RTM Nagpur University
Mechanical Engineering –III Sem
Mathematics – III Syllabus (Theory)
Course Code-BEME301T

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III	**Mathematics – III**	03	01	00	04	30	70	100	03

Sr. No.	Course Objective The objective of this course is–
1	A primary objective is to introduce and develop advanced mathematical skills of students that are imperative for effective understanding of engineering subjects.
2	The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.
3	Understand the impact of scientific and engineering solutions in a global and societal context.
4	Create the groundwork for post-graduate courses, specialized study, and research in mathematics.
Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Apply Laplace Transform to solve ordinary differential equations, Integral equations and Integro-differential Equations.
CO2	Apply Fourier series in the analysis of periodic functions in terms sine and cosine encountered in engineering problems and Fourier Transform to solve integral equations.
CO3	Learn the concept of differentiating, integrating and expanding of analytic functions in complex numbers and their applications such as evaluation of integrals of complex functions
CO4	Solve partial differential equations of first order, higher order with constant coefficients and of second order using method of separation of variables.
CO5	Analyze real world scenarios to recognize when matrices are appropriate, formulate problems about the scenarios, creatively model these scenarios in order to solve the problems using multiple approaches. .

Mathematics III -SYLLABUS	
Contents	No of hours
Unit I LAPLACE TRANSFORM Definition, Properties (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform using partial fraction method and properties of Laplace transform, Convolution theorem (Statement only), Laplace transform of periodic functions (Statement only), Unit step function and unit impulse function (Statement only), Applications of Laplace transform to solve ordinary differential equations, Integral equations & Integro-differential equations.	10
Unit II **FOURIER SERIES & FOURIER TRANSFORM** **Fourier Series:** Periodic functions and their Fourier expansions, Even and odd functions, Change of interval, Half range expansions. **Fourier Transform:** Definition and Properties (excluding FFT), Fourier integral theorem, Applications of Fourier transform to solve integral equations.	10
Unit III **FUNCTIONS OF COMPLEX VARIABLES** Analytic function, Cauchy-Riemann conditions, Harmonic function (Excluding orthogonal system), Milne-Thomson method, Cauchy integral theorem & integral formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and singularities of analytic function, Residue theorem (Statement only).	10
Unit IV **PARTIAL DIFFERENTIAL EQUATIONS** Partial differential equations of first order first degree i.e. Lagrange's form, Linear homogeneous equations of higher order with constant coefficients, Method of separations of variables, Simple applications of Laplace transform to solve partial differential equations (One dimensional only).	10
Unit V **MATRICES** Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest eigen value and corresponding eigen vector by iteration method.	08

Text/Reference Books:

(1) Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
(2) Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.
(3) Advanced Engineering Mathematics (S. Chand), H. K. Dass.
(4) Applied Mathematics for Engineers and Physicists, L. A. Pipes and L. R. Harville.
(5) Advanced Mathematics for Engineers, Chandrika Prasad.
(6) A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M. Goyal.

RTM Nagpur University
Mechanical Engineering –III Sem
Manufacturing Processes Syllabus (Theory)
Course Code- BEME302T

Semester	Course Title	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Exam	Total	
III	Manufacturing Processes	3	00	00	3	30	70	100	3

Sr. No.	Course Objective The objective of this course is–
1	To understand the pattern making, gating system, moulding process and casting process.
2	To expose the students to the principles of the metal joining methods.
3	To study metal forming techniques, rolling, drawing, sheet metal forming, shearing operations and knowledge about process behavior.
4	To learn about plastics, ceramics and glass along with properties, types, applications and shaping
Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Understand the importance of manufacturing processes, techniques of pattern making and moulding with their properties. Design gating system along with selection of different types of melting furnaces and special casting process.
CO2	Get acquainted with the basic concept of joining process, welding process and its types, defects and application.
CO3	Get acquainted with the forming process for metal, mechanics of forming process along with different types of rolling machine.
CO4	Understand and define press working process along with its classification, types and terminology, different types of dies and introduction to shaping operation.
CO5	Understand introduction to plastics, ceramics and glasses, its properties, application, forming and its shaping.

Manufacturing Processes Syllabus	
Contents	**No of hours**
Unit I **Pattern Making & Moulding:** - Pattern making: Types, materials used, Pattern making allowances, color codes. **Moulding sand:** Composition, moulding sand properties, Sand testing - Grain fineness, moisture content, clay content and permeability test. Core making: - Types, core material & its properties. Types of sand moulds. **Gating System & Casting Processes:** - Gating design - Elements of gating systems, riser design. Melting furnaces - Types, Electric furnace, Induction furnace, Cupola construction & operation, Cleaning, inspection & casting defects - types, causes & remedy. Moulding machines. Special casting processes such as Investment Casting, Centrifugal Casting, Slush Casting, Die Casting, Shell moulding and CO_2 moulding.	10
Unit II **Joining Processes:** - Major grouping of joining processes, welding, brazing and Soldering, Broad classification of welding processes, types and Principles. Electrodes, weldability of Metals, Welding equipments. Fixtures, Arc Welding & Gas Welding Processes, TIG Welding, MIG Welding, Spot Welding, Plasma Arc welding and Electron Laser Beam welding. **Weld:** Inspection, Defects in various joints and their remedies. **Joint through Adhesive –** classification of adhesive, types of adhesive, applications. ,	09
Unit III **Forming Process for metals:**- Rolling, Forging, Extrusion, Drawing, Mechanics of forming process, Determination of Rolling pressure and roll specification force, drive force and torque, power loss in bearing, Determination of forging forces and stresses, Equipment (hammer/press) capacity required. (No analytical treatment) ,	09
Unit IV **Sheet metal working**: - Classification, types of presses, press terminology, Force analysis in press working, Die cutting operation, types of dies, Die and punch allowance, introduction to shaping operations, bending, forming and drawing. ,	08
Unit V Introduction to Plastics, Properties & types, applications, Forming & Shaping of plastics – Extrusion, injection moulding, Blow moulding, wire drawing, Compression moulding, Transfer moulding, Embossing, Calendaring. Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors. ,	09

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students as assignments.

References:

Text Books Recommended:

1. Workshop Practice, H. S. Bawa, Tata Mc-Graw Hill
2. Manufacturing Engineering & Technology, Kalpakjian, Pearson
3. Modern Materials and Manufacturing Process, R. Gregg Bruce, John E. Neely,Pearson Education
4. Degarmon's Materials and Processes in Manufacturing, 11th Ed. Black, Ronald A Kohser, Wiley India
5. Workshop Technology (Volume I), Hajra Chaudhary, Media Promoters &Publishers
6. Workshop Technology (Vol. I & II), B. S. Raghuwanshi, Dhanpat Rai & Co.
7. Manufacturing technology (Vol. I), P. N. Rao, Tata Mc-Graw Hill
8. Manufacturing Science, Ghosh & Malik, East West Press.
9. Textbook of Production Engineering, P.C. Sharma, S. Chand & Co.
10. "ASM Metals Hand Book on Casting", 1992.
11.Parmer R.S; "Welding Processes& Technology", Khanna Publishers, 1994.
12.Lancaster J.F., George Allen and Unwin, 1991, "Metallurgy of Welding".
13.Metals Hand Book, Vol 6,8th edition, ASM, 1971.
14.AWS Welding Hand Book,Vol 1 to 4 AWS.

Reference Books Recommended:

1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-Heinemann.
2. Manufacturing Processes, M. Begman.
3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon.

RTM Nagpur University
Mechanical Engineering –III Sem
Manufacturing Processes Syllabus (Practical)
Course Code- BEME302P

Semester	Course Title(Subject)	Hours / Week			Credits	Maximum Marks		
		L	T	P		Continual Assessment	University Examination	Total
III	Manufacturing Processes	00	00	2	1	25	25	50

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Think in core concept of their engineering application by studying various topics involved in branch specific applications.
CO2	Understand the relevance and importance of the Different manufacturing techniques and real life application in industry.
CO3	Design the gating and riser system needed for casting and requirements to achieve defect free casting.
CO4	Analyze the welding process behavior and requirements to achieve sound welded joint while welding different similar and dissimilar engineering material
CO5	Understand the plastic, glass and ceramic Processing

Sr. No.	List of Practical's
01	Study of Cupola Furnace.
02	Study of Moulding Techniques
03	Study of Casting Process
04	Study of Pattern Making
05	Study of Joining Processes
06	Study of Forming Processes
07	Study of Drawing Processes
08	One Job – Pattern Making
09	One Job – Casting
10	One Job – on TIG/ MIG/ Resistance welding
11	Demonstration on Plastic, Glass and Ceramic Processing (Industrial Visit)

Suggested References:

1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-Heinemann.
2. Manufacturing Processes, M. Begman.
3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon

RTM Nagpur University
Mechanical Engineering–III Sem
Engineering Thermodynamics Syllabus (Theory)
Course Code- BEME303T

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
B.E. III Sem	**Engineering Thermodynamics**	3	1	-	4	30	70	100	03

Sr. No.	Course Objective The objective of this course is–
1	This course deals with the fundamentals of Thermodynamics, including thermodynamic systems and properties, relationships among the thermos-physical properties, the laws of thermodynamics and applications of these fundamental laws in thermodynamic systems
2	To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective.
3	Explain the working principle of various power cycles used in thermal systems.
Course Outcomes	
After successful completion of this course, the student will be able to:	
CO1	**Explain** thermodynamics concepts, **relate** laws of the ideal gas, **identify** various thermodynamic processes and apply the laws to **determine** the energy transfer in terms of heat and work.
CO2	**Explain** the first law of thermodynamics and **apply** the law to **evaluate** open, closed systems, thermal components and devices.
CO3	**Interpret the** second law of thermodynamics, entropy, and apply the law to evaluate heat engine, heat pump, and refrigerator performance.
CO4	**Relate** various steam properties, and **analyze** the different types of processes using steam as working fluid to **determine** the energy transfer in terms of heat and work.
CO5	**Compare** various power cycles and **analyze** the cycles to **determine** the energy transfer in terms of heat, work and efficiency.

Engineering Thermodynamics Syllabus	
Contents	No of hours
Unit I Basic concepts of Thermodynamics, Systems and their types, Property, State, Process, Phase, Cycles. Comparison of microscopic and macroscopic approaches. Path and point functions. Thermodynamic Equilibrium. Zeroth law of thermodynamics and its significance for temperature measurement Introduction to First law of thermodynamics, Energy transfer, Heat and work transfer. Ideal Gas laws: Boyle's law, Charle's law, Gay-Lussac's law, Avagadro's law, Equation of state, General gas equation, Specific Heat, Universal gas constant. Thermodynamic Processes: Constant pressure, Constant volume, Isothermal, Isentropic and Polytropic process, representation on P-V and T-s Diagram, Calculation of Heat transfer, Work done, Change in Internal Energy and Enthalpy for these processes.	10
Unit II The first law of Thermodynamics for Closed System undergoing a process and cycle (Control Mass System) and Open System (Control Volume System) Steady Flow process applies to Compressor, Pump, Turbine, Boiler, Steam Nozzle, Throttling Device, Heat Exchanger, Fan and blower. (Analytical treatment on First law applied to thermodynamic processes and cycles and Steady low energy equation applied to various flow devices is expected). ,	9
Unit III Second Law of Thermodynamics:- Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat Pump, Kelvin-Plank and Clausius Statements, Perpetual Motion Machine I and II, Carnot Cycle, Thermodynamic Temperature scale. Entropy:- Clausius Inequality, Entropy, Principle of Increase of Entropy, Change in Entropy for different thermodynamics processes with T-S Diagram, Reversible and Irreversible Processes. (Simple analytical treatment on COP calculation is expected) ,	9
Unit IV Properties of Steam:- Formation of steam and its thermodynamic properties like Sensible Heat, Latent Heat, Critical State, Triple Point, Wet Steam, Dry Steam, Superheated Steam, Dryness Fraction, Enthalpy, Internal Energy of Steam, External Work Done during Evaporation, T-S Diagram, Mollier Chart, Work and Heat Transfer during various Thermodynamic Processes with steam as working fluid. Measurement of Dryness Fraction using various Calorimeters. (Analytical Treatment using steam table and Mollier chart is expected) ,	9

Unit V Power Cycles: - Otto Cycle, Diesel Cycle, Dual Cycle, Brayton Cycle, Representation on P-v and T-s diagrams. The equation for work done, heat transfer, air standard efficiency, and mean effective pressure. Comparison of Otto, Diesel and Dual cycles. Introduction to simple vapour power cycle, i.e., Rankine cycle (Analytical treatment in terms of calculation Work done & efficiency analysis is expected on Otto Cycle, Diesel Cycle and Dual Cycle)	9
Total Hours	46

Sr. No.	List of Tutorials
01	Application of first law to control mass (closed system) system
02	Application of first law to control volume (open system) system
03	Determination of Heat transfer, Work done, Change in Internal Energy and Enthalpy of various thermodynamic processes and cycles.
04	Determination of various properties of steam by using Steam table and Mollier chart
05	Application of second law to heat engine, refrigerator and heat pump.
06	Thermodynamic analysis of Otto cycle.
07	Thermodynamic analysis of Diesel cycle.
08	Thermodynamic analysis of Dual cycle and Brayton cycle.

References:

Text Books Recommended:

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw-Hill Publications
2. Thermodynamics, S. C. Gupta, Pearson Publications
3. Thermal Engineering, P. L. Ballani, Khanna Publications
4. Engineering Thermodynamics, S.S. Khandare, Charotar Publication House
5. Engineering Thermodynamics, R. K. Rajput, Laxmi Publication

Reference Books Recommended:

1. Thermodynamics and Engineering approach, Yunus A. Cengel, Michael A. Boles, Tata McGraw-Hill Publications
2. Engineering Thermodynamics, D. P. Mishra, Cengage Learning Publications
3. Engineering Thermodynamics, Gordon Rogers, Pearson Publications

RTM Nagpur University
Mechanical Engineering –III Sem
KINEMATICS OF MACHINES (Theory)
Course Code- BEME304T

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III	KINEMATICS OF MACHINES	3	1	0	4	30	70	100	3

Sr. No.	Course Objective The objective of this course is–
1	Make student conversant with the process of motion transformation, develop ability to critically analyse the machines, mechanisms and controlling devices, and contrive new mechanisms.

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Perform kinematic and dynamic analysis (Displacement, Velocity, acceleration, Inertia forces) of a given mechanism using analytical and graphical method.
CO2	Understand the concept of compliant mechanisms.
CO3	Contrive or synthesize new mechanisms for specific requirements and Perform computer aided analysis of simple mechanisms.
CO4	Construct cam profiles and analyse the follower motion.
CO5	Understand Geometry of gear, its types, analysis of forces and motions of gear teeth. Study of gear trains and governors.

KINEMATICS OF MACHINES SYLLABUS	
Contents	No of hours
Unit I - INTRODUCTION Basic concept of mechanism, link, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, machine, simple & compound chain, Degrees of freedom, Estimation of degree of freedom of mechanism by Grubber's criterion and other methods. Harding's notations, Classification of four bar chain , Class-I &Class-II, Kutzbach's criteria, Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight line mechanism, Approx. straight line mechanism, Pantograph mechanism. Introduction to compliant mechanisms	8
Unit II- KINEMATIC ANALYSIS a. Kinematic analysis of simple mechanisms using vector algebra (Graphical method). Concept of Corioli's component of acceleration. Velocity analysis using Instantaneous center of Rotation method, Kennedy's theorem. b. Kinematic analysis using analytical method and formulation of algorithm for computer program of kinematic analysis of four bar mechanism and slider crank mechanism (Can use excel spread sheets).	10
Unit III – KINEMATIC SYNTHESIS a. Synthesis of mechanisms, Graphical b. Synthesis of mechanisms analytical technique. Restricted to design of crank rocker and slider crank mechanism only.	6
Unit IV - Cams and followers: a. Types of cams and followers, types of follower motion, velocity and acceleration diagrams, Construction of cam profile. b. Introduction to cams with specified contours (No analytical treatment).	10
Unit V – Gears, gear trains and Governor a. Classification of gears, Types of gears, Spur gears - terminology, conjugate gear tooth action and law of gearing, involute and cycloidal profile , contact ratio, Interference and under cutting, methods of avoiding interference, minimum number of teeth,. b. Helical gears: Nomenclatures, center distance, force analysis. Spiral Gears, Worm and worm Gears, Bevel Gears; their terminologies, center distance, force analysis and efficiency, Gear Trains. c. Introduction, Types, Governor Effort and governor power, Controlling force analysis, sensitivity, stability, isochronisms and hunting, friction, insensitiveness. Introduction to modern electronic governors (Without Numerical) .	14

Sr. No.	KINEMATICS OF MACHINES : List of Tutorials
01	Demonstration of various links, joints, pairs and mechanisms available in TOM lab
02	Drawing sheets on Inversion of i) Class I & Class II four bar chain ii) Single slider crank chain iii) Double slider crank chain
03	Problem solving on kinematic analysis at least 3 No's one each on four bar mechanism and slider crank mechanism and one considering Coriolis component.
04	Cam construction activity for three hours (mini workshop)
05	Problems on gears 1. Determination of contact ration, 2. Min. number of teeth, 3. Equivalence of helical and spur gear, 4. Force analysis of spur gear one problem, 5. Force analysis of helical gear one problem.
06	One problem each on worm, bevel and spiral gears
07	Problems on gear trains at least two
08	Demonstration of various governors in TOM lab

Workshop (Guidelines): There are few concepts in the subject like motion transformation, positioning of joints and the paths generated by input output motions of links will be cleared very easily through hands on training. If a graphical technique is used to draw the locus of a point on the connecting rod same can be validated by using computer software (Soft intigration.com or by NPTL tutorial) and by building a prototype model. Here we can introduce them with design of four bar mechanism and slider crank mechanism by the simple graphical technique given in Hall A. S. Jr. or Shigley's book.

This will be a two days workshop conducted by interchanging the faculties of different institutions so that there will be interaction among design fraternity.

This activity can be planned after completion of first three units.

Assignments (Guidelines):

1. Ask students to collect list of at least 100 machines used in and around. Ask them to select any two machines and identify the basic mechanism, to draw its kinematic sketch, identify links, pairs, input and output links, input and output motion, degree of freedom.

Eg. A pedal pump of street puncher vendor, washing machine, compressor, bike, car, lathe machine, sewing machine, computer printer, printing machine, food processor, bicycle, e-vehicle, autorikshaw, various construction equipments, farm equipments, industrial machines, etc.

2. The mini project on mechanism building to be completed in the three day workshop.

3. Disassembly and assembly of gearbox/ steering/ cam follower etc and sketching the appropriate drawing of the system and a small write up about the system

References:

Text Books Recommended:

1. Theory of Machine, S. S. Rattan, Tata McGraw Hill.
2. Mechanism and Machine Theory, J.S. Rao & Dukki Patti, New Age International (P) Ltd, Publishers
3. Theory of Machines, P L Ballaney, Khanna Publications.

Reference Books Recommended:

1. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, Oxford University Press
2. Theory of Machines, Sadhu Singh, Pearson publications.
3. Advanced Mechanism Design–Analysis and Synthesis, A.G.Erdman and G.N.Sandor, Vol. I and II, Prentice – Hall
4. "Mechanisms and Mechanical Devices Source Book", Neil Sclater, Nicholas P Chrironis, McGraw-Hill
5. Kinematics and Linkage Design, A. S. Hall, Jr., Prentice – Hall
6. Mechanism Synthesis and Analysis, A. H. Soni, McGraw Hill

RTM Nagpur University

Mechanical Engineering–III Sem

Machine Drawing and Solid Modeling (tutorial)

Course Code- BEME305P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III	**Machine Drawing and Solid Modeling**	-	01	02	02	-	-	-	

Sr. No.	Course Objective **The objective of this course is–**
1	To make students conversant with machine drawing standards, techniques, symbols, notations, creation of2-D and 3-D detailing of parts, GD&T, drawing reading, production drawing and process sheet.

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Interpret and describe basic elements of standard machine drawing like lines, dimensions, tolerances,symbols etc.
CO2	Create 2-D detailing, sectional views of machine elements from given isometric view.
CO3	Understand and apply concepts of GD&T for creating part and assembly drawing.

Machine Drawing and Solid Modeling Syllabus	
Contents	No of hours
Unit I : Basic Drawing Standards: Drawing Sheets, Name Blocks, Types of Lines, Types of Dimensioning, Applying Tolerances, Standard Components and their representations, Standard Features, Machining Symbols, Welding Symbols, Surface Finish Symbols, Heat Treatment,Manufacturing Instructions, Allowances, Materials.	5 hrs
Unit II: Orthographic projections: 2-D orthographic projection of machine elements,Sectionalviews, Dimensioning and detailing.	5hrs
Unit III: GD & T: Concepts of Limit, Fits and Tolerances (Standard, types, application and selection for assembly and manufacturing method), Surface Finish requirement for assembly, Manufacturing Method, Geometry suitable for assembly. Principals and practical applications of geometrical dimensioning and tolerance.	5 hrs

Sr. No.	List of Tutorials
01	Drawing Sheets, Name Blocks, Types of Lines, Standard dimensioning methods, Applying Tolerances.
02	Standard Components and their representations, Standard Features.
03	Machining Symbols, Welding Symbols, Surface Finish Symbols.
04	Heat Treatment, Manufacturing Instructions, Allowances, Materials.
05	2-D orthographic projection of machine elements
06	2-D orthographic projection of machine elements
07	Sectional views
08	Dimensioning and detailing.
09	Limit, Fits and Tolerances (Standard, types, application and selection for assembly and manufacturingmethod)
10	Geometrical dimensioning and tolerances (symbols, applications) datum's, referencing.
11	**Industrial Drawing Reading:** Students to be give industrial (production) drawing of different components,they will be asked to study the drawing thoroughly, understand and interpret the meanings of symbol and notations and there importance.

References:

Text Books Recommended:

1. Naryana K.L., Kannaiah R., Venkata Reddy K “Machine Drawing”, New Age Int.Pub,
2. Naryana K.L., Kannaiah R., Venkata Reddy K “Production Drawing ", New Age Int.Pub,
3. N.D.Bhatt “Machine Drawing; Ed”, Charotar Publishing House, 33 . rd

Reference Books Recommended:

1. PSG College of Technology “Design data”, DPV Printers, Coimbature, 1 2000.
2. “Engg. Drawing practice for schools & colleges”, Bureau of Indian Standards, 1 Ed.; , 2002. st1998

RTM Nagpur University
Mechanical Engineering –III Sem
Machine Drawing and Solid Modeling Syllabus (Practical)
Course Code- BEME305P

Semester	Course Title(Subject)	Hrs/Wk			Credits	Maximum Marks		
		L	T	P		Continual Assessment	University Examination	Total
III	Machine Drawingand Solid Modeling		1	2	2	50	50	100

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Create 2-D orthographic manual drawings as well as digital drawing using CAD software packageof standard machine components
CO2	Apply standard practices for creation of 2-D orthographic manual drawings as well as digitaldrawing using CAD software package of assembly with dimension detailing, part list and ballooning. Also perform 2-D detailing of assembly components.
CO3	Create 3-D solid model and 2-D detailing of simple parts using CAD software package andperform 2-D detaining.
CO4	Create production drawing and process sheet for standard machine components.
CO5	Get hands on experience of reverse engineering process and concepts.

Sr. No.	Machine Drawing and solid Modeling (Practical)
01	2-D Orthographic pencil drawings of standard components with dimensions and detailing: Minimum Onesheet
02	2-D Orthographic pencil drawings showing sectional views of part with dimensions and detailing: MinimumOne sheet
03	2-D Orthographic pencil drawings of Assembly showing at least two views with assembly dimensioning, partlist and ballooning: Minimum One sheet
04	2-D Orthographic pencil drawings of Assembly detailing (disassembly) showing dimensional details ofassembly components : Minimum One sheet
05	Creating 3-D solid model of simple part with basic features like extrude, revolve, holes, round, chamfer fromgiven 2-D detailing using any CAD software package. Perform 2-D drafting and detailing of solid model: Print out showing 2-D detailing and pictorial view (isometric view) of part to be submitted.
06	Creating 2-D Orthographic drawings of Assembly with one sectional view with assembly dimensioning, partlist and ballooning using any CAD software package: Print out to be submitted.
07	**Production drawing and process sheet:** Prepare production drawing and process sheet of any standardmachine component using CAD software package: Submit print out.
08	**Compulsory Reverse engineering group activity (maximum 4 members in a group):** Each group to be given unique assembly comprising of minimum four components (preferably standard assembly e.g. bearing housing, tool post, clutch housing, automobile parts, parts in workshop facilities etc.). Students to disassembleall parts, study each part, identify standard components, perform complete reverse engineering process: createrough sketch of each part, measure its various dimensions using basic measuring instruments (ruler scale,

RTM Nagpur University
Mechanical Engineering –III Sem
Computer Application/Programming Syllabus (Practical)
Course Code- BEME306P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assess	University Exam	Total	
III	Computer Application/Programming	0	1	2	2	50	50	100	-

Sr. No.	Course Objective The objective of this course is–
1	To to apply knowledge of basic concepts of programming in C to solve mechanical Engineering problems
Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Understand and explore concepts in basic programming like data types, input/output functions, operators, programming constructs and user defined functions.
CO2	Develop capabilities of writing 'C' programs in optimized, robust and reusable code
CO3	Apply appropriate concepts of data structures like arrays, structures implement programs for various applications

Computer Application/Programming SYLLABUS	
Contents	No of hours
Introduction to C programming: Basic structure of C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types	05
Operators and Expressions: Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, Conditional operators, Bit-wise operators, Arithmetic expressions. Evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity.	05
Decision Making: Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement. The while statement, The do while statement, The 'for' statement, Jumps in loops.	05
Arrays: One dimensional arrays, Declaration of one dimensional arrays. Initialization of one dimensional arrays, Two dimensional arrays, Initializing two dimensional arrays. Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to screen, String handling functions	05
User-defined functions: Need for User Defined Functions, Definition of functions, Return values and their types, Function calls, Function declaration. **Introduction to Pointers:** Introduction, Declaration and initialization of pointers. Examples Structures and Unions: Introduction, Structure and union definition, Declaring structure and union variables, Accessing structure members.	05

Sr. No.	Computer Application/Programming (List of Practical)
01	Development of programs in C To find area/surface area, volume for Planes, Solids. (Applications for cost involved for painting surface of any plane(square, rectangular, hexagonal etc), costing based on metal sheet material required for manufacturing cylinder(ends open/closed/one end open), cone, cube etc. with varying quantity of products)
02	Development of programs in C To find Stress with given force and cross sectional

	area(square, rectangle, circular etc)
03	Development of programs in C To find angular velocities and acceleration of the output and coupler link for four bar chain mechanism.
04	Development of programs in C for given inner, outer radii for single plate clutch and axial force calculate minimum, maximum, and average pressure acting on clutch plate.(or calculating inner outer radii, width of friction lining, axial force etc. for single/multi plate clutch or similar type of simple calculation programme for block brake.
05	Development of programs in C for Addition, Multiplication Matrices.
06	Development of programs in C for any Numerical methods like Newton Raphson, Gauss-Elimination, Gauss-Jordan, Crout's method and Gauss-Seidel Method. Development of programs in C / C+ + for any Numerical methods like Taylor's series method, Runge Kutta method, Euler's modified method, Milne's predictor corrector method, Iterative methods for eigen value & eigen vector determination.
07	Development of programs in C To determine type of flow of fluid(laminar/turbulent/transient) on the basis of Reynolds's Number
08	Development of programs in C To calculate specific density, specific weight, weight if specific gravity is given for liquid

Note: During University practical examination of 50 marks, students are expected to prepare & execute computer programs in C of total 30 marks in one hours duration. Viva-Voce of 20 marks shall be conducted during University practical examination.

References:

Text Books Recommended:

1)Programming in C , P. Dey, M. Ghosh, First Edition, 2007, Oxford University press, ISBN (13): 9780195687910.
2. The C Programming Language, Kernighan B.W and Dennis M. Ritchie, Second Edition, 2005, Prentice Hall, ISBN (13): 9780131101630.
3. Turbo C: The Complete Reference, H. Schildt, 4th Edition, 2000,Mcgraw Hill Education, ISBN-13: 9780070411838.
4. Understanding Pointers in C, Yashavant P. Kanetkar, 4th Edition, 2003, BPB publications, ISBN-13: 978-8176563581
5. C IN DEPTH, S.K Srivastava, Deepali Srivastava, 3rd Edition, 2013, BPB publication, ISBN9788183330480

Reference Books Recommended:

1. An Introduction to Data Structures with Applications, Trembly J. P. And Sorenson P. G., Tata McGraw Hill Pub. Co. Ltd.
2. Fundamentals of Computer Algorithms, Horowitz E. And Sahani S., Galgotia Publications Ltd.
3. Programming in C, Gotterfield B., Schaums Outline Series. 4. Mastering C, R. Venu Gopal Prasad, Tata McGraw Hill Pub. Co. Ltd.

RTM Nagpur University
Mechanical Engineering –III Sem
SPORTS
Course Code- BEME307P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III & IV	SPORTS	0	0	3		00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	Through sports, students should able to build a wide range of abilities and skills such as leadership, confidence, teamwork, patience, self-reliance, trust, and many more which facilitate the overall development of an individual
2	Students should learn to manage time between their lectures, sports, and personal life.

EXPECTATION FROM INSTITUTES

1. Provide sports facilities
2. Provide platforms for participation in events
3. Develop interest for sports amongst students
4. Conduct regular events (every month) in college for all indoor and outdoor sports

RTM Nagpur University
Mechanical Engineering –III Sem
YOGA
Course Code- BEME307P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III &IV	YOGA	0	0	3		00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	To introduce basic wellness principles and practices of Yoga to students
2	To bring awareness of the fundamentals of Yoga for wellness in their daily lives
3	To bring peace and harmony in the society at large by introducing the Yogic way of life.

EXPECTATION FROM TRAINERS

1. Brief to origin of Yoga,
2. History and Development of Yoga: Vedic Period, Classical Period, Post classical period, Modern Period.
3. Etymology and Definitions of Yoga in classical Yoga texts
4. Meaning, Aim and Objectives of Yoga,
5. Misconceptions about Yoga;
6. True Nature of Yoga;
7. Principles of Yoga;
8. Basis of Yoga.

RTM Nagpur University
Mechanical Engineering –III Sem
National Service Scheme (NSS)
Course Code- BEME307P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III & IV	National Service Scheme (NSS)	0	0	3	00	00	00	00	00

Sr. No.	COURSE OBJECTIVE
1	1. Understand the community in which they work. 2. Understand themselves in relation to their community. 3. Identify the needs and problems of the community and involve them in problem-solving. 4. Develop among them a sense of social and civic responsibility. 5. Utilize their knowledge in finding practice solutions to individual and community problems. 6. Develop competence required for group-living and sharing of responsibilities. 7. Gain skills in mobilizing community participation. 8. Acquire leadership qualities and democratic attitudes 9. Develop capacity to meet emergencies and natural disasters. 10. Practice national integration and social harmony

EXPECTATION FROM TRAINERS
5. To assist and guide the NSS unit for implementation of NSS programs at college level 6. To advise in organizing camps, training and orientation programs for the NSS volunteers 7. To visit the NSS units for monitoring and evaluation. 8. To ensure implementation of NSS regular activities and special camping programs

RTM Nagpur University
Mechanical Engineering –III Sem
National Cadet Corps (NCC)
Course Code- BEME307P

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
III &IV	National Cadet Corps (NCC)	0	0	3		00	00	00	00

ABOUT NCC

1. NCC is the Indian military cadet corps wing of the Indian armed forces.
2. NCC offers training to the students of schools and colleges.
3. This is not compulsory training for all students.

Sr. No.	OUTCOMES EXPECTED
1	During the training of NCC, candidates should get the basic military training. This training should be conducted to develop the interest of young students in all three forces; the army, the navy and the air force of India. Students should be able to check their abilities to join the Indian Defence Services.

Sr. No.	AIM
1	To create an organized, trained and motivated youth, create soldiers for the nation, develop the leadership skills in the youth.

EXPECTATION FROM INSTITUTES

- Create awareness amongst students about NCC
- Make understand the students about the importance of NCC
- Conduct regular Drills and Training exercises
- Conduct Regular exams
- Arrange for Training Camps