Academic Course Description

BHARATH UNIVERSITY

Faculty of Engineering and Technology

Department of Mechanical Engineering

BME 501 –MACHINE DESIGN I

Fifth Semester, 2015-16 (odd Semester)

Course (catalog) description

Familiarize the students with the fundamental concepts of designing the various elements of machines and to highlight the design approaches in designing shafts, springs, couplings, riveted joints, Welded joints and bolted joints.

Compulsory/Elective course : Compulsory

Credit & contact hours : 4 & 75

Course Coordinator : **V. Jose Ananth Vino**

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
V. Jose Ananth Vino	V Sem – A , C	JR 106	8940737381	Srinivasan.mech@ bharathuniv.ac.in	Tuesday 12.30 to 01.30
Dr.Balambika	V Sem – B ,FSection	JR305	8939990775	Manavalan.mech@ bharathuniv.ac.in	
Mr. Sharavanan	V Sem – D,E Section	JR105	9952586083	Manikandan.mech@ bharathuniv.ac.in	Wednesday 12.30 to 01.30

Relationship to other courses:

Pre –requisites **:** Mechanics of solids

Assumed knowledge : Engineering Mechanics

Following courses : Mechanics of fracture

Syllabus Contents

UNIT I FUNDAMENTALS (9+6)

Design process – Engineering Materials and Mechanical properties – Eccentric loading – Principal stresses – Design criteria – Calculation of permissible stress – Failure theories – Stress Concentration – Design for variable loading –Soderberg, Goodman and Gerberg relations - Introduction to Fracture Mechanics. Introduction to Optimum Design

UNIT II DESIGN OF SHAFTS (9+6)

Design of Shafts using fatigue factors – Shafts carrying pulleys gears – overhanging and simply Supported Shafts - Hollow shafts - Design of Axles.

UNIT III DESIGN OF SPRINGS (9+ 6)

Design of tension and compression Helical springs – Springs for Buffers – Springs for impact loads – Concentric springs - Springs in series and parallel connection –Design of Leaf springs – Semi elliptical cantilever type.

UNIT IV DESIGN OF RIVETED & WELDED JOINTS (9+6)

Design of riveted joint for a Boiler – Lozenge joint – Design of eccentrically loaded riveted joints – Design of Welded joints.

UNIT V DESIGN OF BOLTED JOINTS & COUPLINGS (9+6)

Design of eccentrically loaded bolted joints – Screw fastenings – Gasket joints for cylinders – Design of Rigid couplings, Pin and Bush type flexible couplings, Muff coupling and Clamp coupling

TOTAL 60 HOURS

Text book(s) and/or required materials

TEXT BOOKS :

1. Prabhu T.J. – Fundamentals of Machine Design, 2009.

REFERENCES :

1. Bhandari V.B – Design of Machine Elements - TataMcGraw Hill, 2007
2. . Shigley J.E. & Misheka – Mechanical Engineering Design2004 – McGraw Hill,2007.
3. Dobrovolosky, Machine Elements – Mir Publications, 1978.
4 . Pandya & Shah – Elements of Machine Design, 2000. 5. Design Data, PSG College of Technology, 2007.
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Computer usage: Nil

Professional component

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

Broad area : Design of machine

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 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

Familiarize the students with the fundamental concepts of Management and to highlight the approaches in organization behavior	Correlates to program outcome		
	H	M	L
1. Understanding the concepts of Machine design	a	f,l,j	g
2. Knowledge on Selection of Materials	c	a,e,d	i
3. Understanding the use of design data book	d	a	h
4. Knowledge on the optimum design	e,j	a,e,g	i
5. Clear insight on design principles of various elements of design	a	i	b
6. In-depth Understanding about the design of components.	f		

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

Draft Lecture Schedule

Session	Topics	Problem Solving (Yes/No)	Text / Chapter
1.	Introduction to design process	yes	[T2] chapter - 5, [R1] chapter -3
2.	Engineering Materials	No	
3.	Mechanical properties of materials	No	
4.	Eccentric loading	yes	
5.	Principal planes and principal stresses	yes	
6.	Failure theories	yes	
7.	Stress concentrations	yes	
8.	Design for variable loading	yes	
9.	Introduction to fracture mechanics and optimum design	yes	
10.	Fundamental of shaft design	yes	
11.	Shaft design using fatigue factors	yes	
12.	Design of shafts carrying pulleys	yes	
13.	Design of shafts carrying gears	yes	[T2] chapter – 6
14.	Design of overhanging shafts	yes	
15.	Design of simply supported shafts	yes	
16.	Design of hollow shafts	yes	
17.	Introduction to spindles and axles	yes	

18.	Design of axles	yes	
UNIT 3 Design of springs			
19.	Design of tension springs	yes	[T2] chapter – 6, [R1] chapter - 8
20.	Design of compression springs	yes	
21.	Closely coiled springs and open coiled springs	yes	
22.	Design of springs for buffer	Yes	
23.	Design of springs for impact loads	yes	
24.	Springs in series and parallel connections	yes	
25.	Design of concentric springs	yes	
26.	Design of leaf springs	yes	
27.	Design of semielliptical and cantilever type springs	yes	
UNIT 4 Design of riveted and welded joints			
28.	Introduction to rivets and riveted joints	No	[T2] chapter– 4, [R1] chapter–2
29.	Types of riveted joints	No	
30.	Design of riveted joints for Boiler.	yes	
31.	Lozenge jont	yes	
32.	Design of eccentrically loaded riveted joints	yes	
33.	Introduction to welding and weld joints	yes	
34.	Types of weld joints	yes	
35.	Design of weld joints for static loading	yes	
36.	Design of weld joints for fatigue loading	yes	
UNIT 5 Design of bolted joints and couplings			
37.	Introduction to bolted joints	No	
38.	Design of bolt joints	yes	
39.	Design of eccentrically loaded bolted joints	yes	
40.	Design of screw fastenings	yes	
41.	Design of bolts for cylinders with gasket joints	yes	[T2] chapter– 5,6
42.	Types of couplings and their applicationss	No	[R1] chapter–7
43.	Design of rigid couplings	yes	
44.	Design of pin and bush type flexible couplings	yes	
45.	Design of muff coupling and clamp couplings	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.
- 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: V. Jose Ananth Vino

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
V. Jose Ananth Vino Dr.Balambika	
Mr. Sharavanan	

Course Coordinator **HOD/MECH**

V. Jose Ananth Vino