



# K. S. INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU, Approved by AICTE

Department of Mechanical Engineering

## FIRST / SECOND SEMESTER SYLLABUS

<b>Course : Engineering Mechanics</b>		Semester	I/II
<b>Course Code</b>	<b>25BPSC105A / 205A</b>	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	<b>3:0:0:0</b>	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		
<b>Course Objectives (Course Skill Set)</b>			
1: To introduce the basic concepts of dimensions, units, force, and classification of force systems. 2: To explain the principle of transmissibility, moments, and characteristics of a couple. 3: To enable students to construct and interpret free body diagrams. 4: To develop understanding of composition and resolution of concurrent and non-concurrent coplanar forces. 5: To apply Varignon's theorem and moment principles in solving simple engineering problems			
<b>Module-1</b>			
<b>Coplanar force system:</b> Basic dimensions and units, Idealisation, Force, Classification of force system, principle of transmissibility of a force, Composition and resolution of forces, Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Moment, Couple and Characteristics of couple, Varignon's theorem: Numerical Examples. <b>Number of Hours:8</b>			
<b>Module-2</b>			
<b>Equilibrium:</b> Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems, Lami's theorem, Equilibrium of coplanar non-concurrent force system, Numerical examples. Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams. Support reactions for statically determinate beams subjected to various loadings: Numerical examples. <b>Number of Hours:8</b>			
<b>Module-3</b>			
<b>Friction:</b> Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic) friction, Laws of friction, Angle of repose, Cone of friction, Equilibrium of blocks on horizontal and inclined plane, Ladder friction: Numerical examples. <b>Number of Hours:8</b>			
<b>Module-4</b>			
<b>Centroid:</b> Introduction, definitions of centroid and centre of gravity. Axes of symmetry, Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, Centroid of composite areas and simple buildup sections: Numerical examples. <b>Number of Hours:8</b>			
<b>Module-5</b>			
<b>Moment of Inertia of plane Areas:</b> Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration. 2 Moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples <b>Number of Hours:8</b>			

**Course outcome (Course Skill Set)**

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

**CO1: Explain** the fundamental concepts of force systems, equilibrium, friction, centroid, and moment of inertia in engineering mechanics.

**CO2: Construct** free body diagrams and apply principles of resolution, composition, and transmissibility to analyze coplanar force systems.

**CO3: Apply** conditions of equilibrium, Lami's theorem, and support reaction analysis to solve problems on beams and structures.

**CO4: Analyze** problems involving friction, centroid of plane figures, and moments of inertia of simple and composite sections using appropriate theorems and methods.

**CO5: Solve** numerical problems in engineering mechanics by integrating theoretical principles with practical applications for real-world systems.

**Suggested Learning Resources:**

**Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year) Text Books:**

**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.
6. J K Gupta and S K Gupta, Engineering Mechanics and Applied Mechanics, first edition, 2021, Cengage learning. ISBN: 9789353505851.

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8Ppw>
- <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
- <https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5>
- <https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18>
- <https://www.youtube.com/watch?v=3YBXteL-qY4>
- <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
- <https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7>
- [https://www.youtube.com/watch?v=atoP5\\_DeTPE](https://www.youtube.com/watch?v=atoP5_DeTPE)
- <https://www.youtube.com/watch?v=ksmsp9OzAsI>
- <https://www.youtube.com/watch?v=x1ef048b3CE>

- [https://www.youtube.com/watch?v=l\\_Nck-X49qc](https://www.youtube.com/watch?v=l_Nck-X49qc)
- [https://play.google.com/store/apps/details?id=appinventor.ai\\_jgarc322.Resultant\\_Force](https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force) 3
- <https://www.youtube.com/watch?v=RIBeeW1DSZg>
- <https://www.youtube.com/watch?v=R8wKV0UQtlo>
- [https://www.youtube.com/watch?v=0RZHHgL8m\\_A](https://www.youtube.com/watch?v=0RZHHgL8m_A)
- <https://www.youtube.com/watch?v=Bl55KnQOWkY>

### 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 (**25 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
<b>Understanding of Case (5 Marks) (PO 1)</b>	Demonstrates deep understanding <b>(5)</b>	Good understanding <b>(4)</b>	Adequate understanding. <b>(3)</b>	Limited understanding <b>(2)</b>	No clear understanding. <b>(0-1)</b>
<b>Analysis &amp; Critical Thinking (10 Marks) (PO 2)</b>	Thorough, logical analysis with strong reasoning and innovative insights. <b>(9-10)</b>	Clear analysis with mostly logical reasoning. <b>(7-8)</b>	Basic analysis with some reasoning gaps. <b>(5-6)</b>	Weak analysis; mostly descriptive without reasoning. <b>(3-4)</b>	No clear analysis or reasoning. <b>(0-2)</b>
<b>Documentation &amp; Presentation Skills (10 Marks) (PO 9)</b>	Documentation is complete, accurate, well structured, follows all formatting guidelines. Well-structured, clear, confident delivery; excellent visuals. <b>(9-10)</b>	Documentation is mostly complete and accurate, well organized, follows formatting guidelines with minor deviations. Good structure, clear delivery; visuals mostly effective. <b>(7-8)</b>	Documentation covers most required elements but has some inaccuracies or omissions. Average structure; delivery clear but lacks engagement. <b>(5-6)</b>	Documentation is incomplete with noticeable inaccuracies. Poor organization; visuals unclear. <b>(3-4)</b>	Documentation is largely missing or irrelevant, lacks structure. Unclear, disorganized presentation. <b>(0-2)</b>

<b>Q&amp;A Handling (5 Marks) (PO 9)</b>	Confident, accurate, and concise responses. <b>(5)</b>	Good responses with minor gaps. <b>(4)</b>	Adequate responses; some uncertainty. <b>(3)</b>	Weak or hesitant responses. <b>(2)</b>	Unable to answer questions. <b>(0-1)</b>
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**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