

Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering

BME202 - ENGINEERING MECHANICS
Second Semester, 2015-16 (Even Semester)

Course (catalog) description

To understand the concept of basic engineering mechanism

Compulsory/Elective course : Compulsory Mechanical students

Credit & contact hours : 3 & 60

Course Coordinator : Mr.Saravana Kumar A

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in)	Consultation
Mr.Saravanan	First year MECH	SA003		Saravanan.mech@bharathuniv.ac.in	9.00 - 9.50 AM
Mr.Sathish Kumar K	First year MECH	SA003		Sathishkumar.mech@bharathuniv.edu	12.45 - 1.15 PM

Relationship to other courses:

Pre –requisites : Engineering Mathematics I , II, Engg. Physics

Assumed knowledge : Mathematics

Following courses : Kinematics of Machines, Mechanics of solids, Machine Design I,

Syllabus Contents**UNIT I BASICS AND STATICS OF PARTICLES****12**

Introduction - Units and Dimensions - Laws of Mechanics – Lamé’s theorem, Parallelogram and triangular Law of forces – Vectors –Vectorial representation of forces and moments – Vector operations on forces - Coplanar Forces – Resolution and Composition of forces – Resultant of several concurrent forces - Equilibrium of a forces – Forces in space - Equilibrium of particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES**12**

Free body diagram – Types of supports and their reactions – requirements of 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 - Equilibrium of Rigid bodies in two dimensions -Equilibrium of Rigid bodies in three dimensions.

UNITIII PROPERTIES OF SURFACES AND SOLIDS

12

Determination of areas – First moment of area and the Centroid of standard sections – T section, I section, Composite figures, Hollow section – second moments of plane area – Rectangle, triangle, circle - T section, I section, Hollow section – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Basic concept of Mass moment of inertia.

UNITIV FRICTION

12

Frictional force – Laws of Coloumb friction – Cone of friction – Angle of repose – Simple contact friction – Sliding of blocks – Wedge friction - Ladder friction – Screw Jack – Belt friction - Rolling resistance.

UNIT V DYNAMICS OF PARTICLES

12

Displacements, Velocity and acceleration, their relationship – Relative motion – Relative acceleration – Curvilinear motion of particles – **Newton’s law** – work energy equation – impulse and Momentum – Impact of elastic bodies.

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R, “Vector Mechanics for Engineers: Vol. 1 Statics and vol. 2 Dynamics”, McGraw-Hill International Edition, 2013.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2011.

REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010
2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013.
3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

Total : 60 HOURS

Computer usage:

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	100%
Professional subject	-	0%

Broad area : Machine Design

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 14	2 Periods
2	Cycle Test-2	March 2 nd week	Session 15 to 28	2 Periods
3	Model Test	April 3 rd week	Session 1 to 45	3 Hrs
5	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To understand the concept of basic engineering mechanism	Correlates to program outcome		
	H	M	L
1. Students will understand the concepts of engineering mechanics	a,b,f,j,k		c,h
2. Students will understand the vectorial representation of forces and moments	f,g	h	
3. Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.	f,g	j	h
4. Students will gain knowledge regarding various types of forces and reactions and to draw free body diagram to quicker solutions for complicated problems.	f,g	j	h
5. Student will gain knowledge in solving problems involving work and energy	f,g	j	h
6. Student will gain knowledge on friction on equilibrium and its application.	f,g	j	h

H: high correlation, M: medium correlation, L: low correlation

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I BASICS AND STATICS OF PARTICLES			
1.	Introduction - Units and Dimensions	Yes	T1, T2
2.	Laws of Mechanics	Yes	
3.	Lame's theorem, Parallelogram and triangular Law of forces	Yes	
4.	Vectors – Vectorial representation of forces and moments	Yes	
5.	Vector operations on forces - Coplanar Forces	Yes	
6.	Resolution and Composition of forces	Yes	
7.	Equilibrium of a forces – Forces in space	Yes	
8.	Equilibrium of particle in space	Yes	
9.	Equivalent systems of forces	Yes	
10.	Principle of transmissibility	Yes	
11.	Resultant of several concurrent forces	Yes	
12.	Single equivalent force	Yes	
UNIT II EQUILIBRIUM OF RIGID BODIES			
13.	Free body diagram	Yes	T1, T2,R2
14.	Types of supports and their reactions	Yes	
15.	Types of supports and their reactions	Yes	
16.	requirements of stable equilibrium	Yes	
17.	Moments and Couples	Yes	
18.	Moment of a force about a point and about an axis	Yes	
19.	Vectorial representation of moments and couples	Yes	
20.	Scalar components of a moment	Yes	
21.	Varignon's theorem	Yes	
22.	Equilibrium of Rigid bodies in two dimensions	Yes	
23.	Equilibrium of Rigid bodies in three dimensions.	Yes	
24.	Equilibrium of Rigid bodies in three dimensions.	Yes	
UNITIII PROPERTIES OF SURFACES AND SOLIDS			
25.	Determination of areas	Yes	T1, T2,R2
26.	First moment of area and the Centroid of standard sections – T section	Yes	
27.	First moment of area and the Centroid of standard sections –I section	Yes	
28.	Composite figures , Hollow section	Yes	
29.	second moments of plane area – Rectangle, triangle, circle	Yes	
30.	second moments of plane area – Rectangle, triangle, circle	Yes	
31.	second moments of plane area - T section	Yes	
32.	I section, Hollow section	Yes	
33.	Parallel axis theorem and perpendicular axis theorem	Yes	
34.	Polar moment of inertia	Yes	
35.	Principal moments of inertia of plane areas	Yes	
36.	Principal axes of inertia – Basic concept of Mass moment of	Yes	

	inertia		
UNITIV FRICTION			
37.	Frictional force	Yes	[T1] Chapter – 7, [R1]Chapter-7
38.	Laws of Coloumb friction	Yes	
39.	Cone of friction – Angle of repose	Yes	
40.	Simple contact friction	Yes	
41.	Simple contact friction	Yes	
42.	Sliding of blocks	Yes	
43.	Sliding of blocks	Yes	
44.	Wedge friction	Yes	
45.	Ladder friction	Yes	
46.	Screw Jack	Yes	
47.	Belt friction	Yes	
48.	Rolling resistance	Yes	
UNIT V DYNAMICS OF PARTICLES			
49.	Displacements, Velocity and acceleration, their relationship	Yes	[T1] Chapter -8, 9 [R1]Chapter-12,14
50.	Displacements, Velocity and acceleration, their relationship	Yes	
51.	Relative motion	Yes	
52.	Relative acceleration	Yes	
53.	Curvilinear motion of particles	Yes	
54.	Newton’s law	Yes	
55.	work energy equation	Yes	
56.	work energy equation	Yes	
57.	impulse and Momentum	Yes	
58.	impulse and Momentum	Yes	
59.	Impact of elastic bodies	Yes	
60	Impact of elastic bodies	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment / Seminar / Online		
Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mr.Saravana Kumar A

Addendum

ABET Outcomes expected of graduates of B.Tech / MECH / program by the time that they graduate:

- a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) The ability to identify, formulate and solve engineering problems.
- c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) The ability to design and conduct experiments, as well as to analyze and interpret data
- e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- f) The ability to apply reasoning informed by the knowledge of contemporary issues.
- g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- h) The ability to understand professional and ethical responsibility and apply them in engineering practices.
- i) The ability to function on multidisciplinary teams.
- j) The ability to communicate effectively with the engineering community and with society at large.
- k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
- l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:

Mechanical Engineering graduates are enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:

Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:

Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:

Mechanical Engineering graduates became skilled to afford training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:

Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

BME202 - ENGINEERING MECHANICS

Course Teacher	Signature
Mr.Saravanan Mr.Sathish Kumar K	

Course Coordinator
Mr.Saravanan

HOD/MECH

