

Lovely Professional University, Punjab

Course Code	Course Title	Course Planner
MEC107	BASIC ENGINEERING MECHANICS	21545::Dr. Manjeet Singh

Course Outcomes :Through this course students should be able to

CO1 :: discuss and Understand and analyze forces, moments and their applications in real life situations.

CO2 :: describe and Understand the basic concepts of the laws of friction and moment of inertia and its real life applications.

CO3 :: analyze and determine the forces in members of trusses and frames.

CO4 :: apply fundamental concepts of kinematics and kinetics of particles and rigid bodies to the analysis of practical problems

	TextBooks (T)		
Sr No	Title	Author	Publisher Name
T-1	VECTOR MECHANICS FOR ENGINEERS, STATICS AND DYNAMICS	BEER AND JOHNSTON	MCGRAW HILL EDUCATION

	Reference Books (R)		
Sr No	Title	Author	Publisher Name
R-1	ENGINEERING MECHANICS: STATICS	ANDREW PYTEL JAAN KIUSALAAS	CENGAGE LEARNING
R-2	ENGINEERING MECHANICS	BASUDDEB BHATTACHARYYA	OXFORD UNIVERSITY PRESS
R-3	ENGINEERING MECHANICS - STATICS AND DYNAMICS	R. C. HIBBELER, A. GUPTA	PEARSON
R-4	ENGINEERING MECHANICS - STATICS AND DYNAMICS	S K SINHA	PEARSON

Relevant Websites (RW)		
Sr No	(Web address) (only if relevant to the course)	Salient Features
RW-1	http://www.mecmesin.com/coefficient-of-friction-test-standards	Friction standards
RW-2	http://nptel.ac.in/courses/122104015/	NPTEL online lectures on Basic Engineering Mechanics
RW-3	http://www.nptel.ac.in/courses/112103109/	NPTEL online lecture on Engineering Mechanics

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RW-4	http://emweb.unl.edu/	Engineering Mechanics notes by UML College of Engineering and Technology
RW-5	http://www.animations.physics.unsw.edu.au/jw/rotation.htm	Animations of moment of inertia
RW-6	http://nptel.ac.in/courses/112103108/3	video lecture on truss analysis
RW-7	http://www.nptel.ac.in/courses/122104014/	NPTEL online lectures on engineering mechanics
RW-8	http://www.nptel.ac.in/courses/112106180/	NPTEL online lecture on Engineering Mechanics and dynamics

Audio Visual Aids (AV)		
Sr No	(AV aids) (only if relevant to the course)	Salient Features
AV-1	https://onlinecourses.nptel.ac.in/noc18_me23/preview	NPTEL MOOCs

Virtual Labs (VL)		
Sr No	(VL) (only if relevant to the course)	Salient Features
VL-1	http://nptel.ac.in/video.php?subjectId=122102004	NPTEL video lecture on Engineering Mechanics
VL-2	http://www.nptel.ac.in/courses/112103108/	NPTEL video lecture on Engineering Mechanics

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Introduction to Mechanics (Basic concepts)	T-1 R-1 R-3	RW-2 RW-7 AV-1 VL-2	Lecture Zero	To understand the need of studying the subject and its applications	ppt	NA
	Lecture 2	Introduction to Mechanics (System of forces)	T-1 R-1 R-3	RW-7 VL-2	Introduction to force and force system	Student will be able to understand the effect of force on particles	Lecture delivery using whiteboard, ppt	Force exerted by a person due to his weight, tension in wire

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Week 1	Lecture 3	Introduction to Mechanics (Coplanar Concurrent Forces)	T-1 R-1 R-3	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position
		Introduction to Mechanics (Components in 2-D Plane- Resultant-Moment of Forces and its Applications)	T-1 R-1 R-2	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position
Week 2	Lecture 4	Introduction to Mechanics (Coplanar Concurrent Forces)	T-1 R-1 R-3	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position
		Introduction to Mechanics (Components in 2-D Plane- Resultant-Moment of Forces and its Applications)	T-1 R-1 R-2	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position
	Lecture 5	Introduction to Mechanics (Coplanar Concurrent Forces)	T-1 R-1 R-3	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position

Week 2	Lecture 5	Introduction to Mechanics (Components in 2-D Plane- Resultant-Moment of Forces and its Applications)	T-1 R-1 R-2	RW-7 VL-2	Resultant of several concurrent forces, resolution of force into components, rectangular components of a force. Free body diagram, Equilibrium of a body	Student will learn to resolve forces and to find resultant of several forces & will learn to represent forces on a body and determine its equilibrium condition	Lecture delivery using whiteboard	Force acting on an object kept on an inclined plane, Reaction forces on a person in standing and sitting position
	Lecture 6	Introduction to Mechanics (Couples and Resultant of Force System)	T-1 R-3	RW-3 VL-1	Vector product of two vectors, moment of a force about a point, Varignon's theorem	Student will learn importance of moment, its importance and procedures to find moments	Whiteboard	Doors and windows
Week 3	Lecture 7	Introduction to Mechanics (Equilibrium of System of forces)	T-1 R-3 R-4	VL-1 VL-2	Vector product of two vectors, moment of a force about a point, Varignon's theorem	Student will learn importance of moment, its importance and procedures to find moments	Whiteboard	Doors and windows
		Introduction to Mechanics (Free body diagrams)	T-1 R-3	RW-7 VL-2	Vector product of two vectors, moment of a force about a point, Varignon's theorem	Student will learn importance of moment, its importance and procedures to find moments	Whiteboard	Doors and windows
		Introduction to Mechanics (Equations of Equilibrium of Co-planar Systems)	T-1 R-3 R-4	RW-7 VL-2	Vector product of two vectors, moment of a force about a point, Varignon's theorem	Student will learn importance of moment, its importance and procedures to find moments	Whiteboard	Doors and windows
	Lecture 8	Friction (Introduction to friction)	T-1 R-3 R-4	RW-3 VL-1	Introduction to friction, types	Students will learn about friction and its importance along with its advantages and disadvantages along with its basic standards such as ASTM-D1894, ISO-15359	Lecture delivery using whiteboard	Writing on whiteboard, brakes of vehicles, walking
		Friction (Types of friction)	T-1 R-3	RW-7 VL-2	Introduction to friction, types	Students will learn about friction and its importance along with its advantages and disadvantages	Lecture delivery using whiteboard	Writing on whiteboard, brakes of vehicles, walking

Week 3	Lecture 9	Friction(Limiting friction)	T-1 R-3 R-4	RW-4 RW-7 VL-2	Laws of dry friction, coefficients of friction, angles of friction	Student will learn the procedure to determine friction force and concept of angles of friction	Lecture delivery using whiteboard, presentation	NA
		Friction(Laws of Friction)	T-1 R-3	RW-3 VL-1	Laws of dry friction, coefficients of friction, angles of friction	Student will learn the procedure to determine friction force and concept of angles of friction	Lecture delivery using whiteboard, presentation	NA
Week 4	Lecture 10	Friction(Static and Dynamic friction)	T-1 R-3	RW-4 RW-7 VL-2	Problem involving dry friction	Student will learn how to determine friction force and state of equilibrium of a body using different methods	Lecture delivery using whiteboard	kids slides
	Lecture 11	Friction(Motion of bodies)	T-1 R-3	RW-1 RW-7	Problem involving dry friction, learning about the different friction standards	Student will learn how to determine friction force and state of equilibrium of a body using different methods	Lecture delivery using whiteboard	kids slides
	Lecture 12	Centroid and Moment of Inertia(Centroids of areas and lines)	T-1 R-3	RW-4	Centroid, center of gravity	Students will know about centroid and center of gravity	Lecture delivery using whiteboard and presentation	Centroid location of blackboard.
		Centroid and Moment of Inertia(First moments of areas and lines)	T-1 R-3	RW-5	Centroid, center of gravity	Students will know about centroid and center of gravity	Lecture delivery using whiteboard and presentation	A man carries long rod while walking on a rope in order to increase its inertia so that more stability can be achieved.
Week 5	Lecture 13				Online Assignment			
	Lecture 14	Centroid and Moment of Inertia(Centroids of composite plates and wires)	T-1 R-3	RW-5	First moment of area, centroid of composite plates and wires	Student will learn how to find centroid of standard and composite sections	Lecture delivery using whiteboard, ppt	Point of representation of weight of a uniform section body, I and T section beam
		Centroid and Moment of Inertia(Center of gravity)	T-1 R-3	RW-3 RW-5	First moment of area, centroid of composite plates and wires	Student will learn how to find centroid of standard and composite sections	Lecture delivery using whiteboard, ppt	Point of representation of weight of a uniform section body, I and T section beam

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Week 5	Lecture 15	Centroid and Moment of Inertia(Moment of inertia of plane sections)	T-1 R-3	RW-7 RW-8 VL-2	First moment of area, centroid of composite plates and wires	Student will learn how to find centroid of standard and composite sections	Lecture delivery using whiteboard, ppt	A man walking on rope carrying a long rod to increase its moment of inertia for stability.
Week 6	Lecture 16	Centroid and Moment of Inertia(Theorems of moment of inertia)	T-1 R-3	RW-5	Theorem of parallel axis, Theorem of perpendicular axis	Students will learn to determine moment of inertia about an axis not passing through centroid	Lecture delivery using whiteboard	Moment of inertia of I section, T section
	Lecture 17	Centroid and Moment of Inertia(Theorems of moment of inertia)	T-1 R-3	RW-5	Theorem of parallel axis, Theorem of perpendicular axis	Students will learn to determine moment of inertia about an axis not passing through centroid	Lecture delivery using whiteboard	Moment of inertia of I section, T section
	Lecture 18	Centroid and Moment of Inertia(Moment of inertia of standard and composite sections)	T-1 R-3	RW-7	Mass moment of inertia	Student will learn difference between area moment of inertia and mass moment of inertia and the procedure to determine mass moment of inertia	Lecture delivery using whiteboard	Rolling of two cylinders of different masses
Week 7	Lecture 19	Centroid and Moment of Inertia(Mass moment of inertia of thin plates)	T-1 R-3	RW-7 VL-2	Mass moment of inertia	Student will learn difference between area moment of inertia and mass moment of inertia and the procedure to determine mass moment of inertia	Lecture delivery using whiteboard	Rolling of two cylinders of different masses
SPILL OVER								
Week 7	Lecture 21				Spill Over			
MID-TERM								
Week 8	Lecture 22	Analysis of structures (Introduction to trusses)	T-1 R-3	RW-6	Introduction to truss, definition of truss, simple trusses	Student will learn what is truss and its applications	Lecture delivery using whiteboard, ppt	
		Analysis of structures (Definition of trusses)	T-1 R-3	RW-6	Introduction to truss, definition of truss, simple trusses	Student will learn what is truss and its applications	Lecture delivery using whiteboard, ppt	
	Lecture 23	Analysis of structures (Simple trusses)	T-1 R-3	RW-6	Analysis of truss by method of joint	Student will learn what is method of joint and apply it to solve truss problem	Lecture delivery using whiteboard	

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Week 8	Lecture 23	Analysis of structures (Analysis of truss by method of joint)	T-1 R-3	RW-6	Analysis of truss by method of joint	Student will learn what is method of joint and apply it to solve truss problem	Lecture delivery using whiteboard	
	Lecture 24	Analysis of structures (Simple trusses)	T-1 R-3	RW-6	Analysis of truss by method of joint	Student will learn what is method of joint and apply it to solve truss problem	Lecture delivery using whiteboard	
		Analysis of structures (Analysis of truss by method of joint)	T-1 R-3	RW-6	Analysis of truss by method of joint	Student will learn what is method of joint and apply it to solve truss problem	Lecture delivery using whiteboard	
Week 9	Lecture 25	Analysis of structures (Analysis of truss by method of section.)	T-1 R-3	RW-6	Analysis of truss by method of sections	Student will learn the procedure to solve a truss problem using method of sections	Lecture delivery using whiteboard	
	Lecture 26	Analysis of structures (Analysis of truss by method of section.)	T-1 R-3	RW-6	Analysis of truss by method of sections	Student will learn the procedure to solve a truss problem using method of sections	Lecture delivery using whiteboard	
	Lecture 27	Analysis of structures (Analysis of truss by method of section.)	T-1 R-3	RW-6	Analysis of truss by method of sections	Student will learn the procedure to solve a truss problem using method of sections	Lecture delivery using whiteboard	
Week 10	Lecture 28	Introduction to Dynamics (Types of motion)	T-1 R-3	RW-8	Position, velocity and acceleration, basic equations of motion	Student will learn the fundamental relations used in the kinematic calculations	Lecture delivery using whiteboard	
	Lecture 29				Online Assignment			
	Lecture 30	Introduction to Dynamics (General Plane motion)	T-1 R-3	RW-8 VL-2	Uniform general plane motion, uniformly accelerated plane motion, general plane motion of several particles, dependent motion	Students will learn to calculate position, velocity and acceleration of a particle having general plane motion	Lecture delivery using whiteboard, animations	
Week 11	Lecture 31	Introduction to Dynamics (Rectilinear motion)	T-1 R-3	RW-8	Uniform rectilinear motion, uniformly accelerated rectilinear motion, rectilinear motion of several particles, dependent motion	Students will learn to calculate position, velocity and acceleration of a particle having rectilinear motion	Lecture delivery using whiteboard, animations	

Week 11	Lecture 32	Introduction to Dynamics (Plane curvilinear motion)	T-1 R-3	RW-8 VL-2	Plane curvilinear motion: position, velocity and acceleration, derivatives of vector functions, rectangular components, motion relative to frame in translation	Student will learn the procedure to calculate position, velocity and acceleration of body having plane curvilinear motion	Lecture delivery using whiteboard	
	Lecture 33	Plane Kinematics and Kinetics of Rigid bodies (Work energy principle and its application in plane motion of connected bodies)	T-1 R-3	RW-7 RW-8 VL-2	Kinetic energy of a particle, principle of work and energy, applications of the principle of work and energy	Student will learn work energy principle and its applications	Lecture delivery using whiteboard	
Week 12	Lecture 34	Plane Kinematics and Kinetics of Rigid bodies (Work energy principle and its application in plane motion of connected bodies)	T-1 R-3	RW-7 RW-8 VL-2	Kinetic energy of a particle, principle of work and energy, applications of the principle of work and energy	Student will learn work energy principle and its applications	Lecture delivery using whiteboard	
	Lecture 35				Online Assignment			
	Lecture 36	Plane Kinematics and Kinetics of Rigid bodies (Kinetics of rigid body rotation)	T-1 R-3	RW-8	Types of motions, rotation about a fixed axis and its equations, absolute and relative velocity in plane motion, absolute and relative acceleration in plane motion	Students will learn to calculate velocity and acceleration in plane motion of rigid bodies	Lecture delivery using whiteboard, presentation	
Week 13	Lecture 37	Plane Kinematics and Kinetics of Rigid bodies (Kinetics of rigid body rotation)	T-1 R-3	RW-8	Types of motions, rotation about a fixed axis and its equations, absolute and relative velocity in plane motion, absolute and relative acceleration in plane motion	Students will learn to calculate velocity and acceleration in plane motion of rigid bodies	Lecture delivery using whiteboard, presentation	
	Lecture 38	Plane Kinematics and Kinetics of Rigid bodies (Kinetics of rigid body rotation)	T-1 R-3	RW-8	Types of motions, rotation about a fixed axis and its equations, absolute and relative velocity in plane motion, absolute and relative acceleration in plane motion	Students will learn to calculate velocity and acceleration in plane motion of rigid bodies	Lecture delivery using whiteboard, presentation	

Week 13	Lecture 39	Plane Kinematics and Kinetics of Rigid bodies(D' Alembert's principle and its applications in plane motion and connected bodies)	T-1 R-3	RW-8 VL-2	Equations of motion for a rigid body, D' Alembert's principle, solution of problems involving the motion of a rigid body	Student will learn to determine forces acting on a rigid body in motion	Lecture delivery using whiteboard	
Week 14	Lecture 40	Plane Kinematics and Kinetics of Rigid bodies(D' Alembert's principle and its applications in plane motion and connected bodies)	T-1 R-3	RW-8 VL-2	Equations of motion for a rigid body, D' Alembert's principle, solution of problems involving the motion of a rigid body	Student will learn to determine forces acting on a rigid body in motion	Lecture delivery using whiteboard	
		SPILL OVER						
Week 14	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	Problem solving on 2D forces	Problem Solving
Tutorial2	Problem solving on Equilibrium and Free body Diagram	Problem Solving
Tutorial3	problem solving on moments	Problem Solving
Tutorial4	Problem solving on Friction	Problem Solving
Tutorial5	Problem solving on Centroid	Problem Solving
Tutorial6	Problem solving on centroid (composite areas) and Moment of inertia by integration	Problem Solving
Tutorial7	Problem solving on calculating moment of inertia (composite areas)	Problem Solving
After Mid-Term		
Tutorial8	Problem solving on Trusses to calculate forces in members using method of joint and section	Problem Solving
Tutorial9	problem solving on Kinematics (rectilinear motions)	Problem Solving
Tutorial10	Problem solving on curvilinear motions	Problem Solving

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Tutorial11	Problem solving on calculating velocity of bodies in Plane motion (relative method)	Problem Solving
Tutorial12	problem solving on Work energy principle	Problem Solving
Tutorial13	Problem solving on rotational motion.	Problem Solving
Tutorial14	Problem solving on D'Alembert principle and rotational motion.	Problem Solving