Course Type	Course Code	Name of Course	L	T	P	Credit
DE	OMED624	Design of Mechanical Transmission Systems	3	0	0	3

Prerequisites
Bachelor/Master/PhD students having background in Mechanical Engineering/Production Engineering/Manufacturing Technology/Engineering Design. Knowledge of Strength of Materials and Design of Machine Elements.
Course Objective
1. Develop expertise in designing mechanical components for power transmission systems. 2. Master gear design, shaft selection, and bearing applications for transmission efficiency. 3. Analyze mechanical transmission systems used in automotive, gearbox, and brake manufacturing. 4. Apply design principles to optimize power transmission, torque capacity, and system reliability. 5. Understand failure modes, stress analysis, and fatigue considerations in transmission components. 6. Enhance domain proficiency for careers in automotive, gear manufacturing, and brake sectors. 7. Integrate transmission design with overall mechanical system performance requirements. 8. Utilize design standards and manufacturing constraints for practical transmission solutions. .
1. Students will design mechanical components for efficient power transmission systems. 2. Students will select and analyze gears, shafts, and bearings for transmission applications. 3. Students will optimize gear box configurations for automotive and industrial requirements. 4. Students will evaluate brake system designs for torque transmission and safety. 5. Students will perform stress analysis and fatigue assessment of transmission elements. 6. Students will integrate transmission systems with overall mechanical powertrains. 7. Students will apply industry standards to transmission component manufacturing. 8. Students will troubleshoot and improve existing transmission system performance.

Unit No.	Topics to be covered	No. of Lecture Videos	Video Time (Minutes)	Learning out come
1.	Course Introduction, Evaluation, and application of Gearbox, a. Machine tool gearbox, GP, Step Ratio, Preferred Numbers, Structural Formula & Rules of optimum Gearbox, Ray diagram construction. b. Machine tool gear box – Ray diagram construction.	4	112	Student understand the pre-requisite knowledge about gear types, nomenclature, forces, stress calculations, shaft design, bearing selection & lubrication selection.
2.	Machine tool Gear Box: Kinematic Diagram construction; Machine tool gear box: Centre Distance and Teeth Calculation; Machine Tool gear Box: Problem solving	3	111	Learn about the machine tool gear box with kinematic diagram construction, Centre distance and teeth calculations.

3.	Automobile Gearbox - General engine operation and transmission types, Saw tooth diagram and design procedure for gear box; Automobile Gearbox – Problem solving, Tyre specification;	3	112	Understanding about automobile gear box, Saw tooth diagram and gear box design methodology.
4.	Basic transmission types and kinematic diagram, Gear failures and material selection module calculation concept – part I.	3	123	Learn about the transmission types with kinematic diagram; Understanding of gear failures, material selections, module calculation etc.,
5	Module calculation concept – part II shaft design, lubrication selection and method; Bearing selection and gearbox losses.	3	119	Learn about module calculations, shaft design, lubrication selection as per design specification, bearing selection etc.,
6	Brake - Introduction, working principle and types; Torque requirement for drum brake systems; Problem solving.	3	120	Understanding about brake systems, working principles and types; Learn about torque requirement for drum brake systems with problem solving.
7	Torque requirement for disc brake systems; Static and dynamic analysis; dynamic analysis – brake force distribution and optimum.	3	130	Learn about torque requirement for disc brake systems, static & dynamic analysis; Understanding about brake force distribution and arrive optimum solution.
8	Brake : Problem solving Braking efficiency & distance and brake factor; Brake: Problem solving and friction materials.	3	117	Understanding about brake with solving problems; Selection of friction elements; Brake efficiency and stopping distance and brake factor calculations.
9	Brake : Thermal analysis and braking conditions; Brake: Energy and power, braking power absorbed by lining and drum/disc.	2	82	Understanding about brake thermal analysis and brake conditions including problem solving;
10.	Brake: Single stop braking and repeated braking – temperature analysis. Brake: Thermal Analysis problem solving.	2	81	Learn about single stop braking and repeated braking with temperature analysis including problem solving.
11.	Clutch: Types and working method; Clutch: Torque transmitting capacity – uniform pressure & wear theories. Clutch - Multiple discs and cone clutches, problem solving.	3	121	Understanding about clutch types and working method; Learn about clutch torque transmitting capacity using uniform pressure and wear theories.

12.	Clutch: Centrifugal clutch Clutch: Dynamic Analysis; Clutch - Dynamic analysis problem solving; Belt Drives - Introduction and types, Geometrical relationship for open and crossed belt drives - V and micro-v belts, Selection of V and micro-v belts, V and micro-v pulley design.	3	125	Learn about centrifugal clutch, Clutch Dynamic analysis; Understanding about belt drives.
Total		33	1353	

Text Books:

1. P.H. Joshi, Machine Tools Handbook – Design and Operation, Tata McGraw Hill, New Delhi, 2007.
2. N.K. Mehta, Machine Tool Design and Numerical Control, McGraw Hill, New Delhi, 2010.
3. G. Lechner and H. Naunheimer, Automotive Transmissions: Fundamentals, Selection, Design and Application, Springer, Berlin, 1999.

Reference Books:

1. Peter Lynwander, Gear Drive Systems: Design and Application, Marcel Dekker Inc., New York, 1983.
2. Stephen P. Radzevich, Dudley's Handbook of Practical Gear Design and Manufacture, CRC Press, New York, 2012.
3. Damir Jelaska, Gears and Gear Drives, Wiley Publication, Chichester, UK, 2012.
4. Gitan Maitra, Handbook of Gear Design, Tata McGraw Hill, New Delhi, 2001.
5. U.C. Jindal, Machine Design, Pearson, New Delhi, 2010.
6. R. Limpert, Brake Design and Safety, SAE International, 1992.
7. T.P. Newcombe and R.I. Spur, The Braking of Road Vehicles, Chapman and Hall Ltd., London, 1969.