

**DEPARTMENT OF PRODUCTION TECHNOLOGY  
MADRAS INSTITUTE OF TECHNOLOGY CAMPUS  
ANNA UNIVERSITY :: CHENNAI – 600 044.**

**COURSE PLAN**

**COURSE DETAILS:**

<b>Degree</b>	B.E.		
<b>Programme Name</b>	Mechanical Engineering		
<b>Course Code &amp; Title</b>	<b>ME5601 Design of Transmission System</b>		
<b>Credits</b>	3	<b>Session</b>	Jan – May 2024
<b>Course Type</b>	Theory/ Theory-with Lab/ Lab	<b>Section</b>	6/8 Mechanical Engineering
<b>Name of the Faculty</b>	<b>Dr. S.Vijayakumar</b> Associate Professor Department of Production Technology, MIT Campus, Anna University, Chennai – 600044. vijayakumar@mitindia.edu.		

**COURSE CONTENT:**

**Syllabus:** (Approved Syllabus as per Regulation 2019)

**ME5601 DESIGN OF TRANSMISSION SYSTEMS**

**L T P C  
3 0 0 3**

**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students for:

1. Designing flexible elements like belt, ropes and chain drives for engineering applications.
2. Designing spur and helical gear drives for power transmission.
3. Designing bevel and worm drives for power transmission.
4. Designing multi speed gear box for machine tool and automotive applications.
5. Designing clutch and brake systems for engineering applications.

**UNIT I DESIGN OF FLEXIBLE ELEMENTS**

**9**

Motor power capacity for various applications - Design of Flat belts and pulleys - Selection of V belts and sheaves – Selection of wire ropes and pulleys – Design of Transmission Chains and Sprocket.

**UNIT II SPUR AND HELICAL GEARS**

**9**

Gear materials - Design of straight tooth spur & helical gears based on speed ratios, number of teeth, Fatigue strength, Factor of safety, strength and wear considerations. Force analysis – Tooth stresses - Dynamic effects - Helical gears – Module - normal and transverse, Equivalent number of teeth – forces.

**UNIT III BEVEL AND WORM GEARS**

**9**

Straight bevel gear: Gear materials - Tooth terminology, tooth forces and stresses, equivalent number of teeth, estimation of dimensions of straight bevel gears. Worm Gear: Gear materials - Tooth terminology, Thermal capacity, forces and stresses, efficiency, estimation of dimensions of worm gear pair.

**UNIT IV GEAR BOXES**

**9**

Need - Design of sliding and constant mesh gear boxes: Speed selection - Geometric progression - Standard step ratio - Ray diagram, kinematic layout – Determination of number of teeth. Design of multi speed gear box for machine tool applications, Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications - Continuous variable transmission system.



**UNIT V CLUTCHES AND BRAKES**

9

Design of single and multi-plate clutches, cone clutches, internal expanding rim clutches and Electromagnetic clutches. Design of brakes: External shoe brakes - Single and Double Shoe, Internal expanding shoe brakes and Band brakes.

**TOTAL:45 PERIODS**

**Note: (Use of standard Design Data Book is permitted in the University examination)**

**COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

1. Design flexible elements like belt, ropes and chain drives for engineering applications.
2. Design spur and helical gear drives for power transmission.
3. Design bevel and worm drives for power transmission.
4. Design multi speed gear box for machine tool and automotive applications.
5. Design clutch and brake systems for engineering applications.

**TEXT BOOKS:**

1. Shigley. J., Mischke. C., Budynas, R., and Nisbett. K., "Mechanical Engineering Design", 10<sup>th</sup> Edition, Tata McGraw-Hill, 2014.
2. Sundararamamoorthy. T. V. and Shanmugam. N., "Machine Design", 9th Edition, Anuradha Publications, Chennai, 2003.
3. Sen and Bhattacharya, "Principles of Machine Tools", New Central Book Agencies, 1975.

**REFERENCES:**

1. Bernard Hamrock, Steven Schmid, Bo Jacobson, "Fundamentals of Machine Elements", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2006
2. Bhandari V, "Design of Machine Elements", 15th Reprint, Tata McGraw-Hill Book Co, 2014.
3. C.S.Sharma, Kamlesh Purohit, "Design of Machine Elements", Prentice Hall of India, Pvt. Ltd., 2003.
4. Design Data Hand Book, PSG College of Technology, 2013- Coimbatore.
5. Gitin Maitra, L. Prasad "Handbook of Mechanical Design", 2nd Edition, Tata McGraw Hill, 2001.
6. Md. Jalaludeen, Machine Design, Volume II, Design of Transmission Systems, 4th edition, Anuradha Publications, 2014.
7. Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2003.
8. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine component Design", 5<sup>th</sup> Edition, Wiley, 2011.

**TOTAL: 60 PERIODS****COURSE ARTICULATION MATRIX**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	3	2	1			1				2	3		2
2	2	2	3	2	1			1				2	3		2
3	2	2	3	2	1			1				2	3		2
4	2	2	3	2	1			1				2	3		2
5	2	2	3	2	1			1				2	3		2

The correlation levels: 1: Low; 2: Medium; 3: High.



## COURSE ALIGNED PROGRAMME OUTCOMES (PO) & PROGRAMME SPECIFIC OUTCOMES (PSO)

PO	Programme Outcome	
PO1	Engineering knowledge	Apply knowledge of mathematics, basic science and engineering science.
PO2	Problem analysis	Identify, formulate and solve engineering problems.
PO3	Design/development of solutions	Design a system or process to improve its performance, satisfying its constraints.
PO4	Conduct investigations of complex problems	Conduct experiments & collect, analyze and interpret the data.
PO5	Modern tool usage	Apply various tools and techniques to improve the efficiency of the system.
PO6	The Engineer and society	Conduct themselves to uphold the professional and social obligations.
PO7	Environment and sustainability	Design the system with environment consciousness and sustainable development.
PO8	Ethics	Interacting industry, business and society in a professional and ethical manner.
PO9	Individual and team work	Function in a multidisciplinary team.
PO10	Communication	Proficiency in oral and written Communication.
PO11	Project management and finance	Implement cost effective and improved system.
PO12	Life-long learning	Continue professional development and learning as a life-long activity.

PSO	Graduates demonstrate
PSO1	Understand, apply, analyze, design and develop engineering systems adopting thermal, design and manufacturing concepts.
PSO2	Utilize computational and design tools for efficient product development
PSO3	Apply the acquired knowledge for innovative solutions to cater societal needs and industrial problems.

## COURSE PLAN

Sl. No	Date	Hrs	Unit	Topics	Mode of Delivery	Text / Ref.
<b>UNIT-I DESIGN OF FLEXIBLE ELEMENTS</b>						
1	24.01.2024	7,8	1	Introduction to DTS, Motor power capacity and various applications.	PPT	R1
2	31.01.2024	7,8	1	Design of Flat belts and pulleys	Chalk & Talk	R1
3	02.02.2024	6,7	1	Design and selection of V belts and sheaves	Chalk & Talk	T2/ R1
4	07.02.2024	7,8	1	Design and selection of wire ropes and pulleys	Chalk & Talk	T2/ R1
5	09.02.2024	6,7	1	Design of Transmission Chains and Sprocket.	Chalk & Talk	T2/ R1
<b>UNIT-II SPUR AND HELICAL GEARS</b>						
6	14.02.2024	7,8	2	Design of gear drives, applications, nomenclature.	PPT	T2/ R1
7	16.02.2024	6,7	2	Design of spur gear based on wear and strength.	Chalk & Talk	T2/ R7
8	21.02.2024	7,8	2	Design of helical gear based on wear and strength	Chalk & Talk	T2/ R7
9	23.02.2024	6,7	2	Problems solving	Chalk & Talk	T2/ R7



UNIT-III BEVEL AND WORM GEARS						
10	28.02.2024	7,8	3	Introduction to bevel and worm gears and applications, efficiency, materials, nomenclature.	PPT	T2/ R7
11	01.03.2024	6,7	3	Design of bevel gears	Chalk & Talk	T2/ R7
12	06.03.2024	7,8	3	Design of worm and worm wheel drive	Chalk & Talk	T2/ R7
13	08.03.2024	6,7	3	Gear tooth terminology, force analysis, thermal capacity	Chalk & Talk	T2/ R7
UNIT-IV GEAR BOXES						
14	13.03.2024	7,8	4	Introduction to gear boxes, Fluid Couplings-Torque Converters for automotive applications - Continuous variable transmission system.	Flipped class	T2/ R6
15	15.03.2024	6,7	4	Selection of speed, Standard step ratio - Ray diagram, kinematic layout.	Chalk & Talk	T2/ R6
16	20.03.2024	7,8	4	Design of 12 speed, 14 speed gear boxes.	Chalk & Talk	T2/ R6
17	22.03.2024	6,7	4	Determination of number of teeth.	Chalk & Talk	T2/ R6
UNIT-V CLUTCHES AND BRAKES						
18	27.03.2024	7,8	5	Introduction to clutches and brakes applications.	PPT	T2/ R6
19	29.03.2024	6,7	5	Design of various clutches	Chalk & Talk	T2/ R6
20	03.04.2024	7,8	5	Problems solving	Chalk & Talk	T2/ R6
21	05.04.2024	6,7	5	Design of various brakes	Chalk & Talk	T2/ R6
22	10.04.2024	6,7	5	Design of internal expanding shoe brakes and Band brakes	Chalk & Talk	T2/ R6
23	12.04.2024	6,7	5	Problems solving	Chalk & Talk	T1/ R2

#### COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:

<input checked="" type="checkbox"/> Chalk & Talk/PPT	<input checked="" type="checkbox"/> Stud. Assignments	<input checked="" type="checkbox"/> Web Resources
<input checked="" type="checkbox"/> LCD/Smart boards	<input checked="" type="checkbox"/> Stud. Seminars	<input type="checkbox"/> Add-On Courses

#### COURSE ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> University (End Semester) Examination	<input checked="" type="checkbox"/> Internal Assessment Tests		
<input checked="" type="checkbox"/> Assignments	<input type="checkbox"/> Laboratory Practices	<input type="checkbox"/> Mini/Major Projects	<input checked="" type="checkbox"/> Stud. Seminars
<input type="checkbox"/> Viva Voce	<input type="checkbox"/> Certifications	<input type="checkbox"/> Add-On Courses	<input type="checkbox"/> Others

#### COURSE ASSESSMENT METHODS

S.N.	Mode of Assessment	Date	Duration	% Weight
1	Internal Assessment Tests 1	02.03.2024	1½ hr	25 %
2	Internal Assessment Tests 2	25.04.2024	1½ hr	25 %
3.	University Examination		3 hr	50 %
Additional marks may be given for Assignments / Group / Team Seminar Presentation)				



## COURSE ASSESSMENT METHODOLOGIES-INDIRECT

<input checked="" type="checkbox"/> Assessment of CO (By Feedback, Once)	<input checked="" type="checkbox"/> Student Feedback On Faculty (Once)
<input type="checkbox"/> Assessment of Mini/Major projects by Ext. Experts	<input type="checkbox"/> Others

## COURSE (EXTRA) ESSENTIAL READINGS:

1. <https://archive.nptel.ac.in/courses/112/106/112106137/>

## COURSE EXIT SURVEY (will be collected at end of the course)

The purpose of this survey is to find out from students about their learning experiences and their thoughts about the course.

Rating:	1: Slight (Low)	2: Moderate (Medium)	3: Substantial (High)
CO1:			
CO2:			
CO3:			
CO4:			
CO5:			

## COURSE POLICY (Compensation Assessment)

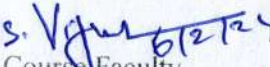
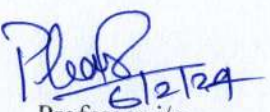
1. Attending all the assessment is mandatory for every student
2. Course policy will be followed as per the academic course regulation

## COURSE ACADEMIC DISHONESTY AND PLAGIARISM

1. All rules and regulation prescribed by the ACOE, University Departments, are applicable in the Internal Assessment Tests and University (End Semester) Examinations. ([https://acoe.annauniv.edu/download\\_forms/student\\_forms/Guidelines.pdf](https://acoe.annauniv.edu/download_forms/student_forms/Guidelines.pdf))
2. In general, possessing a mobile phone, carrying bits of paper with materials, talking to other students, copying from other students during Internal Assessment Tests and University (End Semester) Examinations will be treated as Malpractice and punishable as per the rules and regulations. The misuse of Assignment / Project / Seminar works from others is considered as academic dishonesty and will be treated with the rules and regulations of the University.

## COURSE ADDITIONAL INFORMATION

Queries / clarifications / discussion (if required) may be e-mailed to / contact the course instructors during their Office Hours.

For Approval		
 S. Vignesh Course Faculty	 Professor i/c	HOD