K. S. INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU, Approved by AICTE

Department of Mechanical Engineering

FIRST / SECOND SEMESTER SYLLABUS

Course : **Introduction to Engineering Mechanics**		Semester	I/II
Course Code	**25BESC104/ 204G**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3-0-0-0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course Objectives (Course Skill Set)

1: To develop student's ability to analyse the problems involving forces, moments with their applications.

2: To analyse the member forces in trusses.

3: To make students to learn the effect of friction on different planes

4: To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.

5: To make the students learn about kinematics and kinetics and their applications.

Module-1

System of forces: Resultant of coplanar concurrent and non-concurrent forces

Resultant of coplanar force system: Basic dimensions and units, Idealisations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system- Numerical examples

Number of Hours:8

Module-2

System of forces: Equilibrium concepts, Support reactions and Truss analysis

Equilibrium of coplanar force system: Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples. Analysis of Trusses: Introduction, Classification of trusses, analysis of plane perfect trusses by the method of joints and method of sections- Numerical examples **Number of Hours:8**

Module-3

Friction

Friction: Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction - Numerical examples

Number of Hours:8

Module-4

Centroid and Moment of Inertia

Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built up sections, Numerical examples. Moment of inertia of plane areas: Introduction, Rectangular moment of inertia, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built up sections- Numerical examples.

Number of Hours:8

Module-5

Kinematics

Kinematics: Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion Projectiles: Introduction, numerical examples on projectiles. Kinetics: Introduction, D 'Alembert's principle of dynamic equilibrium and its application in-plane motion and connected bodies including pulleys- Numerical examples

Number of Hours:8

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

CO1. Apply the concepts of statics for the analysis of coplanar force systems.

CO2. Apply the concept of equilibrium of forces to resolve the forces on a truss element.

CO3. Apply the principles of static equilibrium for solving problems involving friction

CO4. Apply the centroid concepts and evaluate second moment of area of plane composite and built-up areas.

CO5. Apply the concepts of dynamics to solve problems related to kinematics and kinetics of particles.

Textbooks:

1. Bhavikatti S S, Engineering Mechanics, 2019, New Age International
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2018, EBPB
3. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.

Reference books / Manuals:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill
2. Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
3. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press
5. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.

Web links and Video Lectures (e-Resources):

- NPTEL: Engineering Mechanics https://archive.nptel.ac.in/courses/112/106/112106286/
- https://www.iitg.ac.in/rkbc/me101/Presentation/L16-18.pdf

Assessment Structure:

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCA shall be conducted for 25 marks. It is evaluated through the learning activity which is aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity : Case Study Presentation **(15 Marks)**

Learning activity 2- 1 Assignment covering all syllabus for (**10 Marks)**

Rubrics for Learning Activity:

Case Study Presentation (25 Marks)

Case Study topic should relate to key learning area from the syllabus and allow exploration of practical applications, challenges, and innovations relevant to engineering education and industry

Performance Indicators	**Excellent**	**Good**	**Satisfactory**	**Needs Improvement**	**Poor**
Understanding of Case (5 Marks) (PO 1)	Demonstrates deep understanding **(5)**	Good understanding **(4)**	Adequate understanding. **(3)**	Limited understanding **(2)**	No clear understanding. **(0-1**)
Analysis & Critical Thinking (5 Marks) (PO 2)	Thorough, logical analysis with strong reasoning and innovative insights. **(5)**	Clear analysis with mostly logical reasoning. **(4)**	Basic analysis with some reasoning gaps. **(3)**	Weak analysis; mostly descriptive without reasoning. **(2)**	No clear analysis or reasoning. **(0-1)**
Documentation & Presentation Skills & QA Handling (5 Marks) (PO 9)	Documentation is complete, accurate, well structured, follows all formatting guidelines. Well-structured, clear, confident delivery; excellent visuals. Confident, accurate, and concise responses **(5)**	Documentation is mostly complete and accurate, well organized, follows formatting guidelines with minor deviations. Good structure, clear delivery; visuals mostly effective. Good responses with minor gaps. **(4)**	Documentation covers most required elements but has some inaccuracies or omissions. Average structure; delivery clear but lacks engagement. Adequate responses; some uncertainty. **(3)**	Documentation is incomplete with noticeable inaccuracies. Poor organization; visuals unclear. Weak or hesitant responses. **(2)**	Documentation is largely missing or irrelevant, lacks structure. Unclear, disorganized presentation. Unable to answer questions. **(0-1)**

Suggest Innovative Deliver Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play