

17MD014 GEAR ENGINEERING

COURSE CODE	COURSE TITLE	L	P	T	C
17MD014	GEAR ENGINEERING				

Course Description and Objectives: Gears are prime machine element members in many of the power transmission devices. Proper design and selection of efficient gearing system improves the overall efficiency of the system. Force analysis on gears and various dimensions of gears based on static, dynamic and wear considerations covered in this course. Gear failure and optimum gear design is also focused.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Analyze forces acting on gear
- Design various types of gears under static and dynamic loading
- Identify the gear failures
- Design gear box and selection of gear trains
- Apply optimization principles to design gear against strength, space, size, weight etc.

- SKILLS ACQUIRED:**
1. Force analysis on gears
 2. Power transmitted by gears evaluation
 3. Gear dimension and other parameters estimation
 4. Gear failure analysis and able to suggest remedies
 5. Gear box design
 6. Gear design optimization

UNIT-I

Introduction : Principles of gear tooth action, Generation of Cycloid and Involute gears, fundamental law of gearing, contact ratio, gear manufacturing processes ,gear tooth failure modes, stresses.

Spur Gears : Tooth loads, Principles of Geometry, Design considerations and methodology, Complete design of spur gear teeth considering Lewis beam strength, Buckingham's dynamic load and wear load,.

UNIT-II

Helical Gears : Helical gear geometry, helical gear forces, virtual number of teeth, contact ratio, Design considerations ,Completedesignofhelicalgearsteethconsidering Lewis beam strength,Buckingham's dynamicload andwearload,.

Bevel Gears : Tooth loads, Principles of Geometry, Design considerations and methodology, Complete designofbevelgearsteethconsidering Lewis beam strength,Buckingham's dynamicload andwearload,.

UNIT-III

Worm Gears : Nomenclature of worm and worm wheel, materials for worm gears, forces on worm wheels, , Design considerations and methodology, Complete designofwormgearsteethconsidering Lewis beam strength,Buckingham's dynamicload andwearload,Heatdissipationconsiderations.

Gear Failures: Analysisofgear toothfailures,Nomenclature ofgear toothwearandfailure,tooth breakage,pitting,scoring,wear,overloading,gear-causingproblems,lubricationfailures.

UNIT-IV

Gear Trains: Simple,compound andepicyclicgeartrains,Raydiagrams,Designofagearboxof anautomobile,Designofgeartrainsfromthepropellershaftsofairplanesforauxiliarysystems.

UNIT-V

Optimal Gear design:

Optimizationofgear designparameters,Weightminimization,Constraintsin geartraindesign-space, interference,strength,dynamicconsiderations, rigidityetc. Compactdesign ofgeartrains,multiobjectiveoptimizationofgeartrains.

ACTIVITIES:1. Spur gear design for the given power requirement based on space constraints.

2. Helical gear design based on static and wear considerations.

3. Bevel gear design for differential In automobile applications.

4. Ray diagram preparation and gear box design for machine tool applications.

5. Gear design optimization with space , weight and cost constraints.

TEXTBOOKS:

1. Norton, "Machine Design- An Integrated Approach", 2nd Edition, Pearson Publications, 2003

2

Henry E. Merrit, "Gear Engineering", 2nd Edition, Wheeler Publishing, Allahabad, 2000

REFERENCE BOOKS:

1.

Shigley, "Mechanical Engineering Design", 10th Edition, McGraw Hill Publishers, 2015.

2..

G.M. Maitha, "Hand Book of Gear Design", 2nd Edition, Tata Mc. Graw Hill Publishing company Ltd., New Delhi, 1995.