GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of (Mechanical Engineering).

Scheme for B. Tech. (Mechanical Engineering)

SEM V														
Course Code	**Name of the Course**	**Group**	**Teaching Scheme Hrs /week**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	**TUT**	**PR**	**Total**	**ISA**	**ISE1**	**ISE2**	**ESE**	**ICA**	**ESE**		
ME301	Machine Design –I	D	3		---	3	10	15	15	60	---	---	100	3
ME302	Theory of Machines-II	D	3	---	---	3	10	15	15	60	---	---	100	3
ME303	Industrial Engineering and Management	C	3	---	---	3	10	15	15	60	---	---	100	3
ME304	Material Science and Engineering Metallurgy	D	3	---	---	3	10	15	15	60	---	---	100	3
ME305	Heat Transfer	D	3	---	---	3	10	15	15	60	---	---	100	3
ME306	Mechanical Measurements	D	1	---	2	3	---	---	---	---	50	---	50	2
ME307	Machine Design –I Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME308	Theory of Machines –II Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME309	Material Science and Engineering Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME310	Heat Transfer Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME311	Self Study - I	D	---	---	----	---	---	---	---	---	---	---	50**	2
	Total		**16**		**10**	**26**	**50**	**75**	**75**	**300**	**150**	**100**	**800**	**23**

SEM VI														
Course Code	**Name of the Course**	**Group**	**Teaching Scheme Hrs /week**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	**TUT**	**PR**	**Total**	**ISA**	**ISE1**	**ISE2**	**ESE**	**ICA**	**ESE**		
ME351	Internal Combustion Engines	D	3	--	---	3	10	15	15	60	---	---	100	3
ME352	Metrology and Quality control	D	3	---	---	3	10	15	15	60	---	---	100	3
ME353	Turbo Machinery	D	3	---	---	3	10	15	15	60	---	---	100	3
ME354	Machine Design –II	D	3	---	---	3	10	15	15	60	---	---	100	3
ME355	Numerical Analysis and Computational Methods	B	3	---	---	3	10	15	15	60	---	---	100	3
ME356	Internal Combustion Engines Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME357	Metrology and Quality Control Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME358	Turbo Machinery Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME359	Machine Design -II Lab	D	---	---	2	2					25	25	50	1
ME360	Mini Project	D	----	----	4	4	---	----	---	----	50	---	50	2
ME361	Self Study - II	D	---	---	----	---	---	---	---	---	---	---	50**	2
ME362	Industrial Lectures*	D	1	---	----	1	---	---	---	---	---	---	---	---
	Total		**16**	**---**	**12**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**800**	**23**

* In the course Industrial Lectures, at least 12 lectures from industrial expert should be arranged and continuously assessed (06 lectures in VIth and VI th semester each).

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of (Mechanical Engineering).

Scheme for B. Tech. (Mechanical Engineering)

SEM V

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
ME301	Machine Design –I	D	3		---	3	10	15	15	60	---	---	100	3
ME302	Theory of Machines-II	D	3	---	---	3	10	15	15	60	---	---	100	3
ME303	Industrial Engineering and Management	C	3	---	---	3	10	15	15	60	---	---	100	3
ME304	Material Science and Engineering Metallurgy	D	3	---	---	3	10	15	15	60	---	---	100	3
ME305	Heat Transfer	D	3	---	---	3	10	15	15	60	---	---	100	3
ME306	Mechanical Measurements	D	1	---	2	3	---	---	---	---	50	---	50	2
ME307	Machine Design – I Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME308	Theory of Machines –II Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME309	Material Science and Engineering Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME310	Heat Transfer Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME311	Self Study - I	D	---	---	----	---	---	---	---	---	---	---	50**	2
		Total	**16**		**10**	**26**	**50**	**75**	**75**	**300**	**150**	**100**	**800**	**23**

ME 301 MACHINE DESIGN - I

Teaching Scheme: 03L**, Total:** 03 **Credit :** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks :** 100
Duration of ESE: 04 Hrs.

COURSE DESCRIPTION:

This course introduces undergraduate students to different parts of machines, failure criteria and conventional design procedures.

DESIRABLE AWARENESS/SKILLS:

A sound knowledge of Mathematics, Engineering Mechanics, SOM, TOM and Machine Drawing are required.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:

1. to understand procedure of machine design and develop an ability to apply it for simple component design.
2. to understand the different theories of failure and develop an ability to apply its knowledge for design of mechanical component and determine the resisting areas against failure
3. to determine forces on transmission shaft and design of transmission shaft
4. to determine the endurance strength and design of components subjected to fluctuating loads
5. to determine the forces in welds , riveted joints and formulate design solution for size of weld and size of rivet
6. to determine forces on power screw and bolted joints and formulate design solution for size of power screw and size of bolt.
7. to determine the forces on springs and flywheels.

COURSE OUTCOMES:

On completion of this course student should be able to:

1. analyze the stresses and strains induced in a machine element.
2. design different components as keys, cotters, couplings and joints including riveted, bolted and welded joints and energy storing and releasing devices.
3. understand component behavior subjected to loads and identify the failure criteria.
4. design a machine component using theories of failure.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	1	2
PO-b	2	3	2	2
PO-g	3	3	3	2
PO-h	3	3	3	3
PO-j	3	3	3	3
PO-l	2	3	2	3
PO-m	2	3	2	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Basic and Design of Simple Machine Elements

Introduction of machine design, basic steps of machine design, technical design aspect of designing, requisites of design engineer, design of machine elements, sources of design data, use of standards in design, selection of preferred sizes, simple Stress, thermal Stresses, impact stress, torsional stress, poisson's ratio, volumetric strain, young's modulus, maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, maximum strain energy theory, maximum distortion energy theory . Stress concentration – causes & remedies. Design of simple machine components– knuckle joint & cotter joint, turn-buckle joints (Numerical on all theories of failure and design of simple machine components)

Design of Shaft Keys and Coupling

Shafts:-Material, design on the basis of strength considering shaft subjected to, twisting moment only, bending moment only, combine twisting and bending moment, axial load in addition to twisting and bending. Design on the basis of rigidity. A.S.M.E. code for shaft design, keys:- classification of keys, design considerations in parallel and tapered sunk keys, design of square, flat and kennedy keys, splines. Couplings:- Design considerations, classification, design of rigid, muff coupling, flange coupling and flexible bushed pin coupling.

Design of Joints and Fasteners

Riveted Joint: Riveted joints for boilers, structural works (uniform strength joint) and eccentric loaded joint. Threaded Joints:- Different forms of threads, bolts of uniform strength, locking devices, I.S.O. metric screw threads, stresses in threaded joint, eccentrically loaded bolted joint, torque requirement for bolt tightening design of power screw jack. Welded Joints: - Types of welding and joints, strength of transverse and parallel fillet welded section, axially loaded unsymmetrical welded section, eccentrically loaded joint.

Design of Elastic member and Energy storing device

Spring:- Types, applications and materials of springs, stress and deflection equations for helical springs, style of ends, Wahl's stress factor, design of helical compression and tension springs, springs in series and parallel, concentric helical springs, leaf spring, shot peening, flywheel: function and material, torque analysis, coefficients of fluctuation of energy, solid disk flywheel, rimmed disk flywheel, stresses in flywheel rim.

Design of Dynamic loading

Design for fluctuating Loads: stress concentration - causes and remedies, fluctuating stresses, fatigue failure, endurance limit, notch sensitivity, reversed stresses, Solderberg and Goodman diagrams, fatigue design of components under combined stresses such as shafts, bolts and springs. Statistical consideration in design: - Design and natural tolerances –Design for assembly- statistical analysis of tolerances – mechanical reliability and factor of safety.

Text Book:

1. Mechanical Engineering Design, Shigley J.E. and Mischke C.R., 8th edition, 2008, Tata McGraw Hill Publication Co. Ltd.
2. Design of Machine Elements, Spotts M.F. and Shoup T.E., 7th edition, 1998, Prentice Hall International.

Reference Book:

1. Design of Machine Elements, Bhandari V.B., 3rd edition, 2010, Tata McGraw Hill Publication Co. Ltd.
2. Machine Components Design, Willium C. Orthwein, 2006, West Publishing Co. and Jaico Publications House.
3. Design Data, P.S.G. College of Technology, Coimbatore.
4. Fundamentals of Machine Components Design, Juvinal R.C., 3rd edition, 2003, John Wiley and Sons.
5. Theory and Problems of Machine Design, Hall A.S., Holowenko A.R. and Laughlin H.G, 1930, Schaum's Outline Series.
6. Mechanical Analysis and Design, A. H. Burr and J. B. Cheatham, 4th edition, 1985, Prentice Hall.

ME 302- THEORY OF MACHINE –II

Teaching Scheme : 03L, Total: 03 **Credit:** 03
Education Scheme: 15 ISE1 + 15 ISE 2 + 10 ISA + 60 ESE **Total Marks:** 100
Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Theory of Machines. Course includes design of cam follower, working of brakes & dynamometer, principles of governor & flywheel. Various methods of balancing of masses, one unit on gears &vibration cover the necessary details for engines & machineries.

DESIRABLE AWARENESS/SKILLS:

Engineering mechanics, Dynamics

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:
1) understand & Develop Concept of design Cam profile.
2) determine the forces and power calculations for brakes & Dynamometer.
3) understand the principles of Governor & flywheel.
4) determine the balancing of rotating masses & reciprocating masses.
5) understand the principles of gears & vibrations.

COURSE OUTCOMES:

On completion of this course student should be able to:
1) apply the fundamental Concept of Cams & follower for various mechanisms.
2) understand the principles of Brakes & Dynamometer.
3) understand the principles of Governor & flywheel for engines.
4) apply the principles of balancing of masses to various links, mechanisms & engines.
5) understand the principles of Gears & vibrations for various transport vehicles & Machineries.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-b	3	3	3	3	3
PO-h	3	3	2	3	1
PO-j	1	1	2	2	---

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Cams and Followers:

Types of cams and followers, types of follower motion, SHM, uniform velocity, acceleration and retardation, cycloidal. Displacement, velocity and acceleration diagrams. Cams with specified contours.

Brakes and Dynamometers:

Introduction, brake materials, types of brake, shoe brake, pivoted shoe brake, double block brake, Simple band brake, differential block brake, band and block brake, Tangential braking force, Braking torque, internal expanding brake. Types of dynamometer, rope brake, epicylic train, belt transmission, torsion and eddy current dynamometer.

Governor & Flywheel:

Introduction, types of governor sensitiveness of governor, hunting of governor, controlling force, stability, isochronism, power of governor, effort of governor. Turning moment diagram for single cylinder, double acting Steam engine, 4-Stroke cycle I.C.engine, multicylinder engine, fluctuation of energy, energy stored in flywheel.

Balancing and Vibration

Static and dynamic balancing, balancing of revolving several masses on several planes. Balancing of reciprocating masses in single and multi-cylinder engines, balancing of radial engines, direct and reverse crank method. Introduction to vibration causes and effect of vibration, Types of Vibration, Terms used in vibration, Basic features of vibrating system, Critical or whirling speed of shaft.

Gears

Introduction, classification of gears, terms used in gears, materials of gears. Cycloidal &involutes teeth, law of gearing. Interference in involutes teeth, and gear trains

Text Books:

1. Theory of Machines, S.S.Rattan, 3rd edition, 2009, Tata McGraw Hill, New Delhi.
2. Theory of Mechanisms & machines, Ballaney, 21st edition, 2003, Khanna publication.
3. Theory of Machines by Dr. R.K. Bansal, 5th edition, 2015, Laxmi Publications (P) Ltd.
4. Theory of Machines by Sadhu Singh, 3rd edition, 2012, Pearson Publication.

Reference Books:

1. Theory of Machines and Mechanisms, Shigley, J.E. and Uicker, J.J. 4th Edition, 2010, Mc GrawHill International Book co.
2. Mechanisms and Machines theory, Rao J.S and Dukkipati R.V. 2nd edition, 2014, Wiley Eastern Ltd.
3. Theory of Mechanisms and Machines, Amitabh Ghosh and Ashok Kumar Malik, 2nd edition, 2000, East West Press Pvt. Ltd., New Delhi.

ME 303 - INDUSTRIAL ENGINEERING AND MANAGEMENT

Teaching Scheme: 03 L, Total = 03 Hrs **Credits:** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total Marks:** 100
Duration of ESE: 03 hrs.

COURSE DESCRIPTION:

The course is intended to:

1. Build up necessary background for understanding the Industrial knowledge.
2. Understand the applications of knowledge and correlation of various departments.
3. Acquire managerial skills of handling Industrial Environment.
4. Develop awareness about Industrial Engineering and Management.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge and Interaction related to Industry.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:

1) study the basics and details of Production, planning and control
2) understand the use of work study, method study and Time study analysis related to production
3) enable students to do the material and purchase management and inventory control
4) study about the Plant location and lay outs
5) enable to use the Demand forecasting and Production information system

COURSE OUTCOMES:

On the successful completion of this course; student shall be able to:

1) provide an introductory course in Production.
2) present the student with an overall view of the decision-making process as it relates to the major areas of production.
3) present the principles of operations economies (how to employ labour materials, machines, and capital) in a balance to match the changing relative values of the basic components.
4) the course will provide students with knowledge that can be applied in an industry for production planning and scheduling, as well as for its realization by production management.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-b	2	2	1	3
PO-d	2	1	1	3
PO-e	2	3	3	3
PO-g	2	2	2	2
PO-i	3	2	3	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Introduction:
Definition, objectives, functions, technique of industrial engineering, productivity, productivity measures and measurement models, introduction to production planning and control (PPC), various functions of PPC, routing, scheduling, dispatching, follow up and progress report.

Plant Layout and Product Design:
Introduction, factors governing selection of a plant layout, criteria of location decisions, site selection, state regulations of location, backward areas and industrial policy, Government Policies for decentralisation, industrial estates, comparison of locations, Sub-Urban area, Economic Survey of site selection, objectives of a good plant layout, importance of plant layout, situations in which layout problem may arise, factors influencing plant layout, principles of plant layout, techniques used in plant layout, steps in planning and layout for a new enterprise, different types of plant layout, symptoms of bad layout, work station design, storage space requirements, new product development, product life cycle, product design process, standardization.

Method Study:
Introduction, objectives, method study procedure, steps of method study, recording techniques, SIMO chart, multiple activity charts, principles of motion economy, two handed person chart, work sampling, predetermined motion time system, objectives and uses of P.M.T.S., P.M.T.S. technique/development of a P.M.T. system, selection of a particular P.M.T. system, advantages, limitations and uses of P.M.T.S., work factor system, method time measurement.

Time Study:
Introduction, objectives of work measurement, techniques of work measurement, objectives, and procedure of time study, performance rating and allowances, predetermined motion time analysis, method time measurement, use of time study in wage incentives, simple numerical problems on industrial applications.

Value Engineering:
Introduction, concept of value analysis, definition of value analysis, aims/objectives of value analysis, difference between value analysis and value engineering, when to apply value analysis, unnecessary costs, tests for value analysis, advantages of value analysis, applications, different steps in value analysis, function analysis systems techniques, principles of value analysis.

Ergonomics and Modern Trends in Industrial Engineering:
Concepts of Ergonomics, objectives of Ergonomics, historical background, related sciences of Ergonomics, man- machine system-interfaces, important aspects of Man-Machine system, design of control, environmental factors,, anthropometry, principles in the application of anthropometry data, development of anthropometry considerations in design steps by steps, body measurements, posture, movement and workplace design, manual materials handling, Ergonomics and safety, introduction to MRP, objectives of MRP, benefits of MRP, introduction to supply chain management, supply chain strategy, framework.

Text Books:

1. Introduction to Work Study, 3rd Revised Edition, 2000, International Labour Office (ILO), Geneva.
2. Elements of Production Planning & Control, Samuel Eilon, 3rd Edition, 2003, Universal Book Corporation, Mumbai.

3. Production and Operations Management, Chary S N, 3rd Edition, 2004, Tata McGraw Hill Pub. New Delhi.

Reference Books:

1. Industrial Engineering and Management, O. P. Khanna: 3rd edition, 2002, Dhanpat Rai & Sons, New Delhi.
2. Motion and Time Study, Burnes R M, 7th Edition, 1980, John Wiley & Sons, New York.
3. Human Factors in Engineering & Design Mark S Sanders, Mccormick,7th edition 1993, McGraw Hill Company, New York.
4. Production Systems, Planning Analysis and Control, Riggs J L, 3rd Edition, 2005, John Wiley & Sons, New Delhi.
5. Work Study and Ergonomics, Jhamb L. C., 4th Edition, 2003, Himalaya Pub. House, Mumbai.

ME 304 - MATERIAL SCIENCE AND ENGINEERING METALLURGY

Teaching Scheme: 03L**, Total:** 03 **Credit:** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks:** 100
Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course provides the introduction of the fundamentals of Material Science and Metallurgy to undergraduate students. The objective of the course is to understand the basic principles of material science and metallurgy. It includes mechanical testing to determine mechanical properties. It also includes various heat treatments, introduction of furnaces and various engineering materials and their applications.

PREREQUISITE COURSES:

Fundamental knowledge of engineering chemistry and physics

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:

1. enhance the basic knowledge in the field of material science.
2. get exposure to Iron – Carbon equilibrium diagram and solidification of steels.
3. understand the basic concept of Time Temperature Transformation Diagram and properties heat treatment of High Speed steels.
5. able to explain the necessity of various heat treatments.
6. understand the concept of harden ability and various hardness Test.
7. understand the concept of nonferrous alloys, bearing materials and their essential properties.

COURSE OUTCOMES:

On completion of this course student should be able to:

1. understand the crystal structure and classification of materials.
2. understand methods of determining mechanical properties and their suitability for applications.
3. classify cast irons and study their applications.
4. select suitable heat-treatment process to achieve desired properties of metals and alloys.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	2	3
PO-b	3	3	3	3
PO-c	2	3	1	2
PO-l	1	3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Metal and its Behavior
Classification of materials, Properties and applications of materials, crystalline nature of materials, especially microscopic examinations of metals- specimen preparation, etching & its mechanism. Spark testing of steels, flow line observation of forged parts relationship between Structures-Property-Processing- Performance. Crystal defects and their effects on plastic deformation i.e. description of point, line and surface defects and slip and twinning & its mechanism, Strengthening mechanisms in metals - solid solution ,strengthening, Strain hardening, Dispersion and precipitation hardening, phase transformation

Material Characteristics and its Testing
Engineering and True stress-strain curves, evaluation of properties, ductility, brittleness and toughness. Types of engineering stress-strain curve, compression test. Hardness testings- Brinell hardness Test, Poldi hardness Test, Rockwell hardness Test, and Vickers hardness test. Durometers, micro hardness. Erichson's Cupping Test, Impact test- Charpy and Izod impact test, Fatigue and creep test. Spark testing Non-destructive test of metals-Dye Penetrant test, magnetic particle test. Ultrasonic testing, radiography and eddy current testing.

Solid Solution
Alloys and solid solutions, types and their formations, Gibb's Phase rule, Lever rule for phase mixtures and their application in system.

Phase Diagram Characteristics and CI
Iron, allotropy, cooling curves and volume changes of iron. Iron-Iron Carbide equilibrium diagram, critical temperatures, various phase, reactions, solubility of carbon in iron, microstructure of slowly cooled steels, Non - equilibrium of cooling of steels. Cast Iron and its classification (all in detail), Effects of various parameters on structure and properties of C.I. like carbon equivalent, cooling rate during eutectic reaction and alloying additions, properties, compositions, applications and specifications of C.I.

Heat treatment on Steels
Principle of heat treatment of steel, transformation, products of Austenite, isothermal transformation diagram, procedure of plotting IT diagram, continuous cooling transformations Heat treatment for steels such as core heat treatment – Annealing and its types, Normalizing, Hardening, tempering of martensite, Jominy test for hardenability and its considerations. Quench media, Austempering and martempering, surface heat treatment of steels- flame hardening, induction hardening, laser and electron hardening, beam hardening, case hardening, cyaniding, nitriding, sursulf, tufftride.

Engineering Steels
Classification and application of steels, effect of alloying elements, specification of some commonly used steels for eengineering applications, classification of alloying elements, examples of alloy steels − limitation of plain carbon steels, stainless steels-classification, heat treatment of stainless steels, tool steels-classification, cold work and hot work tool steels, High speed tool steels , heat treatment of high speed tool steel, special purpose tool steels, introduction to Non-ferrous Materials, iintroduction of advanced materials- types and properties of composite materials, high temperature materials, engineering ceramics.

Text Book:

1. Material Science and Metallurgy for Engineers, by V. D. Kodgire, 37th edition, 2015, Everest Publishing House, Pune.
2. Material Science and Metallurgy, by U. C. Jindal, 1st edition, 2012, Pearson Publication.

Reference Books:

1. Materials and processes in manufacturing, Degarmo's, by J.T. Black, Ronald A. Kosher, 10th edition, 2010, Willey student edition.
2. Introduction to Engineering Materials, by B. K. Agrawal, 1989, Tata McGraw Hill, New Delhi.
3. An Introduction to Physical Metallurgy, by S.H. Avner, 2nd edition, 1997,Tata McGraw Hill, New Delhi.
4. Fundamentals of modern manufacturing materials, processes and systems, by Mikell P. Groover, 4th edition 2010, Wiley student edition, New Delhi.
5. Introduction to Materials Science for Engineers, by James F. Shackleford & Madanapalli K. Muralidhara, 2nd edition 1998, Pearson Publication
6. A textbook of Material Science and Metallurgy, by O. P. Khanna, 2nd edition, 2014, Dhanpat Rai.

ME 305 HEAT TRANSFER

Teaching Scheme: 03L**, Total:** 03 **Credit:** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks:** 100
Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces undergraduate students to Heat Transfer. The background required includes a sound knowledge of Mathematics, Engineering Thermodynamics, Applied thermodynamics and Fluid Mechanics of second year Level. The course aims at imparting knowledge of Heat Transfer and modes of Heat Transfer.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of physics and engineering thermodynamics.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:

1. understand the different laws and mechanisms of different modes of heat transfer like conduction, convection and radiation
2. understand to analyze the steady state and unsteady state conduction mode of heat transfer
3. understand the need, application and performance evaluation of various types of fins
4. understand the construction, working and performance of different heat exchangers

COURSE OUTCOMES:

On completion of this course student should be able to:

1. understand the basic modes of heat transfer.
2. compute temperature distribution in steady - state and unsteady, state heat conduction.
3. understand and analyse heat transfer through extended surfaces.
4. interpret and analyze forced and free convection heat transfer.
5. understand the principles of radiation heat transfer
6. design heat exchangers using LMTD and NTU methods.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-a	3	3	2	1	3	2
PO-b	3	2	2	2	3	2
PO-c	2	3	3	3	2	2
PO-j	1	2	3	3	1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Heat Conduction

Concepts and mechanism of heat flow: steady and unsteady state heat transfer, modes of heat transfer and their physical mechanism. Laws of heat transfer, thermal conductivity, and heat transfer coefficient, radiation heat transfer coefficient. Isotropic and anisotropic materials, insulation materials, thermal resistance and thermal conductance. Generalized one dimensional heat conduction equation and reduction to Fourier, Poisson and Laplace equations, boundary conditions, steady state heat conduction without heat generation in plane wall, cylinder and sphere, thermal contact resistance, critical thickness of insulation on cylindrical bodies.

Heat Transfer in Extended Surfaces

Steady state heat conduction with heat generation in plane and composite wall, hollow cylinder, hollow sphere. Extended Surface: types of fins, governing equation for pin fin for infinite long fin and fin with negligible heat loss, fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, approximate solution of fins. Error in temperature measurement by thermometer.

Convection Heat Transfer

Principle of heat convection: mechanism, natural and forced convection. Non Dimensional Numbers, Dimensional analysis for Natural and Forced Convection. convection boundary layers: laminar, turbulent, momentum and energy equation, Laminar flow over bodies, turbulent flow inside circular and noncircular ducts, Reynolds Colburn analogy for flow over flat plate and flow inside tube, coefficient of friction and friction factor. Heat transfer in fully developed flow, Natural convection over vertical planes, use of empirical correlation for convection, principle of condensation and boiling (No numerical treatment).

Radiation Heat Transfer

Thermal radiation: concept, black body radiation, Spectral and total emissive power, Stefan Boltzmann law, radiation laws. Irradiation, radiosity, surface absorption, reflection, transmission and emissivity. Radiation view factor, Properties of view factor, (No numerical treatment on view factor), radiation heat exchange between two diffuse gray surface, radiation shield.

Heat Exchangers

Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement, condenser and evaporator, Overall heat transfer coefficient, fouling factor. Log-mean temperature difference method and NTU – effectiveness method of analysis for rating and sizing of heat exchangers. Requirement of good heat exchanger and heat exchanger and design and selection, practical applications, heat pipe.

Text Books:

1. Heat and Mass Transfer, R. K. Rajput, S. Chand & Company Ltd, New Delhi.
2. Engineering Heat and Mass Transfer, M. M. Rathore 2nd Edition, 2010, Laxmi Publications, New Delhi.

Reference Books:

1. Heat Transfer, J. P. Holman,7th edition, 1992, Mc Graw Hill.
2. Heat and Mass Transfer, R. K. Rajput, Revised edition, 2012, S.Chand & Company Ltd, New Delhi.
3. Heat and Mass Transfer, D. S. Kumar, 8th edition 2010, S. K. Kataria & Sons, Delhi
4. Heat Transfer, P. K. Nag, 3rd edition, 2011,Tata McGraw Hill Publishing Company Ltd,

New Delhi.
5. A Text Book on Heat Transfer, Sukhatme S.P, 3rd edition ,1989, Orient Longmans Ltd, New Delhi.
6. A Course in Heat and Mass Transfer, Arora S.C. & Domkundwar , 4th edition, 1994, Dhanpat Rai & Sons.
7. Heat Transfer –A Practical Approach, Yunus A. Cengel, 2nd edition 2002, Tata McGraw Hill.
8. Engineering Heat and Mass Transfer, M. M. Rathore, 2nd Edition, 2006, Laxmi Publications, New Delhi.

ME 306 MECHANICAL MEASUREMENTS

Teaching Scheme: 01 L + 02 P, Total: 03 **Credit:** 02
Evaluation Scheme: 50ICA **Total Marks:** 50

COURSE DESCRIPTION:

This course provides basics of Mechanical Measurements. Course includes importance of mechanical measurements, basic static and dynamic characteristics of an instrument. It consists of Types of errors, primary sensing elements and transducers. It also includes various instruments used for pressure, strain, flow and temperature measurements.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of mathematics, physics, electrical, electronics and thermodynamics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with:

1. understanding significance of measurement and static and dynamic characteristics of measuring instruments
2. understanding working principle of primary sensing elements and transducers
3. use of pressure, strain and temperature measuring instruments.

COURSE OUTCOMES:

On completion of this course student should be able to:

1. understand importance of measuring instruments' static and dynamic characteristics of measuring instruments
2. perform experiments, as well as to analyse and interpret data related to pressure measurements.
3. perform experiments, as well as to analyse and interpret data related to strain measurements.
4. perform experiments, as well as to analyse and interpret data related to temperature measurements.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	3	3
PO-c	3	3	3	3
PO-d	1	1	1	1
PO-g	2	2	3	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Measurements and measurements systems, characteristics of instruments and errors
Introduction, significance of measurements, mechanical measurements, methods of measurements, elements of generalized measurement systems. Definition of accuracy, precision, sensitivity, reproducibility, drift, static error and dead zone. Linearity, hysteresis. Definition of speed of response, measuring lag, fidelity and dynamic error, types of errors.

Primary sensing elements and transducers
Introduction, mechanical devices as primary detectors, mechanical spring devices: - cantilever, helical spring, proving ring, load cells, pressure sensitive primary devices: - Bourdon tube, diaphragms, bellows. Transducers: - classification, factors influencing the choice of transducers, resistive transducers: - potentiometer, strain gauges, rosettes, resistance thermometer, thermistors, thermocouples, linear variable differential transducer, capacitive transducer, piezoelectric transducer

Pressure, strain, flow and temperature measurements
Pressure measurements:-Introduction, U – tube Manometer, Bourdon tube, Bellows, Diaphragms, measurement of high pressure, Low pressure (vacuum) pressure- McLeod Gauge, Pirani gauge. Strain measurements:- Wheat stone bridge, Gauge sensitivity, Gauge orientation and interpretation of results, strain gauge connected in series, stress strain relationships. Flow measurement: - Venturi meter, Orifice plate, Rotameters, hot wire anemometers. Temperature measurements:- Liquid in glass thermometers, pressure gauge thermometers, Liquid vapour filled thermometers, bimetallic thermometers, Electrical resistance thermometers, Thermocouples, Radiation pyrometers.

Text Books:

1. A course in Mechanical Measurements and Instruments, A. K. Sawhney, Puneet Sawhney, Dhanpat Rai & Co. Publication, New Delhi, 2004 onwards.
2. Mechanical and Industrial measurements, R. K. Jain, Khanna Publisher, New Delhi, 2013 onwards.
3. Mechanical Measurement and Instrumentation, R. K. Rajput, S. K. Kataria and sons Publication, 2013 onwards.

Reference Books:

1. Mechanical measurements, S.P. Venkateshan, ANE books Publication, 2009 onwards.
2. Mechanical measurements, R. S. Sirohi, H. C. Radha Krishna, New Age International Publication, 1991 onwards.

ICA Performance:-

Minimum eight experiments and two assignments shall be performed to cover entire curriculum of course ME306. The list given below is just a guideline.

List of experiments:

1. Study of bourdon tube as a generalized measuring system
2. Study of resistive transducer
3. Displacement measurement by using linear variable differential (LVDT)
4. Study of piezoelectric transducer
5. Strain measurement by using strain gauge
6. Flow measurement by using Venturi meter, Orifice plate, Rotameters, hot wire anemometers
7. Temperature measurement by using Liquid in glass thermometer, bimetallic thermometers, Thermocouples, Radiation pyrometers

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

ME307 – MACHINE DESIGN – I LAB

Teaching Scheme: 02P, **Total:** 02 **Credit:** 01

Evaluation Scheme: 25 ICA+25 ESE **Total Marks: 5**0

Internal continuous assessment performance shall be based on ME 301 & consist of following Assignments and Project

1. Internal continuous assessment shall consist of "ONE" design project. The design project shall consist of assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of the components and assembly should be submitted in a separate file.

2**.** Design projects should include selection of prime mover and design of mechanical systems comprising of machine elements: Design data book shall be used extensively for the selection of the components.

3. Total five assignments (One on each unit - only Numerical)

Guide lines for ICA:

Internal continuous assessment should support for regular performance of practical and its regular assessment with proper understanding principle of practicles completed.

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 308 - THEORY OF MACHINE –II LAB

Teaching Scheme: 02P, Total: 02 **Credit: 01**
Evaluation Scheme: 25 ICA +25ESE **Total Marks: 50**

Students shall Complete the following practical (Any Five) and five assignments shall conduct on syllabus of ME 302.

1) To Study of different types of Gear boxes.
2) Draw profile of Cam & follower (Four Problems).
3) To Study of types of brakes
4) To Study the Performance of Governor
5) Verification of Principle of Gyroscopic couple
6) To Study static and dynamic balancing
7) To Study different types of dynamometer
8) Determination of natural frequency of longitudinal vibration.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 309 - MATERIAL SCIENCE AND ENGINEERING METALLURGY LAB

Teaching Scheme: 02P**, Total:** 02 **Credit:** 01
Evaluation Scheme: 25ICA+25ESE **Total marks:** 50

All experiments and three assignment shall be performed to cover entire curriculum of course ME304.

List of Experiments:

1. Detection of defect by Non-destructive tests such as Dye Penetrant test, Magnetic particle testing, ultrasonic testing, eddy current test.(any two).
2. Destructive Test malleability of sheets by Erichsen Cupping Test.
3. Micro Specimen Preparation and use of metallurgical microscope.
4. Study and drawing microstructure of mild steel, medium carbon, eutectoid Steel, hypereutectoid steel.
5. Demonstration of Annealing, Normalizing and Hardening of medium carbon Steel specimens and measurements of hardness and drawing Microstructures.
6. Study and drawing microstructure of white, malleable, gray and Spheriodal Cast iron and any one non-ferrous metal.
7. Spark testing of steels, Flow line observation of forged parts.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 310 HEAT TRANSFER LAB

Teaching Scheme: 02P**, Total:** 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25 ESE **Total Marks:** 50

Minimum Ten experiments shall be performed to cover entire curriculum of course ME305.
List of Experiments:

1. Determination of thermal conductivity of metal rod.
2. Determination of thermal conductivity of insulating powder.
3. Determination of thermal conductivity of composite wall.
4. Determination of heat transfer coefficient in natural convection
5. Determination of heat transfer coefficient in forced convection.
6. Determination of temperature distribution, fin efficiency in natural and forced convection.
7. Determination of emissivity of a test surface.
8. Determination of Stefan Boltzmann constant.
9. Study of pool boiling phenomenon and determination of critical heat flux.
10. Determination of LMTD, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.
11. Determination of heat transfer from a heat pipe.
12. Calibration of thermocouple.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The end semester examination for this laboratory course shall be based on performance in one of the experiments performed by the student in the semester followed by sample questions to judge the depth of understanding / knowledge by the students. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 311 - SELF STUDY - I

Teaching Scheme: 00**, Total:** 00 **Credit: 02**
Evaluation Scheme: 50ISE **Total Marks: 50**

Content and Guide line:-

The 20% syllabus for self - study shall be declared by subject teacher of five subjects at the beginning of semester and he/she shall conduct the test examination for that course, assess answer papers of test examination and submit the marks to course coordinator.

Marks and hence grade of course Self Study I shall be based on one test each conducted on 20% syllabus of five subjects ME301, ME302, ME303, ME304and ME305. One faculty member should be appointed as course coordinator for the course ‘self study’ to compile the marks of all tests and enter into the MIS.

SEM VI

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
ME351	Internal Combustion Engines	D	3	--	---	3	10	15	15	60	---	---	100	3
ME352	Metrology and Quality control	D	3	---	---	3	10	15	15	60	---	---	100	3
ME353	Turbo Machinery	D	3	---	---	3	10	15	15	60	---	---	100	3
ME354	Machine Design –II	D	3	---	---	3	10	15	15	60	---	---	100	3
ME355	Numerical Analysis and Computational Methods	B	3	---	---	3	10	15	15	60	---	---	100	3
ME356	Internal Combustion Engines Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME357	Metrology and Quality Control Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME358	Turbo Machinery Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME359	Machine Design -II Lab	D	---	---	2	2					25	25	50	1
ME360	Mini Project	D	----	----	4	4	---	----	---	----	50	---	50	2
ME361	Self Study - II	D	---	---	----	---	---	---	---	---	---	---	50**	2
ME362	Industrial Lectures*	D	1	---	----	1	---	---	---	---	---	---	---	---
		Total	**16**	**---**	**12**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**800**	**23**

- ****In the course Industrial Lectures, at least 12 lectures from industrial expert should be arranged and continuously assessed (06 lectures in VIth and VIIIth semester each).**

ME 351 - INTERNAL COMBUSTION ENGINES

Teaching Scheme: 03 L**, Total:** 03 **Credits:** 03
Evaluation Scheme: 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE **Total Marks:** 100
Duration of ESE: 03 Hrs**.**

COURSE DESCRIPTION:

This course provides the knowledge of Internal Combustion Engine. Course includes different engine cycles its performance analysis, various systems in IC Engine such as fuel feed, lubrication, cooling, ignition, supercharging and turbo charging, fundamental of combustion in IC Engine, types and design of combustion chambers. Various emission control norms.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Mathematics, Basic Engineering Thermodynamics, various ideal gas processes, Applied Thermodynamics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with:

1. analysis of air standard cycles in the regard of I C Engine.
2. understanding of induction system along with fuel feed system.
3. impart insight in various operating systems like cooling, lubrication, Ignition system.
4. be familiar with combustion chamber design and pollution control norms.
5. performance analysis of I C Engine.

COURSE OUTCOMES:

On completion of this course; student should able to:

1. understand working and performance of IC Engines through thermodynamic cycles.
2. fuel feeding system for SI and CI Engines.
3. various types of Ignition, Lubrication, Cooling system used in IC Engines.
4. understand combustion phenomena in SI and CI engines and factors influencing combustion chamber design.
5. evaluate methods for improving the IC engine performance.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO,	CO-1	CO-2	CO-3	CO-4	CO-5
PO-b	3	2	2	3	2
PO-c	3	2	1	1	2
PO-g	2	2	3	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Basic Concepts and Engine Cycles

Introduction: classification of I.C. Engines, components and their functions, terminology, engine work (indicated and brake), mean effective pressure, torque and power (brake and indicated), mechanical efficiency, thermal and volumetric efficiencies of engine, air fuel ratio, specific fuel consumption, numerical, Air standard cycles: assumptions, Otto, Diesel, Dual combustion cycle, derivation of their efficiency equation, work done and mean effective pressure, numerical on Air standard cycles, comparison on the basis of heat input, compression ratio, maximum pressure and temperature, Actual cycle, pumping losses, time losses.

Fuel Feeding Systems

Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow, Carburetion: Requirement, factors affecting carburation, simple carburetor, air fuel mixtures, compensating devices for starting, economy range, acceleration, compensating jet etc., Solex carburetor, S. U. Carburetor. Fuel feeding systems in CI engines: Requirement, classification, fuel feed pump, jerk type injection fuel pump, distributor type pump, injection pump governor, mechanical governor, pneumatic governor, fuel injector and nozzles, types of nozzles.

Ignition, Cooling and Lubrication Systems

Ignition systems: Requirement, battery ignition, magneto ignition, firing order, ignition timing. Lubrication: Function of lubrication, mechanism of lubrication, lubrication systems, properties of lubricants, additives for lubricants. Cooling systems: Requirement, need for cooling systems, types of cooling systems and comparison of cooling systems, Starting methods of engines: Supercharging, types of superchargers, effect of super charging, limitations and advantages of supercharging, and turbo charging of engines.

Combustion in SI and CI Engines

Homogeneous and heterogeneous mixtures, combustion in SI engines: stages in combustion, flame front propagation, factors influencing flame speed, detonation, factors affecting the detonation, pre-ignition, combustion chamber of SI engines, combustion in CI engine: stages of combustion, factors affecting the delay period. Diesel knock, effect of engine variables on Diesel knock, comparison of knock in SI and CI engines, combustion chamber for CI engines.

Engine Testing and Performance

Different methods for measurement of friction power, indicated power, brake power, numerical, heat balance sheet and efficiency calculations, numerical on performance of engines, BIS specification, and recent trends in IC engines. Engine emission, air pollution due to engines, various EURO & BHARAT norms, unburnt hydrocarbon emission in two stroke and CI engines, CO and NOx emission, particulates, EGR, emission control methods catalytic converters (Introductory), crank blow by losses.

Text Books:

1. Internal Combustion Engines, V. Ganesan, 3rd edition, 2007, Tata McGraw Hill, New Delhi.
2. Internal Combustion Engines, R. K. Rajput, 2nd edition, 2007, Laxmi Publications, New Delhi.
3. Internal Combustion Engines, Sharma R.P. and Mathur M. L., 2010, Dhanpat rai Publications, New Delhi.

Reference Books:

1. Fundamentals of Internal Combustion Engines, W. W. Pulkrabek, 2nd edition, 2000, Prentice Hall of India (P) Ltd., New Delhi.
2. Internal Combustion Engines and Air Pollution, E. F. Obert, Harper and Row, New York.
3. Internal Combustion Engines, Ferguson C. R, 2nd edition, 2000, Johnes Wiley and sons, New York.
4. Internal combustion engine fundamentals, John Heywood, 1st edition, 1988, McGraw- Hill USA.

ME 352 METROLOGY AND QUALITY CONTROL

Teaching Scheme: 03 L, Total: 03 **Credit:** 03
Evaluation Scheme: 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE **Total Marks**: 100
Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course provides basics of Metrology and Quality Control and its importance. It consists of standards of measurements and types standards, linear measuring instruments. It also includes measurement of straightness, flatness, roundness, machine tool metrology and measurement by light wave interference. It comprises of design of gauges, use of comparators, angular and surface finish measurement. The course involves measurement of screw thread and gear. It also covers Quality Control and Statistical Quality Control.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Graphics, Machine Drawing, Mathematics, Physics, Electrical and Electronics

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with:

1. determine measuring instruments capabilities
2. introduce measuring instruments used for linear and angular measurement
3. introduce concept of limits and fits for engineering applications
4. study various comparative measurements
5. study Control chart techniques in quality control.

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Identify techniques to minimize the errors in measurement.
2. Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
3. Understand Design the limit gauges.
4. Students will be able to work in Quality control and quality assurances divisions in industries
5. To know the principles of quality management, quality tools, SQC.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	2	3	3	2	3
PO-c	3	3	3	3	3
PO-d	1	1	1	2	3
PO-f	3	3	3	2	1
PO-i	1	1	1	3	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Metrology

Definition: Measurement, precision, accuracy, sensitivity, classification of method of measurement, linear measurement:-Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge straightness, flatness and squareness:-Surface plates, measurement of straightness, flatness testing, squareness testing, roundness testing, machine tool metrology, measurement by light wave interference:- Basic principle, sources of light, optical flats, fringe patterns and their interpretation, testing of flat, convex and concave and irregular surface, checking of slip gauges.

Design of gauges, Comparators, Angular Measurement and Measurement of surface finish

Design of gauges:- Types of gauges, limits, fits, tolerances, Taylor's principle, problems on design of gauges, Comparators:-Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators, angle measurement:-Sine bars, sine centres, use of sine bar, angle gauges, autocollimator angle dekkor, constant deviation prism, measurement of surface finish:-Types of surface texture, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf.

Metrology of Screw thread, Gear & recent trend in metrology

Metrology of screw threads:-Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, gear measurement:- callipers measurements, involute testing, roller measurements, study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine, recent trend in engineering metrology:-precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, machine vision.

Quality Control

Quality Introduction to quality: - factors controlling quality of design and conformance, balance between cost of quality and value of quality, introduction to quality tools: Demings, PDCA, PDSA cycles & juran trio logy approach, seven quality tools, pareto analysis, cause & effect diagram, brainstorming, concurrent engineering, total quality management: zero defect concept, 5S, Kaizen, Kanban, Poka yoke, TPM, ISO 9000 & TQM, Quality assurance:- QFD, difference between inspection, quality control and quality assurance, quality survey.

Statistical Quality Control

Statistic concept:-Concept of variation, variable & attribute data, the frequency distribution, quantitative description of distribution, normal curve, concept of six sigma, control chart for variables:- definition of control chart, objectives of control chart, X and R charts, problems on X and R charts, control chart for attributes:-practical limitations of the control charts for variables charting chart, P and C charts, problems on P & C charts. Acceptance sampling:-Sampling inspection Vs hundred percent inspection, basic concept of sampling inspection, OC Curve, conflicting interests of consumer and producer, producer's and consumer's risk, AQL LTPD, sampling plans.

Text Books:

1. Engineering Metrology, R. K. Jain, Khanna Publishers, New Delhi, 2002 onwards.
2. Statistical quality control, M. Mahajan, Dhanpat Rai & Co., New Delhi, 2002 onwards.

Reference Books:

1. Handbook to industrial metrology, ASTME, Prentice Hall Publication.
2. Handbook of quality control, G. M. Juran, McGraw Hill Publication.
3. A textbook of Engineering Metrology, I. C. Gupta, 2002, Khanna Publishers, New Delhi,
4. A textbook of metrology, M. Mahajan, Dhanpat Rai & co., New Delhi, 2010 onwards.
5. Statistical quality control, M. Jeya Chandra, CRC Press, 2001 onwards.
6. Statistical quality control, Douglas Montgomery, Wiley, 2001 onwards.

ME 353 Turbo Machinery

Teaching Scheme: 03L, **Total:** 03 **Credit:** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks:** 100
Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces undergraduate students to Turbo Machinery. The background required includes a sound knowledge to Mathematics. Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level. The Course aims at imparting knowledge of Turbo Machinery.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Mathematics, Basic Engineering Thermodynamics, various ideal gas processes, Applied Thermodynamics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with:

1. study and analyze the construction, working and performance different steam turbines.
2. study and analyze the construction, working and performance different Gas turbines and jet propulsion.
3. study and analyze the construction, working and performance hydraulic turbines.

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. apply thermodynamic concepts to analyze turbo machines.
2. analyze power plant and propulsion cycles.
3. analyze impulse and reaction turbo machines for energy transfer
4. design gas turbine and steam turbine components.
5. evaluate the performance of turbo machine components

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO,	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	3	2	1	1	2
PO-b	3	3	3	2	2
PO-h	3	3	3	2	3
PO-j	2	2	3	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Steam Turbines
Types of turbines, constructional details impulse turbine. Compounding of turbine, velocity diagrams, output efficiency. Reaction turbine, velocity diagrams, degree of reaction. Governing of turbines, application of turbines, losses in turbines.

Gas Turbines
Theory and fundamentals of gas turbines, principles, classification. Joule's cycles, assumptions for simple gas turbines, cycle analysis, work ratio, concept of maximum and optimum pressure ratio, actual cycle. Effect of operating variable on thermal efficiency, regeneration, intercooling, reheating, their effects on performance. Closed cycle and semiclosed cycles gas turbine plant, applications of gas turbines.

Jet Propulsion
Introduction, theory of jet propulsion, types of Jet engines. energy flow through Jet Engines, thrust, thrust power and propulsive efficiency. Turbo jet, turbo prop, turbo fan engines, pulse jet and ram jet engines. Performance characteristics of these engines, thrust segmentation, application of jet engines, concept of rocket propulsion.

Hydraulic Turbines
Impulse momentum principle, fixed and moving flat plate and curve vanes, series of plates & vanes, velocity triangles and their analysis, work done, efficiency etc. Classification of hydraulic turbines, heads & various efficiencies. Impulse turbine: Main components and constructional features of pelton wheel. Velocity diagrams & work done, Condition for maximum hydraulic efficiency, number of buckets, jets, non dimensional parameters (speed ratio, jet ratio).

Hydraulic Turbines (Reaction Type)
Reaction turbine, main components & constructional features. Types of reaction turbine (Francis, Kaplan), velocity diagrams. Unit quantities, selection of turbine considering various factors, specific speed, types of characteristic curves. draft tube types, efficiency, cavitations, governing mechanisms for pelton wheel, Francis, Kaplan turbines.

Text Books:

1. Thermal Engineering, Domkundwar, 9th edition, 2005, Dhanpat Rai and Co Ltd. Delhi.
2. Thermal Engineering, P L Ballaney, 4th edition, 2008, Khanna Publications, Delhi.
3. Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, 10th edition, 2010, Laxmi publication Ltd, New Delhi.

References Book:

1. Thermal Engineering, R K Rajput, 9th edition, 2010, Laxmi Publication ltd, New Delhi.
2. Hydraulic Machine, Dr. Jagdish Lal, 2nd edition, 1994, Metro Politan book co. pvt Ltd, Delhi.
3. Hydraulics & Fluid Machine, Dr. Modi Seth, 14th edition, 2002, Standard book house, Delhi.
4. Steam & Gas turbine, R. Yadav, 7th edition, 2000, Central Publications, Allahabad.
5. Gas Turbine Theory & Jet Propulsion, J. K. Jain, 7th edition, 2000, Khanna Publications, New Delhi.

ME354- MACHINE DESIGN-II

Teaching Scheme: 03L, **Total**: 03 **Credit:** 03
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks:** 100
Duration of ESE : 03 Hrs

COURSE DESCRIPTION:

This course provides the knowledge of machine design. Course includes design of different types of gears such as spur gears , helical gears , bevel and warm gears. students will study selection of bearings from manufacturer,s catalogue .the sudent will also learn the design of cylinders and pressure vessels etc.

DESIRABLE AWARENESS/SKILLS:

The background expected familiar with Strength of Material, Theory of machine & Machine Drawing etc.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:

1. strengthen the knowledge in designing and preparing the part as well as assembly drawings.
2. design the common machine elements for solving design problems involving machine elements.

COURSE OUTCOMES:

On the successful completion of this course; student shall be able to

1. use the design principles involved in design of gears, pressure vessels,bearings etc.
2. use design data book and different codes of design.
3. identify, formulate, and solve engineering design problems.
4. design and prepare part as well as assembly drawings.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-c	3	3	3	3
PO-e	3	3	2	3
PO-g	2	2	2	2
PO-h	3	--	--	3
PO-l	3	3	2	3
PO-m	--	--	1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Aesthetic and Ergonomic considerations in Design

Aesthetic considerations- Basic type of product form, design features like shape, colour, materials and finishes, quality etc. Ergonomic considerations- Man-Machine closed loop system, design of display panels, design of controls etc.

Spur Gears:

Classification of gears, selection of type of gears, standard system of gear tooth. Number of teeth and face width, type of gear tooth failure, desirable properties and selection of gear material, force analysis, beam strength (Lewis) equation, velocity factor, service factor, load concentration factor, effective load on gear, wear strength equation, estimation of module based on beam and wear strengths, estimation of dynamic tooth load by velocity factor and Buckingham's equation,

Helical Gears:

Transverse and normal module, virtual number of teeth, force analysis, beam and wear strengths, effective load on gear tooth, estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.

Bevel Gears

Straight tooth bevel gear terminology and geometric relationship, Formative number of teeth, Force analysis, design criteria of bevel gears, beam and wear strengths, dynamic tooth load by velocity factor and Buckingham's equation, effective load, design of straight tooth bevel gears, selection of material for bevel gears .

Worm Gear

Worm gear geometry and nomenclature, force and efficiency analysis, bending and surface fatigue strength, worm gear thermal considerations, methods of lubrications.

Rolling contact Bearings

Types, static and dynamic load carrying capacity, load-life relationship, selection of bearing from manufactures catalogue.

Design of Cylinders and pressure vessels:

Thick and thin cylinders- Thin cylindrical and spherical vessels- Lame's equation- Clavarino's and Birnie's equation- Auto frottage and compound cylinders- Casketed joints in cylindrical vessels. Type of welded joints- weld joints efficiency- Corrosion, erosion and protection vessels, stresses induced in pressure vessels, material of construction. Opening in pressure vessels- Reinforcement of opening in shell and end closures. Area compensation method.

Text Books:

1. Design of Machine Elements, Bhandari V.B., 2nd edition, 2007, edition Tata McGraw Hill Publ. Co. Ltd.

2. Mechanical Engineering Design, Shigley J.E. and Mischke C.R, 8th edition, 2008, McGraw Hill Publ. Co. Ltd.

Reference Books:

1. Design of Machine Elements, Spott's M.F. and Shoup T.E. , 8th edition, 2006, Pearsons India.
2. Machine Design, Black P.H. and O. Eugene Adams, Revised 3rd edition, 1968, edition McGraw Hill Book Co. Ltd.
3. Machine Component Design, Willium C. Orthwine, 1st edition, 1999, West Pub. Co. and Jaico Pub. House.
4. Design Data, P.S.G. College of Technology, Coimbatore.
5. Machine Design , P.Kannaiah, 2nd edition, 2010, Scitech Publication.
6. Theory and Problems of Machine Design , Hall A.S., Holowenko A.R. and Laughlin H.G, 1981, chaum's Outline Series.

ME 355 NUMERICAL ANALYSIS AND COMPUTATIONAL METHODS

Teaching Scheme: 03L, Total: 03 **Credit: 03**
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 03Hrs

COURSE DESCRIPTION:

This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand the guaranteed accuracy that various methods provide the efficiency and scalability for large scale systems and issues of stability.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:
1. introduce numerical methods for solving linear and non-linear equations.
2. apply the knowledge of these methods to solve practical problems with suitable software.
3. introduce numerical methods for evaluating definite integrals.

COURSE OUTCOME:

On the successful completion of this course; student shall be able to:
1. Identified, classified and choose the most appropriate numerical method for solving the problem.
2. developed Numerical skills to Mechanical Engineering Problems.
3. compute models to aid decision making and financial planning.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3
PO -c	3	2	1
PO -j	2	2	2
PO-m	2	2	3

1- Weak 2 -Moderate 3- Strong

COURSE CONTENTS:

Software development And Solution of transcendental equation

Software development principles, mathematical modelling problem solving, algorithm, flowchart, errors, graphical method, solution of transcendental equation - Bisection method, false position method, successive approximation method, Newton-Raphson method, Horner's method, rate of convergence

Numerical Integration and Solution of ordinary Differential Equation

Numerical integration Trapezoidal rule, Simpson's 1\3rd rule, Simpson's 3\8th rule, Gauss Quadrature method: Taylor's series method, Euler's method, Improved & modified Euler's method, Fourth order Range- Kutta method.

Interpolation and Curve Fitting

Interpolation- Linear and quadratic interpolation, Lagrange's interpolation, Newton's forward interpolation, Newton's backward interpolation, Newton's divided difference interpolation, Stirling interpolation, Curve fitting - Linear & quadratic regression, Logarithmic curve fitting, Exponential curve fitting.

Solution of Linear Algebraic Equation and Iterative method

Solution of linear algebraic equation - Gauss elimination method, Gauss Jordan method, LU-decomposition method. Iterative method - Jacobi iteration method, gauss seidel interactive method, Cholesky method.

Finite Element Analysis and FDM

Finite Element Method: Introduction, steps used in finite element analysis, general approach, interpolation function and introduction to finite difference method, comparison with finite element.

Text Books:

1. Applied Numerical Analysis, Gerald, G.F, and wheatley P.O, 6th Edition, 2002, Pearson Education Asia, New Delhi.
2. Numerical Method, Balagurusamy, E, Tata McGraw- Hill Pub.Co.Ltd, New Delhi 1999.
3. Introductory Methods of Numerical Analysis, by S.S. Sastry; 4th edition, 2009, Prentice Hall of India, New Delhi.
4. Applied Numerical Analysis, by Curtis F Gerald & Patrick G Whealley; 7th edition, 2007, Pearson Education Ltd.
5. Computational Methods in Engineering by Prof. S.P. Venkateshan Prasanna Swaminathan,1st edition 2013.
6. Numerical Solutions of Engineering Problems BY K. Nandkumar, 17 Jun 2004, Madras University, India.

Reference Books:

1. Numerical Methods, Kandasamy, P. Thilakavthy, K and Gunavathy, K., S.Chand and Co. New Delhi 1999.
2. Numerical Analysis, Burden, R.L and Faries, T.D, 7th Edition, 2002, Thomson

Asia Pvt. Ltd, Singapore.
3. Numerical Method, Venkatraman M.K, 5th edition 1991, National Pub. Company, Chennai.
4. Numerical Methods for Scientists and Engineers, Sankara Rao K, 2nd Edition, 2004, Prentice Hall India.
5. Numerical Method for Engineer, Chapra, Canale, 5th edition 2005, McGraw Hill Co.
6. Numerical Methods, Joh. H. Mathews, 4th edition, 2004, Pearson Education.
7. Finite Element Method, J. N. Reddy, 3rd edition 2005, McGraw Hill Co.

ME 356 INTERNAL COMBUSTION ENGINE LAB

Teaching Scheme: 02P**, Total:** 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25 ESE **Total Marks:** 50

Minimum eight experiments shall be performed to cover entire curriculum of course ME 351
List of Experiments:

1. Study of cooling systems.
2. Study of lubrication systems.
3. Study of simple and Solex carburetors.
4. Study of fuel pump and fuel injector.
5. Trial on a petrol engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
6. Trial of a Diesel engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
7. Morse test and determination of bsfc and isfc.
8. Study of combustion chambers of SI engines.
9. Study of combustion chambers of CI engines.
10. Study and demonstration of mechanical and Pneumatic governors.
11. Study and analysis of exhaust emission from the engine (PUC).
12. Visit to automobile industry (compulsory).

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 357 METROLOGY AND QUALITY CONTROL LAB

Teaching Scheme: 02 P, Total: 02 **Credit:** 01

Evaluation Scheme: 25ICA +25ESE **Total Marks**: 50

Minimum eight experiments shall be performed to cover entire curriculum of course ME 352. The list given below is just a guideline.

List of experiments:

1. Determination of linear/angular dimensions of part using precision & non precision instrument.
2. Machine tool alignment tests on any machine tool like Lathe, Drilling and Milling.
3. Interferometer-Study of surfaces using optical flat.
4. Surface finish measurement.
5. Measurement of roundness /circularity using mechanical comparator.
6. Measurement of screw parameters.
7. Measurement of Gear parameters, gear tooth thickness, PCD.
8. Study and applications of tool maker's microscope.
9. Use of profile projector.
10. Study and use of control charts.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 358 TURBO MACHINERY LAB

Teaching Scheme: 02P, Total: 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25 ESE **Total Marks:** 50

Minimum Ten experiments shall be performed to cover entire curriculum of course ME353.
List of Experiments:

1. Study of steam turbine power plant.
2. Study of steam turbine systems.
3. Trial on steam turbine.
4. Study of gas turbines.
5. Study of hydraulic turbines
6. Trial on pelton wheel.
7. Trial on Francis turbine.
8. Trial on Kaplan turbine.
9. Trial on gas turbine plant
10. Study of various jet propulsion devices/ engine.
11. Visit to hydraulic power plant.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal And sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 359 MACHINE DESIGN – II LAB

Teaching Scheme: 02PR, **Total:** 02 **Credit:** 01
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50

Internal continuous assessment performance shall be based on ME 354 & consist of following Assignments and Project

1. Term work shall consist of "ONE" design project. The design project shall consist of two imperial size sheets- one involving assembly drawing with a part list and overall dimension and the other sheet involving drawing with of individual components & also using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculation of the design of the components and assembly should be submitted in a separate file. Design projects should be in the form of 'Design of Mechanical System' comprising of machine elements studied and topics covered in the syllabus. Design data book shall be used extensively for the selection of the component.
2.Total five assignments (only Numericals)

Guide lines for ICA:

Internal continuous assessment should support for regular performance of practical and its regular assessment with proper understanding principle of practicals completed.

Guide Lines for ESE:

The End Semester Exam for this course shall be based on oral examination which covers content of syllabus and practical conducted, to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 361 MINI PROJECT

Teaching Scheme: 04PR, **Total:** 04 **Credit:** 02
Evaluation Scheme: 50 ICA **Total Marks:** 50

COURSE DESCRIPTION:

The mini project is one of the most important single piece of work in the degree programme. It is introduced in curriculum to put into practice some of the techniques that have been taught to students in earlier years. It also provides the opportunity to students to demonstrate independence and originality, to plan and organise a large project over a long period. The mini-project topic should be selected to ensure the satisfaction of the need to establish a direct link between the techniques they learnt and productivity. Thus it should reduce the gap between the world of work and the world of study.

DESIRABLE AWARENESS/SKILLS:

Knowledge of concepts, principles and techniques studied in all earlier courses.

COURSE OBJECTIVES:

The objectives of offering this course are

- to develop ability to synthesize knowledge and skills previously gained and to put some of them into practice.
- to make students capable to select from different methodologies, methods and forms of analysis studied to produce a suitable system or sub-system.
- to inculcate ability to present the findings of their technical solution in a written report.
- to plan and organise a large project over a long period.

COURSE OUTCOME:

On successful completion of this course students shall

1. be able to apply the knowledge and skills previously gained into practice.
2. take appropriate decision wrt various parameters related to production of a system or sub-system.
3. demonstrate the leadership quality along with ability to work in a group.
4. prove the ability to present the findings in a written report or oral presentation.

CONTENTS:

- The mini project shall be carried out in-house i.e. in the department's laboratories/centres by a group 2 – 4 students. In any case the group shall not consist of more than four students.
- The mini project outline (a brief or condensed information giving a general view of mini project topic) on the selected topic should be submitted to the course coordinator for approval within one weeks from the commencement of the term.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.

• Each student is required to maintain separate log book for documenting various activities carried under minor project.
• Maximum three minor project groups shall be assigned to one teaching staff.
• Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:

- Size of report shall be of minimum 35 pages.
- Student should preferably refer minimum five reference books / magazines/standard research papers.
- **Format of report**
  - Introduction.
  - Literature survey.
  - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
  - Future scope.
  - Conclusion.

Assessment of Minor Project
Name of the Project:
Name of the Guide:
Table A of assessment

S.N.	Exam Seat No	Name of Student	Project Selection & documentation	Design /Simulation / optimization and result	Presentation	Total	Remark
			10	**20**	**20**	**50**	
1							
2							

EVALUATION SYSTEM:

It includes Internal Continuous Assessment (ICA) and End Semester Examination (ESE). Guidelines for ICA and ESE are given bellow.

Internal Continuous Assessment (ICA)

- The ICA shall be evaluated by course coordinator.
- Course coordinator shall judge the students on the principle of continuous evaluation and contribution of individual student in the group.
- It shall be evaluated on the basis of deliverables of mini project and depth of understanding.
- Course coordinator shall maintain the record of continuous evaluation in appropriate format available on institute/department's web site.

End Semester Examination (ESE)

The End Semester Examination for this course shall be based on demonstration of the system or sub system developed by the group of students, deliverables of mini project and depth of understanding (oral examination). It shall be evaluated by two examiners out of which one

Every student shall undertake the Minor Project in semester VI.

ME 361 SELF SUDY - II

Teaching Scheme: 00, **Total:** 00 **Credit:** 02
Evaluation Scheme: 50ISE **Total Marks:** 50

Content and Guide line:

The 20% syllabus for self - study shall be declared by subject teacher of five subjects at the beginning of semester and he/she shall conduct the test examination for that course, assess answer papers of test examination and submit the marks to course coordinator.

Marks and hence grade of course Self Study II shall be based on one test each conducted on 20% syllabus of five subjects ME351, ME352, ME353, ME354, ME355. One faculty member should be appointed as course coordinator for the course 'self study' to compile the marks of all tests and enter into the MIS.

ME 362 INDUSTRIAL LECTURES

Teaching Scheme: 01Th, **Total:** 01 **Credit:** 00
Evaluation Scheme: 00 **Total Marks:** 00

COURSE DESCRIPTION:

This course reflects on the importance of acquaintanceships and the interchange of needed information between practicing engineers in industry and students in educational institutions. There is a criticism, especially from practicing engineers, that existing engineering education is too theoretical and numerical with less orientation toward practical aspects. This course is designed to overcome this criticism. This course is intended to generate such interaction directly, through expert lectures by outstanding practicing engineers. This course will prove helpful to denote and understand the relations among the employers, employees, and other organisations.

DESIRABLE AWARENESS/SKILLS:

Listening, understanding and analysing ability along with the knowledge of concepts, principles and techniques studied earlier.

COURSE OBJECTIVES:

The objectives of offering this course are:

1. to make students familiar with industrial environment i.e. to provide appropriate exposure to world of work.
2. to know and understand the industrial experience, attitudes, needs, and viewpoints of industrial expert to students.
3. to denote and understand the role of various parties' viz., employers, employees, and state in maintaining industrial relations..
4. to improve industry institute interaction.

COURSE OUTCOME:

On successful completion of this course students shall

1. become familiar with industrial environment/ world of work.
2. understand expectations of industry wrt expertise, attitude and viewpoint.
3. demonstrate the good inter personnel relations.
4. be able to work in industrial environment either as employee or self employed (entrepreneur) with comfort.

Topics:

- Priority of Industrial lecture shall be strictly organizes on topics of recent Updates in techniques / Processes for various fields in Mechanical engineering such as,
  - Biomedical analysis
  - Industrial Automation / Mechatronic Engineering
  - CAD / CAM / CAE/ Simulation software uses in various field,
  - Basics of FEA and its industrial application,
  - Piping Engineering
  - Computational fluid Dynamics tools ,
  - Quality and testing / quality audits,
  - Recent role of advance manufacturing processes for employment.
  - Optimization techniques for manufacturing / Additive manufacturing / Flexible manufacturing system,
  - Robotics Applications and its programming,
  - CPM / PERT/ Inventory Control techniques / supply chain managements / HRs allocation techniques,
  - Any other techniques or processes, if recently demands etc.
- General updates shall consist of personality developments, soft skill techniques / General Proficiency.

Guide line:

- In the course Industrial Lectures, at least 12 lectures from industrial expert should be arranged and continuously assessed (06 lectures in each VIth and VIIIth semester).
- Industrial Lectures shall be based on recent updates techniques which are assisting to modernize the Industrial Culture and Progression.
- Lectures shall be based on managerial aspects for governance of organization.
- Industrial lectures shall be on Entrepreneur ship for Industry establishment and self-Independent strength of student.
- Evaluation of the course ME362 Industrial Lectures shall be done in VIIIth semester along with the subject ME460 Industrial Lectures.
- There shall be minimum 6 lectures of 60 -90 minutes duration.
- The lecture shall include presentation, informal discussions with students and faculty, and laboratory tours (if required).
- In general or Professional introductory for encouraging student :- Typically speakers should talk about:
  i. Their own career following (and sometimes including) university.
  ii. Interesting jobs/projects they have had worked on.
  iii. The areas of work they are currently involved in.
  iv. The type of work engineering graduates can expect.
  v. Current job opportunities that may be available for engineering graduates in general and electronics and telecommunication engineering graduates in particular.
  vi. Any suggestions for students with regard to job hunting / CV writing / interviews etc.
  vii. Latest technology used in the industry which is not the part of curriculum or routine training programmes.

viii. Any other suitable topic/information which provides industrial exposure and improves entrepreneurship quality/ employability of the students.

- Course coordinator shall discuss with students on the content of lecture and may conduct oral or give written assignments to judge the depth of understanding of students.
- Students shall submit the report based on minimum six lectures giving summary of the lecture delivered.
- The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in the format provided by institute/department.
- Industrial Lecture deliverables: An industrial lecture report as per the specified format (available on the department and institute's website) and assignments given by course coordinator (if any).

(Note: List of renowned experts/Officials/Enterprenuers from Industries/Government Organizations/Private Sectors/Public Sectors / R&D Labs etc shall be prepared by the committee appointed by HoD and shall be approved by principal. After approval from the principal, minimum six Industrial Lectures shall be arranged, which shall be delivered by experts to cover the various aspects of course content)

EVALUATION SYSTEM:

It includes Internal Continuous Assessment (ICA). Guidelines for ICA are given bellow.

Internal Continuous Assessment (ICA)

- The ICA shall be evaluated by course coordinator.
- Course coordinator shall judge the students on the principle of continuous evaluation and contribution of individual student.
- It shall be evaluated on the basis of deliverables of industrial lecture and depth of understanding (oral conducted by course coordinator).
- Course coordinator shall maintain the record of continuous evaluation (oral) and handover to HoD as the marks and credit are to be allotted in the VIIIth semester.