

COURSE TITLE : **AUTOMOBILE DESIGN**
COURSE CODE : **4019**
COURSE CATEGORY : **A**
PERIODS/WEEK : **5**
PERIODS/SEMESTER : **90**
CREDITS : **4**

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Introduction Basic Link Mechanism Bearings Shafts	24
2	Keys and Couplings Clutch	22
3	Cams Piston Connecting rod	22
4	Gear and Gear Trains Belt Drive and Chain Drive	22
	Total	90

OBJECTIVES

Upon the completion of the study of this subject, the student should be able to

MODULE I

- 1.1.0 Understand the factors governing design of machine elements
 - 1.1.1 List the factors governing design of machine elements
 - 1.1.2 Extend those factors in the design of machine elements
- 1.2.0 Understand the working of basic link mechanism define the terms like link, pair, kinematics pair, chain, inversion, mechanism, machine, constrained motion
 - 1.2.2 Explain the working of coupling rod, Ackerman steering gear, beam engine,
 - 1.2.3 Explain the inversions of single slider crank chain – oscillating cylinder engine mechanism, reciprocating steam engine mechanism.
 - 1.2.4 Explain the inversions of double slider crank chain – scotch yoke, Oldham coupling, ellipse trammel
- 1.3.0 Recognize the appropriate bearing for a given situation
 - 1.3.1 Discuss the advantages and disadvantages of antifriction bearings
- 1.4.0 Design of shafts subjected to twisting and bending moments

- 1.4.1 Design shafts subjected to twisting moment, bending moment, combined twisting and bending moments
- 1.4.2 Design shafts subjected to fluctuating loads
- 1.4.3 Compare the weight and strength of solid shaft with hollow shaft

MODULE II

- 2.1.0 Design keys and coupling
 - 2.1.1 Discuss the various types of keys
 - 2.1.2 Discuss the effect of keyways
 - 2.1.3 Compute the proportions of keys, considering shearing and crushing
 - 2.1.4 Discuss the requirements of shaft coupling
 - 2.1.5 Design muff coupling and flange coupling
- 2.2.0 Understand the design of a single and multiplate clutch
 - 2.2.1 Design single plate and multiplate clutches including the size of pressure springs

MODULE III

- 3.1.0 Recognize cam profile for a given application
 - 3.1.1 Discuss the cam terminology
 - 3.1.2 Draw cam profile when the follower moves with uniform velocity, simple harmonic motion, uniform acceleration and retardation etc
- 3.2.0 Design of I.C. Engine Piston
 - 3.2.1 Design I.C. Engine Piston from the given data
- 3.3.0 Design of I.C. Engine connecting Rod
 - 3.3.1 Design I.C. Engine connecting Rod, considering weight of Reciprocating parts

MODULE IV

- 4.1.0 Appreciate different gear trains
 - 4.1.1 Discuss different types of gears
 - 4.1.2 Discuss the terminology of spur gears
 - 4.1.3 Differentiate the types of gear trains like simple, compound, reverted and epicyclic
 - 4.1.4 Find the number of teeth on gears of automobile gear box using velocity ratio
- 4.2.0 Understand the application of belt drive and chain drive
 - 4.2.1 Discuss the types of belt like flat belt, v-belt and rope.
 - 4.2.2 Specify the materials used for making belt
 - 4.2.3 Derive the equation for length of open belt drive and crossed
 - 4.2.4 Find the belt thickness, face width etc
 - 4.2.5 Discover the condition for maximum power transmission
 - 4.2.6 Discuss the types of Chain drive.

CONTENT OUTLINE

MODULE I

Introduction –

Factors governing the design of machine parts, general procedure in design..

Basic link mechanism

Definitions – link, pair, kinematic pair, lower pair and higher pair-kinematic chain, constraint motions, mechanism, machine, inversion of a machine, inversions of four bar chain, single slider crank chain and double slider crank chain

Bearing: -

Function and types – journal, footstep, collar, thrust.

Shafts: -

Design of shafts subjected to twisting, bending, and combined twisting and bending, and shaft subjected to fluctuating loads.

MODULE II

Keys and Couplings:-

Effect of keyways on shaft. Function of keys – types of keys – sunk, saddle tangent, round and splines. Empirical proportions of square and rectangular keys – design of key against shearing and crushing - Couplings: - Functions – requirements – classifications – design of sleeve coupling, protected and unprotected flange couplings.

Clutch: -

Design of single and multiplate clutch – design of pressure springs.

MODULE III

Cams :-

Terminology – cam profile – uniform velocity, simple harmonic motion, uniform acceleration and retardation types of followers

IC Engine piston:-

Design of piston from the data like brake power, revolutions/second, and explosion pressure.

IC Engine connecting rod:-

Design of connecting rod using Rankins and Eulers equations.

MODULE IV

Gear and gear trains: -

Types of gear – terminology of gears– Gear trains -Simple, Compound, Reverted and Epicyclic, Calculation of number teeth of gear and gear ratios of automobile gearbox .

Belt drive and chain drive: -

Types of belt and materials - flat belt drives and v-belt .

Equation for length of open and crossed belt drive, belt thickness, face width, the condition for maximum power transmission

Types of chain – roller type and silent type.

TEXT BOOKS

1. Machine design - R.S. Khurmi
2. Theory of machines - R.S. Khurmi

REFERENCES

1. Automobile Engineering Vol. 2 -Anil Chhikara
2. Auto design -R.B.Guptha
3. Auto engine design -J G Giles
4. Machine Design -Thomas Beven