with ANSYS, improving students' skills in design, simulation, and analysis of power screws.

5. Design and Testing of a Multi-Purpose Key and Spline System for High Torque Applications

This project involves designing and testing a key and spline system to efficiently transmit high torque in mechanical systems using ANSYS. Students will study key and spline types, select appropriate materials, and design the system to meet high-torque requirements. They will perform stress analysis, create 3D models, and simulate the system under different loading conditions to evaluate performance and identify potential failure modes. The project also includes optimizing the design for strength and durability. Through this project, students will gain hands-on experience with ANSYS, enhancing their understanding of key and spline design principles and their proficiency in simulation and analysis.