| MIT Academy of Engineering (An Autonomous Institute) | COURSE SYLLABUS | | |
|---|---|---|---|
| **SCHOOL OF MECHANICAL AND CIVIL ENGINEERING** | **W.E.F.** | : | 2022-23 |
| **FY BTECH** | **COURSE NAME** | : | **APPLIED MECHANICS** |
| | **COURSE CODE** | : | CV103 |
| | **COURSE CREDITS** | : | 03 |
| **RELEASE DATE : 01/11/2022** | **REVISION NO.** | : | 2.0 |

| **TEACHING SCHEME :** | | **EVALUATION SCHEME :** | | | | | |
|---|---|---|---|---|---|---|---|
| **LECTURE** | **PRACTICAL** | **THEORY** | | | **PRACTICAL** | **PRESENTATION/ DEMONSTRATION** | **TOTAL** |
| | | **MSE** | **ESE** | **IA** | | | |
| 02 | 01 | 20 | 40 | 15 | 50 | 00 | 125 |

**PRE-REQUISITE:** 10+2 Physics and Mathematics

**COURSE OBJECTIVES:**

CV103.CEO.1: - To define fundamental concepts and laws of rigid body mechanics.
CV103.CEO.2: - To state conditions of equilibrium for engineering structures.
CV103.CEO.3: - To describe kinematic parameters of rectilinear and curvilinear motion.
CV103.CEO.4: - To explain energy and momentum methods of kinetics.

**COURSE OUTCOMES:**

The students after completion of the course will be able to

CV103.CO.1: - Determine the resultant of system of forces acting on bodies(L2).
CV103.CO.2: - Calculate the support-reactions and member forces for simple structures(L2).
CV103.CO.3: - Analyse bodies in rectilinear and curvilinear motion (L4).
CV103.CO.4: - Apply energy and momentum methods for kinetics problems(L3).

**THEORY:**

| **Unit I** | **Basics of Statics** | **7 Hours** |
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Fundamental Concepts and Principles in mechanics, Force and force systems, Resolution, Resultant, and Moment of a force system; Equilibrium of a particle systems. Free body diagram(FBD). Equilibrium of rigid bodies.

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| **Self-study/further study**: Observe the Static objects things around you, draw the free body diagram and find the resultant. | | |
| **Unit II** | **Applications of Statics** | **7 Hours** |
| Types of supports and their reactions. Beam reactions, Analysis of cables, Analysis of trusses, and Analysis of frames. Centroid of plane laminas. Engineering applications of friction. Belt Friction, Wedge friction.<br>**Self-study/further study**: Understanding following questions are expected from the students.<br>1. What does it mean for a design of members to be "Statically indeterminable"?<br>2. What is a "Two force Member"?<br>3. Which forces are allowed on a member? | | |
| **Unit III** | **Kinematics of particle** | **7 Hours** |
| Basic concepts in kinematics- Position, velocity, acceleration, jerk. Rectilinear motion with constant and variable acceleration. Connected body motions. Relative motion. Curvilinear motion in Cartesian coordinates and path coordinates.<br>**Self-study/further study:** Study of gyroscopic motion | | |
| **Unit IV** | **Kinetics of particle** | **7 Hours** |
| Kinetics- Equation of motion. Concept of work done, energy and power. Principle of work and energy. Conservation of energy. Principle of impulse and momentum. Conservation of momentum. Collisions- Direct central impact. Coefficient of restitution.<br>**Self-study/further study:** Study of vehicle dynamics | | |

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| **PRACTICAL:** | | |
| **Practical No. 1** | **Parallelogram Law** | **2 Hours** |
| To verify parallelogram law of force addition. | | |
| **Practical No. 2** | **Law of moments** | **2 Hours** |
| To verify law of moments for parallel forces. | | |
| **Practical No. 3** | **Block Friction** | **2 Hours** |
| To determine coefficient of static friction for a block on a plane. | | |
| **Activity No 1** | **Truss model** | **2 Hours** |
| To develop truss model | | |
| **Practical No. 4** | **Belt Friction** | **2 Hours** |
| To determine coefficient of static friction for a flat belt on a drum. | | |

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| **Practical No. 5** | **Centroid 1D** | **2 Hours** |
| To determine centroid of composite wire object. | | |
| **Practical No. 6** | **Centroid 2D** | **2 Hours** |
| To determine centroid of composite plane lamina. | | |
| **Activity No 2** | **Model making for Centroid** | **2 Hours** |
| To develop the model for centroid | | |
| **Practical No. 7** | **Projectile Motion** | **2 Hours** |
| To analyze projectile motion in Cartesian coordinates. | | |
| **Activity No 3** | **Model making for Projectile** | **2 Hours** |
| To develop the model for projectile | | |
| **Practical No. 8** | **Compound Pendulum** | **2 Hours** |
| To determine mass moment of Inertia of compound pendulum**.** | | |
| **Practical No. 9** | **Fly Wheel** | **2 Hours** |
| To analyse rotational motion of a flywheel about a fixed axis. | | |
| **Activity No 4** | **Model of parachute** | **2 Hours** |
| To develop the parachute model. | | |
| **Practical No. 10** | **Direct Central Impact** | **2 Hours** |
| To determine coefficient of restitution for direct central impact. | | |

**TEXT BOOKS:**


1. Nelason, A. (2009). Engineering Mechanics: Statics and Dynamics. 2nd Edition, Tata McGraw-Hill Education.
2. Anil Kumar D. (2015). Engineering Mechanics: Statics & Dynamics", 1st edition, Tata McGraw-Hill Education.


**REFERENCE Books:**


1. Hibbeler, R. C. (2009). Gupta Ashok Engineering Mechanics: Statics & Dynamics.", 14th Edition, Pearson Education Inc., Prentice Hall.
2. Beer, F. P., Johnston, E. R., Eisenberg, E. R., Mazurek, D. F., Clausen, W. E., & Cornwell, P. J. (1977). Vector mechanics for engineers (Vol. 4). New York: McGraw-Hill.", 11th Edition, McGraw-Companies, Inc., New York.