SEMESTER III

S. No.	Course Code	Course Title	Cate-Gory	Periods per week			Total contact periods	Credits
				L	T	P		
THEORY								
1.	MA3351	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2.	ME3393	Manufacturing Processes	PCC	3	0	0	3	3
3.	AU3301	Thermodynamics and Heat Transfer	ESC	3	0	0	3	3
4.	ME3351	Engineering Mechanics	ESC	3	0	0	3	3
5.	AU3302	Automotive Hydraulics and Machinery	ESC	3	0	0	3	3
6.	AU3303	Automotive Engines	PCC	3	0	0	3	3
PRACTICALS								
7.	AU3311	Mechanical Sciences Laboratory	ESC	0	0	4	4	2
8.	ME3382	Manufacturing Technology Laboratory	PCC	0	0	4	4	2
9.	GE3361	Professional Development[$]	EEC	0	0	2	2	1
			TOTAL	**18**	**1**	**10**	**29**	**24**

$ Skill Based Course

SEMESTER IV

S. No.	Course Code	Course Title	Cate-Gory	Periods per week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	AU3401	Fuels and Lubricants	PCC	3	0	0	3	3
2.	AU3402	Automotive Chassis	PCC	3	0	0	3	3
3.	AU3403	Vehicle Body Engineering	PCC	3	0	0	3	3
4.	ML3391	Mechanics of Solids	ESC	3	0	0	3	3
5.	AU3404	Automotive Transmission	PCC	3	0	0	3	3
6.	GE3451	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2[#]		3	0	0	3	3 #
PRACTICALS								
8.	AU3411	Vehicle Components Laboratory	PCC	0	0	4	4	2
9.	AU3412	Fuels and Lubricants Laboratory	PCC	0	0	4	4	2
			TOTAL	**17**	**0**	**8**	**25**	**21**

[#] NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

MA3351	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier, transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of PDE – Method of separation of variables - Fourier series solutions of one-dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms - – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students should be able to:

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two-dimensional heat flow problems and one-dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016.

REFERENCES:

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers", SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
4. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

ME3393 MANUFACTURING PROCESSES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To illustrate the working principles of various metal casting processes.
2. To learn and apply the working principles of various metal joining processes.
3. To analyse the working principles of bulk deformation of metals.
4. To learn the working principles of sheet metal forming process.
5. To study and practice the working principles of plastics molding.

UNIT – I METAL CASTING PROCESSES **9**

Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Molding sand Properties and testing – Cores – Types and applications – Molding machines – Types and applications– Melting furnaces – Principle of special casting processes- Shell, Investment – Ceramic mould – Pressure die casting – low pressure, gravity- Tilt pouring, high pressure die casting- Centrifugal Casting – CO2 casting –- Defects in Sand casting process-remedies

UNIT II METAL JOINING PROCESSES **9**

Fusion welding processes – Oxy fuel welding – Filler and Flux materials—Arc welding, Electrodes, Coating and specifications – Gas Tungsten arc welding –Gas metal arc welding - Submerged arc welding – Electro slag welding– Plasma arc welding — Resistance welding Processes -Electron beam welding –Laser beam Welding Friction welding – Friction stir welding – Diffusion welding – Thermit Welding, Weld defects – inspection &remedies – Brazing - soldering – Adhesive bonding.

UNIT III BULK DEFORMATION PROCESSES **9**

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – cold forging- Characteristics of the processes – Typical forging operations – rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts – Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Introduction to shaping operations.

UNIT IV SHEET METAL PROCESSES **9**

Sheet metal characteristics – Typical shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes - Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning – Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming – Incremental forming.

UNIT V MANUFACTURE OF PLASTIC COMPONENTS **9**

Types and characteristics of plastics – Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – injection molding – Plunger and screw machines – Compression

molding, Transfer Molding – Typical industrial applications – introduction to blow molding – Rotational molding – Film blowing – Extrusion – Thermoforming – Bonding of thermoplastics – Puff moulding.

TOTAL :45 PERIODS

OUTCOMES:

At the end of the course the students would be able to

1. Explain the principle of different metal casting processes.
2. Describe the various metal joining processes.
3. Illustrate the different bulk deformation processes.
4. Apply the various sheet metal forming process.
5. Apply suitable molding technique for manufacturing of plastics components.

TEXT BOOKS:

1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India,4th Edition, 2013
2. P.N.Rao Manufacturing Technology Volume 1 Mc Grawhill Education 5th edition,2018.

REFERENCES:

1. Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006.
2. S. Gowri P. Hariharan, A.Suresh Babu, Manufacturing Technology I, Pearson Education, 2008.
3. Paul Degarma E, Black J.T and Ronald A. Kosher, Eligth Edition, Materials and Processes, in Manufacturing, Eight Edition, Prentice – Hall of India, 1997.
4. Hajra Chouldhary S.K and Hajra Choudhury. AK., Elements of workshop Technology, volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
5. Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2004

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3		2			2	3	1	1	-	-	1	3	1	2
2	3		2			2	3	1	1	-	-	1	3	1	2
3	3		2			2	2	1	1	-	-	1	3	1	2
4	3		2			2	2	1	1	-	-	1	3	1	2
5	3		2		2	2	2	1	1	-	-	1	3	1	2
Low (1) ; Medium (2) ; High (3)															

AU3301 THERMODYNAMICS AND HEAT TRANSFER L T P C

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted) **3 0 0 3**

COURSE OBJECTIVES:

The objective of this course is to prepare the students with the knowledge of basic principles of thermodynamics via real world engineering examples in order to apply, analyse and evaluate air standard cycles, Steam power cycles and Refrigeration and Air conditioning cycles

UNIT I BASIC THERMODYNAMICS 9

Systems, closed, open and isolated. Property, state, path and process, quasi-static process, Zeroth low, First law. Steady flow energy equation. Engineering Applications of Steady flow energy equation Heat and work transfer in flow and non-flow processes. Simple problems- Second law, Kelvin-Planck statement – Clausius statement - Concept of Entropy (descriptive).

UNIT II AIR STANDARD CYCLES AND COMPRESSORS 9

Cycle, Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles; Calculation of Air standard efficiency (simple problems). Mean effective pressure (Definition only). Compressors, Classifications of compressors, Reciprocating compressor- Rotary, Axial and Vane compressors (descriptive).

UNIT III STEAM PROPERTIES AND CYCLE 9

Formation of steam and its thermodynamic properties, T-s and h-s diagrams. Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – simple Rankine cycle, Efficiency, Steam Nozzles, Types of nozzles, Friction in nozzles (descriptive)

UNIT IV REFRIGERATION AND AIR-CONDITIONING 9

Construction and working principles of refrigeration, Vapour compression system - Vapour absorption types, comparison – Definition of Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V INTRODUCTION TO HEAT TRANSFER 9

Modes of heat transfer, Heat conduction in parallel, radial and composite wall – Heat conduction through hollow and composite cylinders, spheres (simple problems). Basics of Convective heat transfer and Fundamentals of Radiative heat transfer (descriptive only)– Types of heat exchangers, Arithmetic and Logarithmic Mean Temperature Difference (AMTD & LMTD).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

1. Demonstrate the understanding of the nature of the thermodynamic processes for pure substances of ideal gases
2. Interpret First Law of Thermodynamics and its application to systems and control volumes
3. Solve any flow specific problem in an engineering approach based on basic concepts and logic sequences.
4. Compare and contrast between various types of refrigeration cycles
5. Understand the basics and modes of heat transfer

TEXT BOOKS:

1. Chattopadhyay. P Engineering Thermodynamics", oxford University Press, New Delhi, 2010.
2. Nag. P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2007.
3. Rathakrishnan E., "Fundamentals of Engineering Thermodynamics" Prentice-Hall India, 2005.

REFERENCES:

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
2. Holman. J. P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2007.
3. Mathur& Sharma Steam Tables, Jain Publishers, New Delhi.
4. Merala C, Pother, Craig W, Somerton, "Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.
5. Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	2	2		3	2					3		1	3
2	1	2	2	2		3	2					3		1	3
3	1	2	2	2		3	2					3		1	3
4	1	2	2	2		3	2					3		1	3
5	1	2	2	2		3	2					3		1	3
Avg.	1	2	2	2		3	2					3		1	3

ME3351 **ENGINEERING MECHANICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1 To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
2 To introduce the equilibrium of rigid bodies, vector methods and free body diagram
3 To study and understand the distributed forces, surface, loading on beam and intensity.
4 To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5 To develop basic dynamics concepts – force, momentum, work and energy;

UNIT I STATICS OF PARTICLES **9**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES **9**

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III DISTRIBUTED FORCES **9**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by

Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION **9**

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V DYNAMICS OF PARTICLES **9**

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the students would be able to

1. Illustrate the vector and scalar representation of forces and moments
2. Analyse the rigid body in equilibrium
3. Evaluate the properties of distributed forces
4. Determine the friction and the effects by the laws of friction
5. Calculate dynamic forces exerted in rigid body

TEXTBOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12thEdition, 2019.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	2							2	3	1	1
2	3	2	2	1	2							2	3	1	1
3	3	2	3	1	2							2	3	1	2
4	3	2	3	1	2							2	3	1	2
5	3	2	3	1	2							2	3	1	2
Low (1); Medium (2); High (3)															

AU3302 AUTOMOTIVE HYDRAULICS AND MACHINERY L T P C
3 0 0 3

COURSE OBJECTIVES:

The objective of this course is to prepare the students to learn the basics of fluid statics and dynamics, and solve numerical related to equations of fluid motion, fluid flow in pipes, dimensional analysis, model studies and hydraulic machinery

UNIT I BASIC CONCEPTS 9

Classification of fluids and their properties – Measurement of pressure and viscosity – Fluid statics and force on submerged bodies – Stability of floating bodies.

UNIT II EQUATIONS OF FLUID FLOW 9

Kinematics – Motion of a fluid particle – Fluid deformation – Navier Stokes equation and Euler's equation – Basic laws of fluid motion in integral form and differential form - Linear momentum equation.

UNIT III INCOMPRESSIBLE INVISCID AND VISCOUS FLOWS 9

Bernoulli's equations – Applications — Flow measurement – Orifice plate – Venturi meter – Fully developed laminar flow between parallel plates – Laminar and turbulent flow through pipes – Velocity profiles – Energy considerations in pipe flow – Calculation of head loss Pipe flow problems – Hydraulic and energy grade lines.

UNIT IV DIMENSIONAL ANALYSIS ANDMODELSTUDIES 9

Dimensional analysis – non-dimensional numbers - The Buckingham-Pi theorem – Significant dimensionless groups – Flow similarity and model studies-

UNIT V HYDRAULIC MACHINERY FOR VEHICLE APPLICATIONS 9

Impact of jets - Euler's equation - Classification of turbines – heads and efficiencies – velocity triangles. Turbochargers – selection of type, working principle - Reciprocating pump, Rotary pumps –classification and working principle. Fuel pumps – selection of type and working principle.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

1. Apply the basic concepts of fluids statics and dynamics
2. Summarize the concepts of flow governing equations
3. Generate solutions to complex pipe flow problems
4. Interpret the results of dimensional analysis
5. Understand the applications of fluid machinery in automotives

TEXT BOOKS:

1. R.K. Bansal, "A textbook of fluid mechanics and hydraulic machines", Laxmi Publications (P) Ltd, Revised Ninth Edition.

REFERENCES:

1. E. Rathakrishnan, "Fluid Mechanics: An Introduction", Prentice Hall of India (II Ed.), 2007.
2. Robert L. Mott, Joseph A. Untener, "Applied Fluid Mechanics", Pearson Publications (2014), Seventh edition.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	2	2		3	2					2		1	3
2	1	2	2	2		3	2					2		1	3
3	1	2	2	2		3	2					2		1	3
4	1	2	2	2		3	2					2		1	3
5	1	2	2	2		3	2					2		1	3
Avg.	1	2	2	2		3	2					2		1	3

AU3303 **AUTOMOTIVE ENGINES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

The objective of this course is to prepare the students with the knowledge on basics of constructional and working principles of automotive SI and CI engines along with their sub systems, thermochemistry of fuel-air mixtures, combustion process, performance and emission characteristics of IC engines.

UNIT I ENGINE FUNDAMENTALS **9**

Engine types and their operation- classifications – Terminology- Four stroke and two stroke cycle- Engine components, working principle of SI and CI engines - Engine operating parameters- Fuel – air and actual cycle analysis – Engine emissions – valve and port timing diagram – firing order

UNIT II INDUCTION AND IGNITION SYSTEM **9**

Carburettors – mixture requirements - working principles, different circuits – Requirements and objective of injection system – types of injection - Jerk and distributor type pumps, Unit injector, common rail direct injection - Electronic fuel injection – GDI, Injection timing, Injection lag. Types of injection nozzle, Nozzle tests. Spray characteristics. Split and Multiple injection. Mechanical and pneumatic governors. Ignition system- battery coil, magneto coil and Electronic ignition system

UNIT III COMBUSTION OF FUELS **9**

Combustion in SI engine - Stages of combustion- Flame Propagation- Rate of pressure rise- Abnormal combustion- combustion chambers – design objectives and types Engine Knock Thermodynamic analysis of SI engine combustion- Burned and Unburned mixture states – combustion process characterization- CI Engine - Importance of air motion – Swirl, Squish and Tumble. Swirl ratio. Stages of combustion. Delay period – factors affecting delay period. knock in CI & SI engines. Direct and indirect injection combustion chambers for diesel combustion.

UNIT IV ENGINE COOLING, LUBRICATING AND EXHAUST SYSTEM **9**

Cooling system – Function- types - working principle - Lubricating system- Function- types - Lubricant Requirements Necessity and limitation of supercharging. Types of supercharger and turbocharger. Intercooler. Matching of turbocharger. Modification of an engine for supercharging. Effect of supercharging on engine performance- exhaust system- exhaust manifold - muffler types.

UNIT V ENGINE TESTING AND MEASUREMENTS 9

Engine testing and measuring equipment- Indicated and brake MEP, operating variables that affect engine performance, efficiency and emission – Automotive and stationary engine testing and related standards – use of transient dynamometer for engine testing. Engine power– measurement of indicated power-brake power- frictional power- efficiencies – Heat balance – Methods to improve engine performance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to,

1. Identify various components of SI and CI engines
2. Explain the functions of IC engine sub-systems like Ignition, cooling and lubrication
3. Understand the actual engine working principle and its thermochemistry of fuel-air mixtures
4. Describe the basic knowledge on SI and CI engine combustion and its related parameters
5. Apply their knowledge in analyzing the engine performance and pollution characteristics.

TEXT BOOKS:

1. John B.Heywood , " Internal Combustion Engines" , McGraw-Hill Book Company, ISBN No: 0-07-100499-8
2. M.L. Mathur and R.P.Sharma, Internal Combustion Engine, Dhanpath Rai Publications (P) Ltd, New Delhi 110002
3. V. Ganesan, Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 2010.

REFERENCES:

1. Heinz Hesiler, Advanced engine technology. Butterworth Heinmann publications
2. Heldt, P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta,
3. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
4. Maleev, V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 1974.
5. Obert, E.F., Internal Combustion Engine analysis and Practice, International Text Book Co.,Scranton, Pennsylvania, 1988.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	2	1		3	2					2		1	3
2	1	1	2	1		3	2					2		1	3
3	1	1	2	1		3	2					2		1	3
4	1	1	2	1		3	2					2		1	3
5	1	1	2	1		3	2					2		1	3
Avg.	1	1	2	1		3	2					2		1	3

AU3311 **MECHANICAL SCIENCES LABORATORY** **L T P C**

0 0 4 2

COURSE OBJECTIVES:

The objective of this course is to prepare the students to conduct experiments in order to understand the various physical characterization, mechanical properties and testing methods of materials, performance of fluid flow measuring devices and fluid machinery.

LIST OF EXPERIMENTS

1. Tension Test
2. Torsion Test
3. Testing of springs
4. Impact test i) Izod, ii) Charpy
5. Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
6. Deflection of Beams
7. Mass Moment of inertia of connecting rods
8. Determination of the Coefficient of discharge of given Orifice meter.
9. Determination of the Coefficient of discharge of given Venturi meter.
10. Calculation of the rate of flow using Rota meter.
11. Determination of friction factor for a given set of pipes.
12. experiments and drawing the characteristic curves of centrifugal pump
13. Experiments and drawing the characteristic curves of reciprocating pump.
14. Experiments and drawing the characteristic curves of Gear pump.
15. Experiments and drawing the characteristic curves of Pelton wheel / Francis turbine/ Kaplan turbine

TOTAL: 60 PERIODS

COURSEOUTCOMES

Upon completion of this course, the students will be able to,

1. Conduct experiments to understand the physical characterization of materials.
2. Identify the various experimental testing methods for of mechanical properties of materials.
3. Evaluate the basics of fluid flow characteristics.
4. Measure experimentally the Performance characteristics of pumps.
5. Determine experimentally the Performance characteristics of turbines.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	2	2	1		2		1	1		2		1	3
2	1	2	2	2	1		2		1	1		2		1	3
3	1	2	2	2	1		2		1	1		2		1	3
4	1	2	2	2	1		2		1	1		2		1	3
5	1	2	2	2	1		2		1	1		2		1	3
Avg.	1	2	2	2	1		2		1	1		2		1	3

ME3382	MANUFACTURING TECHNOLOGY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1 To Selecting appropriate tools, equipment's and machines to complete a given job.
2 To Performing various welding process using GMAW and fabricating gears using gear making machines.
3 To Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling and analysing the defects in the cast and machined components.

LIST OF EXPERIMENTS

1. Fabricating simple structural shapes using Gas Metal Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
3. Taper Turning and Eccentric Turning on circular parts using lathe machine.
4. Knurling, external and internal thread cutting on circular parts using lathe machine.
5. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
6. Drilling and Reaming using vertical drilling machine.
7. Milling contours on plates using vertical milling machine.
8. Cutting spur and helical gear using milling machine.
9. Generating gears using gear hobbing machine.
10. Generating gears using gear shaping machine.
11. Grinding components using cylindrical and centerless grinding machine.
12. Grinding components using surface grinding machine.
13. Cutting force calculation using dynamometer in milling machine
14. Cutting force calculation using dynamometer in lathe machine

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1.	Centre Lathes	7 Nos.
2.	Shaper	1 No.
3.	Horizontal Milling Machine	1 No.
4.	Vertical Milling Machine	1 No.
5.	Surface Grinding Machine	1 No.
6.	Cylindrical Grinding Machine	1 No.
7.	Radial Drilling Machine	1 No.
8.	Lathe Tool Dynamometer	1 No.
9.	Milling Tool Dynamometer	1 No.
10.	Gear Hobbing Machine	1 No.
11.	Gear Shaping Machine	1 No.
12.	Arc welding transformer with cables and holders	2 Nos.
13.	Oxygen and Acetylene gas cylinders, blow pipe and other welding outfit	1 No.
14.	Moulding table, Moulding equipments	2 Nos.

TOTAL:60 PERIODS