Kerala Technological university KTU First year B.tech Syllabus for
BE100 ENGINEERING MECHANICS

Course No. : BE100
Course Name: ENGINEERING MECHANICS
L-T-P-Credits: 3-1-0-4

Year of Introduction: 2015

Course Objectives:

1.   To apply the principles of mechanics to practical engineering problems.
2.   To identify appropriate structural system for studying a given problem and isolate it from its environment.
3.   To develop simple mathematical model for engineering problems and carry out static analysis.
4.   To carry out kinematic and kinetic analyses for particles and systems of particles.

Syllabus:

Statics: Fundamental concepts and laws of mechanics; Force systems; Principle of moments; Resultant of force and couple systems; Equilibrium of rigid body; Free body diagram; Equilibrium of a rigid body in three dimension; Support reactions; Properties of surfaces and solids - Centroid, Moment of inertia, Polar moment of inertia, Mass moment of inertia, Product of inertia and Principal moment of inertia; Theorems of Pappus – Guldinus; Friction; Principle of virtual work.
Dynamics: Rectangular and cylindrical coordinate system; Combined motion of rotation and translation; Newton's second law in rectilinear translation; D'Alembert's principle; Mechanical vibration; Simple harmonic motion; Spring-mass model.

Expected outcome:

1. Students will be able to apply and demonstrate the concepts of mechanics to practical engineering problems.
2. Students will be able to determine the properties of planes and solids.
3. Students will be able to apply fundamental concepts of dynamics to practical problems.

Text Book:

ShamesI.H.,EngineeringMechanics,StaticsandDynamics,Pearson Prentice

TimoshenkoS.&YoungD.H.,EngineeringMechanics,Mc-GrawHill

References:

1. Beer and Johnson, Vector Mechanics for Engineers - Statics and Dynamics, Tata Mc-Graw Hill Publishing Company Limited
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics. Pearson Prentice Hall
3. Benjamin J., Engineering Mechanics, Pentex Book Publishers and Distributors
4. Kumar K. L., Engineering Mechanics, Tata Mc-Graw Hill Publishing Company Limited
5. Tayal A. K., Engineering Mechanics- Statics and Dynamics, Umesh Publications
6. S.S.Bhavikkatti, Engineering Mechanics, New Age International Publishers
7. Jaget Babu, Engineering Mechanics, Pearson Prentice Hall
8. Merriam J. L. and Kraige L. G., Engineering Mechanics – Vol. I and II, John Wiley.
9. Rajasekaran S. and G. Sankarasubramanian, Engineering Mechanics, Vikas Publishing House Private Limited

Module 1 Contents

Statics: Fundamental concepts and laws of mechanics – Rigid body –Principle of transmissibility of forces Coplanar force systems - Moment of a force – Principle of moments Resultant of force and couple system Equilibrium of rigid body – Free body diagram – Conditions of equilibrium in two dimensions – Two force and three force members.

Module 2 Contents

Types of supports – Problems involving point loads and uniformly distributed loads only.Force systems in space – Degrees of freedom – Free body diagram – Equations of equilibrium – Simple resultant and Equilibrium problems.

Module 3 Contents

Properties of planar surfaces – Centroid and second moment of area (Derivations not required) - Parallel and perpendicular axis theorem – Centroid and Moment of Inertia of composite area.Polar Moment of Inertia – Radius of gyration – Mass moment of inertia of cylinder and thin disc (No derivations required).Product of inertia – Principal Moment of Inertia (conceptual level).Theorems of Pappus and Guldinus.

Module 4 Contents

Friction – Characteristics of dry friction – Problems involving friction of ladder, wedges and connected bodies. Definition of work and virtual work – Principle of virtual work for a system of connection bodies – Problems on determinate beams only.

Module 5 Contents

Dynamics: Rectangular and Cylindrical co-ordinate system Combined motion of rotation and translation – Concept of instantaneous centre – Motion of connecting rod of piston and crank of a reciprocating pump. Rectilinear translation – Newton's second law – D'Alembert's Principle – Application to connected bodies (Problems on motion of lift only).

Module 6 Contents

Mechanical vibrations – Free and forced vibration - Degree of freedom.Simple harmonic motion – Spring-mass model – Period – Stiffness –
Frequency – Simple numerical problems of single degree of freedom. Hence the B.tech Syllabus for KTU .