

THIRD SEMESTER, B TECH

SL. No.	SUB-CODE	SUBJECT	HOURS PER WEEK			CREDIT S
			L	T	P	C
THEORY						
1	MA131301	MATHEMATICS III	3	2	0	4
2	ME131302	MECHANICS OF MATERIALS	3	2	0	4
3	ME131303	BASIC THERMODYNAMICS	3	2	0	4
4	ME131304	MECHANISM AND MACHINES I	3	2	0	4
5	ME131305	PRIMARY MANUFACTURING	2	2	0	3
6	HS131306	SOCIOLOGY	2	0	0	2
PRACTICAL						
7	ME131312	MECHANICS OF MATERIAL LAB	0	0	2	1
8	ME131315	PRIMARY MANUFACTURING LAB	0	0	2	1
9	ME131317	MACHINE DRAWING	0	0	4	2
TOTAL			16	10	8	25
WORKING HOURS = 34						
TOTAL CREDITS = 25						

Course Title: Mathematics III

Course Code: MA131301

L-T-P:C 3-2-0 =4

Abstract:

This course of Mathematics is important for almost all the engineering disciplines. It deals with the partial differential equations of first order and 2nd order.

Prerequisites: Concept of solution of ODE, Elementary complex numbers and properties, Elementary probability and statistics – measures of central tendency, dispersions. Basic differentiation and integration [HS / diploma level]

Course Outcomes:

The students will

- ❖ Be able to apply the fundamental concepts of Partial differential Equations.
- ❖ Get familiarised with the applications of Ordinary Differential Equations and Partial Differential Equations.
- ❖ Be able to apply different techniques of integration, including partial fractions, integration by parts and recurrence formulae, to solve problems.

Module	Topic	No of hours	Marks
1	First order Partial differential equation: Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co- efficient, Cauchy type, Monge's method. Second order Partial differential equation: Second order partial differential equation The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.	15	30

2	<p>Complex Analysis: Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions.</p> <p>Mathematical Series: Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method.</p>	15	30
3	<p>Probability and statistics:</p> <p>(i) Definition of probability, Laws of probability, Bays theorem, random variables, probability distributions and characteristics, binomial distribution, poisson's distributions and Normal distribution.</p> <p>(ii) elementary sampling theory, tests of hypothesis (statistical inference), Standard error, Fiducial (Confidence) limits, Tests of significance- Students' T-tests, Chi square tests and Z –tests.</p>	10	25
4	<p>Laplace Transform</p> <p>Definition of Laplace transform, Laplace transform of elementary functions, inverse of Laplace transforms. Properties of Laplace Transform- Linearity, multiplication by t^n and division by t. Laplace Transform of derivatives and integrals. Shifting theorems, Laplace transform of (i) periodic function (ii) unit step function, (iii) Dirac-delta function. Convolution theorem, Application of Laplace transform to initial value problems.</p>	8	15

Reference books:

1. E. Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, Wiley India.
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hil Education.
3. N.P.Bali and Manish Goel, "A text book of Engineering mathematics", Laxmi Publication.
4. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.
5. Babu Ram, "Engineering Mathematics", Pearson.

ME131302	MECHANICS OF MATERIALS	L = 3 T = 2 C = 4
MODULE-I	PRINCIPAL STRESSES AND STRAINS, NORMAL AND SHEAR STRESS, MOHR'S CIRCLE OF STRESS AND STRAIN, STRAIN ROSETTE'S.	7 HOURS
MODULE-II	FLEXURAL LOADING THEORY OF PURE BENDING, FLEXURAL FORMULA, SHEAR FORCE AND BENDING MOMENTS DIAGRAMS FOR DIFFERENT TYPES OF LOADING AND SUPPORT CONDITIONS ON BEAMS. TRANSVERSE SHEAR STRESS DISTRIBUTION IN CIRCULAR, HOLLOW CIRCULAR, I, BOX AND T, ANGLE SECTIONS.	7 HOURS
MODULE-III	DEFLECTION OF BEAMS- I: STRAIN CURVATURE AND MOMENT CURVATURE RELATION, SOLUTION OF BEAM DEFLECTION., PROBLEMS BY DIRECT INTEGRATION METHOD, AREA MOMENT METHOD	7 HOURS
MODULE-IV	COLUMNS: EULER'S FORMULA FOR DIFFERENT END CONDITIONS, CONCEPT OF EQUIVALENT LENGTH, ECCENTRIC LOADING, RANKINE FORMULA.	6 HOURS
MODULE-V	ENERGY METHODS STRAIN ENERGY FOR UNI-AXIAL STRESS, PURE BENDING, SHEARING STRESSES, USE OF ENERGY THEOREMS TO DETERMINE DEFLECTION AND TWIST OF BEAMS, CASTIGLIANO'S THEOREMS, MAXWELL BETTE RECIPROCAL THEOREM.	5 HOURS
MODULE-VI	THICK CYLINDER: LAME'S EQUATION, LONGITUDINAL AND SHEAR STRESS, STRESSES DUE TO SHRUNK FIT.	4 HOURS
MODULE-VII	STRESSES IN DISCS OF ROTATION.	4 HOURS
TOTAL		40 HOURS
REFERENCE BOOKS 1. S.S.RATTAN, STRENGTH OF MATERIALS, TATA MCGRAW HILL PUBLICATIONS. 2. RAMAMRUTHAM, S, "STRENGTH OF MATREIALS", DHANPAT RAI & SONS, 1991 3. POPOV, E.P., "MECHANICS OF MATERIALS", PRENTICE HALL INC., 1984 4. ANDREW, P. AND SINGER, F.L., "STRENGTH OF MATERIALS", HAPPER & ROW PUBLISHERS 5. ELEMENTS OF STRENGTH OF MATERIALS BY TIMOSHENKO		

ME 131303	BASIC THERMODYNAMICS	L = 3 T = 2 C = 4
MODULE-I	SYSTEM AND CONTINUUM: INTENSIVE AND EXTENSIVE PROPERTIES – THERMODYNAMIC STATE, PRESSURE, ENERGY, WORK AND HEAT – PROCESS AND CYCLE – MACROSCOPIC AND MICROSCOPIC POINTS OF VIEW – KINETIC THEORY OF GASES.	6 HOURS
MODULE-II	LAWS OF THERMODYNAMICS: ZEROth LAW – CONCEPT OF EQUILIBRIUM – PRINCIPLES OF THERMOMETRY – FIXED POINTS.	3 HOURS
MODULE-III	FIRST LAW OF THERMODYNAMICS AND ITS APPLICATION TO OPEN AND CLOSED SYSTEMS – CONCEPT OF INTERNAL ENERGY – STEADY FLOW ENERGY EQUATION – PROCESSES OF CLOSED SYSTEMS.	6 HOURS
MODULE-IV	SECOND LAW OF THERMODYNAMICS – VARIOUS STATEMENTS – CARNOT CYCLE – REVERSIBLE AND IRREVERSIBLE PROCESSES – THERMODYNAMIC EFFICIENCY AND TEMPERATURE SCALES – CONCEPT OF ENTROPY – ENTROPY CHANGES IN VARIOUS PROCESSES	6 HOURS
MODULE-V	PROPERTIES OF STEAM: LATENT HEAT – SATURATION PRESSURE AND TEMPERATURE – DRYNESS FRACTION – DEGREE OF SUPERHEAT – TOTAL HEAT; RANKINE CYCLE.	6 HOURS
MODULE-VI	AIR STANDARD CYCLES: OTTO, DIESEL – PRINCIPLES OF WORKING AND DESCRIPTION OF TWO AND FOUR STROKE SI AND CI ENGINES – DUAL FUEL CYCLE, AIR STANDARD EFFICIENCY, MEAN EFFECTIVE PRESSURE AND POWER- REPRESENTATIONS OF PROCESSES ON T-S AND P-V DIAGRAMS.	6 HOURS
MODULE-VII	FUELS AND COMBUSTIONS: CLASSIFICATION OF FUELS; HCV, LCV, BOMB CALORIMETER, BOY'S GAS CALORIMETER; COMBUSTION OF FUELS; MINIMUM AIR REQUIRED (BY WEIGHT AND BY VOLUME); CONVERSION OF VOLUMETRIC ANALYSIS INTO WEIGHT ANALYSIS AND VICE VERSA; EXCESS AIR AND ORSAT'S APPARATUS.	7 HOURS
TOTAL		40 HOURS
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. ENGINEERING THERMODYNAMICS BY P K NAG, TATA MCGRAW HILL PUBLICATION 2. FUNDAMENTALS OF THERMODYNAMICS BY CENGEL AND BOLES, TATA MCGRAW HILL PUBLICATION 3. ENGINEERING THERMODYNAMICS BY P. CHATTOPADHYAY, OXFORD UNIVERSITY PRESS 		

ME 131304	MECHANISM AND MACHINES I	L = 3 T = 2 C = 4
MODULE-I	MECHANISMS : BASIC KINEMATIC CONCEPTS AND DEFINITIONS, LINK, KINEMATIC PAIR, CLASSIFICATION OF KINEMATIC PAIRS, DEGREES OF FREEDOM, KINEMATIC CHAIN, MECHANISM, INVERSION OF MECHANISM, BINARY, TERNARY AND QUATERNARY JOINTS, DEGREES OF FREEDOM FOR PLANE MECHANISM, GRASHOF'S LAW, GRUEBLER'S CRITERION, FOUR BAR CHAINS AND THEIR INVERSIONS, SLIDER CRANK CHAIN, DOUBLE SLIDER CRANK CHAIN AND THEIR INVERSION.	5 HOURS
MODULE-II	KINEMATIC ANALYSIS : DETERMINATION OF VELOCITY USING GRAPHICAL AND ANALYTICAL TECHNIQUES, INSTANTANEOUS CENTRE METHOD, RELATIVE VELOCITY METHOD, KENNEDY THEOREM, VELOCITY IN FOUR BAR MECHANISM, SLIDER CRANK MECHANISM, RUBBING VELOCITY AT A PIN-JOINT. ACCELERATION DIAGRAM FOR A SLIDER - CRANK MECHANISM, CORIOLI'S COMPONENT OF ACCELERATION AND ITS APPLICATION, VELOCITY AND ACCELERATION OF PISTON BY ANALYTICAL METHOD.	10 HOURS
MODULE-III	INERTIA FORCES IN RECIPROCATING PARTS: PISTON EFFORT, FORCE ACTING ALONG THE CONNECTING ROD, CRANK EFFORT, TURNING MOMENT ON CRANKSHAFT. TURNING MOMENT DIAGRAMS FOR DIFFERENT TYPES OF ENGINES, FLUCTUATION OF ENERGY AND FLUCTUATION OF SPEED.	6 HOURS
MODULE-IV	FRICTION: FRICTION OF A SCREW AND NUT, SQUARE THREADED SCREW, V-THREADED SCREW, PIVOT AND COLLAR FRICTION, FRICTION CIRCLE, FRICTION AXIS, FRICTION CLUTCHES, TRANSMISSION OF POWER BY SINGLE PLATE, MULTI-PLATE AND CONE CLUTCHES.	6 HOURS
MODULE-V	BRAKES & DYNAMOMETERS : CLASSIFICATION OF BRAKES, ANALYSIS OF SIMPLE BLOCK, BAND AND INTERNAL EXPANDING SHOE BRAKE, BRAKING OF A VEHICLE. ABSORPTION AND TRANSMISSION DYNAMOMETERS, PRONY BRAKE, ROPE BRAKE, BAND BRAKE DYNAMOMETER, BELT TRANSMISSION DYNAMOMETER, TORSION DYNAMOMETER.	6 HOURS
MODULE-VI	DRIVES: GEAR TRAINS: SIMPLE TRAIN, COMPOUND TRAIN, REVERTED TRAIN, EPICYCLIC TRAIN AND THEIR APPLICATIONS. BELT DRIVES, LENGTH OF OPEN & CROSS BELT, INITIAL TENSION, EFFECT OF CENTRIFUGAL TENSION ON POWER TRANSMISSION, MAXIMUM POWER TRANSMISSION CAPACITY, BELT CREEP AND SLIP, CROWNING OF PULLEY.	7 HOURS
TOTAL		40 HOURS
REFERENCE BOOKS <ol style="list-style-type: none"> 1. THEORY OF MACHINES BY THOMAS BEVAN, CBS PUBLICATIONS 2. THEORY OF MACHINES BY S.S.RATTAN, TATA MCGRAW HILL. 3. THEORY OF MACHINES BY V.P.SINGH. 4. THEORY OF MECHANISMS AND MACHINES BY GHOSH & A.K.MALLIK, EAST WEST PUBLICATION. 		

ME131305	PRIMARY MANUFACTURING	L = 2 T = 2 C = 3
MODULE-I	TYPES OF PATTERNS, PATTERN MATERIALS AND PATTERN ALLOWANCES. (B) MOULDING MATERIALS - SAND MOULDING, METAL MOULDING, INVESTMENT MOULDING, SHELL MOLDING. (C) COMPOSITION OF MOULDING SAND, SILICA SAND, ZIRCON SAND, BINDERS, ADDITIVES, BINDERS - CLAY, BINDERS FOR CO2 SAND, BINDER FOR SHELL MOULDING, BINDERS FOR CORE SAND. (D) PROPERTIES OF MOULDING SAND AND SAND TESTING. (E) MELTING FURNACES - CUPOLA, RESISTANCE FURNACE, INDUCTION AND ARC FURNACE. (F) SOLIDIFICATION OF CASTINGS, DESIGN OF RISERS AND RUNNERS, FEEDING DISTANCE, CENTRE LINE FREEZING RESISTANCE CHILLS AND CHAPLETS. (G) DEGASIFICATION AND INOCULATION OF METALS. (H) CASTING METHODS LIKE CONTINUOUS CASTING, CENTRIFUGAL CASTING, DISC CASTING. (I) CASTING DEFECTS.	10 HOURS
MODULE-II	WELDING AND CUTTING: INTRODUCTION TO GAS WELDING, CUTTING, ARC WELDING AND EQUIPMENTS. TIG (GTAW) AND MIG (GMAW) WELDING, RESISTANCE WELDING AND THERMIT WELDING. WELDABILITY. MODERN WELDING METHODS LIKE PLASMA ARC, LASER BEAM, ELECTRON BEAM, ULTRASONIC, EXPLOSIVE AND FRICTION WELDING, EDGE PREPARATION IN BUTT WELDING. BRAZING AND SOLDERING, WELDING DEFECTS. DESTRUCTIVE AND NON-DESTRUCTIVE TESTING OF CASTINGS AND WELDING. BRIEF INTRODUCTION TO POWDER METALLURGY PROCESSES.	12 HOURS
MODULE-III	PLASTIC DEFORMATION OF METALS: VARIABLES IN METAL FORMING AND THEIR OPTIMIZATION. DEPENDENCE OF STRESS STRAIN DIAGRAM ON STRAIN RATE AND TEMPERATURE. HOT AND COLD WORKING OF METALS, CLASSIFICATION OF METAL FORMING PROCESSES. ROLLING: PRESSURE AND FORCES IN ROLLING, TYPES OF ROLLING MILLS, ROLLING DEFECTS. FORGING: SMITH FORGING, DROP AND PRESS FORGING, M/C FORGING, FORGING DEFECTS. EXTRUSIONS: DIRECT, INDIRECT, IMPACT AND HYDROSTATIC EXTRUSION AND THEIR APPLICATIONS, EXTRUSION OF TUBES. WIRE DRAWING METHODS AND VARIABLES IN WIRE-DRAWING, OPTIMUM DIE SHAPE FOR EXTRUSION AND DRAWING. BRIEF INTRODUCTION TO SHEET METAL WORKING: BENDING, FORMING AND DEEP DRAWING, SHEARING. BRIEF INTRODUCTION TO EXPLOSIVE FORMING, COATING AND DEPOSITION METHODS.	14 HOURS
MODULE- IV	MACHINING OF TYPICAL PRODUCTS INVOLVING LATHE, MILLING/SHAPING OPERATIONS AND FINISHING PROCESSES; MACHINING OF GEARS.	4 HOURS
TOTAL		40HOURS
REFERENCE BOOKS		
1. MANUFACTURING TECHNOLOGY - BY P.N.RAO, TATA MCGRAW HILL PUBLICATION. 2. WELDING TECHNOLOGY BY R.A. LITTLE, TMH 3. MANUFACTURING SCIENCE BY A.GHOSH AND A K MALICK, EWP		

HS131306	SOCIOLOGY	L = 2 T = 0 C = 2
MODULE-I	SOCIOLOGY IN THE INDUSTRIAL PERSPECTIVE: CONCEPT OF SOCIOLOGY/ SOCIOLOGY AS A SCIENCE?/ SOCIOLOGY OF WORK AND INDUSTRY/ PERSPECTIVES FOR SOCIOLOGICAL ANALYSIS OF WORK/ CLASS CONFLICT IN INDUSTRY/ SOCIAL IMPACT OF INDUSTRIALIZATION	12 HOURS
MODULE-II	WORK AND SOCIAL CHANGE: NATURE OF MODERN SOCIETIES/ EMERGENCE OF INDUSTRIAL CAPITALISM/ TECHNOLOGY AND SOCIAL CHANGE/ THE INFORMATION SOCIETY AFTER THE INDUSTRIAL SOCIETY/ POSTMODERNITY/ GLOBALIZATION AND CONVERGENCE/ SIGNIFICANCE OF THE SERVICE SECTOR TODAY/ WORK RESTRUCTURING AND CORPORATE MANAGEMENT	12 HOURS
MODULE-III	WORK EXPERIENCES IN INDUSTRY: THE CONCEPT OF ALIENATION/ WORK SATISFACTION/ TECHNOLOGY AND WORK EXPERIENCE/ SOCIAL BACKGROUND OF WORKERS/ WORK ORIENTATIONS/ STRESS AND ANXIETY OF THE WORKER/ WORK AND LEISURE/ UNEMPLOYMENT/ CONFLICTS IN THE WORKPLACE	12 HOURS
TOTAL		36 HOURS
REFERENCE BOOKS <ol style="list-style-type: none"> 1. MILLER AND FORM, INDUSTRIAL SOCIOLOGY (LONDON: HARPER & ROW, 1968) 2. N. R. SHETH, SOCIAL FRAMEWORK OF INDIAN FACTORY (BOMBAY: OXFORD UNIVERSITY PRESS, 1968) 3. GISBERT, FUNDAMENTALS OF INDUSTRIAL SOCIOLOGY (NEW DELHI: OXFORD UNIVERSITY PRESS, 1971) 4. P. GISBERT, FUNDAMENTALS OF INDUSTRIAL SOCIOLOGY (NEW DELHI: OXFORD UNIVERSITY PRESS, 1971) 5. TONY J. WATSON, SOCIOLOGY, WORK AND INDUSTRY (NEW YORK: ROUTLEDGE, 2004 REPRINT) 		

ME131312	MECHANICS OF MATERIAL LAB	L-T-P: 0-0-2, CREDIT: 1
	<ol style="list-style-type: none"> 1. TO OBTAIN STRESS-STRAIN CURVE FOR DUCTILE MATERIAL USING UNIVERSAL TESTING MACHINE (UTM). 2. TO OBTAIN STRESS-STRAIN CURVE FOR BRITTLE MATERIAL USING UNIVERSAL TESTING MACHINE (UTM). 3. TO PERFORM COMPRESSION TEST USING UTM. 4. TO DETERMINE THE SHEAR FORCE AND BENDING MOMENT DIAGRAM FOR A SIMPLY SUPPORTED BEAM. 	
ME131315	PRIMARY MANUFACTURING LAB	L-T-P: 0-0-2, CREDIT: 1
	<p>WELDING:</p> <ol style="list-style-type: none"> 1. DEMO ON ALL WELDING POSITIONS (VERTICAL, HORIZONTAL, OVERHEAD, DOWN HEAD). 2. 333@ 3. DISCUSSION ON TIG AND MIG. 4. GAS WELDING: OXY-ACETYLENE GAS WELDING. 5. BRAZING & SOLDERING. <p>MACHINING:</p> <ol style="list-style-type: none"> 1. DOVE TAIL CUTTING AND FITTING AND V-GROOVE CUTTING. 2. SHAPING MACHINE (QUICK RETURN MECHANISM): DEMO 3. MILLING AND SURFACE GRINDING (DEMO) <p>TURNING:</p> <ol style="list-style-type: none"> 1. DRILLING, THREADING, KNURLING. 2. LATHE (CENTER LATHE, ALL GEAR LATHE, CONVENTIONAL LATHE): DEMO 	

ME131317	MACHINE DRAWING	L = 0 T = 0 P = 4 C = 2
UNIT	CONTENT	HOURS
PART 1		
I	PRINCIPLES OF GRAPHICS: REVIEW OF SCALES, LINES, DIMENSIONING, BIS CONVENTIONS AND REPRESENTATIONS	4
II	ORTHOGRAPHIC PROJECTIONS: 1 ST ANGLE AND 3 RD ANGLE PROJECTION SYSTEMS. CONVERSION OF PICTORIAL VIEWS INTO ORTHOGRAPHIC VIEWS OF STANDARD MACHINE ELEMENTS. SECTIONAL VIEWS	10
III	ISOMETRIC PROJECTION: ISOMETRIC AXES AND SCALES, ISOMETRIC PROJECTION OF PYRAMID, CYLINDER, CONE AND SPHERE.	4
PART 2		
I	PROFILE OF VARIOUS THREADS, REPRESENTATION OF VARIOUS THREADS, DIFFERENT TYPES OF NUTS AND BOLTS; RIVETED JOINTS: LAP AND BUTT JOINTS; DIFFERENT TYPES OF KEYS, COTTER JOINT KNUCKLE JOINT, FLANGE COUPLING, UNIVERSAL COUPLING; PIPE JOINT: FLANGED JOINT & HYDRAULIC JOINT.	8
II	ASSEMBLY DRAWING: ENGINE PARTS-STUFFING BOX, ECCENTRIC, CROSS HEAD, VALVES- STOP VALVE, FEED-CHECK VALVE, BEARINGS-PEDESTAL BEARING.	14
		40
REFERENCE BOOKS 1. MACHINE DRAWING BY BASUDEB BHATTARCHARYYA, OXFORD UNIVERSITY PRESS 2. MACHINE DRAWING BY N.D. BHATT & PANCHAL, CHAROTAR PUBLISHING HOUSE		
