

B. Tech. Semester I/II

Subject Name: Engineering Mechanics

Subject Code: BTCL12113

Type of course: Engineering Science

Prerequisite: Basics of Physics and Mathematics

Rationale: Engineering Mechanics is the subject who teaches the application of laws of physics and mathematics. Generally, everyone comes across various applications in day-to-day life wherein the different types of forces acting on the body and hence the study of engineering mechanics enables people to understand the different types of forces acting on the body, its behaviour and analysis.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
2	0	2	3	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction to Engineering Mechanics: Basic concepts– Six principles of Mechanics & Statics of Particles, Force Systems – Coplanar-Non Coplanar Concurrent-Non concurrent, Collinear, Parallel Forces, Free body diagram, Equilibrium of force system, Equivalent system of forces of Rigid bodies, Types of beams, loads, supports, determination of support reactions...	6	20%
2.	Centroid and Moment of Inertia: Centre of Gravity, Centre of mass, Centroid of line, area, volume, composite bodies, Pappus Guldinus theorem, Moment of inertia of an area, Parallel Axes Theorem, Concept of mass moment of inertia of body.	6	20%

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3.	Friction: Introduction, Theory of frictions – Classifications, Angle of friction, Angle of repose, Laws of Dry Friction, Application of Frictions - wedges, ladders & Belts.	6	20%
4.	Basic structural Analysis: Introduction, Stability and Determinacy of Plane Truss, Method of Analysis – Method of Joints & Method of Sections.	6	20%
5.	Fundamental of Vibrations: Definitions, Spring-Mass-Dashpot system, Basics of Free & Forced Vibrations, Equation of motion for single degree of freedom. System of Springs in Parallel & Series. Problem solution relevant to the sub topics.	6	20%

Suggested Specification table of Marks as per Bloom’s Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	30	20	0

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels.

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Vector Mechanics for Engineers - Statics and Dynamics	<u>Ferdinand P. Beer</u> , <u>E. Russell Johnston Jr.</u>	Tata McGraw-Hill, New Delhi, ISBN-10 9353166624 ISBN-13 978-9353166625	2019	12th
2.	Engineering Mechanics: Statics and Dynamics	Hibbeler, R.C.	Pearson Education, ISBN-13 978-9332584747	2017	14 th
3.	Engineering	Meriam, J.L. and	John Wiley and sons,	2017	8 th (Indian

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
	Mechanics: Statics, SI Version	Kraige, L.G., J. N. Bolton	New York. ISBN-10 : 8126564032 ISBN-13 : 978-8126564033		Edition)
4.	Engineering Mechanics: Dynamics, SI Version	Meriam, J.L. and Kraige, L.G., J. N. Bolton	John Wiley and sons, New York. ISBN-10 : 8126565373 ISBN-13 : 978-8126565375	2018	8 th (Indian Edition)
5.	Engineering Mechanics (In SI Units)	S. Timoshenko, D.H. Young, J.V. Rao	McGraw Hill Education ISBN-13 : 978-1259062667	2017	5 th
6.	Engineering Mechanics Statics and Dynamics	Shames/Rao	Pearson Education India ISBN-10 : 8177581236 ISBN-13 : 978-8177581232	2005	4 th
7.	Engineering Mechanics: Statics and Dynamics	Rajasekaran S	Vikas Publication, New Delhi. ISBN-10 : 8125918647 ISBN-13 : 978-8125918646	2005	3 rd
8.	Engineering Mechanics Statics and Dynamics	N H Dubey	McGraw Hill Education ISBN-13 : 978-0071072595	2017	1 st
9.	Applied Mechanics	Shah H. J. and Junarkar S. B.,	Charotar publication, Anand. ISBN :	2015	19 th

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
			9789385039065		
10.	Engineering Mechanics	Bhavikatti S. S. and Rajashekarappa KG.	New Age International Publication	2019	4 th
11.	Engineering Mechanics-Statics and Dynamics	Tayal, A.K.	Umesh Publications ISBN-10 : 8188114014 ISBN-13 : 978-8188114016	2008	14 th
12.	Engineering Mechanics	Kumar, K.L.	Tata McGraw Hill Publishing Company Limited ISBN-10 : 0070681813 ISBN-13 : 978-0070681811	2017	3 rd

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Apply fundamental principles of mechanics, equilibrium and statics to practical problems of engineering. <i>(R,U,A,N,E - Cognitive level)</i>	20
CO-2	Determine centroid and moment of inertia of a different geometrical shape and its use in engineering problem. <i>(R,U,A,N,E - Cognitive level)</i>	20
CO-3	Determine the interactive forces at two contact surfaces.	20
CO-4	Analyze the plane roof trusses. <i>(R,U,A,N,E - Cognitive level)</i>	20
CO-5	Co-relate fundamental concepts of dynamics to practical applications. <i>(R,U,A,N,E - Cognitive level)</i>	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	1	3	-	1	-	-	1	2	-	2			
CO-2	3	2	-	2	-	-	-	-	1	2	-	2			
CO-3	3	2	-	2	-	-	-	-	1	2	-	2			
CO-4	3	2	-	3	-	-	-	-	1	2	-	2			
CO-5	3	2	-	1	-	-	-	-	1	2	-	2			
Rationale*	15	11	1	11	-	1	-	-	5	10	-	10			

***Rationale:**

All most all the COs are satisfying the well-defined POs & PSOs except few ones up to certain extent. The principles of engineering mechanics will help to solve various engineering problems and justify the programme outcomes.

LIST OF PRACTICALS:

1. Coplanar Concurrent force system (Plane force Polygon)
2. Coplanar Parallel force system (Beams)
3. Non-coplanar Concurrent force system (Space frame)
4. Mass M.I. of flywheel
5. Static Surface Friction
6. Belt Friction
7. Simple Plane roof truss
8. Springs in Parallel & series

FOR LAB SESSIONS:

The students will have to solve at least three examples and related theory from each topic as an assignment/tutorial. Students will have to perform following experiments in laboratory and prepare the laboratory manual.

Major Equipment:

1. Universal Force table
2. Beam set up
3. Space Frame

4. Fly wheel set up
5. Surface friction set up
6. Belt Friction set up
7. Truss set up
8. Spring set up.

List of Open Source/learning website:

- <https://nptel.ac.in/courses/112/103/112103108/>
 - Fundamentals of EM
 - Equations of Equilibrium
 - Truss Analysis
 - Internal forces, Internal Forces in Beams
 - Friction and its applications
 - Centroid and Moment of Inertia
 - Mass moment of Inertia
 - Free and Forced vibrations
- <https://nptel.ac.in/courses/112/106/112106286/>
 - Introduction of EM
 - Force system
 - Equilibrium of Rigid Bodies
 - Trusses
 - Beams
 - Friction
- <https://nptel.ac.in/courses/122/104/122104015/>
 - Equilibrium
 - Plane Trusses
 - Friction
 - Properties of Surfaces
- <https://nptel.ac.in/courses/115/104/115104094/>
 - Introduction to vectors
 - Equilibrium of rigid bodies
 - Equivalent system of forces
 - Plane trusses
 - Dry Friction
 - Properties of Surfaces

List of Open Source Software: Nil