

1152AU135

DESIGN AND OPTIMIZATION OF GEARS

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1. Preamble

This course provides knowledge of designing an automotive gear drive with spur, helical, bevel and worm gears. Also it offers the importance of optimization in engineering design process.

2. Prerequisite

1151AU105 Mechanics of Machines

3. Links to other Courses

- Vehicle Design and Data Characteristics

4. Course Educational Objectives:

Students undergoing this course are expected to:

- Acquire knowledge about the Design process in engineering.
- Understand the importance of engineering optimization
- Acquire skills in designing a gear drive for the given specifications.
- Acquire knowledge about the Gear measurement methods.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Explain the fundamental concepts of engineering design process, product life cycle and fundamental concepts of optimization process.	K2
CO2	Demonstrate the terminology and design procedure for a spur and helical gear drive	K3
CO3	Demonstrate the terminology and design procedure for a Bevel gear drive	K3
CO4	Demonstrate the terminology and design procedure for a worm and worm wheel gear drive	K3
CO5	Discuss the measurement methods used for gear parameters.	K2

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	M	M	M	M	L	L				L	L	M	M
CO2	H	H	H	H	H	L	L				L	L	H	H
CO3	H	H	H	H	H	L	L				L	L	H	H
CO4	H	H	H	H	H	L	L				L	L	H	H
CO5	M	M	M	M	M	L	L				L	L	M	M

H- High; M-Medium; L-Low

7. Course Content

UNIT – I: INTRODUCTION TO DESIGN PROCESS

L- 9

Need and Importance of Design - The Design Process - Morphology of Design - Product Life Cycle - Introduction to optimization - Importance and benefits – Basics of Single variable and multivariable optimization – Definition of Design Objectives, Constraints, Objective function.

UNIT – II: DESIGN OF SPUR AND HELICAL GEAR DRIVE

L- 9

Gear Terminology - Speed ratios – selection of materials based on mechanical properties - Design of spur gear and helical gear - Simple design problem on spur gear and helical gear drive- Based on Lewis equation method – Based on Hertz Method

UNIT – III: DESIGN OF BEVEL DRIVE

L- 9

Bevel gear: Types, Straight bevel gear - Tooth terminology - Estimating the dimensions of pair of straight bevel gears – Simple design problem on bevel gear drive – Based on Lewis equation method – Based on Hertz Method.

UNIT – IV: DESIGN OF WORM GEAR DRIVE

L- 9

Worm Gear: Merits and demerits – Terminology - Heat transfer and Heat dissipated on transmission - Design of the worm and gear - Simple design problem on worm gear drive – Based on Lewis equation method – Based on Hertz Method.

UNIT – V: GEAR MEASUREMENTS

L- 9

Gear Measurements – Gear Tooth measurement of gears-tooth thickness-constant chord and base tangent method - Parkinson gear tester - pitch measurement- point to point method – Run out testing – profile checking by optical projection - Gear Errors – factors to be improved.

Total : 45 Hrs

8. TEXT BOOKS:

1. Bhandari V.B., “Design of Machine Elements”, Tata McGraw-Hill Publishing Company Ltd., 4th Ed, 2017
2. Jain R.K., “Engineering Metrology”, Khanna Publishers, 2009.

9. REFERENCES:

1. Rao, Singaresu, S., “Engineering Optimization – Theory & Practice”, New Age International (P) Limited, New Delhi, 2000.
2. Shigley J.E. and Mischke C.R., “Mechanical Engineering Design”, McGraw-Hill International Editions, 1989.
3. “Design Data Book”, PSG College of Technology, Coimbatore, 2000.