



**INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDHALAYA**

(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)

**DEPARTMENT OF MECHANICAL ENGINEERING
STUDY & EVALUATION SCHEME**

W.E.F. SESSION 2011-2012

**Year: B.Tech. III Year
SEMESTER: VI**

S No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			Credits
			L	T	P	INTERNAL ASSESSMENT*	ESE	TOTAL	
(THEORY)									
1.	ME- 361	Dynamics of Machines	3	1	-	40	60	100	4
2.	ME- 362	Machine Design-II	3	1	-	40	60	100	4
3.	ME- 363	Heat & Mass Transfer	3	1	-	40	60	100	4
4.	ME- 364	Manufacturing Science-II	4	-	-	40	60	100	4
5.	ME -365	Measurement Metrology and Control	4	-	-	40	60	100	4
Total			17	3		200	300	500	20

(PRACATICALS)									
6.	ME- 366	Dynamics of Machines Lab	-	-	5	45	30	75	3
7.	ME- 367	Heat & Mass Transfer Lab	-	-	5	45	30	75	3
Total					10	90	60	150	26

Total Credits: 26

Total Contact Hour: 30

Total Marks: 650

***INTERNAL ASSESSMENT-(MSE- Mid Semester Examination of 20 Marks, Two Class Test/Assignment/Quizzes/Group Discussion etc.)
L-LECTURE, T-TUTORIAL, P-PRACTICAL,CT-CLASS TEST, E.S.E –END SEMESTER EXAMINATION.**

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-VI Sem	ME-361	Dynamics of Machines	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-361 Dynamics of Machines

UNIT – I Analysis in plane mechanism: Motion of rigid body subjected to a system of forces, stresses in moving member, dynamic motion analysis, force analysis of a three-bar crank-slide linkage, force analysis of four-bar linkage, force analysis of a slider-crank linkage, force analysis of the inverted slider crank.

UNIT – II Inertia force analysis: Effective force and inertia force of a link, D'Alembert's principle and dynamic equilibrium, equivalent offset inertia force, velocity and acceleration of piston, inertia forces in reciprocating engine, engine force analysis, inertia of connecting rod, turning moment diagram for single and multi-cylinder I.C. Engine, Co-efficient of fluctuation of speed, Co-efficient of fluctuation of energy.

UNIT – III Gyroscope: Gyroscopic forces and couple (Torque), Angular velocity and acceleration of gyroscope, gyroscopic effect on naval ships, gyroscopic effect on airplane and vehicle moving on curved path.

UNIT – IV Balancing: Static and dynamic balancing, balancing of rotating masses and balancing of reciprocating masses, balancing of locomotives, effect of partial balancing in locomotive balancing of I.C. Engine, balancing of IN-line engine, balancing of V-engine, balancing of radial engine, forward and reverse crank method, balancing of rotors.

UNIT – V Vibration: Types of vibration, degree of freedom, free longitudinal vibration, inertia effect of mass spring, damped vibration, logarithmic decrement, forced vibration magnification factor, vibration isolation and transmissibility, whirling of shaft in torsional vibration, free torsional vibration in single rotor.

Text Books:

1. Theory of machine-S.S.Ratan-TMH.
2. Theory of machine-J.E.Shingley-McGraw Hill
3. Theory of mechanisms and machines-A.Ghosh, A.K. Mallik-EWP Press
4. The Theory of machines. –Thomas Bevan-CBS Publisher
5. 'Mechanisms' and machines Theory-J.S.Rao., R.V. Dukkupati-Wiley Eastern Limited

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-VI Sem	ME-362	Machine Design-II	3	1	-	4	Max Marks-60 Min Marks- Duration-4Hrs

ME-362 Machine Design-II

UNIT-I Spring

Spring materials and their mechanical properties, equation for stress and deflection, helical coil springs of circular section for tension, compression and torsion, dynamic loading, fatigue loading, wahl line, leaf spring and laminated spring.

UNIT-II Gears

Spur Gears

Gear drives, classification of gears, selection of types of gears, law of gearing, force analysis, gear tooth failures, selection of material, no of teeth, face width, beam strength of gear tooth, effective load on gear tooth, estimation of module based on wear strength, Lewis equation, gear design for maximum power transmitting capacity, gear lubrication.

UNIT-III Helical Gears

Helical gears, terminology of helical gears, virtual no of teeth, tooth proportions, force analysis, beam strength of helical gear, effective load on gear tooth, wear strength of helical gear,

Bevel Gears: Bevel gears, terminology of bevel gears, force analysis, beam strength of bevel gear, wear strength of bevel gears, effective load on gear tooth,

UNIT-IV Bearing

Rolling Contact Bearing: Types of ball and roller bearings, selection of rolling element bearing for radial and axial load, bearing life, mounting and lubrication, soft scales-contact type and clearance type, load life relationship, load factor.

Journal Bearings:Types of lubrication, viscosity, hydrodynamics theory of lubrication, Sommerfield number, heat balance, self-contained bearings, bearing materials.

UNIT-V Clutches and Brakes

Friction clutches, friction materials, torque transmitting capacity, single and multiple plate clutches, centrifugal clutches. Band and block brakes.

Belt Drive:

Flat and V-belts, belt construction, geometrical relationship for length of the belt, analysis of belt tensions, condition for maximum power, selection of flat and V-belt, adjustment of belt tensions.

Text Books:

1. Design of machine elements from V.B. Bhandari, TMH publications
2. Machine design by Shigley-McGraw Hill Pub.
3. Machine design by Movbnin-MIR publication

4. Machine design by Sharma & Agrawal-Kaston Pub.
5. Principles of mechanical design by R.Phelan- McGraw Hill Pub.
6. Machine design by Suderraj Murthey-Khanna Pub.
7. Machine design, Theory & Practice by Michels Walter J, Wilson Charles E. & Add Macmillan Pub., New York.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-VI Sem	ME-363	HEAT AND MASS TRANSFER	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-363 HEAT AND MASS TRANSFER

Unit-I

Introduction

Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzmann's law, combined modes of heat transfer, thermal transfer, thermal diffusivity, overall heat transfer coefficient.

Conduction

The thermal conductivity of solids, liquids and gases, factors influencing conductivity measurement. The general differential equation of conduction, one dimensional steady state conduction, linear heat flow through a plane and composite wall, tube and sphere critical thickness of insulation, effect of variable thermal conductivity, conduction with heat generation in flat and cylinders.

Unit-II

Fins

Conduction convection system, extended surfaces rectangular, triangular circumferential and pin fins. general conduction analysis, fins of uniform and non-uniform cross section area. Heat dissipated by a fin. Effectiveness and efficiency of fin. Approximate solution. Design a fin for maximum heat transfer. Solution for different boundary conditions. Use of fins analysis for measuring temperature error of thermometer.

Transient/ unsteady state heat conduction

Introduction to unsteady state heating and cooling, system with negligible internal resistance, lumped capacity method and its validity. Unsteady state conduction through finite and semi-infinite slab without surface resistance, convection boundary conditions. Solution through Heisler's chart.

Unit-III

Forced Convection

Physical mechanics of forced convection. Dimensional analysis for forced convection, velocity and thermal boundary layer, flow over plates, flow across cylinders and spheres, flow in tubes, Reynolds's analogy.

Natural Convection

Physical mechanism of natural convection, Dimensional analysis of natural convection, empirical relationship for natural convection.

Unit-IV

Boiling and Condensation

Boiling heat transfer, pool boiling, boiling regimes and boiling curve, nucleate transfer, correlations in pool boiling. Condensation heat transfer, film condensation, derivation for the average heat transfer coefficient 'h' for the case of laminar film condensation over vertical.

Heat Exchangers

Different type of heat exchanger. Determination of heat exchanger performance, heat exchanger transfer unit, analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method).

Unit-V

Thermal Radiation

Introduction, absorption and reflection of radiant energy, emission, radiosity and irradiation, black and non black bodies, Kirchhoff's law; intensity of radiation, radiation exchange between black surface, geometric configuration factors. Grey body relation exchange between surface of unit configuration factors.

Introduction to mass Transfer

Mass and mole concentrations, molecular diffusion, eddy diffusion, molecular diffusion from an evaporating fluid surface, introduction to mass transfer in laminar and turbulent convection combined heat and mass transfer.

Recommended Books:

1. Heat transfer-S.P. Sukhatme-TMH
2. Heat & Mass Transfer-Arora and Domkundwar-Dhanpat Rai
3. Heat Transfer-C P Arora, TMH
4. Heat & Mass Transfer-R.C. Sachdeva-New Age
5. Heat Transfer-J.P. Holman-TMH
6. Heat Transfer-A Practical Approach- Yunus A. Cengel-McGraw Hill

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-VI Sem	ME-364	Manufacturing Science-II	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-364 Manufacturing Science-II

Unit-I

General purpose machine tools

Constructional details of lathe, drilling, milling, shaping, planning machines. Tooling, attachment and operation performed, selection of cutting parameters, calculation of forces and time for machining. Broaching operation. Capston and turret lathes, single and multiple spindle automates, operation planning and tool layout.

Jigs and Fixtures

Degree of freedom, principles of location and clamping, locating, clamping and indexing devices, principles of design, design of simple jigs and fixtures.

Unit-II

Mechanics of metal cutting

Classification of metal removal process and machines, geometry of single point cutting tool and tool angles. Tool nomenclature in ASA, ORS & NRS and interrelationship. Mechanism of chip formation and types of chips, chip breakers. Orthogonal and oblique cutting. Cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface temperature. Friction in metal cutting.

Unit-III

Machinability-Concept & evaluation of Machinability, tool life and mechanisms of tool failure, cutting parameter, Machinability index, factors effecting Machinability.

Cutting Fluids-Types, selection and application methods.

Cutting tool material-Requirement of tool material, classification of tool material and their properties.

Unit-IV Grinding Processes & Gear Cutting:

Abrasives: natural and synthetic, manufacturing nomenclature, Selection of grinding wheels, wheel mounting and dressing, surface and cylindrical grinding, their constructional detail and processes.

Principle of gear generation, gear cutting by milling machines, gear shaping and gear hobbing machines processes.

Unit-V Non Conventional Machining:

Mechanism of material removal, tooling and equipment, process parameter, surface finishing obtained by EDM, LBM, EBM, ECM, USM, AJM processes, benefits, generation application and survey of non-conventional machining process.

Text Books:

1. Manufacturing technology(Vol.-I & II)P.N. Rao-TMH
2. Manufacturing Engg. And technology-S. Kalpakjian & S.R. Schmis-Addision Wesley, Longman, New Delhi
3. Manufacturing science-A. Ghosh & A.K. Mallik-East West Press PVt. Ltd., New Delhi
4. Manufacturing Engg. And Technology- Degamo-PHI
5. Manufacturing Science-II by Sen & Bhattcharya

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-VI Sem	ME-365	Measurement, Metrology and Control	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-365 Measurement, Metrology and Control**Unit-I**

Introduction to measurement and measuring instruments, generalized measuring systems and functional element, static and dynamic performance characteristics of measurement devices, calibration, concept of error, source of error, analysis of error.

Transducers:Types of transducers' and their characteristics, measurement of strain, strain gauges and their working, gauges factor, strain gas circuit, strain rosettes

Unit-II

Measurement of pressure, pressure measuring transducers, elastic diaphragms, measurement of vacuum and low pressure, various low pressure gauges.

Measurement of fluid flow: various method of flow measurement and device.

Temperature measurement: Bi-metallic thermometers, thermocouples, thermisters and pyrometers.

Unit-III

Metrology: standard of linear measurement, line and end standards system of limit and fits, limit gauges and their design, measurement of geometric forms like straightness, flatness, roundness and circularity, measurement of surface textures quantitative evaluation of surface roughness and its measurement.

Introduction of CMM, its working and application

Unit-IV

Interferometry: principles and uses of interferometry, types of interferometers

Comparators: classification, working principle and magnification range of mechanical, electrical, optical, electronic, pneumatic comparators.

Measurement of screw threads & gears, two wire and there wire method.

Unit-V

Process control system components & block diagram representation, transfer functions of control system & physical system, open loop & closed loop control system, automatic controllers and their classification, working , objective, benefits and laws of control system.

Text Books:

1. Bechwith and buch-Mechanical Measurement
2. Raven-H-Automatic control Engg.
3. Donal P Eckman-Automatic Process Control
4. Nakra & Choudhary- Instrumentation Measurement & Analysis
5. Nakra BC-theory & Application of Automatic Controls
6. Experimental Methods for Engineers –J.P.Holman
7. Mechanical Measurement- Dally & Riley