Course Code: ESC106A
Course Title:Construction Materials and Engineering Mechanics

Course Leader: Deepthi M V
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Course Details

- Course: **B. Tech. In Civil Engineering**
- Department: **Civil Engineering**
- Head of the Department: **Prof. H. M. Rajashekhar Swamy (hod.ce.et@msruas.ac.in)**
- Faculty: **Engineering & Technology**
- Dean: **Prof. H. K. Narahari (dean.et@msruas.ac.in)**

Why this Course

The objectives of the course are:

- To impart knowledge on Civil Engineering systems and their subsystems
- To enhance the understanding of the underlying engineering principles of Civil Engineering systems
- To model, simulate and analyse the behaviour of Civil Engineering systems to predict and improve their performance
- To design and build Civil Engineering systems to meet the specific needs
- To impart training on instrumentation and testing of Civil Engineering systems
- To build and test Civil Engineering systems
- To impart training on professional ethics, history, economics, social sciences and interactive skills relevant to professional practice
- To provide a general perspective and opportunities for a career in Civil Engineering, business and commerce
- To provide a foundation in mathematical, Scientific, Engineering and Technology and to solve Engineering and Technological related problems

Course Aim and Summary

This Course deals with fundamentals of Civil Engineering materials and laws of Engineering Mechanics for statics/equilibrium of rigid bodies. Students will be taught the significance of Civil Engineering in infrastructure and exposed to construction materials. They will be trained on application of engineering mechanics to solve practical problems pertaining to statics/ equilibrium of rigid bodies. In addition, effects of friction for analyzing static and dynamic analysis of rigid bodies will be dealt.

Course Intended Learning Outcomes

After undergoing this subject students will be able to:

- Describe role of Civil Engineering in infrastructure development and explain various construction materials with their applications
- State and apply the laws of statics and dynamics for the equilibrium analysis of rigid bodies with and without friction
- Interpret standard mathematical relationships and apply for solving problems in Engineering Mechanics
- Calculate moment of inertia, determine centroid for the structural members
- Describe the principles and types of motion with emphasis on projectiles

Course Content

Introduction to Civil Engineering: Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering, role of civil engineer in infrastructure development.

Soil- Formation and Index properties

Construction materials and technology: Stones, sand, cement, concrete, steel, bricks, lime and mortar, timber, glass and aluminum, flooring materials, panels, plywood and boards, paints and emulsions, plumbing and fittings, water supply and sewage, water harvesting - sources, classification, properties and uses

Course Content

Engineering Mechanics

Branches of mechanics and its importance: Engineering Design, Mechanics in engineering, Introduction to SI units , Basic idealisations - Particle, Continuum, Rigid body and Point force with examples, principles of mechanics with examples- laws of parallelogram, law of transmissibility, gravitation, Classification of force and force systems; Principle of physical independence of forces, Principle of superposition of forces; constraints on rigid bodies and corresponding reactions, of Resolution, Varignon's theorem, RMoment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, equivalent force and couples.

Course Content

Analysis of Coplanar Concurrent and Non-Concurrent System of Forces

Resultant of Concurrent force systems by method of Resolution, Varignon's theorem, Resultant of non-concurrent force systems

Equilibrium of Structural Systems

Types of forces acting on a body, Free Body diagram Analysis, Lami's Theorem, Equilibrium of connected bodies, types of supports in beams, determination of support reactions, Applications to engineering problems. Classification of Structures –Axial force members, trusses, frames, beams and cables, Numerical Examples

Course Content

Centroid of planes and Moment of inertia of area

Differences between centre of gravity and Centroid, use of axis of symmetry, Centroid of simple built up sections by integration, Moment of Inertia of planes, radius of gyration, Theorems of moment of inertia, moments of inertia of standard sections by integration, Numerical Examples

Course Content

Friction in Engineering Systems

Laws of friction, angle of friction, angle of repose, cone of friction, Analysis of blocks resting on horizontal and inclined planes, rolling friction, rope friction, Application to wedge and ladder problems, problems involving non concurrent force systems

Introduction to dynamics:

General principles and types of motions and D'Alemberts principle with examples, Newton's laws of motion

Linear motions and projectiles -Motion with uniform velocity and acceleration, motion with varying acceleration, motion of bodies projected horizontally, projection on inclined planes, Numerical examples

Method of Assessment

There are two components for assessment in this Course:

Component - 1: 50% weight (CE)

It has two sub components

Part A: Term Test: 25% Weight

Part B: Assignment: 25% Weight

Two tests will be conducted one at the end of 6th week and the other at the end of the 12th week, the average of two tests will be the marks scored in term test for a maximum of 25 marks.

Student is required to submit two word processed assignments each assignment is set for 25 marks, the average of two assignments will be the marks scored in assignment for a maximum of 25 marks.

Method of Assessment Contd..

Component - 2 : 50% weight

A 3 hour duration semester end examination will be conducted for maximum marks of 100 and will be reduced to 50% weight. The assessment questions are set to test the learning outcomes. In each component certain learning outcomes are assessed. The following table illustrates the focus of learning outcome in each component assessed:

Method of Assessment Contd..

Intended Learning Outcome		1	2	3	4	5
Component-1	A		X		X	
	B	X		X		
Component-2		X	X	X	X	X

Both components will be moderated by a second examiner.

References

a. Essential Reading

1. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2006.
2. S. S. Bhavikatti, K. G. Rajashekarappa (2012), Engineering Mechanics, New Age International.
3. Satheesh Gopi, Gopi (2010), Basic Civil Engineering, Dorling Kindersley (India) Pvt Ltd
4. R K Rajput (2011), A Text Book of Applied Mechanics, 3rd Edn, Laxmi Publications
5. Richard H. McCuen, Edna Z. Ezzell (2011), "Fundamentals of Civil Engineering: An Introduction to the ASCE Body of Knowledge" , CRC press

b. Recommended Reading

1. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II – Dynamics, 9th Ed, Tata McGraw Hill, 2011.
2. J. L. Meriam and L. G. Kraige, Engineering Mechanics, Vol I – Statics, Vol II – Dynamics, 6th I. H. Shames, Engineering Mechanics: Statics and dynamics, 4th Ed, PHI, 2002.
3. C. Lakshamana rao, J. Lakshinarashiman, Raju sethuraman, Srinivasan M. Sivakumar (1993), Engineering Mechanics: Statics and Dynamics, PHI, New Delhi

Course Delivery Schedule (Theory)

Number of Subject Credits: 3+1

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
1	21/08/17	08.30-9.30	Monday	Introduction to Civil Engineering	Deepthi M V.	
2	21/08/17	09.30-10.30	Monday	Construction Materials and Technology: different building materials and Masonry	Deepthi M V.	
3	22/08/17	09.30-10.30	Tuesday	Construction Materials and Technology: Finishing Materials	Deepthi M V.	
4	23/08/17	11.00-12.00	Wednesday	Water Supply, Plumbing and Rainwater Harvesting	Deepthi M V.	
5	28/08/17	08.30-9.30	Monday	Engineering Mechanics	Deepthi M V.	
6	28/08/17	09.30-10.30	Monday	Fundamental Laws, Elements of Force	Deepthi M V.	
7	29/08/17	09.30-10.30	Tuesday	Resolution of Forces	Deepthi M V.	
8	30/08/17	11.00-12.00	Wednesday	Problems on Resolution of Forces	Deepthi M V.	
9	1/09/17	1.45-2.45	Friday	Composition of forces	Deepthi M V.	
10	4/09/17	08.30-9.30	Monday	Moment of force and couple	Deepthi M V.	

Course Delivery Schedule (Theory)

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
11	4/09/17	09.30-10.30	Monday	Problems on moment and couple	Deepthi M V.	
12	5/09/17	09.30-10.30	Tuesday	System of forces	Deepthi M V.	
13	6/09/17	11.00-12.00	Wednesday	Problems on Coplanar Concurrent Force systems	Deepthi M V.	
14	8/09/17	1.45-2.45	Friday	Problems on Coplanar Concurrent Force systems	Deepthi M V.	
15	11/09/17	08.30-9.30	Monday	Problems on Coplanar Concurrent Force systems	Deepthi M V.	
16	11/09/17	09.30-10.30	Monday	Problems on Coplanar Non Concurrent Force systems	Deepthi M V.	
17	12/09/17	09.30-10.30	Tuesday	Problems on Coplanar Non Concurrent Force systems	Deepthi M V.	
18	13/09/17	11.00-12.00	Wednesday	Problems on Coplanar Non Concurrent Force systems	Deepthi M V.	
19	15/09/17	1.45-2.45	Friday	Problems on Coplanar Non Concurrent Force systems	Deepthi M V.	
20	18/09/17	08.30-9.30	Monday	Equilibrium of Structural systems	Deepthi M V.	

Course Delivery Schedule (Theory)

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
21	18/09/17	09.30-10.30	Monday	Free Body Diagram, Lami's Theorem	Deepthi M V.	
22	20/09/17	11.00-12.00	Wednesday	Problems on Equilibrium of Coplanar Concurrent Force systems- single bodies	Deepthi M V.	
23	22/09/17	1.45-2.45	Friday	Problems on Equilibrium of Coplanar Concurrent Force systems-multiple bodies	Deepthi M V.	
24	3/10/17	09.30-10.30	Tuesday	Problems on Equilibrium of Coplanar Concurrent Force systems –connected bodies	Deepthi M V.	
25	4/10/17	11.00-12.00	Wednesday	Problems on Equilibrium of Coplanar Concurrent Force systems –connected bodies	Deepthi M V.	
26	6/10/17	1.45-2.45	Friday	Supports and support reactions	Deepthi M V.	
27	9/10/17	08.30-9.30	Monday	Types of loads and their conversion to point loads	Deepthi M V.	October 9th – 1st Assignment Submission
28	9/10/17	09.30-10.30	Monday	Problems on Beams	Deepthi M V.	
29	10/10/17	09.30-10.30	Tuesday	Problems on Beams	Deepthi M V.	
30	11/10/17	11.00-12.00	Wednesday	Problems on Beams	Deepthi M V.	

Course Delivery Schedule (Theory)

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
31	13/10/17	1.45-2.45	Friday	Problems on Trusses	Deepthi M V.	
32	16/10/17	08.30-9.30	Monday	Problems on Trusses	Deepthi M V.	
33	16/10/17	09.30-10.30	Monday	Centroids of planes	Deepthi M V.	
34	17/10/17	09.30-10.30	Tuesday	Derivations of Centroid for Regular areas	Deepthi M V.	
35	23/10/17	08.30-9.30	Monday	Derivations of Centroid for Regular areas	Deepthi M V.	
36	23/10/17	09.30-10.30	Monday	Problems on Composite areas	Deepthi M V.	
37	24/10/17	09.30-10.30	Tuesday	Problems on Composite areas	Deepthi M V.	
38	25/10/17	11.00-12.00	Wednesday	Moment of Inertia- Introductory concepts and Theorems	Deepthi M V.	
39	27/10/17	1.45-2.45	Friday	Moment of Inertia	Deepthi M V.	
40	30/10/17	08.30-9.30	Monday	Derivations of Moment of Inertia for Regular areas	Deepthi M V.	

Course Delivery Schedule (Theory)

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
41	30/10/17	09.30-10.30	Monday	Derivations of Moment of Inertia for Regular areas	Deepthi M V.	
42	31/10/17	09.30-10.30	Tuesday	Problems on M.I. For Composite areas	Deepthi M V.	
43	3/11/17	1.45-2.45	Friday	Problems on M.I. For Composite areas	Deepthi M V.	
44	13/11/17	08.30-9.30	Monday	Problems on M.I. For Composite areas	Deepthi M V.	
45	13/11/17	09.30-10.30	Monday	Friction	Deepthi M V.	
46	14/11/17	09.30-10.30	Tuesday	Block Friction and related problems	Deepthi M V.	
47	15/11/17	11.00-12.00	Wednesday	Block Friction and related problems	Deepthi M V.	
48	17/11/17	1.45-2.45	Friday	Problems on Rope Friction	Deepthi M V.	
49	20/11/17	08.30-9.30	Monday	Ladder Friction and related problems	Deepthi M V.	November 20th – 2nd Assignment Submission
50	20/11/17	09.30-10.30	Monday	Ladder Friction and related problems	Deepthi M V.	

Course Delivery Schedule (Theory)

Lecture No.	Date	Time	Day	Topic	Delivered By	Additional Activity
51	21/11/17	09.30-10.30	Tuesday	Wedge Friction and related problems	Deepthi M V.	
52	22/11/17	11.00-12.00	Wednesday	Wedge Friction and related problems	Deepthi M V.	
53	24/11/17	1.45-2.45	Friday	Introduction to dynamics	Deepthi M V.	
54	27/11/17	08.30-9.30	Monday	Introduction to dynamics	Deepthi M V.	
55	27/11/17	09.30-10.30	Monday	Numerical on rectilinear motion	Deepthi M V.	
56	28/11/17	09.30-10.30	Tuesday	Numerical on rectilinear motion	Deepthi M V.	
57	29/11/17	11.00-12.00	Wednesday	Curvilinear translation	Deepthi M V.	
58	1/12/17	1.45-2.45	Friday	Numerical on projectiles	Deepthi M V.	
59				Numerical on projectiles	Deepthi M V.	
60				Numerical on projectiles	Deepthi M V.	

Lecture 1 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Describe Engineering and Civil Engineering in particular
- Explain the different disciplines of civil Engineering and their applications
- Interpret the role of Civil Engineering in infrastructure development

Lecture 2 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define soil and explain its properties
- Describe materials of construction
- Describe the desirable properties and applications of different building materials such as stone, bricks, lime, mortar, etc.
- Explain the properties of cement and types of foundation
- Differentiate materials used in masonry construction and the construction methods

Lecture 3 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Identify the various materials used in the construction and finishing of civil works such as steel, timber, glass and aluminium, flooring materials, panels, plywoods and boards
- Describe the properties of each of the above materials with their advantages and disadvantages
- Explain the properties of paints and emulsions and their application methods

Lecture 4 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define plumbing and fittings
- Describe uses of rainwater harvesting
- Explain the methods and components of rainwater harvesting
- Distinguish water supply and sewage

Lecture 5 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define Engineering Mechanics
- Describe the basic idealizations of Mechanics such as rigid body, continuum, particle and point force
- Explain the concepts of Mechanics
- Differentiate the different branches of Mechanics

Lecture 6 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define Newton's Laws and Law of Gravitation
- Describe Force and its elements
- Explain the laws of transmissibility, superposition and physical independence

Lecture 7 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Explain the concept of resolution of forces
- Solve problems on resolution of forces to find the components of a force

Lecture 8 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Explain the concept of resolution of forces
- Solve problems on resolution of forces to find the components of a force

Lecture 9 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define composition of forces and resultant force
- Explain and prove parallelogram law of forces
- Apply parallelogram law of forces for specific angles
- Distinguish between resolution and composition of forces

Lecture 10 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define a moment and couple
- Describe the characteristics of a couple
- Explain the concepts of moment of a force, couple and moment of a couple

Lecture 11 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Find the components of a force
- Deduce the moment and couple for a given force system
- Calculate the moments about given reference points in different structures

Lecture 12 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define a force system
- Classify the force systems
- Apply theorem of moments to a non-concurrent force system
- Compare the analysis of concurrent and non concurrent force systems

Lecture 13 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Apply the method of resolution and find the resultant of coplanar concurrent force system
- Solve for the unknown forces given the resultant of concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 14 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Apply the method of resolution and find the resultant of coplanar concurrent force system
- Solve for the unknown forces given the resultant of concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 15 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Apply the method of Resolution and find the resultant of Coplanar Concurrent force system
- Solve for the unknown forces given the resultant of concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 16 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Describe Varignon's Theorem
- Apply the method of resolution and find the resultant of coplanar non concurrent force system
- Solve the unknown forces given the resultant of non concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 17 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Describe Varignon's Theorem
- Apply the method of resolution and find the resultant of coplanar non concurrent force system
- Solve the unknown forces given the resultant of non concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 18 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Describe Varignon's Theorem
- Apply the method of resolution and find the resultant of coplanar non concurrent force system
- Solve the unknown forces given the resultant of non concurrent force system
- Calculate the angles of applied forces given the resultant of concurrent force system

Lecture 19 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define equivalent force system
- Describe the concept of equivalent force system
- Solve the problems on replacing the force and couple moment system by an equivalent force

Lecture 20 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define types of forces
- Describe Equilibrium and Equilibrant
- Explain conditions of equilibrium for concurrent and non concurrent force systems

Lecture 21 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define free body diagram
- Describe and derive Lami's theorem
- Draw the free body diagram for different structures in equilibrium

Lecture 22 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Use Lami's theorem to solve equilibrium related problems (for 3 force system)
- Apply the conditions of equilibrium to solve problems (for more than 3 force system)
- Calculate the unknown forces or reactions for equilibrium of coplanar concurrent force system involving single bodies

Lecture 23 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Use Lami's theorem to solve equilibrium related problems (for 3 force system)
- Apply the conditions of equilibrium to solve problems (for more than 3 force system)
- Calculate the unknown forces or reactions for equilibrium of coplanar concurrent force system involving single bodies

Lecture 24 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Use Lami's theorem to solve equilibrium related problems (for 3 force system)
- Apply the conditions of equilibrium to solve problems (for more than 3 force system)
- Calculate the unknown forces or reactions for equilibrium of coplanar concurrent force system involving single bodies

Lecture 25 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Use Lami's theorem to solve equilibrium related problems (for 3 force system)
- Apply the conditions of equilibrium to solve problems (for more than 3 force system)
- Calculate the unknown forces or reactions for equilibrium of coplanar concurrent force system involving single bodies

Lecture 26 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define a beam
- Describe types of supports
- Explain types of beams
- Choose the appropriate number of reactions developed in the supports

Lecture 27 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define and classify Axial members, Frames
- Define cables
- Identify and explain different types of loads

Lecture 28 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Identify the type of support and support reactions
- Apply the conditions of equilibrium
- Calculate the reactions for the beams

Lecture 29 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Identify the type of support and support reactions
- Apply the conditions of equilibrium
- Calculate the reactions for the beams

Lecture 30 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Identify the type of support and support reactions
- Apply the conditions of equilibrium
- Calculate the reactions for the beams

Lecture 31 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define and recognise determinate trusses
- Calculate the forces in the members of trusses by choosing and applying methods of sections or method of joints

Lecture 32 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define and recognise determinate trusses
- Calculate forces in the members of trusses by choosing and applying methods of sections or method of joints

Lecture 33 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define centre of gravity and centroid
- Derive the centroid of lines, planes and volumes
- Solve the problems on CG of structural sections

Lecture 34 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Derive the centroid of different sections

Lecture 35 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate the co-ordinates of the centre of gravity and tabulate them

Lecture 36 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate the co-ordinates of the centre of gravity.

Lecture 37 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate the co-ordinates of the centre of gravity.

Lecture 38 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define Moment of Inertia and Radius of gyration
- Describe theorem of Perpendicular axes
- Explain theorem of Parallel axes

Lecture 39 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Determination of Moment of Inertia of various shapes and curves

Lecture 40 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Determine the Moment of Inertia for different sections

Lecture 41 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Determine the Moment of Inertia for different sections

Lecture 42 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate and convert the composite section into simple regular areas
- Calculate the co-ordinates of the centroid of the composite area
- Solve for the Moment of Inertia of sections with respect to the considered axis

Lecture 43 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate and convert the composite section into simple regular areas
- Calculate the co-ordinates of the centroid of the composite area
- Solve for the Moment of Inertia of sections with respect to the considered axis

Lecture 44 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate and convert the composite section into simple regular areas
- Calculate the co-ordinates of the centroid of the composite area
- Solve for the Moment of Inertia of sections with respect to the considered axis

Lecture 45 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Describe the concepts of friction

Lecture 46 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define Block friction and understand block friction
- Draw Free Body diagrams of Blocks in the given problems
- Evaluate frictional forces or weight of the block or find tension in the string connecting the blocks by assuming impending state of the block

Lecture 47 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Draw Free Body diagrams of Blocks in the given problems
- Evaluate frictional forces or weight of the block or find tension in the string connecting the blocks by assuming impending state of the block

Lecture 48 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Draw Free Body diagrams of pulley in the given problems
- Evaluate frictional forces or find tension in the string on either side of the pulley by assuming impending state

Lecture 49 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Describe the concepts of ladder friction
- Draw Free Body diagrams of Ladder in the given problems
- Evaluate frictional forces or find the height upto which a person can ascend safely or find the force needed to be applied at the floor level to hold the ladder in equilibrium

Lecture 50 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Draw Free Body diagrams of Ladder in the given problems
- Evaluate frictional forces or find the height upto which a person can ascend safely or find the force needed to be applied at the floor level to hold the ladder in equilibrium

Lecture 51 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Define wedge and wedge friction
- Draw Free Body diagrams of wedge in the given problems
- Evaluate frictional forces or find the force needed to lift the wedge

Lecture 52 Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Draw Free Body diagrams of wedge in the given problems
- Evaluate frictional forces or find the force needed to lift the wedge

Lecture 53 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Describe dynamics, kinetics and kinematics
- Explain concepts of position, displacement, velocity, and acceleration
- Explain the particle motion along a straight line and represent this motion graphically

Lecture 54 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define Dynamics, Rectilinear motion and Projectiles
- Define Rectilinear motion and Projectiles
- Describe the concept of projectile
- Explain Displacement-Time Curve, Velocity-Time Curve and Acceleration-Time Curve

Lecture 55 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Solve problems on rectilinear motion

Lecture 56 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Solve problems on rectilinear motion

Lecture 57 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Define and describe projectile and related terms velocity of projection, angle of projection, trajectory, horizontal range, time of flight
- Derive equations of motion of trajectory
- Evaluate time required to reach maximum height, maximum height, horizontal range and time of flight from equation of motion of trajectory

Lecture 58 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Solve problems on horizontal projection, inclined projection on both horizontal and inclined plane are analyzed neglecting air resistance

Lecture 59 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Solve problems on horizontal projection, inclined projection on both horizontal and inclined plane are analyzed neglecting air resistance

Lecture 60 Intended Learning Outcomes

At the end of this lecture, student will be able to:

- Solve problems on horizontal projection, inclined projection on both horizontal and inclined plane are analyzed neglecting air resistance