DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

V SEMESTER

32051 – DESIGN OF MACHINE ELEMENTS

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32051

Semester : V

Subject Title : DESIGN OF MACHINE ELEMENTS

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Design of Machine Elements	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Design of Joints And Fasteners	17
II	Design of shafts, couplings and keys	17
III	Design of friction drives (flat belt and v-belt)	17
IV	Design of bearings	16
V	Design of levers and spur gears	16
	REVISION AND TEST	7
	Total	90

RATIONALE:

The main objective of Machine Design is to create new and better machine components to improve the existing one. A mechanical engineer should have thorough knowledge of design of machine elements to avoid the failure of machines or components.

OBJECTIVES:

- Design riveted joints, welded joints, sleeve and cotter joint and knuckle joint.
- Design eye bolts, cylinder cover studs.
- Design shafts, keys and couplings required for power transmission.
- Compare the different types of couplings.
- Design flat and V-belt for power transmission.
- Study the various types of bearings and their applications.
- Design journal bearings.
- Design spur gear used for power transmission.
- Design hand lever, foot lever and cranked lever.

DESIGN OF MACHINE ELEMENTS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**ENGINEERING MATERIALS, JOINTS AND FASTENERS**	17
	General Considerations in Machine Design. Engineering materials - Factors affecting selection of material – BIS designation of Ferrous materials – Preferred number - Factor of safety and allowable stress – Stresses: Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion - problem. Creep strain and Creep Curve- Fatigue, S-N curve, Endurance Limit - Stress Concentration – Causes & Remedies. Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory. **Joints**: Design of sleeve and cotter joint, knuckle joint and welded joint. **Fasteners:** Design of bolted joints - eye bolts.	
II	**DESIGN OF SHAFTS, KEYS AND COUPLINGS**	17
	Shafts: Design of shafts subjected to – twisting moment – bending moment – combined twisting and bending moments – fluctuating loads – design of shafts based on rigidity.	

Keys: Types of keys - design of sunk keys only - Effect of keyways on shaft-problems.

Couplings: Requirements of good couplings – types - design of - rigid protected type flange couplings - marine couplings – pin type flexible coupling (Description only).

III DESIGN OF FLAT BELTS AND V-BELTS **17**

Flat Belts: Types of belts - materials for belt -– types of belt drives – Speed ratio – effect of slip - length of flat belts –Tension Ratio $T1/T2=e^{\mu\theta}$- centrifugal tension - power transmitted – condition for maximum power - transmission – Initial Tension - problems - design procedure of flat belts - design of flat belt based on manufacturer's data only – problems.

V-Belts: V-belt drive - comparison with flat belt drive - designation of V-belts – length of belt - power transmitted – Design of V-belt using manufacturer's data only – Problem.

IV DESIGN OF BEARINGS **16**

Bearings: Classifications of bearings – sliding contact and rolling contact bearings - radial and thrust bearings - roller bearing – types - Designation of ball bearings - materials used for bearings - journal bearings - heat generated - heat dissipated - cooling oil requirement – problems - design of journal bearings –Problems.

Design based on approved data books only.

V DESIGN OF LEVERS AND SPUR GEARS **16**

Levers: Types of levers – applications - mechanical advantage – leverage - displacement ratio - design of-hand lever-foot lever-cranked lever - problems.

Spur gears: Gear drives - merits and demerits over belt drive – Classification of gears - gear materials - spur gear terminology - design of spur gears based on Lewis & Buckingham equation - Problems – speed reducer – types –(Approved data books only).

Text Book:

1) Machine Design, Pandya & Shah, Edn. 1995, Charotar Publishing House.
2) Machine Design, T. V. Sundararajamoorthy & N. Shanmugam, Revised Edition June-2003–Anuradha Publications, Kumbakonam.
3) Design Data Book – by PSG College of Technology, DPV Printers, Coimbatore.

Reference Book:

1) A text book of Machine Design, R.S. Khurmi & J.K.Gupta, Edn. 18,Eurosia Publishing House Pvt. Limited, New Delhi-110 055.
2) Machine Design Bandari,
3) Theory and Problems of Machine Design, Holowenko, Laughlin, Schaum's outline Series.

BOARD EXAMINATIONS

QUESTION PATTERN

Note:

1. Five questions will be asked, one question from each unit in either or pattern. All the five questions are to be answered.
2. Each question carries 15 marks. These questions may have sub-divisions also.
3. **P.S.G. DESIGN DATA BOOK IS PERMITTED.** (Required abstract pages of the P.S.G. Design Data Book Certified by the Chief Supdt. may be permitted.)