

**Maulana Abul Kalam Azad University of Technology, West Bengal**

(Formerly West Bengal University of Technology)

**Syllabus for B. Tech in Civil Engineering**

(Applicable from the academic session 2018-2019)

<b>CE(ES)301</b>	<b>Engineering Mechanics</b>	<b>3L + 1T =</b>	<b>4 Credits</b>
<b>Module 1</b>	<b>Introduction to Engineering Mechanics</b> Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy	6L	
<b>Module 2</b>	<b>Friction</b> Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;	3L	
<b>Module 3</b>	<b>Basic Structural Analysis</b> Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero-force members; Beams & types of beams; Frames & Machines;	4L	
<b>Module 4</b>	<b>Centroid and Centre of Gravity</b> Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.	5L	
<b>Module 5</b>	<b>Virtual Work and Energy Method-</b> Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.	4L	
<b>Module 6</b>	<b>Review of particle dynamics-</b> Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2 <sup>nd</sup> law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).	4L	
<b>Module 7</b>	<b>Introduction to Kinetics of Rigid Bodies</b> Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work-energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;	5L	
<b>Module 8</b>	<b>Mechanical Vibrations</b> Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;	5L	
<b>Tutorials</b>	From the above modules covering, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the discapparatus; Helical block; To draw a load efficiency curve for a screw jack	6L	
<b>Reference</b>	1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall 2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, -Dynamics, 9th Ed, Tata McGraw Hill 3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press. 4. Andy Ruina and RudraPratap (2011), Introduction to Statics and Dynamics, Oxford University Press 5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education, 6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education 7. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer's Engineering Mechanics 8. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications 9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co. 10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications		