Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering

BME101 - ENGINEERING GRAPHICS
First Semester, 2015-16 (Odd Semester)

Course (catalog) description

To understand techniques of drawings in various fields of engineering

Compulsory/Elective course   :   Compulsory Mechanical students

Credit & contact hours   :   4 & 60

Course Coordinator   :   Mr.Shabirula

Instructors   :

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

Relationship to other courses:

Pre –requisites   **:**   + level Physics

Assumed knowledge :   Basic Drawing

Following courses   :   Machine Drawing

Syllabus Contents

UNIT I   BASICS AND STATICS OF PARTICLES   12
Introduction - Units and Dimensions - Laws of Mechanics – **Lame'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 : Reading and conversion of drawings from 2D to 3 D

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 1st week	Session 1 to 45	3 Hrs
4	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 tom 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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**BASIC CURVES, PROJECTION OF POINTS AND STRAIGHT LINES**		
1.	Conics-construction of ellipse, parabola and hyperbola by eccentricity method	No	T1,T2
2.	Practice	No	
3.	construction of cycloids- construction of involutes of square and circle-Drawing of tangent and normal to the above curves	No	
4.	Scales-Basic drawing conventions and standards	No	
5.	Orthographic projection principles- Principal planes-First angle projection- Projection of points	No	
6.	Projection of straight lines (only first angle projections) inclined to both the principal planes	No	
7.	Practice	No	
8.	Projection of straight lines (only first angle projections) inclined to both the principal planes	No	
9.	Practice	No	
10.	Projection of straight lines (only first angle projections) inclined to both the principal planes	No	
11.	Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces	No	
12.	Practice	No	
UNIT II	**PROJECTIONS OF PLANES AND SOLIDS**		
13.	Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes.	No	T1,T2,R1
14.	Practice	No	
15.	Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes.	No	
16.	Practice	No	
17.	Projection of simple solids	No	
18.	Projection of simple solids	No	
19.	Projection of simple solids	No	
20.	Practice	No	
21.	Practice	No	
22.	Practice	No	
23.	Practice	No	
24.	Practice	No	
UNITIII	**ORTHOGRAPHIC PROJECTIONS, ISOMETRIC PROJECTIONS & FREEHANDSKETCHING**		

25.	Orthographic projection of Simple parts from 3D diagram	No	T2,R1,R2
26.	Orthographic projection of Simple parts from 3D diagram	No	
27.	Orthographic projection of Simple parts from 3D diagram	No	
28.	Principles of isometric projection and isometric view	No	
29.	isometric scale	No	
30.	Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones	No	
31.	Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones	No	
32.	combination of two solid objects in simple vertical positions and miscellaneous problems	No	
33.	combination of two solid objects in simple vertical positions and miscellaneous problems	No	
34.	Free hand sketching of orthographic & Isometric projection	No	
35.	Practice	No	
36.	Free hand sketching of orthographic & Isometric projection	No	

UNITIVPROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

37.	Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section.	No	
38.	Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other	No	[T1] Chapter – 7, [R1]Chapter-7
39.	Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other	No	
40.	Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other	No	
41.	Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other	No	
42.	Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones.	No	
43.	Development of lateral surfaces of simple and sectioned solids	No	
44.	Development of lateral surfaces of simple and sectioned solids	No	
45.	Development of lateral surfaces of simple and sectioned solids	No	
46.	Development of lateral surfaces of solids with cut-outs and holes	No	
47.	Development of lateral surfaces of solids with cut	No	
48.	Development of lateral surfaces of solids with cut	No	

UNIT VPERSPECTIVE PROJECTION, BUILDING DRAWING AND COMPUTER AIDED DRAFTING

49.	Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method.	No	
50.	Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method.	No	
51.	Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method.	No	[T1] Chapter -8, 9 [R1]Chapter-12,14
52.	Introduction- components of simple residential or office	No	

	building-specifications-plan and elevation of different types of Residential buildings and office buildings.	
53.	Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings.	No
54.	Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings.	No
55.	Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings.	No
56.	Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings.	No
57.	Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings.	No
58.	Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages	No
59.	Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages	No
60	Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages	No

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%
Assignments / Seminars / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mr.A.Saravana Kumar

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 graduatesare 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.

Course Teacher	Signature
Mr.Shabirulla	
Mr.Saravanan Mr.Sathish Kumar K	

Course Coordinator   **HOD/MECH**
Mr.Shabirulla