

**Faculty of Engineering & Technology**  
**SRM University, Kattankulathur – 603203**  
**Department of Mechanical Engineering**  
**COURSE PLAN**

Course code : ME 0208

Date : 03 July 2013

Course title : MACHINES AND MECHANISMS

Semester : 3

Academic year / semester : (July – Dec)2013-14/ODD semester

**Section details:**

Sec	Class Room No.	Details of Faculty member				Student contact time
		Name	Room No.	Intercom No.	e-mail id	
A	H301B	Mr.K.Sairam	MED101A	-----	sairam.k@ktr.srmuniv.ac.in	1.00 to 1.30 pm
B	H302F	Mr.B.Ramprasath	MEC202A	1840	bamprasath.b@ktr.srmuniv.ac.in	
C	H302B	Mr.A.Vinoth	MED101B	-----	vinoth.a@ktr.srmuniv.ac.in	
D	H303F	Mr.M.Sachidananadham	MEB305	1803	sachidhanandham.m@ktr.srmuniv.ac.in	
E	H303B	Mr.P.V.Jeyakarthykeyan	MEH101D	1813	jeyakarthy.p@ktr.srmuniv.ac.in	
F	H306	Mr.S.Ravikrishnamoorthy	MEC302	-----	ravikrishnamoorthy.s@ktr.srmuniv.ac.in	
G	H307	Mr.P.Yuvaraj	MEH101B	-----	yuvaraj.p@ktr.srmuniv.ac.in	
H	H308	Mr.S.Arokia Augustine	MEB305	-----	arokyaagustin.s@ktr.srmuniv.ac.in	
I	H309	Mr.J.Santhakumar	MEM12/D	1827	santhakumar.j@ktr.srmuniv.ac.in	
J	H310	Mr.S.Sampath kumar	MEB208G	-----	sampathkumar.s@ktr.srmuniv.ac.in	

**Direct assessment details:**

Name of assessment	Marks	Topics	Tentative date	Duration
Cycle test - I	10	Mechanisms-upto Velocity and Acceleration Diagram	31.07.13	100 minutes
Surprise test	05	Any topic in basics of mechanisms	09.08.13	15 min
Cycle test - II	10	Advanced Mechanisms and Friction	29.08.13	100 minutes
Model examination	20	Full Syllabus	29.10.13	3 hours
End semester examination	50	Full Syllabus	11.11.13	3 hours
Attendance	05	-	-	-

		L	T	P	C
ME0208	MACHINES AND MECHANISMS	3	2	0	4
	Prerequisite				
	Nil				

Student outcomes	Program Educational Objectives			
	The main objective of the B.Tech in Mechanical Engineering Program is to provide a periodically-updated curriculum so that, following the completion of the program and with a few years of experience, our alumni will have the expertise to:			
	1. Practice mechanical engineering in different disciplines towards system design, realization, and manufacturing.	2. Enhance professional practice to meet the global standards with ethical and social responsibility.	3. Solve industrial, social, and environmental problems with appropriate techniques and tools.	4. Work in large cross-functional teams and pursue life-long learning.
(a) an ability to apply knowledge of mathematics, science, and engineering	X		X	
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	X	X	X	
(e) an ability to identify, formulate, and solve engineering problems	X		X	

Course designed by		Department of Mechanical Engineering										
1	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x		x		x						
2	Category	GENERAL (G)			BASIC SCIENCES (B)			ENGINEERING SCIENCES AND TECHNICAL ART (E)			PROFESSIONAL SUBJECTS (P)	
											X	
3	Broad area  (for professional courses only, i.e 'under P' category)	Manufacturing				Design			Thermal		General	
						X						
4	Course Coordinator	<b>K.SAIRAM</b>										

ME0208

P

Machines and Mechanisms

3 2 0 4

### PURPOSE

To expose the students to learn the fundamentals of various laws governing rigid bodies and its motions.

### INSTRUCTIONAL OBJECTIVES

- Basic mechanisms, velocity and acceleration of simple mechanisms
- Drawing the profile of cams and its analysis
- Friction applications, gear train calculations
- Balancing of machines

### MECHANISMS

Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Terminology and definition - Planer, Spherical and Spatial Mechanisms - Grashoff's law - Kutzbach criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms - Simple problems - Instantaneous centre - Kennedy's theorem - Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.

### ADVANCED MECHANISMS AND CAMS

Pantograph - Steering gear mechanism - Davis Steering gear - Ackerman steering gear - Hooke's joint - Double Hooke's joint.

**CAMS:** Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower types - pressure angle.

### FRICTION

**Friction:** Applications - Screw friction - Effort calculations -Efficiency - Self locking and overhauling of screws. Friction clutches - disc, cone clutches - Working principle - Torque, power transmitted derivations and calculations.

## GEAR TRAINS AND CONTROL MECHANISMS

Spur gear terminology and definition - Gear trains: simple, compound, reverted and epicyclic - Velocity ratio and torque calculation in gear trains - Automobile differential.

**Gyroscopes:** Gyroscopic forces and couple - Forces on bearing due to gyroscopic action - Gyroscopic effect in ship, motor cycle, car and aircraft. **Concept of governors:** (elementary treatment only)

## TURNING MOMENT DIAGRAM AND BALANCING

**Turning moment diagrams:** Fly wheels - Application of flywheel - Punching presses.

**Static and dynamic Balancing:** Balancing of rotating masses - Balancing of single cylinder engine - Balancing of multi cylinder engine - Balancing machines.

## TEXT BOOKS

- Ratan, S.S., *Theory of Machines*, Tata McGraw Hill Publishing company Ltd., 2 nd Edition, 2005
- Thomas Bevan, *Theory of Machines*, CBS Publishers and Distributors, 3rd Edition, 1984

## REFERENCE BOOKS

- Shigley, J. E., and Uicker, J. J., *Theory of Machines and Mechanisms*, McGraw Hill, 1995
- Ghosh, A., and Mallick, A. K., *Theory of Mechanisms and Machines*, Affiliated East-West Pvt Ltd., New Delhi, 1988
- Rao, J. S., and Dukkupati, R.V., *Mechanism and Machine Theory*, Wiley-Eastern Ltd., New Delhi, 1995

**LESSON PLAN : ME0208- MACHINES AND MECHANISMS(Common to all 10 sections)**

S. No.	TITLE	BOOK	Chapter No.
<b>MECHANISMS</b>			
1	Overview about the course, Introduction to mechanism, its elements - pairs and its types, links & chains	T-1 & R-2	C-1
2	Degrees of freedom and its application in planar, spherical and spatial mechanism		
3	Simple Problems in Quick return mechanisms		
4	Grashofs law and its application -Grublers criteria and Kutz-batch relationship		
5	Inversion of mechanisms-Four bar mechanism,Single Slider and Double slider mechanism		
6	Velocity analysis of Four bar, single slider crank,Toggle mechanism, and double slider crank mechanisms using relative velocity method	T-1	C-2, C-3
7	Tutorial: Velocity analysis like Four bar, single slider crank and double slider crank mechanisms using Relative Velocity method		
8	Acceleration analysis of Four bar and single slider crank using relative acceleration method.		
9	Tutorial:Acceleration analysis like Four bar, single slider crank mechanism,Toggle Mechanism using Relative acceleration method	R-2	C-2
10	Overview of Instantaneous centre method and Kennedys theorem		
11	Velocity analysis of Four bar, single slider crank and double slider crank mechanisms using Instantaneous centre method		
12	Tutorial:Velocity analysis of Four bar, single slider crank and double slider crank mechanisms using Instantaneous centre method		
<b>ADVANCED MECHANISMS AND CAMS</b>			
13	Pantograph and Steering gear mechanism - Theory	T-1 & R-2	C-6
14	Davis Steering gear Mechanisms - Derivation		
15	Ackerman steering gear Mechanism- Derivation		
16	Hooke's joint - Derivation		
17	Double Hooke's joint and Problems on Hook's joint		
18	Fundamentals of cam and Classification of cam and its follower with its different types of motion	T-1	C-7
19	Undercutting, Interference and Nomenclature of cam		
20	Displacement,Velocity and acceleration analysis - various follower motions		
21	Cam profile construction for Inline Follower with Uniform Displacement and velocity motion and Simple harmonic motion.	R-2	C-8
22	Cam profile construction for Inline Follower with Uniform Acceleration and deceleration motion and Cycloidal motion		
23	Cam profile construction Offset follower with Uniform Displacement and velocity motion and Simple harmonic motion.		
24	Cam profile construction Offset follower with Uniform Acceleration and deceleration motion and Cycloidal motion		

25	Tutorial: Problems in cam construction	R-2	C-8
<b>FRICITION</b>			
26	Definition of friction and its types, applications	T-1	C-8
27	Screw friction and problems in screw friction with its application(Screw Jack)		
28	Tutorials:Problems in screw Friction and its all derivations		
29	Self locking and overhauling of screws		
30	Clutches and its applications, types of clutches and its working		
31	Problems on single plate clutch and multi plate clutch		
32	Problems on Cone clutch and Centrifugal clutch		
33	Torque, Power transmitted derivations and calculations - Clutches		
<b>GEAR TRAINS AND CONTROL MECHANISMS</b>			
34	Gears and its basics - classification of gears - Nomenclature of gears	T-1	C-10
35	Law of gearing - Undercutting and interference of gears	R-2	C-9
36	Tutorials: Problems involving the calculation of module, contact ratio	T-1	C-11
37	Gear trains & its applications - Types, calculation of speed ratio, gear speeds in simple gear train and compound gear train	R-2	C-9
38	Train value calculation in epicyclic gear train and determination of number of tooth in driver and driven, sun and planet gear system	T-1	C-17
39	Torque calculation of gear trains and reverted gear train( <i>simple problems</i> )	R-2	C-10
40	Definition of gyroscope and introduction about gyroscopic couple and moment with precision axis of spin		
41	Forces on bearing due to gyroscopic action		
42	Gyroscopic action and its effect in Aeroplanes		
43	Tutorial: Gyroscopic action and its effect in Aeroplanes		
44	Gyroscopic action and its effect in Ships		
45	Tutorial: Gyroscopic action and its effect in Ships		
46	Gyroscopic action and its effect in two wheelers		
47	Tutorial: Gyroscopic action and its effect in two wheelers	T-1 & R-2	C-11
48	Gyroscopic action and its effect in four wheelers		
49	Tutorial: Gyroscopic action and its effect in four wheelers		
50	Governor and its types - Working principle and simple terminologies		
<b>TURNING MOMENT DIAGRAM AND BALANCING</b>			
51	Turning moment diagram in Flywheel - Theory	T-1	C-13
52	Turning moment diagram in Flywheel - Problem 1- Intercepted areas		
53	Turning moment diagram in Flywheel - Problem 2 - Curve equation		
54	Turning moment diagram in Flywheel - Problem 3 -IC engine application		
55	Problems on Flywheel in punching press deisgn		
56	Balancing - Conditions & Balancing of several masses in same plane - Analytical & Graphical method	T-1	C-14
57	Balancing of several rotating masses in different planes - Theory	R-2	C-7

58	Balancing of several rotating masses in different planes - Problems	R-2	C-7
59	Problems on Balancing of Rotating masses		
60	Balancing of V- engines - Theory & Problem		

**TEXT BOOKS**

1. Ratan, S.S., Theory of Machines, Tata McGraw Hill Publishing company Ltd., 2nd Edition, 2005.
2. Thomas Bevan, Theory of Machines, CBS Publishers and Distributors, 3rd Edition, 1984.

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2. Ghosh, A., and Mallick, A. K., Theory of Mechanisms and Machines, Affiliated East-West Pvt Ltd., New Delhi, 1988.
3. Rao, J. S., and Dukkipati, R.V., Mechanism and Machine Theory, Wiley-Eastern Ltd., New Delhi, 1995

Name of the Faculties:	SECTIONS	Signatures:
Mr.K.Sairam	A	K. Sairam 3/7/13
Mr.B.Ramprasath	B	B. Ramprasath 3/7/13
Mr.A.Vinoth	C	A. Vinoth 4/7/13
Mr.M.Sachidanadham	D	M. Sachidanadham 4/7/13
Mr.P.V.Jeyakarhikeyan	E	P. V. Jeyakarhikeyan 4/7/13
Mr.S.Ravikrishnamoorthy	F	S. Ravikrishnamoorthy 04/07/13
Mr.P.Yuvaraj	G	P. Yuvaraj
Mr.S.Arokia Augustine	H	S. Arokia Augustine
Mr.J.Santhakumar	I	J. Santhakumar
Mr.S.Sampath kumar	J	S. Sampath kumar 3.7.13.

K. Sairam  
3/7/13  
Course Coordinator  
(Mr.K.SAIRAM)

D.K. Jeyakarhikeyan  
7/7/2013  
HOD / Mechanical