
	SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY COURSE PLAN (THEORY)	
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ACADEMIC YEAR:2018-2019

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Subject Code	GE 8292		L	P	T	C
Subject Title	ENGINEERING MECHANICS		3	0	2	4
Year / Dept / Sem	I/ MECH /II		Regulation Year		2017	
Faculty Name / Desg / Dept	Mr.R.PANDIARAJAN / AP / CIVIL					
Course Prerequisite	<ul style="list-style-type: none">• No previous mathematics knowledge beyond algebra, trigonometry and elementary calculus• Geometry and physical perception, Common sense and logical reasoning					

GE8292**ENGINEERING MECHANICS****L T P C****3 2 0 4****OBJECTIVE:**

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I STATICS OF PARTICLES**15**

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES**15**

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – 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 – Single equivalent force – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS**15**

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia–Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES**15**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS**15**

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 75 PERIODS**TEXT BOOKS:**

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
2. Irying H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi (2008)

Course Objective s (CO)	CO1: To develop the capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering. CO2: To develop the students' ability to analyze any problem in a simple and logical manner. CO3: To apply to its solution a few, well understood, basic principles involving statics. CO4: To apply to its solution a few, well understood, basic principles involving dynamics. CO5: Able to gain knowledge about friction force on flat and sliding surface CO6: Able to evaluate the second moment of area for various surfaces.
Expected Course Outcome s (ECO)	At the end of the course, the students should be: ECO1: Illustrate the vectorial and scalar representation of forces and moments ECO2: Analyze the rigid body in equilibrium ECO3: Evaluate the properties of surfaces and solids ECO4: Calculate dynamic forces exerted in rigid body ECO5: Determine the friction and the effects by the laws of friction. ECO6: Evaluate the Moment of inertia for various section.
Mapping of CO & PO(Specify the PO's) - (Fill the cols with the legend given below) Programme Outcomes of Civil Engineering <ol style="list-style-type: none"> a. Graduates of Civil Engineering program will be able to apply the fundamental knowledge of mathematics, science and engineering to solve problems pertaining to Civil Engineering. b. Graduates of Civil Engineering program will be able to identify, analyze, formulate, and solve civil Engineering problems in accordance with Indian Standard codes of practice. c. Graduates of Civil Engineering program will be able to design a system component, or process to meet desired needs within realistic constraint such as economic, environmental, social, political, ethical, health safety, manufacturability, and sustainability. d. Graduates of Civil Engineering program will able be to design and conduct experiments, as well as to analyze and interpret data. e. Graduates of Civil Engineering will be able to use the techniques, skills, and modern civil engineering tools, necessary for engineering practice. f. Graduates of Civil Engineering program will be able to incorporate specific contemporary issues into the identification, formulation, and solution of specific civil engineering problems. g. Graduates of Civil Engineering program will be able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. h. Graduates of Civil Engineering program will be able to understand the role of Civil Engineers 	

- and ethical responsibility.
- Graduates of Civil Engineering program will be able to function on multidisciplinary teams.
 - Graduates of Civil Engineering program will be able to deliver effective verbal, written, and graphical communications.
 - Graduates of Civil Engineering program will be able to recognize the need for, and an ability to engage in life-long learning.
 - Graduates of Civil Engineering program will be able to perform economic analysis, quality checks, time/labour management and cost estimates related to design, construction, operations and maintenance of systems in the civil technical specialties.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	2	1	-	1	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	2	-	-	-	-	-	-	-
CO4	-	-	2	2	2	-	-	-	-	-	-	-
CO5	-	-	1	-	-	1	1	-	-	-	-	-
CO6	-	2	2	3	-	-	1	-	-	-	-	-

Bridging the Curriculum Gap(Additional Topics beyond syllabus/Seminars /Assignments)

BCG1: Centroids for Channel Section.
BCG2: Differential geometry of surfaces.
BCG3: Rigid Body Dynamics With Coulomb Friction.

Related Website URLs

W1: <http://nptel.ac.in/courses/112103108/2>
W2: <http://www.mhhe.com/beer/vme8e>
W3: <http://nptel.ac.in/courses/112103109/11>
W4: <http://nptel.ac.in/courses/112103109/23>




Related Video Course Materials (min. 3 no.s)

V1: <https://www.youtube.com/watch?v=7kt9AoxZILo&list=PL4K9r9dYCOopD-TcVWloFD6yYDah2stY>
V2: https://www.youtube.com/watch?v=fO2Cdx89O_o&list=PLLbvVfERDonIpceRKOjAxiqFTEvghmZKh
V3: <https://www.youtube.com/watch?v=yNIIWETrDF0&list=PLLbvVfERDon3nPOJRpAzze-1KfUiou4AK>
https://www.youtube.com/watch?v=8x59va9CaPI&list=PLhSp9OSVmeyLyqyoDirkcDEHls_LmtDUi
V4: <https://www.youtube.com/watch?v=LG0YzGeAFxk&list=PL63F5D8638872CC3E>
V5: https://www.youtube.com/watch?v=TnWBAnkCDuc&list=PLq7jO-L_k0yUk2tfPwhea9asGRBXcUEpL

S. No	Topic	Page No. in the Text Book (T2)	Teaching Aids	No. of Hour	Cumulative no. of Hours
UNIT – 1 STATICS OF PARTICLES					
1.	Introduction	2	BB	1	1
2.	Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces, Principle of transmissibility	12-13	BB	1	2
3.	Vectorial representation of forces, resultant force	16	BB	1	3
4.	Vector operations of forces additions, subtraction, dot product, cross product	18	BB	1	4

5.	Coplanar Forces – rectangular components	26	BB	1	5
6.	Resultant force for collinear and concurrent force, Equivalent systems of force	28	BB	3	8
7.	Equilibrium of a particle – Forces in space	84	BB	2	10
8.	Equilibrium of a particle in space – 2D	84	BB	4	14
9.	Equilibrium of a particle in space – 3D	85	BB	4	18
UNIT – 2 EQUILIBRIUM OF RIGID BODIES					
10.	Free body diagram – types of supports, action and reaction forces	119	BB	1	19
11.	Stable equilibrium – Moments and couple	123	BB	1	20
12.	Moment of a force about a point and about an axis	124	BB	2	22
13.	Scalar components of a moment	131	BB	2	24
14.	Varignon's theorem – Single equivalent force	151	BB	2	26
15.	Equilibrium of Rigid bodies in two dimensions	151	BB	5	31
16.	Vectorial representation of moments and couples, Equilibrium of Rigid bodies in three dimensions	168	BB	5	36
UNIT – 3 PROPERTIES OF SURFACES AND SOLIDS					
17.	Centroids and centre of mass– Centroids of lines& areas	187	BB	1	37
18.	Centroids of areas - Rectangular, circular, triangular areas by integration	187	BB	2	39
19.	Centroids of T section, I section, - Angle section, Hollow section by using standard formula	189	BB	4	43
20.	Theorems of Pappus - Area moments of inertia	203	BB	1	44
21.	Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula	209	BB	4	48
22.	Parallel axis theorem and perpendicular axis theorem, polar moment of inertia, radius of gyration	213-235	BB	1	49
23.	Product of inertia, Principal moments of inertia of plane areas –Principal axes of inertia	237-241	BB	1	50
24.	Mass moment of inertia for prismatic, cylindrical and spherical solids from first principle, Relation between mass moment of inertia and area moments of inertia	259	BB	1	51
UNIT – 4 DYNAMICS OF PARTICLES					
25.	Displacement, Velocity and Acceleration – their relationship	279	BB	1	52
26.	Rectilinear motion	280	BB	2	54
27.	Curvilinear motion	307	BB	2	56
28.	Newton's law of motion	316	BB	2	58
29.	Work energy equation	340	BB	2	60
30.	Impulse & Momentum	351	BB	2	62
31.	Impact of elastic bodies	361	BB	5	66


UNIT - 5 FRICTION AND RIGID BODY DYNAMICS					
32.	Friction force - law of sliding force	383	BB	1	67
33.	Equilibrium analysis of simple stress with sliding friction	385	BB	5	72
34.	Equilibrium analysis of simple stress with Rolling Resistance	437	BB	4	76
35.	Translation and Rotation of Rigid Bodies	446-467	BB	2	78
36.	General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.	482	BB	3	81

	Prepared by	Approved by	
Signature			
Name	Mr.R.PANDIARAJAN	Dr.P.GANESAN	Dr.J. JAYALAKSHMI
Designation	AP / Civil	HoD/CIVIL	HOD / S&H
Signed date	22.10.18	22/10/18	

LEGEND:**METHODOLOGY TO MAP OBJECTIVE WITH OUTCOME**

Course outcomes are achieved through

- Suitable Analogies and videos.
- Class room teaching.
- Assignments.
- Tutorials
- Weekly, monthly and model exams.
- Group discussion.
- Seminars

1 Endorsed /

 1 Print