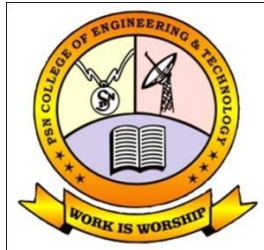


PSN College of Engineering and Technology
(Autonomous)
Tirunelveli - 627152



Course File

Subject Code : ME 650207

Subject Name : **Theory of machines**

Regulation : REGULATION 2022

Semester : V

Academic Year : 2024– 2025 (ODD)

Department : Mechanical and automation Engineering

Degree & Programme : B.E. Mechanical and Automation Engineering

Prepared By

Name : A.SUBBULAKSHMI

Designation : Assistant Professor

Department : Mechanical and Automation Engineering

Course File Verification and Auditing

Part-I

(At the beginning of the semester)

Submission Date	Check List								Verified by HOD	Verified by Academic Auditor
	Vision and Mission	Course Description, Objective and Outcomes	CO-PO mapping	Course Plan and Target	Syllabus and Content beyond Syllabus	Assignments & additional resources	Course Delivery Plan	University Question Papers		

Part-II

(After CAT - I)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Feedback	Proof for Participatory Learning		

Part-III

(After CAT - II)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Question Papers and Keys	Proof for Participatory Learning		

Part-IV

(After Model examination)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Question Papers and Keys	Proof for Participatory Learning		

Semester Academic Audit

Audit Remarks:

Signature of the Auditor(s):

Signature of Director (Academics)

Signature of Principal



PSN COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Melathediyoar, Tirunelveli – 627152

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Department of Mechanical and Automation Engineering
COURSE PLAN
(Regulation 2022)

Subject Name & Code	THEORY OF MACHINES & ME 650207
Course Type	Core
Programme	B. E Mechanical and Automation Engineering
Year/ Semester/ Section	III / V
Nature of Course / Credit	Theory / 3
Course Coordinator	Mrs.A.Subbulakshmi
Course Code	

VISION AND MISSION OF THE INSTITUTE:

Institution Vision	To provide an academic environment to learn, work and do research enabling the students to face challenges in life with strong ethical values.	
Institution Mission	IM-1	To achieve greater heights of excellence in technical knowledge and skill development through innovative teaching and learning practices.
	IM-2	To develop the infrastructure to meet the demands of technological revolution.
	IM-3	To improve and foster research in all dimensions for betterment of society.
	IM-4	To develop individual competencies to enhance employability and entrepreneurship in students.
	IM-5	To instill higher standards of discipline among students, inculcating ethical and moral values for societal harmony and peace.

VISION AND MISSION OF THE DEPARTMENT:

Department Vision	To originate the department into a centralized learning, teaching and research domain to produce proficient Mechanical and Automation Engineers encapsulated with entrepreneurship skill to compete the modernized automation Industries with their technical knowledge.	
Department Mission	DM-1	To develop the student's technical skill to the excel level of Mechanical and Automation engineers by offering standard engineering education by means of excellent teaching methodologies and creating professionalism with their learning's.
	DM-2	To strengthen the student capability of extracting knowledge and prepare them to compete the current scenario in Automated Industries and Research.
	DM-3	To amalgamate the technically enriched student to the stream line of Human values, ethics, communication skills, lifelong learning throughout the life and to work as a teamwork as well as individual.

**ME650207-
L T P C**

Theory of Machines (Common to MECH & MAE)

3 0 0 3

OBJECTIVES:

UNIT 1: MECHANISMS AND VELOCITY & ACCELERATION ANALYSIS

6

Definitions – Link, Kinematic pair, Kinematic chain, Mechanism, and Machine. Analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism) - Graphical Methods for displacement, velocity and acceleration: Shaping machine mechanism - Instantaneous Centre & Kennedy's theorem (Problems).

UNIT 2: UNIT II KINEMATICS OF CAMS

6

Classifications - Cam Nomenclature –Types of follower-Displacement diagrams - Parabolic, Simple harmonic and cycloidal motions – Graphical construction of displacement diagrams and layout of plate Cam profiles - Circular arc with Flat faced follower.

UNIT 3: FLYWHEELS AND BALANCING OF MASSES

6

Static force analysis of mechanisms –Turning moment diagrams –Fluctuation of energy, speed - Flywheels of engines and punching press. Static and dynamic balancing –Balancing of rotating masses - Balancing of reciprocating masses in a single cylinder engine –Primary and secondary unbalanced forces.

UNIT 4: FREE AND FORCED VIBRATIONS

6

Free vibration - Equations of motion - Natural frequency - Whirling of shafts and critical speed - Torsional vibration of two and three rotor systems, torsionally equivalent shaft.

UNIT 5: MECHANISMS FOR CONTROL

Governors - Types - Centrifugal governors –Porter &Proell governor, Hartnell & Hartung governor –Characteristics - Effect of friction - Controlling Force Gyroscopes - Gyroscopic couple - Gyroscopic stabilization

5. COURSE OUT COMES

After successful completion of the course, the students should be able to

CO's	CO - STATEMENTS	PO's
CO1	Explain the importance of links, chains and mechanism	1,5,11
CO2	Study the working principle of cam and follower	1,5,7,8,12
CO3	Explain the working principle of flywheel and importance of balancing of masses	1,5,7,8,12
CO4	Explain the applications of free and forced vibration of rotors	1,5,8,12
CO5	Give importance of working of Portell and Proell governor	1,5,11

6. INSTRUCTIONAL LEARNING OUTCOMES

UNIT	LEARNING OUTCOMES
I	Students will learn about the the importance of links, chains and mechanism. This outcome will be assessed through Assignment – 1, Class Test – 1 and CAT-I,MCQ
II	Students will learn about the working principle of cam and follower . This outcome will be assessed through assignment – 2, class Test – 2, CAT-I,MCQ
III	Students will learn the working principle of flywheel and importance of balancing of masses . This outcome will be assessed through assignment – 3, class Test – 3 and CAT-II,MCQ
IV	Students will know the need for free and forced vibration of rotors. This outcome will be assessed through assignment – 4, class Test – 4 and CAT-II,MCQ
V	Students will learn the Give importance of Portell and Proell governor. This outcome will be assessed through assignment – 5, class Test – 5 and CAT –III,MCQ

7. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

S. No	PEOs
PEO1	To utilize science and engineering principles together with modern tools in solving control and automation engineering problems, design high quality engineering systems, as well as propose implementable solutions for related interdisciplinary problems
PEO2	To apply cross functional knowledge, modern computational concepts and tools to accommodate changing needs of society.
PEO3	To apply high standards in the performance of them professional work with ethical, societal and environmental awareness

8. PROGRAM OUTCOMES [PO's]

PO'S NO	KNOWLEDGE	STATEMENTS	APPLIANC E
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1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of Complex engineering problems.	Theory/ Practical / Project work
2	Problem Analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Theory / Practical / Projects
3	Design / Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the needs with appropriate consideration for the public health and safety, and the cultural, Societal and environmental considerations.	Theory / Practical / Projects
4	Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Theory / Practical
5	Modern Tool usage	Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	Theory / Practical / Project work
6	The Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	Theory / Industrial visit / In plant training
7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.	Theory / Industrial Visit/ In plant Training
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Theory / Industrial visit / In plant training
9	Individual and Team Work	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.	Projects

10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.	Projects/ Seminar/ Mini Project
11	Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Projects
12	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Projects / Higher Studies

9. PROGRAMME SPECIFIC OBJECTIVE (PSO's)

PSO1	Fundamental Knowledge	To impart fundamental knowledge in mathematics, basic sciences and Mechanical Engineering to identify and solve design problems in industry using modern tools
PSO2	Technical Knowledge	To train the graduates to manufacture engineering components through proper production methodologies, and industrial automation processes considering safety aspects
PSO3	Skill Development & Ethics	To develop healthy interpersonal skills, entrepreneurship skills, communication skills, team work, adhering to professional, ethical practices and lifelong learning

10. CO - PO MAPPING

SL. NO.	COURSE OUTCOME	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	P S O 1	P S O 2
CO1	Understand the principle of kinematic links, chains and mechanism	3				1						2		1	
CO2	Analyze the working principle of cam and follower	3				2		1	2				2	1	
CO3	Explain the working principle of flywheel and importance of balancing of masses	3				2		1	2				2	1	
CO4	Acquire the knowledge of free and forced vibration of rotors	3				2			2				2	1	
CO5	Undersatnd the concept of Portell and Proell governor	3				2						2		2	

11. TEXT BOOK & REFERENCE BOOK LIST

Sl. No	Description	Legend
Text Book(s):		
1	R.S.Khurmi "Theory of machines" S.CHAND . publishing, New Delhi 110055.	T1

2	. Sadhu Singh, “Theory of Machines,” Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2ND Edi. 2006.	T2
Reference Book(s):		
1.	Shigley. J. V. and Uickers, J.J., “Theory of Machines & Mechanisms” OXFORD University press.2004	R1
2.	. “Theory of Machines -I”, by A.S.Ravindra, Sudha Publications, Revised 5th Edi. 2004	R2

12. Web Resources

Sl. No	Topic	Web link
1		https://www.idealschool.edu.in/Lecture%20Notes/MECHANICAL%20ENGINEERING-4th/THEORY%20OF%20MACHINE.pdf
2		https://mrcet.com/downloads/digital_notes/ME/II%20year/Theory%20of%20Machines.pdf
3		https://www.idealschool.edu.in/Lecture%20Notes/MECHANICAL%20ENGINEERING-4th/THEORY%20OF%20MACHINE.pdf
4		https://www.selfstudys.com/gate/mechanical-engineering/online/exam/theory-of-machines-book-1
5		https://easyengineering.net/made-easy-theory-of-machine-handwritten-classroom-notes/
NPTEL/ OTHER UNIVERSITY video lectures related to syllabus:		
1	https://archive.nptel.ac.in/courses/112/106/112106270/	
2	https://archive.nptel.ac.in/courses/112/105/112105268/	
3	https://archive.nptel.ac.in/courses/112/104/112104114/	
4	https://archive.nptel.ac.in/courses/112/104/112104121/	

13. E- learning / NPTEL

14. MAGAZINE & JOURNALS

Magazine	
Journals	

15. LESSON PLAN & 18. CONTENT DELIVERY METHODOLOGIES

S.No	Unit	Topic to be covered	Hours Needed	Mode of Teaching (BB/PPT/Others)	Text/ Ref. Book	Page No.
		UNIT 1: MECHANISMS AND VELOCITY & ACCELERATION ANALYSIS				
1.	I	Introduction	1	BB	T1	94-104
2.		Definitions – Link, Kinematic pair, Kinematic chain, Mechanism, and Machine	1	BB	T1	94-104
3.		Analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism)	1	BB	T1	105-112
4.		Graphical Methods for displacement, velocity and acceleration	1	BB	T1	121-125
5.		problems	1	BB	T1	125
6.		Shaping machine mechanism	1	BB	T1	108
7.		Instantaneous Centre & Kennedy’s theorem (Problems	1	BB	T1	124
8.		Problems in instantaneous centre	1	PPT	T1	128-137
9.		Problems in instantaneous centre	1	PPT	T1	128-137
		UNIT II KINEMATICS OF CAMS				
10.	II	Classifications - Cam Nomenclature	1	BB	T1	774-778
11.		Types of follower-Displacement diagrams	2	BB	T1	778-779
12.		Parabolic, Simple harmonic and cycloidal motions	2	BB	T1	779-783
13.		construction of displacement diagrams and layout of plate Cam profiles	2	BB, PPT	T1	784-788
14.		Circular arc with Flat faced follower. problems	2	BB	T1	793-795
		FLYWHEELS AND BALANCING OF MASSES				
15.	III	Static force analysis of mechanisms, Turning moment diagrams, Fluctuation of energy, speed	3	BB	T1	565-600
16.		Flywheels of engines and punching press.	2	BB	T1	601-607
17.		Static and dynamic balancing –Balancing of rotating masses	2	BB	T1	833-857
18.		Balancing of reciprocating masses in a single cylinder engine –Primary and secondary unbalanced forces.	2	BB	T1	858-891

		FREE AND FORCED VIBRATIONS				
19.	IV	Free vibration - Equations of motion - Natural frequency	3	BB, PPT	T1	909-930
20.		Whirling of shafts and critical speed	2	BB, PPT	T1	930-950
21.		Torsional vibration of two and three rotor systems	2	BB, PPT	T1	972-979
22.		torsionally equivalent shaft.	2	BB	T1	980-1000
		: MECHANISMS FOR CONTROL				
23.	V	Governors - Types - Centrifugal governors	3	BB, PPT	T1	653-655
24.		Porter &Proell governor	2	BB	T1	657-677
25.		Hartnell & Hartung governor, Characteristics - Effect of friction	2	BB	T1	678-700
26.		Controlling Force Gyroscopes - Gyroscopic couple - Gyroscopic stabilization	2	BB	T1	711-726
		Total Hours Needed: 45 (L)				

*Beyond the syllabus topics

+**BB** - Blackboard, **WS**-Web Search, **PPT**- Power Point Presentation

17. COURSE TIME TABLE

III YEAR B.E MECHANICAL AND AUTOMATION ENGINEERING SEMESTER V (2024-2025)

SEMESTER V (2024-2025)												
Hours Days	09.00 AM To 10.00 AM	10.00 AM To 11.00 AM	11.00 AM To 11.20 AM	11.20 AM To 12.10 AM	12.10 AM To 01.00 PM	01.00 PM To 02.00 PM	02.00 PM To 02.50 PM	02.50 PM To 03.40 PM	03.40 PM To 03.50 PM	03.50 PM To 04.40 PM		
MON	TOM		BREAK			L U N C H			BREAK			
TUES		TOM										
WED									TOM			
THURS							TOM					
FRI										BREAK		

Code No	Name of the Subject	Name of the Staff	No. of. hours per week
ME650207	THEORY OF MACHINES	Mrs.A.Subbulakshmi	4

19. Assignments

Assignment No.	Description	Submission due
1	Problems on Graphical methods for Displacement, velocity and Acceleration	20.6.2024
2	Circular arc with Flat faced follower. problems	8.7.2024
3	Static and dynamic balancing –Balancing of rotating masses problems	30.7.2024
4	Torsional vibration of two and three rotor systems problems	6.8.2024
5	Porter & Proell governor problems	16.8.2024

20. Assignment Rubrics

Quality	Marks
Submission on Date	2
Understanding	3
Solving Skills/Presentation	3
End results with correct units' conversions / Conclusion	2

21. MAPPING COs with ASSIGNMENTS

CO's	CO - STATEMENTS	A1	A2	A3	A4	A5
CO1	Explain the importance of links, chains and mechanism	3				
CO2	Study the working principle of cam and follower		3			
CO3	Explain the working principle of flywheel and importance of balancing of masses			3		
CO4	Explain the need for free and forced vibration of rotors				3	
CO5	Give importance of Portell and Proell governor					3

22. ASSESSMENT METHODOLOGIES

Assessment Tool			Description
Direct Assessment	Internal Test	40%	CAT – I, CAT – II, CAT –III average will be considered for 15 marks, MCQ 10 marks,

(80%)	Assignments		Assignments-5 marks, Attendance 5 marks. Class test 5 marks
	End semester Examination	60%	100 % for End semester Examination
Indirect Assessment (20%)	Course End Survey (80%)		At the end of Course completion will be evaluated Enclosed separately
	Exit Survey (20 %)		At the end of the degree completion will be evaluated

23. DISTRIBUTION OF PORTIONS FOR ASSESSMENT TESTS

Assessments	Portion Covering Unit	% Of weight age
CAT – I	Unit 1& unit 2	30
CAT – II	Unit 3 & Unit 4	30
CAT – III	Unit 5	60
Assignments – 1	Unit – 1	20
Assignments – 2	Unit – 2	20
Assignments – 3	Unit - 3	20
Assignments – 4	Unit – 4	20
Assignments – 5	Unit – 5	20
End Semester	Unit - 1 to 5	100

24. MARK ALLOTMENT FOR CO ASSESSMENT

COs	CAT - I	CAT - II	CAT - III	Assignment	MCQ	End Semester
CO1	30			20	20	20
CO2	20	20		20	20	20
CO3		30		20	20	20
CO4			30	20	20	20
CO5			20	20	20	20

25. LECTURE NOTES: (Enclosed separately)

III Year B.E Mechanical Engineering – V Semester (2023- 2024)

S.NO	REG.NO	NAME OF THE STUDENT
1.	9522221000 1	Baranidharan P

2.	9522221000 2	Ebin Raj V S
3.	9522221000 3	Ganapathi Subramanian M
4.	9522221000 4	Gokulan P
5.	9522221000 5	Hariharan M
6.	9522221000 6	Harish V
7.	9522221000 7	Jeyavimal S
8.	9522221000 8	Joe Alban S
9.	9522221000 9	Karthikeyan N
10.	9522221001 0	Kishor K
11.	9522221001 1	Koilraj M
12.	9522221001 2	Madhavan S
13.	9522221001 3	Mahesh Raja M
14.	9522221001 4	Mahin Abubakkar J
15.	9522221001 5	Manikandan V
16.	9522221001 6	Manikannan V
17.	9522221001 7	Nagulan M
18.	9522221001 8	Peter P
19.	9522221001 9	Pon Prakash N
20.	9522221002 0	Ragupathi K
21.	9522221002 1	Rajesh G
22.	9522221002 2	Ravirajan R
23.	9522221002 3	Renish Kumar C

24.	9522221002 4	Sarath P
25.	9522221002 5	Siva M
26.	9522221002 6	Sudhakar V
27.	9522221002 7	Thillaimani C
28.	9522221002 8	Thirukkavi M
29.	9522221002 9	Thirumalaikumar E
30.	9522221003 0	Venkatraman S
31.	9522221030 1	Abinukaran M
32.	9522221030 2	Anukirubakaran R
33.	9522221030 3	Bala Esakki Raja K
34.	9522221030 4	Dhanush Raj L
35.	9522221030 5	Esakkiraj P
36.	9522221030 6	Kathiresan
37.	9522221030 7	Muthukumar U
38.	9522221030 8	Nickson Samuel Durai P
39.	9522221030 9	Prem Kumar Durai Arasu
40.	9522221031 0	Raja M
41.	9522221031 1	Sajin A
42.	9522221031 2	Venkatesh Kumar
43.	9522221031 3	Venkatesh R
44.	9522221031 4	Vignesh Kumar M

IIT Year B.E Mechanical Engineering – V Semester (2023- 2024)

S.No	Reg.no	Name
1	95222209001	Alexpandian S
2	95222209002	Arul Dhivakar A
3	95222209003	Arun pandi P
4	95222209004	Athirathinam M
5	95222209005	Ayyasamy A
6	95222209006	Dharani T
7	95222209008	Jason Joseph Raja J
8	95222209009	Manickam M
9	95222209010	Manish S
10	95222209011	Mathana Kumar P
11	95222209013	Nanthakumar S
12	95222209014	Sakthi Vignesh K
13	95222209015	Santhosh Kumar S
14	9522209016	Tamil Selvan A
15	9522209017	Thasappa S