### B. TECH (MECHANICAL)
**1st Semester**

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<td>BTME101</td>
<td>TECHNICAL ENGLISH</td>
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<td>BTME102</td>
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<td>BTME103</td>
<td>ENGINEERING PHYSICS – I</td>
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<td>BTME104</td>
<td>ENGINEERING CHEMISTRY – I</td>
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<td>BTME105</td>
<td>ENGINEERING MECHANICS – (STATICS)</td>
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<td>BTME106</td>
<td>ENVIRONMENTAL STUDIES</td>
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### B. TECH (MECHANICAL)
**2nd Semester**

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<td>BTME206</td>
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### B. TECH (MECHANICAL)  
#### 3\textsuperscript{RD} SEMESTER

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<td>BTME305</td>
<td>MECHANICS OF SOLIDS</td>
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<td>BTME306</td>
<td>FLUID MECHANICS</td>
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<td>BTME307</td>
<td>MECHANICAL MEASUREMENTS &amp; CONTROL</td>
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**TOTAL CREDITS:** 29

### B. TECH (MECHANICAL)  
#### 4\textsuperscript{TH} SEMESTER

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**TOTAL CREDITS:** 30
### B. TECH (MECHANICAL)
#### 5TH SEMESTER

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### B. TECH (MECHANICAL)
#### 6TH SEMESTER

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<td>REFRIGERATION &amp; AIR CONDITIONING</td>
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<td>BTME607</td>
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<td>BTME608</td>
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# B. TECH (MECHANICAL)
## 7th Semester

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<td>BTME702</td>
<td>FINITE ELEMENT ANALYSIS</td>
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<td>BTME703</td>
<td>RENEWABLE ENERGY RESOURCES</td>
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<td>FUELS &amp; COMBUSTION</td>
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<td>BTME705</td>
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<td>BTME706</td>
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# B. TECH (MECHANICAL)
## 8th Semester

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<td>BTME802</td>
<td>ETHICS IN ENGINEERING</td>
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<td>BTME803</td>
<td>INDUSTRIAL RELATION &amp; ORGANIZATIONAL DEVELOPMENT</td>
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<td>BTME804</td>
<td>PROJECT WORK, VIVA &amp; SEMINAR</td>
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SEMESTER 1

BTME 101: TECHNICAL ENGLISH

UNIT 1:
Language Focus- Technical vocabulary, Synonyms and Antonyms, Numerical adjectives, Conjunction and Preposition clauses, Noun and adjective clauses, Abbreviations, Acronyms and homonyms, Phrasal verbs and idioms.

UNIT 2:
Language Focus- Relative clauses, Imperative and infinitive structures, Question pattern, Auxiliary verbs (Yes or No questions), Contrasted time structures, Adverbal clauses of time, place and manner, Intensifiers, Basic pattern of sentences.

UNIT 3:
Reading- Intensive reading, Predicting content, Interpretation, Inference from text, Inferential information, Implication, Critical Interpretation, Reading brief notices, advertisements, editorial of news papers.

UNIT 4:
Listening- Listening to lectures, seminars, workshops, News in BBC, CNN TV channels, Writing a brief summary or answering questions on the material listened.

UNIT 5:
Speaking- Pronunciation, stress and intonation, Oral presentation on a topic, Group discussion, Accepting others“ views / ideas, Arguing against others“ views or ideas, Interrupting others“ talk, Addressing higher officials, colleagues, subordinates, a public gathering, a video conferencing.

Text Books:

1 English for Engineers and Technologists, Volumes 1 and 2, Department of Humanities and Social Sciences, Anna University, Chennai, Orient Longmans Publication, 2008

Reference Books:
BTME 102: BASIC ENGINEERING MATHEMATICS

UNIT 1:
Sets and Functions:
Elementary set theoretic operations, De Morgan’s law, Convex sets, Relations and Correspondences, number systems; Modulus function (distance), sequences and series – convergence; Open and closed sets; Limits and Continuity.

UNIT 2:
Differential Calculus:
Successive derivatives, Leibniz’s theorem, tangent and normal, derivative of arc length (Cartesian & Polar), Tailor’s Series and Maclaurin’s Series, expansion of functions, Asymptotes, curvature, curve tracing, Functions of two or more variables, Partial derivatives, Homogeneous function (Definition)

UNIT 3:
Integral Calculus:
Reduction formulae for indefinite integrals involving power of circular functions of $x$ and Product of $\sin^m x \cos^n x$; Length of plane curves (Cartesian & Polar), Areas under Plane curves (Cartesian & Polar), Volume and surface area of solids of revolution of plane curves.

UNIT 4:
Differential equations:
Solution of ordinary first order and first degree differential equation of the following forms: Homogeneous, reducible to homogeneous, Linear, reducible to linear, Exact, reducible to exact. ODE of 1st order but not of first degree, higher order linear equation with constant coefficients, Cauchy’s homogeneous linear equation, simultaneous linear equations with constant Co-efficient.

UNIT 5:
Vector algebra:
Triple product of vector and their applications.

Text Books:
Higher Engineering Mathematics by B.S. Grewal

BTME 103: ENGINEERING PHYSICS – I

UNIT 1:
Optics and Imaging:
Ray Optics – Lens aberrations (chromatic, achronom, spherical, distortion, astigmatism, coma), measures of correct aberrations; Interference – coherence (spatial, temporal) in thin films of uniform thickness (derivation); Diffraction Grating – use as a monochromator; Imaging including importance, types of imaging (microscopes, telescopes etc.); Classification (visible, IR, electron, magnetic, UV/X-rays, gamma rays, microwaves); Comparative study of different types of imaging (with respect to
magnification, resolution, image quality, applications); Fiber Optics including Introduction, Optical fiber as a dielectric wave guide application of optical fibers.

UNIT 2:
Elastic Properties of materials and Waves:
Relation between elastic constants, internal bending moment, torsion of a cylinder, torsional rigidity; Simple harmonic motion – its expression and differential equation, superposition of two linear SHM’s (with same frequency).

UNIT 3:
Sound:
Definitions: Velocity, frequency, wavelength, intensity, loudness (expression), timber, of sound, reflection of sound, echo; Reverberation, reverberation time, Sabine’s formula, remedies over reverberation; Absorption of sound, absorbent materials; Conditions for good acoustics of a building; Noise, its effects and remedies; Ultrasonics – Production of ultrasonics by Piezo-electric and magnetostriction; Detection of ultrasonics; Engineering applications of Ultrasonics (Non-destructive testing, cavitation, measurement of gauge); Infrasound – Seismography (concept only).

UNIT 4:
Measurements and Errors:
Measurand, precision, accuracy, certainty, resolution; Errors - types and sources of errors (definitions and examples), Systematic error, Random error, Ambiguity error, Dynamic error, Drift, Noise; Elements of statistics including precision and variance; Propagation of error with example of Wheatstone bridge; Design of instrument/experiment, Specifications including Measurand, Utility of Measurand, Environment of instrument; Accomplishment of design including commercial availability of components, detectors, displays, energy sources etc.

Text/Reference Books:

BTME 104: ENGINEERING CHEMISTRY – I

UNIT 1:
*Water* covering, Types of hardness- Units, Determination of hardness by EDTA method, Alkalinity of water and its significance, Numerical problems. Softening methods and Numerical problems based on these methods; Membrane-based processes; Problems with Boiler feed water and its treatments, Specifications for drinking water (BIS and WHO standards), Chlorination of Water; Sources and quality of drinking water, concept of water drainage systems; Concept of water harvesting, storage and recycling; Nature and uses of sludge obtained on treatment of municipal and
industrial effluent water, role of a-forestation for water recycling; Toxicity of water; Sources of water pollutants.

UNIT 2: Polymers & Composites:
Basics of Polymer Chemistry, Molecular weight, Molecular shape, Crystallinity, Glass transition temperature and melting point, Visco-elasticity, Structure-property relationship; Methods of polymerization, Thermoplastics and Thermo-sets, Copolymerization, Elastomers-Structure, Applications, curing techniques; Advanced polymeric materials; Conducting polymers, Liquid crystal properties. Synthesis, Properties and Uses of PE, PVC, PMMA, Formaldehyde resins; Melamineformaldehyde- urea resins, adhesives and their adhesive mechanism; Composites- Basics of composites, Composition and Characteristic properties of composites; Types of Composites- Particle, Fibre, Reinforced, Structural, & their applications; Metallic and non-metallic fillers.

UNIT 3: Surfactants and Lubricants:
Surface active agents- Methods of preparation of soap, Cleaning mechanism, Types and advantages of detergents; Critical miceller concentration, hydrophilic and hydrophilic interactions. Fricoohestiy of surfactant solutions, HLB values; Lubricants- Concept of tribology; Types of lubricants and Mechanism of lubrication, Physical and Chemical properties of lubricants, Additives of lubricants, Selection of lubricants, freezing points of lubricants.

UNIT 4: Biotechnology:
Significance and application of Biotechnology, Bio-reactors, Biotechnological processes; Fermentation, Production of Alcohol, Production of Vitamins; Industrial enzymes, Bio-fuels, Biosensors, Bio-fertilizers, Bio-surfactants; Applications of Biochips; Intra-molecular multiple force theory (IMMFT) of Bio-surfactants.

UNIT 5: Metals & Alloys:
Phase Rule, phase rule applications to one and multiple component systems; Iron-Carbon phase equilibrium diagram; Types of Alloys- ferrous and nonferrous alloys, Carbon steel, Alloy steel, Alloys of Cu, Al, Pb.

Text/Reference Books:
UNIT 1:
Introduction:
Introduction to computer organization; Evolution of Operating Systems; Machine languages, Assembly Languages and High Level Languages; Key Software and Hardware Trends, Procedural & Object Oriented Programming Methodologies; Program Development in C, Structured Programming - Algorithm, Pseudo-code; The C Standard Library, Data types in C, Arithmetic operators, Control Structures – If-else, While, for, do-while, Switch, break and continue statements; Formatted input-output for printing Integers, floating point numbers, characters and strings; Simple C Programming examples.

UNIT 2:
Designing Structured Programs in C:
Top Down Design and Stepwise refinement; Program Modules in C, Math Library Functions, Function Definition, Prototypes; Header files, Parameter passing in C, Call by Value and Call by Reference; Standard functions, Recursive functions, Preprocessor commands, Example C programs; Scope, Storage classes; Arrays covering, Declaring arrays in C, Passing arrays to functions, Array applications, Two – dimensional arrays, Multidimensional arrays, C program examples.

UNIT 3:
Pointers in C:
Pointer variable declaration and Initialization. Pointer operators, Pointer expressions and Arithmetic, Relationship between pointers and arrays; Strings including Concepts, String Conversion functions, C Strings, String Manipulation Functions and String Handling Library.

UNIT 4:
Derived types:
Structures – Declaration, definition and initialization of structures, accessing structures, structures in functions, self referential structures, unions; Data Structures including Introduction to Data Structures, Stacks, Queues, Trees, representation using arrays, Insertion and deletion operations.

UNIT 5:
Dynamic Memory Allocation:
Linked List Implementation, Insertion, Deletion and Searching operations on linear list; Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods.

Text/Reference Books:
1. Dietel & Dietel (2000), C – How to Program, Pearson Education
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson (1993), Fundamentals of Data Structures in C, Prentice Hall of India
BTME 106: ENVIRONMENTAL STUDIES

UNIT 1:
Introduction and Natural Resources:
Multidisciplinary nature and public awareness, Renewable and nonrenewal resources and associated problems, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Conservation of natural resources and human role.

UNIT 2:
Ecosystems:
Concept, Structure and function, Producers composers and decomposers, Energy flow, Ecological succession, Food chains webs and ecological pyramids, Characteristics structures and functions of ecosystems such as Forest, Grassland, Desert, Aquatic ecosystems.

UNIT 3:
Biodiversity and Conservation:
Definition, Genetic, Species, and Ecosystem diversity, Bio-geographical classification of India, Value of biodiversity at global, national, local levels, India as a mega diversity nation, Hot sports of biodiversity, Threats to biodiversity, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

UNIT 4:
Environmental Pollution:
Definition, Causes, effects and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, human role in prevention of pollution, Solid waste management, Disaster management, floods, earthquake, cyclone and landslides.

UNIT 5:
Social issues and Environment:

Text Books:

Reference Books:
UNIT 1:
Introduction to computer organization;
Evolution of Operating Systems; Machine languages, Assembly Languages and High Level Languages;
Key Software and Hardware Trends, Procedural & Object Oriented Programming Methodologies;
Program Development in C, Structured Programming - Algorithm, Pseudo-code; The C Standard Library, Data types in C, Arithmetic operators, Control Structures – If else, While, for, do-while, Switch, break and continue statements; Formatted input-output for printing Integers, floating point numbers, characters and strings; Simple C Programming examples;

UNIT 2:
Designing Structured Programs in C:
Top Down Design and Stepwise refinement; Program Modules in C, Math Library Functions, Function Definition, Prototypes; Header files, Parameter passing in C, Call by Value and Call by Reference; Standard functions, Recursive functions, Preprocessor commands, Example C programs; Scope, Storage classes; Arrays covering, Declaring arrays in C, Passing arrays to functions, Array applications, Two – dimensional arrays, Multidimensional arrays, C program examples;

UNIT 3:
Pointers in C:
Pointer variable declaration and Initialization. Pointer operators, Pointer expressions and Arithmetic, Relationship between pointers and arrays; Strings including Concepts, String Conversion functions, C Strings, String Manipulation Functions and String Handling Library;

UNIT 4:
Derived types covering, Structures – Declaration, definition and initialization of structures, accessing structures, structures in functions, self referential structures, unions; Data Structures including Introduction to Data Structures, Stacks, Queues, Trees, representation using arrays, Insertion and deletion operations;

UNIT 5:
Dynamic Memory Allocation covering Linked List Implementation, Insertion, Deletion and Searching operations on linear list; Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods;

Text/Reference Books:
1. Dietel & Dietel (2000), C – How to Program, Pearson Education
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson (1993), Fundamentals of Data Structures in C, Prentice Hall of India
BTME 108: ENGINEERING GRAPHICS

Drawing instruments:
Handling and use.

Lines and Lettering:
Types, thickness, shades dimensioning, familiarity with relevant IS codes.

Scales:
Reducing and increasing scales, representative fraction, types of scales-plain, diagonal, comparative, vernier and scale of chords.

Curves used in engineering practices:
Conic Section-ellipse, parabola and hyperbola normals and tangents to conic sections, cycloids, trochoid, epicycloids, hypocycloids, epetrochoid, hypotraochoid involutes, archemedian, spiral, logarithmic spiral, helix.

Projections:
Various types, orthographic projections. IS specifications, projection of points in different quadrants.

Projection of line:
Inclined one plane and parallel to other. Inclined to both planes, contained by a plane perpendicular to both planes, true length of a line and its inclination to reference plane, traces of a line.

Projection of a plane:
Traces of a plane, projection when a linear edge on the plane makes a given angle, the plane figure makes given angles, a line or edge and plane figure makes object angles. oblique planes.

Projection of solids:
Simple solids in different positions, axis perpendicular to a plane axis parallel to both planes, axis parallel to one plane and inclined to the other, axis inclined to both planes. axis or edges makes given angles the face of a solid makes given angles, spheres. sections of solids.

Development of surfaces:
Simple cases.

Text/Reference Books:
1. Elementary Engineering drawing; N D Bhatt, Pradeep Publications
2. Engineering Drawing; M B Shah, B C Rana, Pearson education
BTME 109: PHYSICS LAB - I

Choice of three experiments from, Lens aberration; Comparison of reflectivity from plane glass and AR coated glass at different angles of incidence and different wavelengths of visible, infrared, ultraviolet light; Use of diffraction grating as a wavelength selector; Use of polarized light to detect strain; Resolving Power of circular aperture (for different diameters)

Choice of three experiments from, Experiment on photoconductivity; Measurement of sound pressure level; Determination of velocity of ultrasonic waves using ultrasonic interferometer; Measurement of compressibility of liquid using ultrasonic interferometer; Determination of wavelength using acoustic grating;

Choice of four experiments from, Determination of Planck’s constant using photocell; Characteristics of photocell; Estimation of errors in temperature / resistance measurement using Wheatstone bridge; Measurement of white noise in the resistance as a function of temperature and calibration against known thermometer and thus use a resistor as secondary noise thermometer; Temperature dependence of characteristics of semiconductor laser; Laser beam profile – to find beam divergence;

BTME 110: ENGINEERING WORKSHOP – I

The objective of this practical Course is to provide the basic concepts about tools used in an Engineering Workshop. Detailed concepts are proposed in all the major trades of current interest.

Module 1: Mechanical Engineering covering, the following trades for experiments (with a minimum of two exercises under each trade) - Carpentry, Fitting, Tin-Smithy and Development of jobs carried out and soldering, Black Smithy, House Wiring, Foundry (Moulding only), Plumbing;

Module 2: Mechanical Engineering covering, the following trades for demonstration for exposure - Power tools in Construction, Wood working, Electrical and Mechanical Engineering practices;
SEMESTER 2

BTME 201: ENERGY STUDIES

UNIT 1: Energy Sources:
Fossil fuels, Nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

UNIT 2: Energy Conversion:
Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

UNIT 3: Global Energy Scenario:
Role of energy in economic development and social transformation, Overall energy demand, availability and consumption, Depletion of energy resources and its impact on economy, Non proliferation of nuclear energy. International energy policies of G-8, G-20, OPEC and European Union countries.

UNIT 4: Indian Energy Scenario:
Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction, Sector wise energy consumption.

UNIT 5: Energy Policy:

Text Books:

BTME 202: ENGINEERING MATHEMATICS – I

UNIT 1: Differential Calculus:
Euler’s Theorem on homogeneous function, derivatives of Composite functions, total derivatives, Jacobians, Taylor’s theorem for a function of two variables, Maxima & Minima, Lagrange’s method of undetermined multipliers, Errors and approximations, Tangent Plane and normal to a surface.
UNIT 2:
Integral Calculus:
Differentiation under integral sign (Leibniz’s rule), multiple integrals, Areas and Volumes by double and triple integrals, Improper integrals, Beta and Gama functions.

UNIT 3:
Vector Calculus:
Differentiation of vector functions, scalar and vector fields, gradient of a Scales functions, directional derivative, Divergence and curl of a vector point function, physical interpretation of gradient, divergence and curl, properties of grad, div & curl; Repeated operation by \( \nabla \); Integrations of vector functions, Line, surface and Volume integrals, Theorems of Gauss, Stokes and Green.

UNIT 4:
Fourier series:
Fourier series expansion of \( f(x) \) in \( c < x < c + 2\pi \), Dirichlet’s conditions, Fourier series for discontinuous functions, change of intervals, half range series.

UNIT 5:
Analytical solid geometry:
Straight lines, coplanar lines and the equations of the common plane, shortest distance between two skew lines, sphere and circle, standard equations cone, cylinder, conicoids.

BTME 203: ENGINEERING PHYSICS – II

UNIT 1:
Solid State Physics:
Free electron theory (qualitative), Fermi energy, Fermi- Dirac distribution function (with derivation), Kronig-Penny model (qualitative) – formation of allowed and forbidden energy bands, Concept of effective mass – electrons and holes, Density of states (qualitative), Electron scattering and resistance, magneto-resistance, Hall effect (with derivation); Semiconductors and insulators –direct & indirect band gaps, Fermi level for intrinsic (derivation) and extrinsic semiconductors (dependence on temperature and doping concentration). Diffusion and drift current (qualitative), Conductivity and photoconductivity, Classification of different types of diode on the basis of doping concentration (rectifier diode, Zener diode, tunnel diode); Concept of optoelectronics, Light Emitting Diode (as direct band gap material), solar cell, avalanche and photodiode.

UNIT 2:
Laser:
Fundamentals of LASER- Energy levels in atoms, radiation-matter interaction, absorption of light, spontaneous emission of light, Stimulated emission of light – population of energy levels, Einstein A and B coefficients, Metastable state, population inversion, resonant cavity, excitation mechanisms, Lasing action; Properties of laser, characteristics of different types of laser; Types of laser- Solid State

UNIT 3:
Introductory Quantum Mechanics:
Concept of de Broglie’s Matter waves, derivation of wavelength of matter waves in different forms, Heisenberg’s Uncertainty principle, illustration- why an electron cannot exist in the nucleus; Concept of Phase velocity and Group velocity (qualitative); Concept of wave function $\Psi$ and interpretation of $|\Psi|^2$; Schrödinger’s Time independent equation, Applications of Schrödinger’s equation (qualitative treatment) – a) Particle in one dimensional rigid box, b) Potential Barrier (emphasis on tunneling effect), tunnel diode, scanning-tunneling microscope c) Harmonic Oscillator, d) Hydrogen atom model (qualitative); Selection rules; Elements of linear vector spaces- The idea of $n$ – dimensional vector space, use of „bra-ket“ notation, linear independence, basis, inner product, norm of a vector; Hilbert space, Ortho normality; Matrix representation of kets and linear operators; Pauli matrices; Definitions of Hermitian, Inverse and Unitary operators; Commutators; Tensor products.

UNIT 4:
Thermal Physics:
Concept of Heat: Lattice vibrations – Einstein (individual) and Debye (collective), Boltzmann’s distribution; Definition of temperature in terms of Boltzmann’s distribution; Concept of entropy, specific heat; Attaining low temperature by variation of parameter X (like pressure, magnetic field etc.) in two steps- isothermal increase of X followed by adiabatic decrease of X. Example: a) Liquification of gas with X = Pressure; b) Adiabatic demagnetization; Transfer of heat by conduction, convection and radiation – Conduction in a) solids, b) liquids, c) gases, d) interfaces; Convection - heat and mass transfer; Radiation - Stefan’s law (statement and equation); Thermal diffusivity; Applications like, Insulation- Glass Dewar/Thermos flask, Superinsulation Dewar, High temperature furnaces; Heat pipes; Heat sinks and Forced cooling/Radiators; Heat exchangers; Solar water heater.

Text/Reference Books:
1. Kittel C., Introduction to Solid State Physics, Wiley Eastern
2. Laud B.B., Lasers and Non-Linear Optics, New Age Publications
5. Guy K. White, Experimental Techniques in Low Temperature Physics, Oxford Science Publications
6. Dobson K., D. Grace & D. Lovett, Physics, Collins

BTME 204: ENGINEERING CHEMISTRY – II

UNIT 1:
Electrochemistry covering, Conductance, Cell constant and its determination; Single electrode potentials, Electrolytic and Galvanic cells, EMF series, Nernst equation, Cell emf measurement, Reversible and irreversible cells; Thermodynamic overview of electrochemical processes.
UNIT 2:
Corrosion covering, Definition and scope of corrosion, Direct chemical corrosion, Electrochemical corrosion and its mechanisms; Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell); Typical Electrochemical corrosion like Pitting, Intergranular, Soil, Waterline; Factors affecting corrosion, Protection of corrosion, Applications with few practical problems of corrosion; Permeability of oxygen to patch forming materials, scaling of iron materials.

UNIT 3:
Energy Sciences covering, Fuels [Conventional] – Types of fuels, Calorific value, Determination of Calorific value, Numerical problems based on it; Analysis of coal, Refining of Petroleum, Liquid fuels, Fuels for IC engines, Knocking and anti-knock agents, Octane and Cetane values, Cracking of oils; Calorie value of semisolids fuels; Alternative sources of Energy – Limitations of fossil fuels, Non-conventional sources of energy- Solar, Wind, Geo, Hydro power and biomass; Advantages and disadvantages; Nuclear Energy production from nuclear reactions, Nuclear reactor, Nuclear fuel cycles, Nuclear waste disposal; Safety measures of Nuclear reactors; Battery technology – Fundamentals of primary cells, Rechargeable batteries, Ni-Cd, Ni-metal hydride, Li-ion batteries; Fuel cells- principles, applications, advantages/disadvantages; Stable current supply & life of battery.

UNIT 4:
Nanomaterials covering, Introduction, Fullerenes, Carbon nanotubes, Nanowires; Electronic and mechanical properties; Synthesis of nanomaterials; Topdown & bottom up approach; Applications of nanomaterials–Catalysis, Electronics & Telecommunication, Medicines, Composites, Energy sciences; Fundamentals of nanomaterials.

UNIT 5:
Environmental Chemistry covering, Air pollution; Noise pollution, optimum decibel levels; Water pollution; Determination and Significance of COD and BOD; TOC Numerical problems; Solid waste treatment and collection of NKP; Green house effect and Global warming; e-Waste and Radioactive pollution; Role of electromagnetic radiation in global warming.

Text/Reference Books:

BTME 205: BASIC MECHANICAL ENGINEERING

UNIT 1:
UNIT 2:
Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction;
Motion of Bodies, wedge friction, screw jack & differential screw jack;

UNIT 3:
Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook;

UNIT 4:
Introduction to Dynamics covering, Basic terms, general principles in dynamics; Types of motion, instantaneous centre of rotation in plane motion and simple problems; D"Alembert"s principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;

UNIT 5:
Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;

Text/Reference Books:
2. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

BTME 206: BASIC CIVIL ENGINEERING

Unit I
Geological consideration for site selection. Difference between Map & plan Engineering scales.

Unit II
Foundation: Definition of foundation, classification, shallow and deep foundation and their common types, use of Machine foundation Black cotton soil foundation, walls their classification, load bearing, Non load bearing partition and cavity wall.

Unit III
Most common type of masonry used in civil engineering works. Different types of mortars used in masonry work, brick masonry, Stone masonry, concrete block masonry, Bonds used in brick masonry,
BTME 207: BASIC ELECTRICAL ENGINEERING

UNIT 1:
D. C. Circuits covering, Ohm’s Law and Kirchhoff’s Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources; Power and energy; Electromagnetism covering, Faradays Laws, Lenz’s Law, Fleming’s Rules, Statically and dynamically induced EMF; Concepts of self inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields;

UNIT 2:
Single Phase A.C. Circuits covering, Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series-parallel circuits; Three Phase A.C. Circuits covering, Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method;

UNIT 3:
Transformers covering, Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation; Synchronous Generators covering, Principle of operation; Types and constructional features; EMF equation;

UNIT 4:
DC Machines covering, Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, relation between EMF induced and terminal voltage enumerating the brush drop and drop due to armature reaction; DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor;

UNIT 5:
Three Phase Induction Motors covering; Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter.

Text/Reference Books:
4. Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India
7. Van Valkenburg *Network Analysis*, Prentice Hall, India

**BTME 208: PHYSICS LAB – II**

Choice of ten experiments from, Determination of dielectric constant using ac or dc fields; Experiment on piezoelectricity – detection / determination of expansion on application of electric field; Ferroelectric hysteresis; Holography – Recording and reconstruction of hologram; Spectral analysis of He-Ne discharge tube; Newton’s Ring; Measurement of capacitance of different dielectric materials; Hall Effect and determination of Hall coefficient; Determination of energy band gap of semiconductor (diode/thermistor); Characteristics of solar cell at different intensities and determination of maximum workable power; Thermal conductivity of Al and SS (rods) – relative study; Thermal diffusivity of Al and SS (rods); Newton’s cooling law for Al rod and Al sheet with same mass; Thermal conductivity of insulator by Lee’s disc method; Relative thermal resistance of interface between two Aluminum plates by varying (i) surface roughness (ii) with and without conducting paste; Measurement of Magneto-resistance of semiconductors;

**BTME 209: CHEMISTRY LAB**

Choice of ten experiments:
Total Hardness of Water; Determination of carbonate and non carbonate hardness of water sample; Determination of Alkalinity of water sample; Chloride Content in Water; Residual Chlorine in Tap water; Method of removal of hardness of water using ion exchange column; Saponification Value of an Oil; Acid value of an Oil; Viscosity Index and surface tension determination together; Flash Point by Abel’s Apparatus; Flash Point by Pensky-Marten’s Apparatus; Determination of Viscosity of polymer solution using survismeter; Demonstration of TLC / Paper chromatograph.

Experiments to be demonstrated:
Green Tech titration for experimental resource saving in analytical lab using econoburette, semi micro technique based measurement; Determination of water binding capacity of few toxic metal salts, dyes and carcinogenic compounds like pyridine and benzene using survismeter; Determination of friccohesity of oil samples with Survismeter; Comparative water binding capacity of Bovine serum albumin protein, NaCl salt and glucose as carbohydrate molecules with survismeter protein denoturation – precipitation; Friccohesity determination of band locations of glycine, α-alanine and β-alanine in aqueous mixture; Green Tech method of viscosity & surface tension measurements together with survismeter; Determination of viscosity and surface tension together of polymer solution using survismeter; Determination of wetting coefficient and contact angle measurement of soap and detergent using survismeter; Viscosity average molecular weight and shape determination using survismeter; Determination of mutual mixing & emulsion quality of oil and water liquid-liquid-interfaces (LLI) with survismeter; Potentionmetric Titration/Redox potential.
Module 1: To write a C program in each case, to find the sum of individual digits of a positive integer, generate the first n terms of the Fibonacci sequence and generate all the prime numbers between 1 and n, where n is a value supplied by the user; to calculate the Sum = \(1 \cdot x_1/2! + x_4/4! - x_6/6! + x_8/8! - x_{10}/10!\).

Module 2: To write C programs that use both recursive and non-recursive functions, To find the factorial of a given integer and To find the GCD (greatest common divisor) of two given integers; Also, to write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement) and to write a C program that uses functions to perform the Addition of Two Matrices and Multiplication of Two Matrices.

Module 3: To write a C program that uses functions to perform the operations: To insert a substring in to a given main string from a given position; To delete n Characters from a given position in a given string; To write a C program to determine if the given string is a palindrome or not; Also to write a C program that displays the position or index in the string S where the string T begins, 50 or – 1 if S doesn’t contain T; To write a C program to count the lines, words and characters in a given text.

Module 4: To write a C program to generate Pascal’s triangle and also to construct a pyramid of numbers; Also to write a C program that uses functions to perform the following operations on singly linked list: Creation, Insertion, Deletion, Traversal;

Module 5: To write C programs that implements stack (its operations) using Arrays, Pointers and that implements Queue (its operations) using Arrays, Pointers;

Module 6: To write a C program that implements the following sorting methods to sort a given list of integers in ascending order using - Bubble sort, Selection sort; Also, to write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers- Linear search, Binary search;

Module 7: To write a C program that implements the following sorting method to sort a given list of integers in ascending order- Quick sort; Also to write a C program that implements the following sorting method to sort a given list of integers in ascending order- Merge sort;

Text/Reference Books:
1. Dietel & Dietel (2000), C – How to Program, Pearson Education
2. R. J. Dromey (1991), How to solve it by Computer, Prentice-Hall, India.
SEMESTER 3

BTME 301: ENGINEERING MATHEMATICS - II

Unit -1

Introductory linear algebra: vector spaces (over the field of real and complex numbers) matrices and determinants, linear transformation. Rank of system of linear equations and their solutions. Inverse of matrix, equivalent , elementary ,echelon ,normal matrices ,similar matrices ,bilinear forms , diagonalisation of matrices , rotational ,Pauli spin ,Dirac matrices.

Unit – II


Unit – III

Partials differential equations : formation of partial differential equation by eliminating arbitrary constant and arbitrary functions- solution of standard type of first order partial differential equation – lagranges linear equation – linear partial differential equation of second order with constant co – efficient

Unit – IV

z- transform and difference equation: z – transform, elementary properties, inverse z-transform, convolution theorem, solution of difference equation using z-transform

Unit – V

DIRICHKLES condition general Fourier series – odd and even function –half range sine series – half range cosine series – complex form of Fourier series – parseval’s identity

Fourier integral theorem – Fourier transform pair – sine and cosine transforms – properties – transforms of simple function – convolution theorem – parseval’s identity

BTME 302: MATERIAL SCIENCE

Unit – 1

Classification of engineering materials, metals, nonmetals, plastics, ceramics and composites structure of materials – crystalline structure of solids: concept of unit cell and space lattice, miller indices,
crystal structure determination by x-ray diffraction. Crystal structure of ferrous and non-ferrous metals. Crystal imperfections.

Unit – 2

Description of material properties like strength, hardness, toughness, ductility, brittleness their importance in engineering application of materials and manufacturing quantitative evaluation of these properties with destructive testing methods.

Unit -3

Plastic deformation mechanism of plastic deformation, role of dislocations, slip and twinning, strain hardening and recrystallisation. Elementary treatment of creep, fatigue and fracture.


Unit – 4


Unit – 5

Engineering materials: ferrous, cast iron, carbon and alloy steel and their coding. On -ferrous: aluminum, copper, nickel, chromium, zinc, lead, tin, tungsten etc. and their alloys, classification, structure, general properties and applications of polymers, ceramics and composites.

BTME 303: THERMODYNAMICS

Unit – 1


First law of thermodynamics – mechanical equivalent of heat – corollaries of first law – internal energy – steady flow energy equation

Unit – 2

Properties of pure substance – table of properties – diagram of properties – representation on p-v, t-s and h-s diagrams.


Unit – 3

Gas cycles - carnot,otto,diesel,dual and brayton cycle – representation on p-v and t-s diagrams – air standard efficiency – mean effective pressure.

Unit – 4

Vapour cycle: carnot cycle with steam as working substance – rankine cycle – efficiency of these cycle – representation on t-s and h-s diagrams – reheat cycle – specific steam consumption and work ratio – regeneration (concept only)

Unit – 5


BTME304- ELECTRICAL & ELECTRONICS ENGINEERING

Unit-1

D.C motors - principles of operation - back emf - lap and wave winding - commutator-speed and torque equations-method of speed control-speed torque characteristics of series, shunt and compound motors@ - efficiency - swin burnes test - application of d.c motors-starters-necessity and use-types of starters and connections.

Unit-2

Transformer - working principle - phasor diagram for no load and loaded conditions-equivalent circuit-o.c and s.c tests - efficiency and voltage regulation - auto transformer-three phase transformers-constructional features-connections - line voltage and current relations.
Unit-3


Alternators - principle of operation and constructional features- salient and non-salient pole machines-voltage regulation - emf method-synchronous motor - phasor diagram-power factor control-application.

Unit-4

p-n junction - characteristics and uses of semi conductor devices: diode, photo diodes,zener diodes,bjt,fet,ujt & scr, rectifier circuits-half wave, full wave and bridge-filters-zener voltage regulators.

Unit-5

Transistorized amplifiers and oscillators: classification and characteristics - voltage, current and power gain-frequency response-audio amplifier-principle of negative feedback-emitter follower-power amplifier-class a,b,c-applications – oscillators - rc phase shift-Hartley and ujt oscillators.

TME 305: MECHANICS OF SOLIDS

Unit -1


Unit-2

Principal stress and principal strain- triaxial stresses- strain energy and work done in tension and compression- stress in compound bars- temperature stresses- stress concentration.

Unit-3

Bending moment and shearing forces under dead loads- cantilevers- simply supported and overhanging beams with different types of loading- bending moment and shear force diagrams- maximum bending moment-maximum shear force- point of inflexion- bending stress in beams- simple theory of bending stress in beams of varying sections- stress in composite section- moment of resistance- beams of uniform strength.
Unit 4

Deflection of determinate beams - determination of elastic curves - double integration method, macaulay's method - area moment methods - strain energy - the theorem of castingliano - super position method.

Unit 5

Theory of columns - euler's theory for long columns - ranking formula - johnson's formula - column's subjected to eccentric loading - torsion of shaft - theory of pure torsion - power transmitted by a shaft - torsional rigidity - helical springs - open and closed coiled - laminated spring.

BTME 306: FLUID DYNAMICS

UNIT I:


UNIT II:


UNIT III:

Viscous Flow: Flow Regimes and Reynolds's Number, Relationship Between Shear Stress and Pressure Gradient, Unidirectional Flow Between Stationary and Moving Parallel Plates, Movement Of Piston In a dashpot, Power absorbed in Bearings. Flow Through Pipes: Loss of Head due to friction, Bend and Elbows, Sudden Enlargement, Sudden Contraction, Obsoletion and at Entrance, Darcy Weisbach formula, Co-Efficient of Friction, Flow through Compound Pipes, Siphon.

UNIT IV:

Boundary Layer Flow: Boundary Layer Concept, Displacement, Momentum and Energy Thickness, Von-Karman Momentum Integral Equation, Laminar and Turbulent Boundary Layer Flows, Drag on a Flat Plate, Boundary Layer Separation and Control, Streamlined and Bluff bodies lift and drag on a cylinder and an airfoil. Turbulent Flow: Shear Stress in Turbulent Flow, Prandtl Mixing Length
Hypothesis, Hydraulically Smooth and Rough Pipes, Velocity distribution in Pipes, Friction Co-efficient for smooth and Rough Pipes.

UNIT V:
Buckingham's Theorem- Physical Significance of Dimensionless Number - Mach number - Reynolds Number - Froude Number and Weber Number.

BTME 307: MECHANICAL MEASUREMENTS AND CONTROL

UNIT – I

UNIT – II

UNIT – III
Measurements of pressure and flow – measurements of high pressure and low pressure – measurements of flow by obstruction meters – velocity probes – Hot wire anemometer – Calibration of pressure gauges and flow meters – Time constant of pressure gauges.

UNIT – IV
Elementary ideas of automatic control. Open and closed systems. On-off, Proportional, and floating modes reset and rate actions. Combined modes for pneumatic, hydraulic and electrical systems.

UNIT – V
BTME 308: STRENGTH OF MATERIAL LAB

1. To determine the hardness of a given specimen using Rockwell hardness tester.
2. To determine the hardness of a given specimen using Brinell hardness tester.
3. To find out the impact energy of a specimen by impact testing machine.
4. To find out the ultimate tensile strength of mild steel rod using universal testing machine.
5. To find out the ultimate tensile strength of aluminum rod using universal testing machine.
6. To find out the ultimate compressive strength of brick using universal testing machine.
7. To find out the ultimate compressive strength of cast iron using universal testing machine.

BTME 309: ELECTRICAL LAB

Experiments should be performed on performance of

1. D.C. Motors
2. Transformers
3. Three-Phase induction motors
4. Alternators
5. Transistors
6. Diodes
7. Amplifiers
UNIT-I

Method of finite differences: finite difference operators – Solution of first and second order linear difference equation with constant coefficients non-homogenous linear difference equations with constant coefficients.

UNIT-II


UNIT-III


UNIT-IV


UNIT-V

BTME402 HEAT ENGINEERING – I

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V


ME-403 ENGINEERING MECHANICS – DYNAMICS

UNIT-I


UNIT-II

UNIT-III


UNIT-IV


UNIT-V


BTME404 MACHINE DESIGN – I

UNIT-I

Introduction: Types of design factors. Factor of safety, Theories of failure – curved beam, crank hook and C frames.


UNIT-II

Shafts – Material and design stresses – Calculation of equivalent bending moment and twisting moment – Design of shafts subjected to combined bending moment and twisting moment.


UNIT-III

Theory of columns: design of push rod, piston rod and I.C. Engine connecting rods section.

Wire Ropes – Stresses – selection design procedure.
UNIT-IV

Coupling – types – design and selection of coupling – Flange coupling, Bushed pin type, flexible coupling design and selection.

Power screws – thread forms design consideration and materials – wear and shear – design procedure.

UNIT-V

Design of Joints:


BTME405 MECHANICS OF MACHINES – I

UNIT-I


Velocity and acceleration of simple mechanisms by relative velocity method. – Klein’s construction for slider-crank chain.

UNIT-II

Friction – clutches – single plate, multi plate and cone clutches.

Belt and rope drives – tension due to centrifugal force – maximum power transmitted – chain drive – brakes.


UNIT-III

Cams – Layout of cam profile for uniform velocity, simple harmonic, cycloidal and uniform acceleration and retardation with reciprocating and oscillating followers of different types Knife edged, roller and flat – Calculation of maximum velocity and acceleration of followers.

Gyrosopic couple – applications to ship, motor cycle, air crafts and automobiles.
UNIT-IV


UNIT-V


BTME406 PRODUCTION TECHNOLOGY – I

UNIT-I FOUNDRY


UNIT-II METAL FORMING

Hot and cold working – principles of forging, rolling and extrusion process – conditions for yielding of metals – stress-strain relations in elastic and plastic deformations – basics of explosive forming.


UNIT-III WELDING

Oxy-acetylene gas welding – types of flames and their uses – principles of arc welding, resistance welding – TIG and MIG welding and atomic hydrogen welding – Basics of explosive welding – soldering and brazing.

UNIT-IV MACHINE TOOLS-I


Shaper, Planner and Slotter – General arrangement – principle of operation – drive mechanisms.

UNIT-VMACHINE TOOLS-II

Milling, Drilling, Boring and Sawing Milling Machines: Types and specification – operations – types of cutters – attachments and accessories – example of work.

Sawing: power saws – types and principle of operation.

BTME407 MACHINE DRAWING

UNIT-I

Free hand sketches:


Coupling and Joints:


UNIT-II

Orthographic and Assembly drawings.

To draw orthographic views from the given isometric views of simple objects. Detailed assembly drawing of and additional views from the given drawing.

a) Shaft coupling – Protected type and pin type flexible coupling.

b) Bearings and supports – bushed bearing, foot step bearing and plummer block.

c) Steam engine stuffing box

d) Screw jack

Production Drawing:

a) Side Crank

b) Universal coupling

c) Petrol engine connecting rod
SIMPLE MACHINES:

Mechanical advantage and efficiency of simple screw jack, compound screw jack, worm wheel, differential wheel and axle.

BTME409 ENGINEERING WORKSHOP-II

Welding & Joinery:

Foundry:
Hand tools, moulding sands, pattern, types, materials and allowances, moulding methods, uses of gates, risers and runners, cores, chaplets, fettling and finishing casting defects.

Machine Tools:
Use of centre Lathe and bench drilling machine, simple turning operations – Cylindrical, Taper turning, external threading and knurling.

Sheet Metal Works:
Simple exercises line funnel and tray.
UNIT – I
Probability & Random Variables

UNIT – II
Random Process

UNIT – III
Test of Significance
Hypothesis testing – Large sampling test – Small sampling test based on t, f and Chi-square distributions, interval estimation of mean, Standard deviation and proportion.

UNIT – IV
Design of Experiments and Statistical Quality Control
Basic principle of experimental design – Completely randomized design – Analysis of Variance for one way classification or one factor experiments – Randomized Block Design – Analysis of variance for one way classification or one factor experiments – Latin square design – Analysis of Variance for three factor experiments – RDB and LSD comparison.
Basic of control charts – Control charts for variables.

UNIT – V
Reliability Engineering
Definition of Reliability – Hazard rate and mean time to failure – Exponential and Weibull failure models – system reliability – series system, parallel system.

TEXT BOOKS:
UNIT I:


UNIT II:

Static and dynamic balancing – balancing of rotating masses indifferent planes.

UNIT III:


UNIT IV:


UNIT V:

Transverse vibration – natural frequency by energy method - Dunkerly method – Whirling of shafts – critical speed with single and two rotors.

Tensational oscillation of two or three rotor systems – equipment shaft – geared systems.

TEXT BOOKS:

1. Abdulla Sheriff, Theory of Machines, Dhanpat Rai, New Delhi

ME503: HEAT ENGINEERING-II

UNIT-I

Rotary Compressors: Centrifugal compressor-velocity diagrams-performance characteristics-pressure coefficient and slip factor-surging axial, radial and mixed flow compressors-velocity diagram-performance characteristics.

UNIT-II


UNIT-III


UNIT-IV


UNIT-V


TEXT BOOKS:


ME504 HYDRAULICS AND MACHINERIES

UNIT-I

UNIT-II


UNIT-III


Reciprocating pumps – Bucket, Plunger and deep well pump – slip and coefficient of discharge – pump duty – pressure variation in single cylinder single acting pump with and without air vessel.

UNIT-IV

Fluid systems and circuits - Introduction to Industrial hydraulics. ram, air lift pump, actuators, pressure switches. Electro hydraulic and mechanical hydraulic servo systems. Compressors, filter, regulator, lubricator, muffler. Air control valves, quick exhaust valves – pneumatic actuators.

UNIT-V

Selection of components for hydraulic and pneumatic system applications. Installation, fault diagnosis, and maintenance. Microprocessor and PLC applications, power packs.

ME505 MACHINE DESIGN – II

UNIT-I


UNIT-II

Belt drives in flat belts, V-belts using manufacturer’s table – Matched Set of V-belts, Chain Drives for Power Transmission design procedure.

UNIT-III


UNIT-IV

40 | Page
Bevel and worm gears, Bevel gears classification – terminology – forces on bevel gear tooth –
design procedure.

UNIT-V

Gear Box: Standard Step Ratio – Speed diagram – Kinematics layout –Design of six speed,
twelve speed, eighteen speed gear box – calculation of actual speed.

Text Books:


ME506 PRODUCTION TECHNOLOGY – II

UNIT-I Special Purpose Machines

Broaching: Types of broaching machines – broach nomenclature.

Gear manufacture: elementary ideas of gear shaping –gear hopping and gear generation.

Surface finishing process: elementary ideas of lapping and honing – surface finish – polishing
and buffing.

UNIT-II Metal Cutting

Types of cutting tools, tool materials – elementary ideas of machinability – nomenclature of
single point tools – Principles of orthogonal machining – types of chips, merchants theory – merchants
principle (simple problems) – power requirements for turning – tool wear – use of cutting fluids – tool
life equation (simple problems).

UNIT-III Grinding and Metrology

Grinding and allied processes – types of grinding machines – grinding wheels specifications
abrasive materials. Metrology: Line standards and end standards – comparators for inspection – use
of optical flat and autocollimator – measurements of surface finish - gear inspection.

UNIT-IV Jigs and Fixtures

Basic concepts – advantages – types of jigs – elements of jigs and fixtures – locating devises
and types – 3-2-1 principle – clamping devises and types – drill jigs – template jigs – types of fixtures –
milling fixtures – turning fixtures.
UNIT-V Unconventional manufacturing Process

Principle and mechanism of Electro discharge machining, Ultra sonic machining, Laser machining, abrasive jet machining. Automats and transfer machines: single spindle and multiple spindle automatic lathes, transfer machines – rotary indexing and drum type transfer machines.

Text Books:

ME507 INDUSTRIAL ENGINEERING AND MANAGEMENT

UNIT-I Management
Functions of management, scientific management Contributions of F.W.Taylor, Frank & Lilian Gilbreth, H. Grantt, Henry Foyal’s principles of management.
Management by objectives (MBO), Management by exception (MBE) – Strategies and policies – Decision making & group decision making – Line & staff functions – Organizational development.
Comparative and international management – Management information system (MIS) – information system – systems modeling for MIS – data base managements systems.

UNIT-II Engineering Economics
Nature and scope of managerial economics – basic economic tools in managerial economics – introduction to macro & micro economics.
Law of demand & supply, elasticity – determinants and uses.
Cost and Revenue: average, total, marginal and fixed cost concepts – Average, Marginal and Total revenue concepts – their significance.
Market conditions: perfect, monopoly, monopolistic & oligopoly – Porter’s five forces model of competition.

UNIT-III Organizational Behaviour
Introduction to organizational behavior – Motivation & work performance – content and cognitive theories – stress management – Inter group dynamics & management of groups.

UNIT-IV Production Management

Plant location – objectives and models – Break-even model, factor comparison model, Brown Gibson model – illustrative problems.


UNIT-V Work Study

Wor simplification – basic procedure – process charts – SIMO, diagrams, momomotion & cyclographs.

Motion study – therbligs – principles of motion economy.

Work measurement – basic procedure – stop watch method (rating method) work sampling, PMTS, estimating – analytical & comparative.

ME508 Mechanical Engineering Laboratory – I

Experiments in I.C. Engines, Steam, Fuel & Combustion and Measurements & Control Laboratories.

The syllabi for the above will be framed by the Head of the Department from time to time depending on textual background, availability of machines and any future infrastructural development.

ME509 HYDRAULICS LABORATORY

Determination of co-efficient of discharge, velocity and contraction for the different types of orifices and mouth pieces.

Determination of co-efficient of discharge, equations for triangular and rectangular notches, venturimeter.

Determination of the friction factor of the pipes – determination of losses in pipe lines due to change in section and direction.

Determination of co-efficient of orificemeter and discharge equation.
Determination of the co-efficient for different types of vanes. Determination of the metacentric height of the model of a ship

Characteristic curves for different types of centrifugal and reciprocating pumps. Pelton and Francis Turbines.

**Industrial Summer Training:** Training shall be of 4 weeks duration carried out during the summer break after the 6\textsuperscript{th} semester. The report shall be supported in the 7\textsuperscript{th} semester.
SEMESTER 6

BTME601 POWER PLANT ENGINEERING

UNIT-I


UNIT-II


UNIT-III


UNIT-IV

Basics of nuclear fuels – fission and chain reaction – reactor classification – boiling water, pressurerised water, homogenous, gas cooled breeding and metal cooled.

UNIT-V

Actual load curves – fixed and operating cost – tariff methods for electrical energy – peak load and variable load operations – selection of generation type and general equipment. Introduction to safety aspects in power plants – environmental impacts assessment for thermal power plant.

TEXT BOOKS

1) G. R. Nagpal, Power Plant Engineering, Khanna Publications.

2) Arora C. P. and Domkundwar, A course in power plant engineering, Dhanpat Rai Publications.
BTME 602: TRIBOLOGY

UNIT 1:

UNIT 2:

UNIT 3:

UNIT 4:
Film Lubrication Theory- Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation, Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings - Reaction torque on the bearings -Virtual Coefficient of friction - The Somerfield diagram.

UNIT 4:

Text/Reference Books:
1. I.M. Hutchings, Tribology, Friction and Wear of Engineering Material, Edward Arnold
3. E. P.Bowden and Tabor.D., Friction and Lubrication, Heinemann Educational Books Ltd
UNIT-I


UNIT-II


UNIT-III


Brakes – Mechanical, disc, hydraulic and pneumatic brakes – servo brakes.

UNIT-IV


UNIT-V

Sources of automobile pollution – Petrol engine pollution and Diesel engine pollution – formation of oxides of nitrogen, carbon monoxide, hydrocarbon and smoke, particulate emission – evaporative emission control, crankcase emission, Air fuel mixture, EGR, air injection, thermal reactors in cylinder control of pollution, catalyst converters. Use of driving cycles for emission measurements. National and international standards. Non dispersive infrared gas analyser, Smoke measurements and smoke meters.
UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Network models – minimal spanning tree problems, shortest route problem. PERT and CPM – basic steps – rules for constructing the network – Fulkersons rule – time estimates – PERT calculations – probability of meeting the time schedule – time cost trade off – difference between PERT and CPM – Applications – introduction to resource leveling.

UNIT-V
Decision theory – decision making under risk condition – expected value criteria – decision trees – decision making under uncertain condition – minimax, maximin, maximax, Laplace, Hurwics, regret criteria.

TEXT BOOKS
1) Vohra N.D. Quantitative techniques in Management, Tata McGraw Hill.
2) Gupta and Heera, Operations Research, S. Chand and Co.
BTME605 REFRIGERATION AND AIR CONDITIONING

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V


TEXT BOOKS:

UNIT-I

Introduction – applications – Comparison between positive displacement machines with turbo machine – Definition, classification, governing equations – Euler’s equations – forces on rotor blade – Components of energy transfer – Work and Efficiencies In Turbine stage (Total-to-Total, Total-to-Static, Polytrophic and finite stage)- Effect of reheat factor in turbine – Work and efficiencies in Compressors stage(Total-to-Total, Total-to-Static, Polytrophic and finite stage)- Effect of Preheat factor in compressor- With simple problems in turbine and compressor.

UNIT-II

Aerofoil section-Classification–lift and drag on the blade-Blade terminology-Flow through cascade, One and Two Dimensional flow through a cascade-Cascade testing-Measurement of static pressure distribution-Cascade variables-Axial turbine cascade, Nomenclature, Velocity triangles and Blade forces.

(Zweifel’s Criterion)-Losses-Estimation of losses using empirical correlations (Hawthrone’s, Ainley’s and Soderberg’s)

Axial compressor cascade, nomenclature, velocity triangles, blade forces, Static pressure rise and cascade efficiency-Losses-Estimation of losses using empirical correlations (Howell’s)-Annular cascades-Radial cascade.

UNIT-III

Axial flow fans and propeller-Components-Description-Types of axial fan stages-Fan stage parameters-Stage work, stage pressure rise, stage pressure coefficient, reaction ratio and fan efficiency-Propeller-slip steam theory-Blade element theory-Performance of axial fans, Centrifugal fans and Blowers-Components-Description-Types of centrifugal fan-Backward sept, Radial and forward swept blade-Velocity triangles-Stage parameter-Stage work-stage pressure rise-stage pressure coefficient-stage reaction-stage efficiency-Design Parameter-impeller size-blade shape-number of blades. Drum type, Partial flow, losses, fan, bearings, fan drives, fan noise and dust erosion of fan.

UNIT-IV

Radial turbine stages-Elements of radial turbine stage-IFR turbine with cantilever blade-Ninety degree IFR turbine-inward mix-flow turbine-velocity triangles – h-s diagram-Spouting velocity-stage efficiency-Effect of exhaust diffuser-Degree of reaction-stage losses-Performance characteristics-blade to gear speed ratio-Outward flow radial turbine (Ljungstrom turbine) theory only.

UNIT-V

Dimensional analysis and similarity law- Applied to incompressible flow machine-head, capacity, power coefficient-Reynolds number and Mach number-Specific speed-Compressible flow machine-Pressure ratio-Dimensionless speed and mass-flow parameter-power coefficient-Reynolds number-Performance characteristic curves of turbine, compressor, fan, blowers and cascade (with some dimension parameter).
BTME607 REFRIGERATION & AIR CONDITIONING LAB

Study and Performance test on Refrigeration and Air-conditioning Plant.

BTME608 ENGINEERING WORKSHOP - III

- METROLOGY LAB
- METEOROLOGY LAB
- PRACTICES OF SLOTTING MACHINE, MILLING MACHINE ETC.

REST OF THE SYLLABI WILL BE FRAMED BY HEAD OF DEPARTMENT FROM TIME TO TIME DEPENDING ON AVAILABILITY OF MACHINES AND INFRASTRUCTURAL DEVELOPMENT.

BTME609 Mechanical Engineering Laboratory – II

Experiments in I.C. Engines, Steam and Dynamic Laboratories.

The syllabi for the above will be framed by the Head of the Department from time to time depending on textual background, availability of machines and any future infrastructural development.
SEMESTER 7

BTME701 HEAT AND MASS TRANSFER

UNIT-I (Conduction)
Introduction – modes and basic laws of heat transfer – general heat conduction equation (Cartesian)-one D cylinder and spherical co-ordinates. Electrical analogy to heat flow-concept of thermal resistance. One D steady state heat conduction (simple geometries; composite walls, concentric cylinder and sphere-problems)
Logarithmic mean area of cylinder-critical thickness of insulations-temperature effect on thermal conductivity-extended surfaces-governing partial differential equation-one d fin of uniform cross section-simple problems. Introduction to unsteady heat transfer-lumped mass analysis (one mass only)-use of Heisler’s chart.

UNIT-II (Convection)
Introduction to free and forced convection-elementary concept of boundary layers (hydro dynamic and thermal) without problems-critical Reynolds number.
Fully developed flow inside tube (simple problems)-dimensional analysis applied to forced and free convection-selected dimensionless groups-empirical relations.
Heat transfer with phase change (boiling and condensation).

UNIT-III (Radiation)

UNIT-IV (Numerical Heat Transfer)
Conversion of partial differential equation (steady and unsteady) into infinite difference equation – numerical method of solution, for simple one/two dimensional system (relaxation or Gaussian elimination or iteration method) – simple problems – separation of variables – Numerical solution to unsteady state heat transfer with simple problem.

UNIT-V (Applications)
Mass transfer concept and Fick’s first law of diffusion – analogy between heat and mass transport. Diffusion mechanism of air-water (two component system).

Text Books:
BTME702 FINITE ELEMENT ANALYSIS

UNIT-I
Fundamentals of stress-strain relationships, strain-displacement relationships, boundary conditions, temperature effects, Saint Venant’s principle, Introduction to variational formulation and Galerkin’s Method.

UNIT-II
Properties of Matrices and determinants, Gaussian elimination, Cholesky factorization, conjugate gradient method.

UNIT-III
One dimensional problems, Finite element modeling, Coordinates and shape functions – the potential energy approach – assembly of global stiffness matrix and load vector – treatment of boundary conditions – Quadratic shape functions.

UNIT-IV
Constant strain triangular element – axisymmetric solids subjected to axisymmetric loads – two dimensional isoparametric elements – numerical integration.

UNIT-V
Introduction to field problems – Simple Finite element applications using the elements discussed in the earlier units

BTME703 RENEWABLE ENERGY RESOURCES

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Solar space heating and cooling system – Elementary design Methods. Storage of solar energy.
UNIT-V

Wind energy utilization: introduction – types of wind mills – elementary design.
Elementary ideas of Tidal and ocean thermal energy ad geothermal energy: biomass as a source of energy – production of fuel from agricultural waste – Biogas – generation and utilization.

BTME704 FUELS AND COMBUSTION

UNIT-I


UNIT-II

Carbonization of coal – types – physico chemical changes during coal carbonization – Metallurgical coke production – by product coke ovens and recovery – characteristics of Indian coals – Briquetting of Solid fuels.
Liquid fuels from coal by Hydrogenation/Liquidification – Storage and handling of Liquid fuels.

UNIT-III


UNIT-IV


UNIT-V


Text Books:
1. Om Prakash Gupta, Elements of Fuels, Furnaces and Refractories, Khanna publishers.
UNIT-I
Need for maintenance – types – maintenance organization charts for large, medium and small size plants – basic functions of maintenance.


UNIT-II
Maintenance of ball, roller and tapered bearing – maintenance of belt, chain, gears, pulleys, shafting and fasteners.

UNIT-III

UNIT-IV
Devices and methods for safeguarding machines – points to be considered in designing the guards – Enclosures, covers and Barricades – safeguarding of fast and loose pulleys, chain and rope drives, revolving machines, pressure plates and self acting machines – Remote tripping and starting devices.

UNIT-V

Text Books:
1. Morrow, Industrial Maintenance

BTME706 HEAT & MASS TRANSFER LAB

Module 1:
Introduction- Need and Scope of Computer Aided Design, Fundamental of CAD and computer graphics- Application areas, Hardware and software- overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices. Interactive hardware/software techniques, Drawing standards, dimensioning and text writing, concept of layers, advanced concepts of CAD software- blocks, UCS, 3D-line, 3D object, DXF & DXB file formats. Output primitives- Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives Scan line polygon fill algorithm, boundary fill and flood-fill algorithms.

Module 2:
2-D geometrical transforms- Translation, scaling, rotation, reflection and shear transformations. Matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D viewing- The viewing pipeline, viewing coordinate reference frame. Window to view port coordinate transformation, viewing functions. Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

Module 3:
3-D Object Representation- Polygon surfaces, quadric surfaces, spline representation. Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods. 3-D viewing- Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

Module 4:
3-D Geometric transformations- Translation, rotation, scaling, reflection and shear transformations, composite transformations. Visible surface detection methods- Classification, back-face detection, depth buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

Module 5:
Introduction to CAD/ CAM(AUTOCAD, CATIA, SOLIDWORKS)- Overview, orientation and application commands of CAD and CAE modeling software platforms for feature based Parametric and Variation modelling and analysis. Boolean, and sweep operations on primitives with applications to CAD of machine elements.

Text/ Reference Books:
7. NPTEL courses http://nptel.iitm.ac.in/courses.php- web and video resources on Computer Aided Design and Manufacturing.
SEMESTER 8

BTME801 MECHATRONICS

UNIT-I

UNIT-II

UNIT-III
Sensors – Classification ad Characteristics, Types – ductive, capacitive, Force, stress, Ultrasonic, Thermal, Pressure, Film, MEMS, Nano sensors and switches.
Signal conditioning – Operational amplifiers, protection, filtering, ADC ad DAC.

UNIT-IV
Actuation systems – Construction and working Principle of Stepper Motor, servo Motor, Hydraulic and Pneumatic systems.
Advanced digital control systems – Study of Architecture and applications of Microprocessor and Micro Controller.

UNIT-V
Study of architecture, programming and applications of PLC. Introduction to Mechatronics system design – procedure and case studies.

Text Books:

BTME802 ETICS IN ENGINEERING

UNIT-I
Professional and Professionalism – Professions – Membership Criteria – Persuasive definitions – Multiple Motives.

UNIT-II


UNIT-III


Collective Bargaining – Historical Note – Faithful Agent Argument – Public Service Argument – Conclusion.


UNIT-IV


UNIT-V
Engineers as Managers, Consultants and Leaders – Engineers as managers – Managers as Professional – Promoting and Ethical Climate – managing Conflict.
Consulting Engineers – Advertising – Competitive Bidding – Contingency Fees – Safety and Client needs – Provision for resolution of Disputes.
Moral leadership – Morally Creative Leaders – Participation in Professional societies leadership in communities – ideals of Voluntary Service.
Concluding Remarks. Integrity and Ingenuity – Citicorp. Skycraper.

Text Books:

BTME803 INDUSTRIAL RELATION & ORGANIZATIONAL DEVELOPEMENT

UNIT-I – Industrial Relations

UNIT-II – Individual dimensions of Organizational Behaviour

UNIT-III – Interpersonal and Group Dynamics
Dynamics of communication – the communication process, structure of communication, Transactional Analysis, The five common communication networks in an organization. Group dynamics – synergy through groups, Group behaviour, group effectiveness, stages of group development. Properties and characteristics of highly effective groups.

UNIT-IV – Managerial process
Leadership as an influence process – Theories of leadership, leadership effectiveness model. Conflict management – traditional and behavioural views of conflict, conflict resolution models, A contingency approach to conflict management.
UNIT-V – Organizational development & Change

Organizational development – objectives – quality of life, some frequently used intervention strategies. Managing change process – three steps in introducing planned change, management of change. Organizational effectiveness – an input – through put – output approach in OE.

Text Books:

2. Tripathi – Personal Management & Industrial Relations, S. Chand & Sons.

BTME804: PROJECT WORK, VIVA & SEMINAR

UNDER THIS COURSE, STUDENTS OF THE CLASS WILL BE DIVIDED INTO GROUPS OF 2/3/4 STUDENTS. EACH GROUP WILL BE ASSIGNED A TOPIC RELATED TO CIVIL ENGINEERING FIELD. THE TOPIC MAY BE EITHER EXPERIMENTAL OR THEORETICAL. THE GROUP WILL WORK UNDER ONE OR MORE SUPERVISOR(S) FROM THE DEPARTMENT AND SUBMIT A REPORT ON THE WORK. EACH STUDENT WILL GIVE A PRESENTATION ON THE PROJECT WORK BEFORE A PANEL OF EXAMINERS.