

**Department of mechanical engineering**

**DETAILS OF CONTENT TO BE DELIVERED BEYOND THE SYLLABUS**

**Sub Name :ME8651 Design Of Transmission System**

**Year/Semester : III / VI**

**Acadamic year : 2022-2023 Even semester**

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| **S. No** | **Topics** | **Lecture hours** | **Books / Chapter** | **Teaching aids** | **Instructional Delivery Level** | **PO / PSO** |
|
| 1 | Design of Geneva mechanism | 3 | RB3/ch16/ Pg-16.1-16.10 | BB/PPT | ANALYSIS | PO3/  PSO5 |

**CONTENTS**

1. **AIM**
2. **DESIGN PROCEDURE**
3. **APPLICATIONS OF GENIVA MECHANISM**
4. **DESIGN OF GENIVA MECHANISAM USING SOLIDWORKS**
5. **RESULTS/OUTCOMES.**

# ME8651 DESIGN OF TRANSMISSION SYSTEMLTPC

**COURSEOBJECTIVES:**

1. To gain knowledge on the principles and procedure for the design of Mechanical Power Transmission components.
2. To understand the standard procedure available for Design of Transmission of Mechanical elements
3. To learn to use standard data and catalogues

# UNITI DESIGN OF FLEXIBLE ELEMENTS 9+ 3

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

# UNITII SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 9 +3

Speed ratios and number of Teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.

# UNITIII BEVEL, WORM AND CROSS HELICAL GEARS 9+3

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix Angles-Estimating the size of the pair of cross helical gears.

# UNITIV GEAR BOXES 9+ 3

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

# UNITV CAMS, CLUTCHES AND BRAKES 9+ 3

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches- Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

**TOTAL:60PERIODS**

**COURSEOUTCOMES:**Attheendofthecourse, students would:

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| **CO-1** | apply the concepts of design to belts, chains and rope drives |
| **CO-2** | apply the concepts of design to spur, helical gears |
| **CO-3** | apply the concepts of design to worm and bevel gears. |
| **CO-4** | apply the concepts of design to gear boxes |
| **CO-5** | apply the concepts of design to cams, brakes and clutches |

**TEXTBOOK**

**TEXT BOOK-1:**

Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.

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**TEXT BOOK-2:**

Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical

Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008.

# REFERENCES:

**RB.1.Robert L. MOTT, EDWARD M.VaVrek and JYHWEN Wang, “MACHINE ELEMENTS IN MECHANICAL DESIGN” 6th Edition.**

RB.2.Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.

**RB.3.Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000.**

RB.4.Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine Design”, 4th Edition, Wiley, 2005

RB.5.Sundararajamoorthy T. V, Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003.

**UNIT I: DESIGN OF FLEXIBLE ELEMENTS**

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| **Sl. No.** | **TOPICS** | **Lecture Hours** | **Book /**  **Chapter/**  **Pages** | **Teaching Aids/ Method** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 1.1 Design of Flat belts and pulleys | 1,2 | RB1/ch7/Pg-251 | BB | CREATE | CO1 | PO1/  PSO1 |
|  | 1.2 Selection of V belts and pulleys | 3,4 | RB1/ch7/ Pg-252 | BB | ANALYZE | CO1 | PO1/  PSO1 |
|  | 1.3 Selection of hoisting wire ropes and pulleys | 5,6,7 | RB1/ch7/ Pg-292 | BB/ **ABL** | ANALYZE | CO1 | PO1/  PSO1 |
|  | 1.4 Design of Transmission chains | 8,9,10 | RB1/ch7/ Pg-278 | BB | CREATE | CO1 | PO1/  PSO1 |
|  | 1.5 Design of Transmission Sprockets | 11,12 | RB1/ch7/ Pg-278-300 | BB | CREATE | CO1 | PO1/  PSO1 |
| **ABL-ACTIVITY BADED**  **LEARNING** | | 1. Several **Hoisting ropes and belts**samples were taken and placed before the students 2. The students were told the required jobs and asked to **choose** the ropes and belt for it | | | | | |

**UNIT II:SPUR GEARS AND PARALLEL AXIS HELICAL GEARS**

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| **Sl. No.** | **TOPICS** | **Lecture hours** | **Books/ Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 2.1 Speed ratios and number of teeth-Force analysis | 13,14 | RB1/ch9/ Pg-364-365 | BB | ANALYZE | CO2 | PO1/ PSO1 |
|  | 2.2 Tooth stresses - Dynamic effects | 15 | RB1/ch9/ Pg-364 | BB | ANALYZE | CO2 | PO1/ PSO2 |
|  | 2.3 Fatigue strength - Factor of safety | 16,17 | RB1/ch9/ Pg-365 | BB | ANALYZE | CO2 | PO1/ PSO1 |
|  | 2.4 Gear materials | 18 | RB1/ch9/ Pg-389 | BB/**ABL** | ANALYZE | CO2 | PO1/ PSO2 |
|  | 2.5Design of straight tooth spur | 19,20 | RB1/ch9/ Pg-400 | BB | CREATE | CO2 | PO1/ PSO2 |
|  | 2.6helical gears based on strength and wear considerations | 21,22 | RB1/ch10/ Pg-434 | BB | CREATE | CO2 | PO1/ PSO2 |
|  | 2.7Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears | 23,24 | RB1/ch10/ Pg-430-467 | BB | CREATE | CO2 | PO1/ PSO2 |
| **ABL-ACTIVITY BADED**  **LEARNING** | | 1. Many gear models but different types of gear were placed before the students 2. **Spur and Helical** gears were asked to choose 3. From there the design is explained to see the **GEAR TEETH** | | | | | |

**UNIT III: BEVEL, WORM AND CROSS HELICAL GEARS**

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| **Sl. No.** | **TOPICS** | **Lecture Hours** | **Books / Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/ PSO** |
|  | 3.1 Straight bevel gear: Tooth terminology, tooth forces and stresses | 25,26 | RB1/ch10-6/ Pg-439 | BB | ANALYZE | CO3 | PO3/ PSO1 |
|  | 3.2 equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears | 27,28 | RB1/ch10-7/ Pg-441 | BB | CREATE | CO3 | PO3/ PSO2 |
|  | 3.3 Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses | 29,30 | RB1/ch10-10/ Pg-456 | BB | CREATE | CO3 | PO3/ PSO2 |
|  | 3.4 worm gear: efficiency, estimating the size of the worm gear pair | 31,32 | RB1/ch10-10/ Pg-456 | BB | CREATE | CO3 | PO3/ PSO2 |
|  | 3.5 Cross helical: Terminology-helix angles | 33,34 | RB1/ch8-7/ Pg-323 | BB | CREATE | CO3 | PO3/ PSO2 |
|  | 3.6 Cross helical: Estimating the size of the pair of cross helical gears | 35,36 | RB1/ch8-7/ Pg-323 | BB/**ABL** | CREATE | CO3 | PO3/ PSO1 |
| **ABL-ACTIVITY BADED**  **LEARNING** | | 1. Many gear models but different types of gear were placed before the students 2. BEVEL, WORM and CROSS HELICAL gears were asked to choose 3. From there the design is explained to see the GEAR TEETH | | | | | |

**UNIT IV: GEAR BOXES**

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| **Sl.**  **No.** | **TOPICS** | **Lecture Hour** | **Books referred/ Chapter** | **Teaching Method/ Aids** | **Instructional Delivery Level** | **CO** | **PO/**  **PSO** |
|  | 4.1 Geometric progression - Standard step ratio | 37 | RB3/RB3/ Pg-6.1-6.5 | BB | ANALYZE | CO4 | PO3/  PSO1 |
|  | 4.2 Ray diagram, kinematics layout | 38,39 | RB3/RB3/ Pg-6.1-6.5 | BB | ANALYZE | CO4 | PO3/  PSO2 |
|  | 4.3 Design of sliding mesh gear box | 40,41 | RB3/RB3/ Pg-6.5-6.7 | BB | CREATE | CO4 | PO3/  PSO2 |
|  | 4.4 Design of multi speed gear box for machine tool applications | 42,43 | RB3/RB3/ Pg-6.7-6.10 | BB | CREATE | CO4 | PO3/ PSO2 |
|  | 4.5 Constant mesh gear box | 44,45 | RB3/RB3/ Pg-6.12-6.18 | BB | CREATE | CO4 | PO3/ PSO2 |
|  | 4.6 Speed reducer unit | 46 | RB3/RB3/ Pg-6.18-6.20 | BB | CREATE | CO4 | PO3/  PSO2 |
|  | 4.7 Variable speed gear box, Fluid Couplings- Torque Converters for automotive applications | 47,48 | RB3/RB3/ Pg-6.20-6.25 | BB | CREATE | CO4 | PO3/ PSO2 |

**UNIT V: CAMS, CLUTCHES AND BRAKES**

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| **Sl. No.** | **TOPICS** | **Lecture Hour** | **Books / Chapter** | **Teaching Aids/ Methods** | **Instructional Delivery Level** | **CO** | **PO/**  **PSO** |
|  | 5.1 Cam Design: Types-pressure angle and under cutting base circle determination | 49 | RB3/ch15/ Pg-15.1-15.10 | BB | CREATE | CO5 | PO3/ PSO1 |
|  | 5.2 Cam Design: forces and surface stresses | 50,51 | RB3/ch15/ Pg-15.11-15.22 | BB | CREATE | CO5 | PO3/ PSO2 |
|  | 5.3 Design of plate clutches –axial clutches | 52,53 | RB3/ch12/ Pg-12.1-12.5 | BB | CREATE | CO5 | PO3/ PSO2 |
|  | 5.4 cone clutches | 54 | RB3/ch12/ Pg-12.1-12.10 | BB | CREATE | CO5 | PO3/ PSO2 |
|  | 5.5 internal expanding rim clutches | 55 | RB3/ch12/ Pg-12.1-12.10 | BB | CREATE | CO5 | PO3/ PSO2 |
|  | 5.6 Electromagnetic clutches | 56,57 | RB3/ch12/ Pg-12.1-12.10 | BB | CREATE | CO5 | PO3/ PSO2 |
|  | 5.7 Band and Block brakes  external shoe brakes | 58,59 | RB3/ch13/ Pg-13.1-13.20 | BB/**FCL** | CREATE | CO5 | PO3/ PSO2 |
|  | 5.8 Internal expanding shoe brake | 60 | RB3/ch13/ Pg-13.21-13.30 | BB | CREATE | CO5 | PO3/ PSO2 |
| **FCL-FLIPPED CLASS LEARNING** | | 1. That topic should be posted on the first day of class   (**Band and Block brakeexternal shoe brakes**)  2. It should be explained to the students in class | | | | | |

**Activities if any: (problem based)**

**Different Types of problem given a discuss about the problems.**

**Step 1:** Discuss about different types of problems in all units.

**Step 2:** From the whole unit the different types of questions based upon exam point are given to

all the students.

**Step 3:** The students have to prepare the questions and done the problems.

**Step 4:** The teacher will correct their assignments and discuss about their mistakes.

**Content beyond syllabus**

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| **S. No** | **Topics** | **Lecture hours** | **Books / Chapter** | **Teaching aids** | **Instructional Delivery Level** | **PO / PSO** |
|
| 1 | Design of Geneva mechanism | 60 | RB3/ch16/ Pg-16.1-16.10 | BB | CREATE | PO3/  PSO5 |  |  |

**Signature of the Staff Signature of the HOD**