III B.Tech I Semester

15AME24 - DYNAMICS OF MACHINERY

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Course objective:

- To understand the method of static force analysis and dynamic force analysis of mechanism, undesirable effects of unbalance in rotors and engines. To understand the concept of vibratory systems and their analysis and also the principles of governors.

UNIT I

Precession: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

Brakes and Dynamometers: Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers - absorption and transmission types, General description and methods of operation.

Learning outcome & suggested Student Activities:

After completion of this unit, students are able to solve the numerical problems on brakes, students can apply gyroscopic principles on Aeroplane, ship, four wheel and two wheel vehicles. Students may go through text books given for more number of problems on brakes and dynamometers.

UNIT II

Turning Moment Diagrams And Fly Wheels: Turning moment diagrams for steam engine, IC Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed - Fly wheels and their design, Fly wheels for Punching machines.

Learning outcome & Suggested Student Activities:

After completion of this unit students are able to design a flywheel for IC engine. Students may go through text books given for more number of problems on flywheels.

UNIT III

Governors: Watt, Porter and Proell governors. Spring loaded governors - Hartnell and Hartunggovernors with auxiliary springs. Sensitiveness, isochronism and hunting.Effort and power of a governor.

Learning outcome & suggested Student Activities:

The outcome of this unit is to study the basics and definitions related to governors and forces acting on various governors. After completion of this unit students are able to solve numerical problems on different governors. Students may go through text books given for more number of problems on governors.

UNIT IV

Balancing: Balancing of rotating masses - single and multiple - single and different planes.

Balancing Of Reciprocating Masses: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples,V-engine, multi cylinder in- line and radial engines for primary and secondary balancing.

Learning outcome & Suggested Student Activities:

After completion of this unit students can solve numerical problems on balancing of rotating masses and reciprocating masses in V-engine and multi cylinder engines. Students may go through text books given for more number of problems on balancing of rotating masses and balancing of reciprocating masses in locomotives and IC engines.

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UNIT V

Vibration: Free and forced vibration of single degree of freedom system- undamped and damped, Simple problems on free, forced and damped vibrations. Transverse vibrations of beams with concentrated and distributed loads. Dunkerly's method, whirling of shafts and critical speeds. Vibration Isolation & Transmissibility. Raleigh's method.

Torsional Vibrations – undamped - two and three rotor systems.

Learning outcome & Suggested Student Activities:

Upon completion of this unit, the student will perform detailed analysis of the response of one degree of freedom systems with free and forced vibrations, evaluate the critical speed of the shaft and simple vibration calculations of rotor systems. Students may go through text books given for more number of problems on single degree of freedom system, transverse and torsional vibrations.

TEXT BOOKS:
1. Theory of Machines by R.S.Khurmi and Guptha.
2. Theory of Machines, S.S. Rattan, MGH Publishers,3rd Edition,2013.
3. Theory of Machines by P.L Ballaney – Lakshmi Publications.

REFERENCE BOOKS:
1. Theory of Machines, Thomas Bevan, Pearson, 3rd Edition,2012.
2. The theory of Machines, J.E. Shiegley, McGraw Hill .
3. Kinematics and Dynamics of Machinery R.L. Norton, Tata McGraw Hill.

NOTE: End Exam Should be conducted in Drawing Hall.

SUGGESTED LINKS:
- http://nptel.iitm.ac.in/video.php?subjectId=112104114
- http://www.cdeep.iitb.ac.in/nptel/Mechanical/Dynamics%20of%20Machines/TOC.html
- http://nptel.iitm.ac.in/video.php?subjectId=112104121,
- http://www.youtube.com/watch?v=FA04XFpJgwE
- http://www.youtube.com/watch?v=FydJu1A1oeM&list=PL46AAEDA6ABAFCA78&index=7

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