

COURSE TITLE : AUTOMOBILE DESIGN
COURSE CODE : 5051
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/SEMESTER : 65
CREDITS : 5

TIME SCHEDULE

Module	Topic	Periods
1	Basic link mechanism Shaft and bearings.	15
2	Keys and couplings, belt and chain drive	15
3	Clutch and connecting rod	15
4	Cam and gear drive	20
TOTAL		65

GENERAL COURSE OUTCOME

Sl.No.	Sub	Student will be able to
1	1	Understand the factors governing design of machine elements.
	2	Understand the working of Basic link mechanism.
	3	Suggest appropriate bearing for a given situation.
	4	Design shafts subjected is various loads and bending moment.
2	1	Identify different types of keys and couplings.
	2	Calculate proportion of keys and couplings.
	3	Solve the problems on belt drives.
3	1	Understand various loads on Piston and connecting nod.
	2	Design the proportions of piston and connecting nod from given data
	3	Suggest the size of pressure springs in a clutch.
4	1	Understand the cam profile for a given application.
	2	Calculate the numbers of teeth on gear wheels of an Automobile gear box.

SPECIFIC COURSE OUTCOME

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 mechanisms

- 1.2.1 Explain the inversions of four bar chain
- 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, elliptical trammel.
- 1.3.0 Understand the appropriate bearing for a given situation**
 - 1.3.1 List the advantages and disadvantages of antifriction bearings
- 1.4.0 Understand the design of shafts**
 - 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 Analyze different types of keys and couplings**
 - 2.1.1 List the various types of keys
 - 2.1.2 Discuss the effect of keyways
- 2.2.0 Design of keys and couplings**
 - 2.2.1 Compute the proportions of keys, considering shearing and crushing
 - 2.2.2 Discuss the requirements of shaft coupling
 - 2.2.3 Design muff coupling .
- 2.3.0 Understand the application of belt drive and chain drive**
 - 2.3.1 List the types of belt like flat belt, v-belt and rope.
 - 2.3.2 Specify the materials used for making belt
 - 2.3.3 Distinguish between Belt slip and creep.
 - 2.3.4 Derive the length of open and closed belt, Centrifugal tension, Initial tension.
 - 2.3.5 Derive the ratio of belt tensions and condition of maximum power Transmission.
 - 2.3.6 Solve the problems on Belt and Chain drives
 - 2.3.7 List the types of Chain drive

MODULE III

- 3.1.0 Design single plate and multiplate clutches**
 - 3.1.1 Design single plate and multiplate clutches including the size of pressure springs
- 3.2.0 Understand the various loads acting on piston and connecting rod**
 - 3.2.1 Analyse the various loads acting on piston and connecting rod
- 3.3.0 Design I.C. Engine Piston**
 - 3.3.1 Design I.C. Engine Piston from the given data
- 3.4.0 Design I.C. Engine connecting Rod**
 - 3.4.1 Design I.C. Engine connecting Rod, considering weight of Reciprocating parts

MODULE IV

4.1.0 Understand the cam profile for a given application

- 4.1.1 Describe the cam terminology
- 4.1.2 Draw cam profile when the follower moves with uniform velocity, simple harmonic motion, uniform acceleration and retardation etc.

4.2.0 Understand the different gear trains

- 4.2.1 List the different types of gears
- 4.2.2 Describe the terminology of spur gears
- 4.2.3 Differentiate the types of gear trains like simple, compound, reverted type
- 4.2.4 Compute velocity ratio and gear train value.

4.3.0 Understand the working of gear box of an automobile

- 4.3.1 Compute the number of teeth on gears of automobile gear box using velocity ratio.

CONTENT DETAILS

MODULE I

Introduction – Types of design, 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 muff coupling.

Belt drive and chain drive: - Types of belt and materials - flat belt drives and v-belt. Velocity ratio, slip and creep of belt drive, Equation for length of open and crossed belt drive, belt thickness, face width, the condition for maximum power transmission. Centrifugal tension and initial tension. Types of chain – roller type and silent type. Comparison of belt and chain drive

MODULE III

Clutch: - Design of single and multiplate clutch – design of pressure springs.

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

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

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 .

TEXT BOOKS

1. R.S. Khurmi - Machine design – Eurasia publication house
2. R.S. Khurmi - Theory of machines - Eurasia publication house

REFERENCES

1. Anil Chhikara - Automobile Engineering Vol. 2 - Satyaprakasan
2. R.B.Gupta - Auto design – Satyaprakasan
3. J G Giles - Auto engine design -Illiffe
4. Thomas Beven - Machine Design –Pearson India