

## LESSON PLAN

1. Course Title	:	Basic Engineering Mechanics
2. Course Code	:	GEC1211
3. a) Course Faculty	:	Dr.P.N.Kadiresh (Prof/Aero)
b) Course Coordinator	:	Dr.V. Muralidharan (Assoc Prof/Mech)
4. Theory / Practical	:	Theory
5. Semester	:	II semester
6. Academic Year	:	2018-2019
7. Department	:	Aerospace Engineering
8. No. of Credits	:	4

### 9. Course Learning Objectives:

- To impart knowledge about the basic laws of statics and dynamics and their applications in problem solving
- To acquaint both with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium
- To give an exposure on inertial properties of surfaces and solids
- To provide an understanding on the concept of work energy principle, friction, kinematics of motion and their relationship

### 10. Course pre-requisites:

Knowledge on Vector Algebra  
 Knowledge on basic Physics and Mathematics

### 11. Schedule of teaching and learning [furnished as Annexure]

### 12. Course material and References

- Video-graphed Lectures will be made available in the intranet.
- PPT slides on each topic also can be downloaded.

#### References:

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers, Dynamics & Statics", Third SI Metric Edition, Tata McGraw-Hill International Edition, 2001.
2. Hibbeler, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
3. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition Pearson Education Asia Pvt. Ltd., 2003.

*A. S. Me. Shaha*

**13. Assessment Scheme:**

Assessment I	Percentage
Periodical Test 1 Assignment 1	70 30
<b>Assessment II</b>	
Periodical Test 2 Assignment 2	70 30
<b>Assessment III</b>	
End semester exam	100

**i) Periodical tests.**

There will be three periodical assessment tests and the test portions are given below:

- |         |   |
|---------|---|
| Test I  | Complete Module I, II and ( III first half) |
| Test II | Complete Module III (second half), IV and V |

**ii) Carry home exercise**

Twenty problems in each unit will be given as tutorial.

**14. Expected outcome of the course:**

On completion of this course students should be able to

- Analyze and resolve forces, moments and solve problems using various principles and laws of Mechanics
- Apply the concept of equilibrium to particles and solve problems
- Apply the concept of equilibrium to rigid bodies and solve problems
- Analyze and determine the properties of surfaces
- Analyze and evaluate the fractional forces between the bodies
- Apply the laws of motion in solving dynamics problems

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15. Mapping of course outcomes with learning activities and assessments

Course outcomes	Learning activities	Assessments	CAT I * %	CAT II * %	End sem * %
Analyze and resolve forces, moments and solve problems using various principles and laws of Mechanics	Lecture	Tutorial CAT End Exam	40	-	15 - 20
Apply the concept of equilibrium to particles and solve problems	Lecture	Tutorial CAT End Exam	30	-	15 - 20
Apply the concept of equilibrium to rigid bodies and solve problems	Lecture	Tutorial CAT End Exam	30	-	15 - 20
Analyze and determine the properties of surfaces	Lecture	Tutorial CAT End Exam	-	40	15 - 20
Analyze and evaluate the fractional forces between the bodies	Lecture	Tutorial CAT End Exam	-	30	15 - 20
Apply the laws of motion in solving dynamics problems	Lecture	Tutorial CAT End Exam	-	30	15 - 20

Date: 03/01/2019

  
 Head of Department

  
 Course Faculty 030119

ANNEXURE (vide item 11)

Schedule of Teaching and Learning

Module No.	Sl. No	Topics	No. of Periods	Mode of Delivery	Teaching Aids	References/Sources
Module 1 Vector Approach to Mechanics	1	Introduction, units and dimensions, laws of mechanics, Lame's theorem	1	Lecture	PPT, chalk & talk	T1, R1 & R2
	2	Vectors – Vectorial representation of forces and moments	2	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
		Vector Algebra and its Physical relevance in Mechanics				
	3	Coplanar Forces – Resolution and Composition of Forces	3, 4	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
4	Equilibrium of a particle	5, 6, 7	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2	
Module 2 Equilibrium of Particles	5	Forces in space - Equilibrium of a particle in space	8, 9, 10	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	6	Equivalent systems of forces – Principle of transmissibility – Single equivalent Force	11, 12, 13	Lecture & Cooperative Problem solving	And PPT, chalk & talk Mo PPT, chalk & talk	T1, R1 & R2
Module 3 Equilibrium of Rigid Bodies	8	Free body diagram – Types of supports and their reactions – requirements of stable Equilibrium	14, 15	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	9	Moments and Couples – Moment of a force about a point and about an axis –Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem	16, 17, 18	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	10	Equilibrium of Rigid bodies in two dimensions –	19, 20, 21	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	11	Determination of Areas and Volumes – First moment of area Centroid of sections –Rectangle, circle, triangle from integration	22, 23	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2

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Module 4 Properties of surfaces	12	Centroid of sections – T section, I section, Angle section, Hollow section by using standard formula	24, 25	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	13	second and product moments of plane area – Physical relevance - Rectangle, triangle, circle from integration	26, 27	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	14	second and product moments of plane area - T section, I section, Angle section, Hollow section by using standard formula –	28, 29	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	15	Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia	30, 31	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
Module 5 Friction	16	Introduction to Friction – Types of Friction, Laws of Coloumb friction – simple contact friction.	32, 33, 34	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	17	Sliding Friction, Belt friction	35, 36, 37	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	18	Rolling resistance-Ladder Friction	38, 39, 40	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
Module 6 Laws of Motion	19	Review of laws of motion	41, 42	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	20	Newton's law	43, 44	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	21	Work Energy Equation of particles	45, 46, 47	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	22	Impulse and Momentum	48, 49	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2
	23	Impact of elastic bodies.	50, 51	Lecture & Cooperative Problem solving	PPT, chalk & talk	T1, R1 & R2

**Text Books:**

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers, Dynamics & Statics", Third SI Metric Edition, Tata McGraw-Hill International Edition, 2001.

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2. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition Pearson Education Asia Pvt. Ltd., 2003.

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