Course Description Form

1. Course Name:

Theory of machine and vibration

2. Course Code:

WAR-30-04

3. Semester / Year:

third stage/yearly

4. Description Preparation Date:

23-9-2024

5. Available Attendance Forms:

Weekly / theoretical and practical

6. Number of Credit Hours (Total) / Number of Units (Total)

90 hours theoretical+ 30 hours practical

7. Course administrator's name (mention all, if more than one name)

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8. Course Objectives

Course Objectives	To develop students' fundamental knowledge and insight into the theory of machines, balancing of rotating masses, theory of gears, governors, cams, belts, free vibrations and damped vibration to be used in machines design

9. Teaching and Learning Strategies

Strategy	Assessment is based on hand-in assignments, Written exam, Quizzes, Tutorial, Seminars, Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1st week	3 Theoretical + 1practical.	The student understands the subject	Introduction and Definition. Graphical Representation of Displacement, velocity	Theoretical + practical	quiz

			and acceleration with respect time. Solved problems		
2nd week	3 Theoretical + 1 practical	The student understands the subject	Velocity in mechanisms	Theoretical + practical	quiz
3rd week	3 Theoretical + 1 practical	The student understands the subject	Solved problems for velocity in mechanisms. Acceleration in mechanisms	Theoretical + practical	quiz
4th week	3 Theoretical + 1practical	The student understands the subject	Accelerations in slider crank mechanisms. Solved problems for acceleration in mechanisms	Theoretical + practical	quiz
5th week	3Theoretical + 1 practical	The student understands the subject	Balancing of rotating masses. Balancing of a single rotating mass by a single mass rotating in the same plane. Balancing of a single rotating mass by two masses rotating in different planes. Balancing of several masses rotating in the same plane. (a) Analytical method. (b) Graphical method	Theoretical + practical	quiz
6th week	3 Theoretical + 1 practical	The student understands the subject	Balancing of several masses rotating in different planes. Solved problems	Theoretical + practical	quiz
7th week	3Theoretical + 1 practical	The student understands the subject	Classification of gears, spur gears, velocity ratio (gear ratio). Center to center distance	Theoretical + practical	quiz
8th week	3 Theoretical +1practical	The student understands the subject	Gear trains, velocity ratio of simple gear trains, velocity ratio of compound gear trains, solved problems	Theoretical + practical	quiz
9th week	3 Theoretical + 1 practical	The student understands the subject	Epicyclical gear trains, simple epicyclical gear trains	Theoretical + practical	quiz

10th week	3 Theoretical +1 practical	The student understands the subject	Compound epicyclical gear trains	Theoretical + practical	quiz
11th week	3 Theoretical + 1practical	The student understands the subject	Solved problems	Theoretical + practical	quiz
12th week	3 Theoretical + 1practical	The student understands the subject	Types of governors, watt governor, solved problems	Theoretical + practical	quiz
13th week	3 Theoretical +1 practical	The student understands the subject	Porter governor: (a) Equilibrium method. (a) Instantaneous center	Theoretical + practical	quiz
14th week	3 Theoretical + 1 practical	The student understands the subject	Proell governor, Hartnell governor, solved problems	Theoretical + practical	quiz
15th week	3 Theoretical + 1 practical	The student understands the subject	Types of belts, types of flat belt drive, selection of belt drive. Velocity ratio of open belt drive. Effect of belt thickness on Velocity ratio, slip of the belt. Creep of the belt	Theoretical + practical	quiz
16th week	3 Theoretical + 1practical	The student understands the subject	Velocity ratio of a compound belt drive. Length of belt. (a)Open belt. (b)Cross belt. Ratio of driving tension for flat belts. Determination of angle of contact. (a)Open belt. (b)Cross belt.	Theoretical + practical	quiz
17th week	3 Theoretical + 1 practical	The student understands the subject	Power transmitted by a belt. Centrifugal tension (Tc). Maximum tension in the belts (Tmax). Condition for the Transmission of Maximum Power. Initial tension in the belt (to).V – Belt drive and rope drive. Solved problems	Theoretical + practical	quiz
18th week	3 Theoretical + 1 practical	The student understands the subject	Types of brakes. Simple block or shoe brake. (a) Single block or shoe brake. (b) Double block or shoe brake. Band brake: (a) Simple band brake.	Theoretical + practical	quiz

			(b) Differential band brake.		
19th week	3 Theoretical +1practical	The student understands the subject	Band and block brake. Internal expanding shoe brake. The braking of a vehicle. (a) Value of retardation when the brakes are applied to rear wheels only. (b) Value of retardation when the brakes are applied to front wheels only. (c) Value of retardation when the brakes are applied to all the wheels. Solved problems	Theoretical + practical	quiz
20th week	3 Theoretical + 1practical	The student understands the subject	Types of followers. Nomenclatures for cam profile. Motions of the follower. (a) Uniform motion or uniform velocity of a follower. Solved problems	Theoretical + practical	quiz
21st week	3Theoretical + 1practical	The student understands the subject	(b) Simple harmonic motion of follower. (c) Uniform acceleration and uniform retardation. Solve problems	Theoretical + practical	quiz
22nd week	3 Theoretical +1practical	The student understands the subject	Cam profile construction. Solve problems	Theoretical + practical	quiz
23rd week	3 Theoretical +1 practical	The student understands the subject	Types of vibration. Important definitions for vibrating motion. Equivalent spring stiffness. Solved problems	Theoretical + practical	quiz
24th week	3Theoretical + 1 practical	The student understands the subject	Free vibrations. Methods of finding the natural frequency of free. Longitudinal vibrations. (a) Equilibrium method. (b) Energy method.	Theoretical + practical	quiz

			(c) Rayleigh's method. Method for natural frequency of free transverse vibration. Solved problems		
25th week	3 Theoretical +1 practical	The student understands the subject	Natural frequency of transverse vibrations of shafts or Beams under different types of loads and end conditions. (a) Natural frequency of a shaft carrying a single concentrated load. (b) Natural frequency of a shaft carrying a uniformly distributed load. Natural frequency of transverse vibration of a system of several load attached to the same shaft. (a) Energy or (Rayleigh's) method. Dunkerley's method. Solved problems	Theoretical + practical	quiz
26th week	3 Theoretical + 1 practical	The student understands the subject	Whirling speeds or critical speeds. Solved problems	Theoretical + practical	quiz
27th week	3 Theoretical + 1 practical	The student understands the subject	Frequency of free damped vibrations (viscous damping). Solve problems Expression for displacement for over-damped, under-damped and critical-damped system. Logarithmic decrement. Solved problems	Theoretical + practical	quiz
28th week	3 Theoretical + 1 practical	The student understands the subject	Expression for displacement for over-damped, under-	Theoretical + practical	quiz

			damped and critical-damped system. Logarithmic decrement. Solved problems		
29th week	3 Theoretical + 1 practical	The student understands the subject	Natural frequency of free torsional vibrations. Free torsional vibrations of a single rotor system. Free torsional vibrations of a two rotor system.	Theoretical + practical	quiz
30th week	3 Theoretical + 1 practical	The student understands the subject	Torsional equivalent shaft. Solved problems	Theoretical + practical	quiz

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Theory of machine and vibration, by gubta and kromy,2004 2- Theory of machine and vibration, by tomes beven,1995. 3-machine design, by gubta ,2004
Main references (sources)	Theory of machine and vibration, by gubta and kromy,2004
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	