



**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: V

S No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			Credits
			L	T	P	INTERNAL ASSESSMENT*	ESE	TOTAL	
(THEORY)									
1.	ME- 351	Machine Design-I	3	1	-	40	60	100	4
2.	ME- 352	Mechanics of Solid-II	3	1	-	40	60	100	4
3.	ME- 353	Industrial Engineering	3	1	-	40	60	100	4
4.	ME- 354	Internal Combustion Engine	3	1	-	40	60	100	4
5.	ME -355	Fluid Machinery	3	1	-	40	60	100	4
Total			15	5		200	300	500	20

(PRACATICALS)									
6.	ME- 356	Fluid Machinery Lab	-	-	3	30	20	50	2
7.	ME- 357	Internal Combustion Engine Lab	-	-	3	30	20	50	2
8.	ME- 358	Seminar	-	-	3	50	-	50	2
Total					9	110	40	150	26

Total Credits: 26

Total Contact Hour: 29

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-V Sem	ME-351	Machine Design-I	3	1	-	4	Max Marks-60 Min Marks- Duration-4Hrs

ME-351 Machine Design-I

Unit-I

Steady stresses and variable stresses in machine member-introduction to the design process factors influencing machine design, selection of material based on mechanical properties ,direct, bending and torsional stress equation ,impact and shock loading ,calculation of principle stresses for various load combination ,eccentric loading ,design of curved beams ,crane hook and 'c' frame ,factor of safety ,theories of failure ,stress concentration, fatigue design for variable loading ,solderberg ,Goodman and Gerber relations.

Unit-II

Riveted joints – failure of riveted joint, strength and efficiency of riveted joint. Design of butt and lap joint for a boiler ,eccentrically loaded riveted joint.

Design of thread joints, bolted joint in tension, torque requirement for bolt tightening ,bolted joint under fluctuating load. Eccentrically loaded joint in shear ,bolted joint with combined stresses.

Unit-III

Design of cotter and knuckle joints, socket and spigot cotter joint, sleeve and cotter joint Gib and cotter joint, design of knuckle joints.

Welded joints- stresses in butt and fillet welds, strength of welded joints ,eccentrically loaded joint, welding joint subjected to Bending moment.

Unit-IV

Design of Keys and coupling, flat and square keys, woodruff keys, splines, muff coupling, compression coupling, flange coupling, flexible coupling.

Unit-V Design of shafts: subjected to twisting moment, bending moment, combined twisting moment and bending moment, fluctuating loads, design of shaft on the basis of rigidity.

Text Books:

1. Machine Design-Bhandari, TMH
2. Machine Design:Spott, TMH
3. Machine Design: J.Shigley, TMH
4. Machine Design: Khurmi & Gupta, Khanna Pub.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-V Sem	ME-352	MECHANICS OF SOLID-II	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-352 MECHANICS OF SOLID-II

UNIT-I Three dimensional analysis of stress and strain;

State of stress at a point, stress matrix, stress invariants and stress transformation, principal stress and principal planes, three dimensional Mohr's stress circle, Equilibrium equations, stresses on octahedral planes.

Three dimensional strains at a point, strain matrix, principal strain, strain invariants and associated planes, strain transformation, physical interpretation of normal and shear strain, compatibility equations & their interpretation.

UNIT-II Flexural Loading

Unsymmetrical bending, bending of curved bars, shear centre and stress in Thin-Walled open sections.

UNIT-III Axisymmetric Problems

Thick cylinders under internal and external pressure, compound cylinders (shrink fit), rotating disc and cylinders of uniform and variable thickness, thin spherical shells.

UNIT-IV Torsion:

Torsion of non-circular members, General Prismatic bar, rectangular bars and thin walled sections, membrane analogy, Torsion of hollow sections, plastic yielding of circular shafts. Open coiled helical spring.

UNIT-V Energy Methods:

Energy methods: Strain energy expression, strain energy under axial loading, under bending & torsional loading, Maxwell Betti's Reciprocal theorem, Castigliano's theorem and its applications.

Displacement methods; force methods, impact loading, open coiled helical spring.

Text Books :

- Boresi, A.P., and Sidebottom, O.M., "Advance Mechanics of Materials". John Willey and sons, 1985.
- Srinath, L.S., "Advanced Mechanics of Materials", 1952.
- Seeley, F.B. and Smith, J.O., "Advanced Mechanics of Materials", 1952.

- “Mechanics of solid” by Grandall-Dahl, Lardner, TMGH.
- “Strength of material” by Rattan 2/E McGraw Hill
- “Mechanics of solid” by popov, PHI.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-V Sem	ME-353	INDUSTRIAL ENGINEERING	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-353 INDUSTRIAL ENGINEERING

Unit-I Introduction

History & Development of industrial engineering. Productivity definition; means of increasing productivity; work study definition; productivity and work study; work of F.W. Taylor; Frank and Lillian Gilberth and their contribution .

Unit-II Method Study

Definition & basic procedure, selection of jobs, recording technique; micro motion, study; Therbligs; cyclograph and Chronocyclo-graph; principle of motion economy: design of work place layout; analysis in the form of chart; operation chart; flow process chart; flow diagram; string diagram; man machine chart; two hand chart; Simo chart.

Unit-III Work Measurement

Definition, objectives, application, number of cycle to be timed, time study equipment, performance rating; allowances; number of cycle to be studied; determination of standard time; predetermined motion time systems. Conducting work sampling study & establishing standard time.

Unit-IV Wages & Incentives

Characteristics of a good wage or incentive system, method of wage payment. Concept of wage incentive schemes; financial and non financial; Taylor differential piece rate, Halsey premium plane; Merric’s multiple piece rate system.

Ergonomics, work space dimension, design of work place, environmental stresses & impacts on human work.

Unit-V Job Evaluation & Merit Rating

Job Evaluation: Job description, Job specification, objectives & methods of job evaluation quantitative and qualitative techniques of job evaluation.

Merit Rating: Steps, objectives & methods of merit rating-quantitative and qualitative techniques of Merit Rating

Value Engg: concept of value, value analysis approaches, job plan, value tests.

Text Books:

1. ILO, “ Introduction to work study”, Universal publishing corporation, Bobbay, 1986
2. Mundel, “Motion and time study”, Prentices Hall India, 1995
3. Ralph M. Barnes, “Motion and Time Study”, Johan wiley and sons, 1990

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-V Sem	ME-354	INTERNAL COMBUSTON ENGINES	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-354 INTERNAL COMBUSTON ENGINES

Unit-I

Introduction of internal combustion engines, classification of I.C. engines, engines components, basic engine nomenclature, four stroke S.I. and C.I. engine, two stroke engines, comparison of two stroke and four stroke engines, comparison of S.I. and C.I. engines, application of IC engines.

Air Standard Cycle: Otto cycle, diesel cycle, dual cycle, comparison between otto, diesel and dual cycles, fuel-air cycles and actual-cycles, effect of variable specific heats and dissociation on indicator diagram.

Unit-II Combustion in S.I. Engines: Flame development and its propagation, ignition lag, effect of engine mparameters on ignition delay, preignition, knocking in S.I. engines, variables affecting knock, combustion chambers.

Carburetor: Principle of carburetion, elements of carburetor, parameters affecting carburetion, air-fuel

mixtures, expression for air-fuel ratio.

Fuel ignition system: Battery and coil ignition system, magneto ignition system, firing order, spark advancing.

Unit-III Combustion in C.I. Engines

Combustion phenomenon in C.I. engines, p - θ diagram and their study for various stage of combustion, delay period, detonation in C.I. engines, parameters affecting detonation.

Conventional & Alternative Fuels: CNG, Biodiesel, Hydrogen.

Fuel Injection System

Air and solid injection, fuel pump and injectors.

Unit-IV Engine Friction and Lubrication:

total engine friction, blow by losses, pumping loss, factors effecting engine friction, mechanism of lubrication, lubrication system

Cooling system: Piston and cylinder temperature distribution, parameters affecting engine heat transfer, principles and various methods of cooling.

Two Stroke Engine: Constructional details, scavenging parameters, models and performance of scavenging system, advantages and disadvantages of two stroke engines.

Unit-V Supercharging in I.C. engines

Effect of altitude on output, types of supercharger

Testing and Performance of Engines

Engine indicator, measure of air and fuel supply, frictional losses, mechanical and thermal efficiencies, engines losses and heat balance.

Text Books:

1. Internal Combustion Engine by V. Ganeshan, TMGH
2. Internal Combustion Engine by Sharma & Mathur, Dhanpat Rai
3. Internal Combustion Engine & air pollution by R. Yadav, CPH
4. Fundamental of Internal Combustion Engine (PHI), HN Gupta

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Mechanical Engg. B. TECH-V Sem	ME-355	FLUID MACHINERY	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ME-355 FLUID MACHINERY

Unit-I Boundary Layer Theory: Boundary layer definition & characteristics, momentum equation, laminar and turbulent boundary layer, total drag, separation and control

Flow around submerge bodies: Force exerted by flowing on a body: drag and lift; stream lined and bluff body, drag on sphere and cylinder, circulation and lift on circular cylinder, lift of an air foil.

Unit-II Impact of Free Jets: Impulse momentum principle, force exerted by the jet on stationary flat and curve plate, hinged plate, moving plate and moving curve vanes, jet propulsion of ship.

Impulse Turbine: Classification of turbine, impulse turbine, pelton wheel, construction working, work done, head efficiency and design aspects, governing of impulse turbine.

Unit-III Reaction Turbine

Radial flow reaction turbine, Francis turbine: construction, working work done, efficiency, design aspect, advantages and disadvantages over pelton wheel.

Axial floe reaction turbine: Propeller and Kaplan turbine, bulb or tubular turbine, draft tube, specific speed, unit quantities, cavitation, degree of reaction, performance characteristics, surge tanks, governing of reaction turbine.

Unit-IV Centrifugal Pumps

Classification of pumps, centrifugal pump, construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel, specific speed, characteristic, net positive suction head, cavitation.

Unit-V Reciprocating Pumps: Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, air vessels.

Fluid System:Hydraulic accumulator, Hydraulic intensifier, Hydraulic press, Hydraulic crane, hydraulic lift, Hydraulic ram, Hydraulic coupling, Hydraulic torque converter, air lift pump, jet pump, Positive Displacement, machine gear pump.

Text Books:

1. Mechanics of Fluid-Massey B.S.-English language books society(U.K.)
2. Introduction to fluid mechanics and fluid machines-S.K. Som & G. Biswas-TMGH
3. “Fluid Mechanics & Machinery” by Agrawal, TMGH
4. “Fluid Mechanics & Machinery” by Kothandraman & Rudra Mounthy, New Age Publication