MACHINE TOOL DYNAMICS-EL 1
Semester III (Production Engineering) SUB CODE: MEMPR302-D
Teaching Scheme (Credits and Hours)

Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
					Hrs	Marks	Marks	Marks	Marks	
Hrs	Hrs	Hrs	Hrs							
3	0	2	5	4	3	70	30	20	30	150

LEARNING OBJECTIVES:
The objective of this course is

- To learn various concepts related to dynamics of machine tool
- To have practical purview of various vibration damping techniques

LESSON PLANNING

SR.NO	CHAPTER NO	DATE/WEEK	%WEIGTAGE
1	1,2	1^{st} 2^{nd} 3^{rd}	20
2	3,4	4^{th} 5^{th} 6^{th}	20
3	5,6	7^{th} 8^{th} 9^{th}	20
4	7	10^{th} 11^{th} 12^{th}	20
5	8	13^{th} 14^{th} 15^{th}	20

Total hours (Theory): 45, Total hours (Practical):30, Total hours: 75

DETAILED SYLLABUS

Chap. No.	Topic
1	**Vibration theory**: Review of systems with one and two degrees of freedom, damped, undamped free and forced vibrations, beat phenomenon.
2	Transmissibility of vibration and vibration isolation. Vibration measurement.
3	Eigen value problem using lumped mass technique, application to simple structures with damping
4	**Chatter in Machine tools**: Basic pattern of chatter in metal cutting. Regenerative chatter, node coupling. Limit width of cut. Importance of negative real component of receptance. Dynamic cutting force co-efficient
5	Prediction of machine tools instability. Study of chatter behavior of lathe, drilling and milling machines. C.I.R.P., rig stick-slip phenomenon
6	**Stability of Machine tools**: Individual steps in the procedure-Directional factors cutting tests
7	Measurement of dynamic data by excitation tests. Evaluation of the test examples of the analysis of the stability of machine tools like Horizontal knee-type milling machine, vertical knee-type milling machine, center lathes
8	**Damping in Machine tools**: Material and system damping. Dampers – Dynamic, impact and active type. Methods of improving damping in machine tools. Examples of the use of dampers, practical design consideration. Dynamic measurement of forces and vibration – Oscillating tools. Vibration isolation system.

LIST OF PRACTICALS

Sr. No.	Practical Content
1	TO FIND THE NATURAL FREQUENCY OF SINGLE DEGREE OF THE GIVEN SYSTEM
2	TO FIND NATURAL FREQUENCY OF TWO DEGREE OF THE GIVEN SYSTEM
3	ANALYSIS OF STABILITY OF CENTRE LATHE
4	ANALYSIS OF STABILITY OF HORIZONTAL MILLING MACHINE
5	ANALYSIS OF STABILITY OF VERTICAL MILLING MACHINE
6	PREDICTION OF CHATTER BEHAVIOR IN LATHE
7	PREDICTION OF CHATTER BEHAVIOR IN MILLING MACHINE
8	MEASUREMENT OF FORCES AND VIBRATIONS IN LATHE
9	MEASUREMENT OF FORCES AND VIBRATIONS IN MILLING MACHINE
10	DIRECTIONAL FACTORS CUTTING TESTS IN LATHE, MILLING AND DRILLING MACHINE

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

STUDENTS LEARNING OUTCOMES:

At the end of the course the students will gain an experience vibration analysis of machine tools

References:

1. F.Keeningsberager and J. Tlusty, Machine Tool Structure, Porgamon press, 1970.
2. G.Sweeney, Vibration of Machine Tools, Machinery Publishing Co. 1971.
3. Walter C. Hurty and M.F. Bubinstein, Dynamics of Structures, Prentice Hall, 1967.
4. W.T.Thomson, Vibration Theory And Applications, Vibration Theory And Applications, 1965.
5. S.A. Tobias, Machine Tool Vibrations, Blackie publications, 1965.