

Code: 1BESC104A/204A
Credits: 3
SEE: 50%
SEE Hours: 3

Course: Building Sciences & Mechanics
L: T:P 3:0:0
CIE: 50%
Max. Marks:100

Prerequisites if any	Pre-University Physics and Mathematics
Learning objectives	<ol style="list-style-type: none"> 1. To make students learn the scope of various specializations of building science. 2. Construct "Free Body Diagrams" of real-world problems and apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies. 3. To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the various disciplines of building science	Understand
CO2	Apply principles of coplanar concurrent forces acting on particles	Apply
CO3	Apply principles of coplanar non-concurrent forces acting on rigid bodies	Apply
CO4	Analyze truss and Compute centroid, moment of inertia of plane geometrical and composite areas	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-				
CO2	2	3	-	-	-	-	-	-	-	-	-				
CO3	2	3	-	-	-	-	-	-	-	-	-				
CO4	2	3	-	-	-	-	-	-	-	-	-				

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	Introduction to sustainable development goals	1	-	-
1.2	Smart city concept, Clean city concept,	1	-	-
1.3	Safe city concept	1	-	-
1.4	Water Supply and Sanitary systems, urban air pollution management,	1	-	-
1.5	Solid waste management, identification of Landfill sites,	1	-	-
1.6	Urban flood control	1	-	-
1.7	Energy efficient buildings, recycling,	1	-	-
1.8	Temperature and Sound control in buildings, Smart buildings.	1	-	-
Module – 2				
2.1	Classifications of Mechanics, Definitions – Particle, rigid body, force, mass, time, space force system	1	-	-
2.2	Newton's laws, system of units, sign conventions	1	-	-
2.3	Principle of transmissibility of forces	1	-	-
2.4	Concurrent forces in plane: Introduction	1	-	-
2.5	Resultant forces – Parallelogram law, Triangle law & Polygonal law	1	-	-
2.6	Resolution and component of forces	1	-	-
2.7	Resultant of several concurrent forces, free body diagram	1	-	-
2.8	Equilibrium conditions, Lami's Theorem	1	-	-
Module – 3				
3.1	Introduction, Moment of a force about a point	1	-	-
3.2	Varignon's Theorem, Moment of a couple	1	-	-
3.3	Resolution of a force into force-couple system	1	-	-
3.4	Coplanar parallel force system	1	-	-
3.5	Coplanar Non concurrent system	1	-	-
3.6	Resultant of Coplanar non concurrent system	1	-	-
3.7	Equilibrium of Rigid bodies	1	-	-
3.8	Applications of statics of rigid bodies – Types of support in two dimensions, beams, types of loads, multi-force members.	2	-	-
Module – 4				
4.1	Introduction to Plane Trusses, Pin jointed Plane Trusses (Method of Joints & Sections	2	-	-
4.3	Importance of centroid and centre of gravity	1	-	-
4.4	Methods of determining the centroid	1	-	-
4.5	Locating the centroid of plane laminae from first principles	2	-	-
4.6	Numerical examples	2	-	-
Module – 5				
5.1	Importance of Moment of Inertia	1	-	-
5.2	Method of determining the second moment of area (moment of inertia) of plane sections from first principles,	2	-	-
5.3	Parallel axis theorem and perpendicular axis theorem,	1	-	-
5.4	Section modulus, radius of gyration,	1	-	-
5.5	Numerical Examples.	2	-	-
Total No. of Lecture Hours		40	-	-
Total No. of Tutorial Hours				-
Total No. of Practical Hours				-

Self-learning topics identified: (Maximum of 5 topics)

1. Multi-force members
2. Derivation of centroid of Quarter-circle
3. Derivation of moment of inertia of Quarter-circle

Textbooks:

1. R. K. Bansal, R. R. Beohar and A. A. Khan, “Basic Civil Engineering and Engineering Mechanics”, Laxmi Publications, 2015.
2. S. Rajasekharan, G. Sankar Subramanian, “Engineering Mechanics- Statics and Dynamics”- Vikas Publishing House, 2011.

Reference Books:

1. Stephen Timoshenko, D. Young, J Rao “Engineering Mechanics”, Tata-McGraw Hill, Special Indian edition, 2006.
2. Beer FP and Johnson ER, “Mechanics for Engineers- Dynamics and Statics”, 3rd SI Metric edition, Tata McGraw Hill, 2008.
3. P.N. Chandra Mouli, “Engineering Mechanics” PHI Learning, 2011.
4. Shames IH, “Engineering Mechanics – Statics & Dynamics”, PHI, 2009.
5. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Statics", Don Fowley Publishers, 2006.

Online Resources:

1. Engineering Mechanics by Prof. K. Ramesh, IIT Madras <https://nptel.ac.in/courses/112106286>