| Course Title: | | **ENGINEERING MECHANICS** | | |
|---|---|---|---|---|
| Course Code: | | **22CIV13/23** | CIE Marks | 50 |
| Course Type (Theory/Practical/Integrated ) | | Theory | SEE Marks | 50 |
| | | | Total Marks | 100 |
| Teaching Hours/Week (L:T:P: S) | | 2:2:0:0 | Exam Hours | 03 |
| Total Hours of Pedagogy | | 25 hrs Lecture+25 hrs Tutorial = 50 hrs | Credits | 03 |

**Course objectives**
- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To analyse the member forces in trusses
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.
- To make the students learn about kinematics and kinetics and their applications.

**Teaching-Learning Process**
   These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.
   1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
   2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
   3. Encourage collaborative (Group) Learning in the class.
   4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
   5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
   6. Topics will be introduced in multiple representations.
   7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
   8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
   9. Individual teachers can device innovative pedagogy to improve teaching-learning.

| Module-1 **(10)** |
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**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.

| Module-2 **(10)** |
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**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.

| Module-3**(10)** |
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**Analysis of Trusses:** Introduction, Classification of trusses, analysis of plane perfect trusses by the method of joints and method of sections, Numerical examples.

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

| Module-4(10) |
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**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.

| Module-5 (10) |
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**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.

**Course outcome (Course Skill Set)**

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

| CO1 | Compute the resultant of a force system and resolution of a force |
|---|---|
| CO2 | Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces |
| CO3 | Analyse the frictional resistance offered by different planes |
| CO4 | Locate the centroid and compute the moment of inertia of sections |
| CO5 | Analyze the bodies in motion |

## Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation(CIE):**

**Two Unit Tests each of 30 Marks (duration 01 hour 30 Minutes)**

- First test after the completion of 30-40 % (after the completion of first two modules) of the syllabus
- Second test after completion of 80-90% ( after the completion of modules three and four) of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration

**Two assessments each of 20 Marks**

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others.   The Teachers shall choose the types of assessment depending on the requirement of the course and plan to attain the COs and POs.  ( to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE.   Each method of CIE should have a different syllabus portion of the course).  CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**The sum of two tests, two assessments, will be out of 100 marks and will be scaled down to 50 marks**

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:**

**Text Books**

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.

2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

## Reference Books:

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. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.

4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. Bhavikatti S S, Engineering Mechanics, 2019, New Age International

6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication

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

- https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
- 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=ksmsp9OzAsI
- https://www.youtube.com/watch?v=x1ef048b3CE
- https://www.youtube.com/watch?v=l_Nck-X49qc
- https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
- 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=Bls5KnQOWkY

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://play.google.com/store/apps/details?id=vn.edu.best4u.com.bieudonoiluc
- https://www.youtube.com/watch?v=Hn_iozUo9m4
- https://play.google.com/store/apps/details?id=com.teobou
- https://www.youtube.com/watch?v=WOHRp3V-QA0

**COs and POs Mapping (Individual teacher has to fill up)**

| COs | POs | | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| CO1 | 2 | 3 | | | | | | | | | | |
| CO2 | 2 | 3 | | | | | | | | | | |
| CO3 | 2 | 3 | | | | | | | | | | |
| CO4 | 2 | 3 | | | | | | | | | | |
| CO5 | 2 | 3 | | | | | | | | | | |

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

**Note:** Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.