

# Department of Mechanical Engineering

## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

<b>COURSE OUTLINE TEMPLATE</b>			
Course Title	Mechanics of Machines-II		
Course Code	MEPC23	No. of Credits	03
Department	Mechanical Engineering	Faculty	Dr.K.Sankaranarayananasamy
Pre-requisites Course Code	MEPC17		
Course Coordinator(s) (if, applicable)	-----		
Other Course Teacher(s)/Tutor(s), E-mail	ksnsamy@nitt.edu	Telephone No.	9486001114
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
<b><u>COURSE OVERVIEW</u></b>			
<p>This integrated course involves the basic understanding of fundamental engineering principles in-line with analysis of forces and the effects of forces on the engineering components. The course familiarises the students with balancing of machine components, vibration and its analysis and design of any physical system in a very precise and interesting manner and thereby opens a platform to design of mechanical components.</p>			
<b><u>COURSE OBJECTIVE</u></b>			
<ol style="list-style-type: none"> <li>1. To impart knowledge about dynamic analysis of mechanisms and balancing.</li> <li>2. To familiarize about gyroscopes and flywheels.</li> <li>3. To give understanding various aspects of mechanical vibrations and their control.</li> </ol>			
<b><u>COURSE OUTCOMES (CO)</u></b>			
Upon the completion of the course, the students will be able to			Aligned Programme Outcomes (PO)
1. Perform static and dynamic analysis of mechanisms			1,3,4
2. Understand the issues related to balancing of reciprocating and rotating machinery			2,5,7
3. Know the working of Gyroscopes and flywheels			3,4,6

4. Have understanding about the effect of Vibration and vibration control		1,5,8	
<b><u>COURSE TEACHING AND LEARNING ACTIVITIES</u></b>			
S.No.	Week	Topic	Mode of Delivery
1	1 <sup>st</sup> week	Introduction to Force analysis static, dynamic forces, need of force analysis, inertia force, equilibrium concept. Free body diagram, static force analysis simple planar mechanism (four bar & slider mechanism). Problems on static force analysis	Lecture C& T
2	2 <sup>nd</sup> week	Introduction to dynamic ,Force analysis D'Alembert's principles, Dynamic analysis of Reciprocating Engine (Analytical & Graphical methods, Problems on dynamic force analysis (c.rod), analytical method Graphical method	Lecture C& T
3	3 <sup>rd</sup> week	Introduction to kien's construction Problems on dynamic force analysis (kien's method) Introduction to Turning Moment diagram, Flywheel function, maximum fluctuation of energy coefficient of fluctuation of Energy.	Lecture C& T
4	4 <sup>th</sup> week	Maximum fluctuation of speed, Problems on flywheel. Introduction to balancing of masses (rotating, reciprocating). Static and dynamic balancing	Lecture C& T
5	5 <sup>th</sup> week	Balancing of single & several masses (same plane & Different planes) Problems on balancing. Problems on balancing (inline, v- engine)	Lecture C& T
6	6 <sup>th</sup> week	Primary and secondary forces of reciprocating masses, Effect of partial balancing of locomotives, Balancing of multi-cylinder engine.	Lecture C& T
7		CYCLE TEST-I	
8	7 <sup>th</sup> week	Introduction to Gyroscopic principles. Problems on Gyroscopic effect and application	Lecture C& T
9	8 <sup>th</sup> week	Effect of Gyroscopic in ship and aero-plane	Lecture C& T
10	9 <sup>th</sup> week	Introduction to vibration, Types of vibration. Two rotor, three rotor and multi rotor systems.	Lecture C& T
11	10 <sup>th</sup> week	Coupled vibrations. Vibration sensors. Problems on un-damped vibration.	Lecture C& T

12	11 <sup>th</sup> week	Introduction to damping ,Types of damping, Damped free vibrations (single DOF& Multi DOF)	Lecture C& T
13		CYCLE TEST-II	
14	12 <sup>th</sup> week	Problems on damped vibration. Introduction to vibration control. Vibration isolations suspension systems	Lecture C& T
15	13 <sup>th</sup> week	Active, passive control. Tuned vibration absorbers. Uses of vibration in condition monitoring.	Lecture C& T

**COURSE ASSESSMENT METHODS**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test - 1	After 6 <sup>th</sup> week	60 Minutes	20
2.	Cycle Test – 2	After 11 <sup>th</sup> week	60 Minutes	20
3.	* Make up Test	-----	-----	20
4.	Assignment	Two Assignments	----	10
5.	End Examination	-----	180 Minutes	50

Note: \* Applicable for students who do not appear for cycle Test-I OR II and obtain proper permission from the course Teacher within Two days of completion of that particular Assessment

**ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc**

1. Shigley,J.E.,Uicker,JJ., Theory of Machines and Mechanisms, McGraw-Hill,1995.
2. George H.Martin., Kinematics and Dynamics of Machines 2<sup>nd</sup> edition ,Waveland Pr Inc.,2002.

**COURSE EXIT SURVEY**

1. Feedback from the students at the end of each class and during class committee meeting.
2. End semester feedback on Course Outcomes.

**COURSE POLICY (Attendance, Assessment, academic honesty, etc.)**

1. All the correspondence (schedule of classes/schedule of assessment/ course material/ any other information regarding this course) will be done through their class representative.

#### ATTENDANCE

1. Attendance will be taken by the faculty in all contact hours.
2. Any student, who fails to maintain 75 % attendance but have above 60% attendance need to appear for the compensation assessment (CPA) and if they score 60% or more marks will be eligible for attending the end semester examination.
3. Students not having 60% minimum attendance at the end of the semester and those who fail to clear the CPA (scoring less than 60 %) will have to REDO the course.

#### ASSESSMENT

1. Attending all the assessments is MANDATORY for every student.
2. If any student is not able to attend any of the continuous assessments (CAs: 1 -2) due to genuine reason, student is permitted to attend the compensation assessment (CPA) with % weightage equal to maximum of the CAs. However, the maximum of % weightage among the assessments for which the student was absent will be considered for computing marks for CA. (This is not valid for students who have attendance lag.).
3. Finally, every student is expected to score minimum 40 % of the maximum mark of the class in the total assessment to pass the course. Otherwise the student would be declared fail and F grade will be awarded.

#### ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking of information by means of copying assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
2. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.

#### ADDITIONAL COURSE INFORMATION

The course coordinator is available for consultation at times those are displayed on the coordinator's office notice board. Queries may also emailed to the course coordinator directly at [ksnsamy@nitt.edu](mailto:ksnsamy@nitt.edu)

#### FOR SENATE'S CONSIDERATION

    
Course Faculty \_\_\_\_\_ CC-Chairperson \_\_\_\_\_ HOD \_\_\_\_\_