Mathematics III

(COMMON FOR ALL BRANCH)

Course code –BSC- 301

L	T	P	CR.
3	1	0	4

Module I

Laplace Transformation: Laplace Transformation and its applications, Inverse Laplace Transformation, Convolution Theorem, Solution of ODE by Laplace Transformation.

Module II

Fourier Transform: Complex form of Fourier series, Fourier Transformation and inverse Fourier Transformation, sine, cosine Transformation, Inverse Transformations -simple illustration.

Module III

Z-Transform: Inverse Z-Transform- Properties – Initial and final value theorems-convolution theorem- Difference equations, Solution of Difference equations using Z-Transformation.

Module IV

Partial Differential Equations: Solution of Wave equation, Heat equation, Laplace's equation by the method of separation of variables and its applications. Solution of PDE by Laplace Transformation.

Module V

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton – Gregory forward and backward formula, Gauss forward and backward formula, Lagrange's formula , Inverse Interpolation by Lagrange's formula , Numerical Differentiation and **N**umerical Integration : Trapezoidal rule , Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule ,Weddle quadrature formula.

Text Books

- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.

Reference Books

- R. J. Beerends ,H. G. Ter Morsche ,J. C. Van Den Berg, E. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
- Sastry S.S, Introductory Methods of Numerical Analysis, PHI.

THERMODYNAMICS

(ME , PROD)
Course code -ME 301

Objectives:

- To learn about work and heat interactions, and balance of energy between system and its surroundings.
- To learn about application of I law of various energy conversion devices.
- To evaluate the changes in properties of substances in various processes.
- To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

Contents:

Module -I

Fundaments- system and control volume; property; state and process; Exact & inexact differentials; Work-thermodynamic definition of work; examples; displacement work; path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work. **(5hrs)**

Module – II

Temperature , definition of thermal equilibrium and zeroth law; Temperature scales; various thermometers-definition of heat; examples of heat/work interaction in systems-first law for cycle & non-cyclic processes; concept of total energy E; Demonstration that E is a property; Various modes of energy; internal energy and enthalpy**.(5hrs)**

Module – III

Definition of pure substance, ideal gases and ideal gas mixture, real gases and real gas mixtures, compressibility charts-Properties of tow phase system-const. temperature and const. pressure heating of water; Definitions of standard states; P-V-T surface; use of steam tables and R134a tables; saturation tables; superheated tables; identification of states and determination of properties, Mollier's chart.(8hrs)

Module – IV

First law of flow processes-Derivation of general energy equation for a control volume; Steady state flow processes including throttling; Examples of steady flow devices; unsteady processes; Examples of steady and unsteady I law applications

for system and control volume. **(5hrs)**

Module -V
Second law- Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-plank and Clausius statements; Definition of reversible process; internal and external irreversibility; Carnot cycle; Absolute Temperature Scale. **(5hrs)**

Module-VI
Clausius inequality; Definition of energy S; Demonstration that entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of S from steam tables-Principle of increase of entropy; Illustration of processes in T-S co-ordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and availability, availability function for systems and control volume undergoing different processes, Lost work. Second law analysis for a control volume. Energy balance equation and Energy analysis. **(8hrs)**

Module -VII
Thermodynamic cycles- Basic Rankine cycle; Basic Brayton cycle; Basic vapour compression cycle and comparison with Carton cycle. **(4hrs)**

Course Outcomes:

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Students can evaluate changes in thermodynamic properties of substances.
3. The student will be able to evaluate the performance of energy conversion devices.
4. The students will be able to differentiate between high grade and low grade energies.

Text Books:

1. Sonntag R.E., Borgnakke C. and Van wylen G. J., 2003- 6th edition, *Fundamentals of thermodynamics*, John Wiley and sons.
2. Jones, J.B. and Duggan R.E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India.

3. Morgan, M.J and Shapiro, H.N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Nag P.K.,1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.

FLUID MECHANICS

Course Code-ME302

Module I

Fluids and Their Properties: Introduction of fluid, fluid classifications, hypothesis of continuum, Shear stress in a moving fluid, molecular structure of material, fluid density, viscosity, causes of viscosity in gases and liquids, surface tension, capillary effect, vapor pressure, cavitation, compressibility and the bulk modulus

Module II

Pressures and Head: Types of Pressure, Pascal's law of pressure at a point, variation of pressure vertically in a fluid under gravity, equality of pressure at the same level in a static fluid, general equation for the variation of pressure due to gravity from a point to point in a static fluid, pressure and head, the hydrostatic paradox, pressure measurements using Elastic Pressure Transducers, Force Balance Pressure gauge, Electrical Pressure Transducers

Module III

Static Forces on Surface and Buoyancy: Fluid static, action of fluid pressure on surface, resultant force and center of pressure on a plane surface under uniform pressure, resultant force and center of pressure on a plane surface immersed in a liquid, pressure diagrams, forces on a curved surface due to hydrostatic pressure, buoyancy, equilibrium of floating bodies, stability of a submerged body, stability of floating bodies, determination of the metacentric height, etermination of the position of the metacentre relative to the center of buoyancy

Module IV

The Energy Equation and its Application: Momentum and fluid flow, Momentum equation for 2-D and 3-D flow along a stream line, momentum correction factor, Euler's equation of motion along a stream line, Mechanical energy of a flowing fluid – Bernoulli's theorem, kinetic energy correction factor, pitot tube, determination of volumetric flow rate via pitot tube, changes of pressure in tapering pipe, principle of venturimeter, pipe orifices, theory of small orifices discharging to atmosphere, theory of large orifices, Rotameter, elementary theory of notches and weirs, flow in a curved path

Module V

Dimensional Analysis And Similarities: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance of dimensionless, use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, Kinematic similarity, model testing-Model laws, Undistorted and Distorted models.

Module VI

Viscous Flow: Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe- Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing , movement of piston in dash pot, methods of measurement of viscosity Turbulent Flow: Expression for coefficient of friction -Darchy Weishbach Equation, Moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.

Module VII

Flow through pipes: Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes

Compressible Flow: Basic equations for one dimensional compression, Pressure wave propagation, sound velocity in fluid, Mach number, Stagnation properties

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K.Kataria & Sons
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications
3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
4. Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd.
5. Fundamentals of Fluid Mechanics by Munson, Wiley India Pvt. Ltd
6. Fluid Mechanics by A. K. Mohanty, PHI Learning Pvt. Ltd.
7. Laboratory Manual Hydraulics and Hydraulic Machines by R V Raikar

Course Outcome: After learning the course the students should be able to: Understand the basic concept of fluid mechanics.

- Understand statics, dynamics and various approaches to fluid mechanics.
- Understand fundamentals of flow through pipes
- Understand basics of compressible flow
- Correlate fundamentals of fluid mechanics with various mechanical systems

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STRENGTH OF MATERIALS

(ME , PROD,CE)

Course code -ME 303

Objectives:

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams,shafts cylinders and spheres for various types of simple loads.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.

Contents:

Module-1

Deformation in solids-Hooks law, stress and strain-tension, compression and shear stresses –elastic constants and their relations-volumetric, linear and shear strains-principal stresses and principal planes-mohr's circle**(8hrs)**

Module-II

Beams and types transverse loading on beams-shear force and bending moment diagrams-Types of beam supports, simply supported and over hanging beams, cantilevers. Theory of bending of beam, bending stresses distribution and neutral axis, shear stress distribution, point and distributed loads**.(8hrs)**

Module-III

Moment of inertia about the axis and polar moment of inertia, deflection of beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorem**.(8hrs)**

Module-IV

Torsion, stresses and deformation in circular and hollow shafts,stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical spring**.(8hrs)**

Module -V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure**.(8hrs)**

Course Outcomes:

- After completing this course, the students should able to recoginize various type of load applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components.
- The students will be able to evaluate the strains and deformation that will results due to the elastic stresses develop within the material for simple type of loading.

Test Books:

1. Egor P. Popov,Engineering Mechanics of solids,Prentice Hall of india,New Delhi,2001.
2. R.Subramanian, Strength of Materials,Oxford University Press,2007.

Ferdinand P.Been, Russel Johnson Jr and Jhon J.Dewole, Mechanism of materials, Tata McGrawHill Publication Co. Ltd., New Delhi 2005.

MATERIAL ENGINEERING

(ME , PROD)

Course code -MT 301

Course Objectives:

To increasing demand of the available materials, coupled with new applications and requirements has brought about many changes in the style of their uses.
To develop the basic knowledge of metals, polymers composites and ceramics other than conventional metals and alloys to apply them to advance engineering applications.

Module - I

Introduction – Crystalline and Non crystalline solids, Classification of Engineering materials and their selections, Bonding in solids: Ionic, Covalent and Metallic bonding. (5hrs)

Module – II

Crystal Structure- Space lattices, Bravais lattices, Crystal system, Unit Cell, Metallic crystal structures : SC, BCC, FCC, HCP structures, Miller notations of planes and directions, Imperfections in crystal: Point defects, Line surface defects. Dislocations: Edge and Screw dislocation, Burgers vectors. (12 hrs)

Module – III

Metallic Materials – Metals and alloys, ferrous materials- introduction to Iron carbon Diagram, steel and their Heat treatment , Properties and applications. Different types of heat treatment processes. Non-ferrous alloys:- Copper based alloys. Al based alloys, other important non ferrous alloys, properties and applications. (10hrs)

Module – IV

Polymers- Basic concepts of Polymers Science, polymer classifications. Crystallinity of polymers, Copolymers, Thermoplastic and Thermosetting polymers, Elastomers, Properties and Applications. (5hrs)

Module – V

Ceramics- Basic concepts of ceramics science, traditional and new ceramics. Oxide and Non-Oxide ceramics, Ceramics for high temperature applications. Glass, applications of ceramics, and glass. (5hrs)

Module -VI

Composite materials- Definition, general characteristics. Particles reinforced and fiber reinforced composite materials, MMC, CMC, PMC, properties and

applications. (5hrs)

Text Books:

1. Elements of Material Science by Van Vlack
2. Material Science by O.P. Khanna
3. Material Science and Engineering by V. Raghavan
4. Material Science by R. K.Sharma and R.S. Sedha

Reference Books:

1. Material Science and Engineering by Wiliam D. Callister

Course Outcomes:

At the end of this course, the students would be able to :

- Select different materials other than conventional metals and alloys for specific engineering applications.
- To solve the materials problems associated with the weight reduction through the appropriate choice of metals, polymers, ceramics and composites.
- Selection criterion for polymers and composites for various engineering applications.

ENVIRONMENTAL SCIENCE

Course code –BSC 302

L	T	P	CR.
2	0	0	0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, green house effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV

(4 Hrs)

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants. **(4 Hrs)**

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. **(5 Hrs)**

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

MATERIALS ENGINEERING LAB

MT301P

List of experiments

1. To study the Metallurgical Microscope.
2. To study the lattice structure of various types of unit cells, observe the mille indices for

various planes & directions in unit cells.
3. To study the microstructure of cast iron, cold work forged, rolled condition.
4. To study the microstructure of mild steel.
5. To study the microstructure of brass solder underancaed.
6. To verify Hall effect.
7. To verify the fracture, characteristics of ductile & brittle materials.
8. To determine the chemical composition of a few common alloys.

9. To determine the percentage of carbon & sulphur contents in a alloy with Fe as main constituent.
10. Estimation of percentage carbon composition of mild steel.

FLUID MECHANICS LAB

Course Code-ME302P

1. To determine the coefficient of impact for vanes.

2. To determine coefficient of discharge of an orifice meter.

3. To determine the coefficient of discharge of Notch (V and Rectangular types).

4. To determine the friction factor for the pipes.

5. To determine the coefficient of discharge of venturi meter.

6. To determine the coefficient of discharge, contraction & velocity of an orifice.

7. To verify the Bernoulli's Theorem.

8. To find critical Reynolds number for a pipe flow.

9. To determine the meta-centric height of a floating body.

10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.

11. To show the velocity and pressure variation with radius in a forced vertex flow.
12.Verification of momentum theory by impact of Jet
13 .To study the performance characteristics of a Pelton Turbine
14.Determine the operating characteristic of a reaction turbine
15. Determine the operating characteristic of a reciprocating pump
16.Verification of momentum theory by impact of Jet

Strength of Material Lab

ME303P

Name of the Experiment

1.Tensile test: To prepare the tensile test upon the given specimen (Mild Steel)
2.Compression test: To determine the compressive strength of the given specimen
3.Torsion test: To perform the Torsion test on the given specimen.
4.Impact test: To determine the Impact toughness of the given material
5.Brinell hardness test: To determine the hardness of the given specimen
6.Vicker,s Hardness test : To determine the hardness of the given specimen
7.Rockwell Hardness test: To determine the hardness of the given specimen.
8.To determine the shear strength of a mild steel specimen by Double Shear Test
9.To determine the modulus of rigidity of a solid circular rod by conducting Torsion Test.
10.To obtain tensile strength, modulus of elasticity, percentage elongation and percentage reduction in area. of cross-section.

COMMUNICATION SKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation**,** Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required

- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

