

# **Gautam Buddha University, Greater Noida**

## **School of Engineering (Mechanical Engineering)- ME 302**

<b>Degree</b>	<b>Course Name</b>	<b>Course Code</b>	<b>Marks:100</b>
Integrated B. Tech. + M. Tech. / M.B.A.	Mechanical Vibrations	ME 302	SM+MT+ET 25+25+50
<b>Semester</b>	<b>Credits</b>	<b>L-T-P</b>	<b>Exam.</b>
VI	4	3-1-0	3 Hours

### **Unit - I**

Introduction to mechanical vibrations; Important terminology; Degrees of freedom; Harmonic motion; Derivation of equation of motions for 1-D longitudinal; Transverse and torsional vibrations without damping using Newton's second law; D' Alembert's principle and principle of conservation of energy; Compound pendulum and centre of percussion. **(07 hours)**

### **Unit – II**

Damped vibrations of single degree of freedom systems; Viscous damping; Under-damped; Critically damped and over damped systems; Logarithmic decrement; Vibration characteristics of Coulomb damped and hysteretic damped systems; Rotating unbalance; Modelling of stiffness and damping. **(08 hours)**

### **Unit – III**

Forced vibrations of single degree of freedom systems; Forced vibration with constant harmonic excitation; Frequency response curves and phase angle plot; Forced vibration due to excitations; Vibration isolation and transmissibility; Force transmissibility; Motion transmissibility; Forced vibration with rotating and reciprocating unbalance; Materials used in vibration isolation. **(08 hours)**

## **Unit – IV**

System with two degrees of freedom; Principle mode of vibration; Mode shapes; Undamped forced vibrations of two degrees of freedom system with harmonic excitation; Vibration absorber; Undamped dynamic vibration absorber.

**(07 Hours)**

## **Unit – V**

Multiple degrees of freedom systems and their analyses; Exact and approximate analyses methods; Rayleigh's; Dunkerley's; Stodola's and Holzer's methods; Vibrations of continuous systems; Transverse vibration of a string; Longitudinal vibration of a bar; Torsional vibration of a shaft.

**(08 hours)**

## **Unit – VI**

Working principles of various vibration measuring instruments; Description of vibration standards; Vibration monitoring techniques; Case studies related to industrial problems.

**(07 hours)**

### **Recommended Books:**

1. Theory of Vibration with Applications by WT Thomson and M.D. Dahleh; Prentice Hall.
2. Mechanical Vibrations by S. S. Rao; Prentice Hall.
3. Engineering Vibrations by D. J. Inman; Prentice Hall.
4. Introductory course on theory and practice of mechanical vibrations; J.S. Rao & K. Gupta; New Age International

**School of Engineering (Mechanical Engineering)- ME 304**

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Machine Design - II	ME 304	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam.
VI	4	2-2-0	3 Hours

**Note:** Use of design data book is allowed in the examination.

**Unit - I**

Design of gears: Spur; Helical; Bevel and worm gears; Gearbox design including housing.

**(07 Hours)**

**Unit - II**

Design of hydrodynamically lubricated journal bearing; Selection of rolling element bearings

**(06 Hours)**

**Unit - III**

Design of springs: Helical compression and extension springs; Leaf springs.

**(04 Hours)**

**Unit - IV**

Design of flexible machine elements: Flat belts; V-belts and chains.

**(05 Hours)**

**Unit - V**

Design of clutches and brakes: Single; Multiple; Cone clutches; Internal/external shoe type; Disk type.

**(05 Hours)**

## Unit - VI

Design of flywheels and crane Hook.

(03 Hours)

### Recommended Books:

1. Fundamentals of Machine Elements by B. J. Hamrock; B. Jacobson; S. R. Schmid; McGraw Hill.
2. Machine Design by Joseph E. Shigley Tata McGraw Hill.
3. Design of Machine Elements by V.B. Bhandari; Tata McGraw Hill.
4. Machine Design – Fundamentals and Applications; P. C. Gope; PHI learning Pvt. Ltd.
5. Machine Design by P.C. Sharma & D.K. Aggarwal; Katson.
6. Machine Design by Khurmi & Gupta ; S. Chand.
7. Machine Design by Juvinal; Jhon-Wiley Publications.
8. Machine Design by Spots; Prentice Hall Publications.
9. Machine Design- an integrated approach by R. L. Norton; Pearson Education.
10. Machine Design by Pandaya and Shah; Charotar Publications.
11. Machine Design by R. K. Jain; Khanna Publications.
12. Design Data Book compiled by PSG College of Engg. & Tech; Coimbatore.

### School of Engineering (Mechanical Engineering)- ME 306

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Refrigeration & Air Conditioning	ME 306	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam.
VI	4	3-1-0	3 Hours

## **Unit - I**

**Introduction of Refrigeration:** Introduction to refrigeration system; Methods of refrigeration; Carnot refrigeration cycle; Unit of refrigeration; Refrigeration effect & C.O.P.

**Air Refrigeration cycle:** Open and closed air refrigeration cycles; Reversed Carnot cycle; Bell Coleman or Reversed Joule air refrigeration cycle; Aircraft refrigeration system; Classification of aircraft refrigeration system; Boot strap refrigeration; Regenerative; Reduced ambient; Dry air rated temperature (DART).  
**(08 Hours)**

## **Unit - II**

**Vapor Compression System:** Single stage system; Analysis of vapor compression cycle; Use of T-S and P-H charts; Effect of change in suction and discharge pressures on C.O.P; Effect of sub cooling of condensate & superheating of refrigerant vapor on C.O.P of the cycle; Actual vapor compression refrigeration cycle; Multistage vapor compression system requirement; Removal of flash gas; Intercooling; Different configuration of multistage system; Cascade system.  
**(08 Hours)**

## **Unit - III**

**Vapour Absorption system:** Working Principal of vapour absorption refrigeration system; Comparison between absorption & compression systems; Elementary idea of refrigerant absorbent mixtures; Temperature–concentration diagram & Enthalpy – concentration diagram; Adiabatic mixing of two streams; Ammonia – Water vapor absorption system; Lithium- Bromide water vapor absorption system; Classification of refrigerants; Nomenclature; Desirable properties of refrigerants; Common refrigerants; Secondary refrigerants and CFC free refrigerants; Recent substitute for refrigerants.  
**(08 Hours)**

## **Unit - IV**

**Air Conditioning:** Introduction to air conditioning; Psychometric properties and their definitions; Psychometric chart; Different Psychometric processes; Thermal analysis of human body; Effective temperature and comfort chart; Air conditioning systems and their types; Selection of system; Components and controls of air distribution; Window air conditioners; Split air conditioners; Central air conditioners.  
**(08 Hours)**

## **Unit - V**

**Air-Conditioning Load Calculations:** Cooling and heating load calculations; Selection of inside & outside design conditions; Sources of heating load; Sources of cooling load; Heat transfer through structure; Solar radiation; Electrical applications; Infiltration and ventilation; Heat generation inside conditioned space; Internal heat gain; Sensible heat factor (SHF); By pass factor; Grand Sensible heat factor (GSHF); Apparatus dew point (ADP).

**(06 Hours)**

## **Unit - VI**

**Refrigeration Equipment & Application:** Elementary knowledge of refrigeration & air conditioning equipments e. g. Compressors; Condensers; Evaporators & expansion devices; Air washers; Cooling; Towers & humidifying efficiency; Food preservation; Cold storage; Refrigerates freezers; Ice plant; Water coolers; Elementary knowledge of transmission and distribution of air through ducts and fans; Basic difference between comfort and industrial air conditioning.

**(07 Hours)**

### **Recommended Books:**

1. Refrigeration and Air Conditioning; C. P. Arora; Tata McGraw Hill.
2. Principles of Refrigeration; R. J. Dossat; Prentice Hall.
3. Refrigeration and Air Conditioning; Domkundwar; Dhanpat Rai.
4. Refrigeration and Air Conditioning; Manohar Prasad; New Age International.
5. Refrigeration and Air Conditioning; P.L. Ballany; Khanna Publications.
6. Refrigeration and Air Conditioning. Stoecker & Jones.
7. Air Conditioning System design Handbook; Carrier Corporation; USA.

## **School of Engineering (Mechanical Engineering)- ME 308**

<b>Degree</b>	<b>Course Name</b>	<b>Course Code</b>	<b>Marks:100</b>
Integrated B. Tech. + M. Tech. / M.B.A.	Automobile Engineering	ME 308	SM+MT+ET 25+25+50
<b>Semester</b>	<b>Credits</b>	<b>L-T-P</b>	<b>Exam.</b>
VI	3	3-0-0	3 Hours

### **Unit - I**

**Introduction to Automobiles:** Classification; Components; Requirements of automobile body; Vehicle frame; Separate body & frame; Unitised body; Car body styles; Bus body & commercial vehicle body types; Front engine rear drive & front engine front drive vehicles; Four wheel drive vehicles; Safety considerations; Safety features of latest vehicle; Future trends in automobiles; Clutches; Requirement of clutches – principle of friction clutch – wet type & dry types; Cone clutch; Single plate clutch; Diaphragm spring clutch; Multi plate clutch; Centrifugal clutches; Electromagnetic clutch; Over running clutch; Clutch linkages.

**(08 Hours)**

### **Unit - II**

**Power Transmission:** Requirements of transmission system; General Arrangement of power transmission system; Object of the gear box; Different types of gear boxes; Sliding mesh; Constant mesh; Synchro- mesh gear boxes; Epi-cyclic gear box; Freewheel unit; Overdrive unit; Principle of overdrive; Advantage of overdrive; Transaxle; Transfer cases.

**(07 Hours)**

### **Unit - III**

**Drive Lines, Universal Joint, Differential and Drive Axles:** Effect of driving thrust and torque reactions; Hotchkiss drive; Torque tube drive and radius rods; Propeller shaft; Universal joints; Slip joint; Constant velocity universal joints; Front wheel drive; Principle; Function; Construction & operation of differential; Rear axles; Types of load on rear axles; Full floating; Three quarter floating and semi floating rear axles.

**(07 Hours)**

## **Unit - IV**

**Suspension Systems:** Need of suspension system; Types of suspension; Factors influencing ride comfort; Suspension spring; Constructional details and characteristics of leaf springs.

**Steering System:** Front wheel geometry & wheel alignment viz. Caster; Camber; King pin inclination; Toe-in/Toe-out; Conditions for true rolling motions of wheels during steering; Different types of steering gear boxes; Steering linkages and layout; Power steering; Rack & pinion power steering gear; Electronics steering.

**(08 Hours)**

## **Unit V**

**Automotive Brakes; Tyres & Wheels:** Classification of brakes; Principle and constructional details of drum brakes; Disc brakes; Brake actuating systems; Mechanical; Hydraulic; Pneumatic brakes; Factors affecting brake performance; Power & power assisted brakes; Tyres of wheels; Types of tyre & their constructional details; Wheel balancing; Tyre rotation; Types of tyre wear & their causes.

**(07 Hours)**

## **Unit - VI**

**Emission Control System & Automotive Electrical:** Sources of atmospheric pollution from the automobile; Emission control systems – Construction and operation of positive crank case ventilation (PVC) systems; Evaporative emission control; Heated air intake system; Exhaust gas recirculation (ECR) systems; Air injection system and catalytic converters; Purpose construction & operation of lead acid battery; Capacity rating & maintenance of batteries; Purpose and operation of charging systems; Purpose and operations of the starting system; Vehicle lighting system.

**(08 Hours)**

### **Recommended Books:**

1. Automobile Engineering by Anil Chhikara; Satya Prakashan; New Delhi.
2. Automobile Engineering by Dr. Kirpal Singh; Standard Publishers Distributors.
3. Automotive Mechanics Crouse; Anglin; Tata McGraw Hill; New Delhi.
4. Automotive Technology; H.M. Sethi; Tata McGraw Hill; New Delhi.
5. Automotive Mechanics; S. Srinivasan; Tata McGraw Hill; New Delhi.
6. Automotive Mechanics; Joseph Heitner; East West Press.



7. Motor Automotive Technology by Anthony E. Schwaller; Delmer Publishers; Inc.
8. The Motor Vehicle – Newton steeds Garrett; Butter Worths.

### **School of Engineering (Mechanical Engineering)- ME 310**

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Industrial Engineering	ME 310	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam.
VI	4	3-1-0	3 Hours

#### **Unit - I**

**Introduction:** History and development of industrial engineering; Role of industrial engineering in an organization; Production and productivity; Productivity measures; Productivity measurement models; Productivity improvement techniques; Types of production system. **(05 Hours)**

#### **Unit - II**

**Work Study and Motion Study:** Importance of work study; Concept of work content; Techniques of work measurement; Performance rating; Computation of standard time; Work sampling; Scope of method study; Steps involved in method study; Micro motion study; Memo motion study; Principles of motion economy. **(10 Hours)**

#### **Unit - III**

**Plant Location; Layout and Material Handling:** Importance of location; Location factors; Quantitative methods for evaluation of plant location; Plant layout factors; Types of manufacturing system; Types of layout; Material flow patterns; Elements of material handling; Principles of material handling; Selection of material handling equipment; Types of material handling equipments. **(10 Hours)**

#### **Unit - IV**

**Inventory Planning and Control:** Types of inventories; Inventory costs; Inventory models; safety stock; Inventory cost relationships. **(07 Hours)**

#### **Unit - V**

**Human Factor Engineering:** Objectives of human engineering; Human engineering areas; Man – machine systems; Anthropometry; Workplace design. **(07 Hours)**

#### **Unit - VI**

**Job Evaluation; Wages and Incentives:** Objectives of job evaluation; Procedure for job evaluation; Job analysis; Job description; Job evaluating systems and merit ratings; Rational wage policy; Types of wage payments; Incentive schemes; Incentive plans. **(06 Hours)**

#### **Recommended Book:**

1. Industrial Engineering and Production Management by Martand Telsang; S. Chand.
2. Industrial Engineering. & Management by O.P. Khanna; Dhanpat Rai and Sons
3. Modern production operations Management-Buffa E.S. Wiley Eastern