| Mechanics of Materials & Machine | | Semester | III |
|---|---|---|---|
| Course Code | BAG304 | 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 nature (SEE) | Theory | | |

**Course objectives:**

- To learn about simple stresses and strains and their applications.
- To learn how to find shear force and bending moment and construction of SFD & BMD
- To understand the concept of machines, mechanisms and to analyze a mechanism for displacement, velocityand acceleration at any point in a moving link.
- To understand the force-motion relationship in components subjected to external forces and analysis ofstandard mechanisms
- To understand the theory of gears and gear trains.

**Teaching-Learning Process (General Instructions)**

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Videodemonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Adopt flipped classroom teaching method.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such asevaluating, generalizing, and analysing information.

**Module-1**

**Simple Stresses and Strains:** Elasticity and plasticity – Types of stresses and strains – Hooke's law – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them

**Module-2**

**Shear Force and Bending Moments:** Types of supports – Types of beams – Shear force and bending moment diagrams for simply supported - Cantilever and over hanging beams with point loads, uniformly distributed load, uniformly varyingloads and couples – Relationship between shear force and bending moment.

**Module-3**

**Introduction:** Mechanisms and machines, Kinematic pairs-types, degree of freedom, Kinematic chains and their classification, Kinematic inversions,

**Velocity and Acceleration analysis of planar mechanisms Graphical method:** Velocity and Acceleration Analysis ofMechanisms Velocity and acceleration analysis of four bar mechanism, slider crank mechanism.

**Module-4**

**Static force analysis**: Static equilibrium, analysis of four bar mechanism, slider crank mechanism.

**Dynamic force analysis**: D'Alembert's principle, analysis of four bar and slider crank mechanism.

**Flywheel:** Introduction to Flywheel and calculation of its size for simple machines like punching machine, shearing machine

**Spur Gears**: Gear terminology, law of gearing, path of contact, arc of contact, contact ratio of spur gear. **Gear Trains**: Simple gear trains, compound gear trains. Epicyclic gear trains.

**Module-5**

**MACHINE DESIGN** – Definition, Classification of machine design, General considerations in machine design, General procedure in machine design. Fundamental units, Mass and Weight, inertia, laws of motion, force, moment of force, couple mass density, torque, work, power and energy. **LEVERS** – Introduction, application of levers in

engineering practice, design of lever hand levers, foot lever, and cranked lever. Springs – Introduction, types of springs, material for helical springs, spring wire, terminology

**Course outcome (Course Skill Set)**

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

1. The students would be able to understand the behaviour of materials under different stress and strainconditions.
2. Knowledge of mechanisms and their motion and the inversions of mechanisms
3. Analyse the mechanisms for static and dynamic equilibrium.
4. Carry out the balancing of rotating and reciprocating masses
5. Analyse different types of governors used in real life situation.
6. Various basic terms related to machine design aspect

**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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

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

- The question paper will have ten questions. Each question is set for 20 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.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**


1. R.S. Khurmi, Theory of Machines, Khanna Publishers, 2003.
2. S. S. Ratan, Theory of Machines, Tata McGraw Hill, 2nd Edition, 2005
3. Ghosh A. and Mallick A.K, Theory of Mechanisms and Machines, Affiliated East-West Press, 2nd Edition, 1988.
4. Thomas Bevan, Theory of Machines, CBS Publishers, 3rd Edition, 1984

J.S Rao. & R.V Dukkipati, Mechanism and Machine Theory, Newagepublishers, 2nd edition 1992


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

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

- Quizzes
- Assignments
- Seminars

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