

# 10 ME 413 MACHINE DYNAMICS AND VIBRATIONS (SI UNITS)

## IV B.Tech I Semester

(with effect from the academic year 2013-2014)

Lectures/week: 4 Hrs  
University Exam: 3 Hrs

Credits: 4  
Sessional Marks: 40  
End Examination Marks: 60

### UNIT-I

**CAMS** : Classifications of cams and followers, Displacement, Velocity & acceleration diagrams when the followers moves with uniform velocity, S.H.M, uniform acceleration & retardation, cycloidal motion, construction of cam profiles for radial cam with knife edge follower, roller follower and flat faced follower, tangent cam.

### UNIT-II

**BALANCING OF MASSES**: Static and dynamic balance – balancing of rotating masses analysis and graphical methods. Balancing of reciprocating masses – Single and multi cylinder in line engines – firing order, Balancing of radial and V engines. Partial balancing locomotive balancing – Variation of tractive effort, swaying Couple and Hammer blow – Practical Methods of balancing of rotors.

### UNIT-III

**VIBRATIONS**: Introduction – Single degree freedom system, Differential equation of motion – linear vibrations, Transverse vibrations of beams with concentrated and distributed loads – Dunkerly's Method – energy Method – equivalent shaft – torsional Vibration of two and three rotor systems – torsional vibrations of geared system – Whirling or critical speeds of shafts.

### UNIT-IV

**DAMPED AND FORCED VIBRATIONS**: Introduction – Critical damping – damping ratio logarithmic decrement forced vibrations – Harmonic excitation amplitude and phase determination.

Force transmitted and transmissibility, vibration and shock isolation- Introduction to multi degree freedom system – differential equation of motion- general solutions, Normal modes, modal analysis, Practical applications.

### UNIT-V

**FORCE ANALYSIS**: Introduction, Newton's Laws, applied and constraints forces, free body diagrams, condition for equilibrium, two and three force members and four force members, friction force modern, Static analysis of shaper. Shaking forces Forces on reciprocation parts of engines, Inertia force analysis.

### TEXT BOOKS:

1. Theory of Machines : Khurmi R.S.
2. Mechanisms and Machine Theory : Rao J.S. and Dukkupati R.V.

### REFERENCES:

1. Theory of Machines : Thomas Bevan
2. Principles of Vibration : Benson H.Tongue
3. Theory of Machines : Rattan S.S.