### I YEAR I SEMESTER

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*MC609 - Environmental Science – Should be Registered by Lateral Entry Students Only.

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*MC – Satisfactory/Unsatisfactory

**Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

**Professional Elective - I**

- ME611PE Unconventional Machining Processes
- ME612PE Machine Tool Design
- ME613PE Production Planning & Control

**Professional Elective – II**

- ME711PE Additive Manufacturing
- ME712PE Automation in Manufacturing
- ME713PE MEMS

**Professional Elective – III**

- ME721PE Power Plant Engineering
- ME722PE Automobile Engineering
- ME723PE Renewable Energy Sources

**Professional Elective – IV**

- ME731PE Computational Fluid Dynamics
- ME732PE Turbo Machinery
- ME733PE Fluid Power Systems

**Professional Elective – V**

- ME811PE Industrial Robotics
- ME812PE Mechanical Vibrations
- MM813PE Composite Materials

**Professional Elective – VI**

- ME821PE Industrial Management
- ME822PE Production and Operations Management
- ME823PE Tribology
MA101BS: MATHEMATICS - I

B.Tech. I Year I Sem.  L  T/P/D  C
3  1/0/0  4

Course Objectives: To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to
- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices
Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors
Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Sequences & Series
Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert’s ratio test; Raabe’s test; Cauchy’s Integral test; Cauchy’s root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT-IV: Calculus
Mean value theorems: Rolle’s theorem, Lagrange’s Mean value theorem with their Geometrical Interpretation and applications, Cauchy’s Mean value Theorem. Taylor’s Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-V: Multivariable calculus (Partial Differentiation and applications)**
Definitions of Limit and continuity.
Partial Differentiation; Euler’s Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
Course Objectives:

- The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
- Students will be able to demonstrate competency and understanding of the concepts found in Mechanics, Harmonic Oscillations, Waves in one dimension, wave Optics, Lasers, Fiber Optics and a broad base of knowledge in physics.
- The main purpose of this course is to equip engineering undergraduates with an understanding of the scientific method, so that they may use the training beneficially in their higher pursuits.
- Today the need is to stress principles rather than specific procedures, to select areas of contemporary interest rather than of past interest, and to condition the student to the atmosphere of change he will encounter during his carrier.

Course outcomes: Upon graduation, the graduates will have:

- The knowledge of Physics relevant to engineering is critical for converting ideas into technology.
- An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements.
- In the present course, the students can gain knowledge on the mechanism of physical bodies upon the action of forces on them, the generation, transmission and the detection of the waves, Optical Phenomena like Interference, diffraction, the principles of lasers and Fibre Optics.
- Various chapters establish a strong foundation on the different kinds of characters of several materials and pave a way for them to use in at various technical and engineering applications.

UNIT-I: Introduction to Mechanics
Transformation of scalars and vectors under Rotation transformation, Forces in Nature, Newton’s laws and its completeness in describing particle motion, Form invariance of Newton’s second law, Solving Newton’s equations of motion in polar coordinates, Problems including constraints and friction, Extension to cylindrical and spherical coordinates.

UNIT-II: Harmonic Oscillations
Mechanical and electrical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion, Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor, Mechanical and electrical oscillators, Mechanical and electrical impedance, Steady state motion of forced damped harmonic oscillator, Power observed by oscillator.

UNIT-III: Waves in one dimension
Transverse wave on a string, The wave equation on a string, Harmonic waves, Reflection and transmission of waves at a boundary, Impedance matching, Standing waves and their Eigen frequencies, Longitudinal waves and the wave equations for them, Acoustic waves and speed of sound, Standing sound waves.

UNIT-IV: Wave Optics
Huygen’s principle, Superposition of waves and interference of light by wave front splitting and amplitude splitting, Young’s double slit experiment, Newton’s rings, Michelson’s interferometer, Mach-Zehnder interferometer, Fraunhofer diffraction from a single slit and circular aperture, Diffraction grating- resolving power.
UNIT-V: Lasers and Fibre Optics

TEXT BOOKS:

REFERENCE BOOKS:
2. O. Svelto, “Principles of Lasers”
CS103ES/CS203ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I Sem.  

Course Objectives:
- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes: The student will learn
- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT - I: Introduction to Programming
Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems  
Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming  
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments  
Bitwise operations: Bitwise AND, OR, XOR and NOT operators  
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops  
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:
Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays  
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings  
Structures: Defining structures, initializing structures, unions, Array of structures  
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation)  
Enumeration data type

UNIT - III: Preprocessor and File handling in C:
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef  
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:
Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions
Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: Introduction to Algorithms:
Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc.
Basic searching in an array of elements (linear and binary search techniques),
Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms),
Basic concept of order of complexity through the example programs

TEXT BOOKS:

REFERENCE BOOKS:
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
ME104ES/ME204ES: ENGINEERING GRAPHICS

B.Tech. I Year I Sem.  

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Pre-requisites: Nil
Course objectives:
- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Course Outcomes: At the end of the course, the student will be able to:
- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

UNIT- II

UNIT – III
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT – V

Introduction to CAD: (For Internal Evaluation Weightage only):
Introduction to CAD Software Package Commands. - Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:
1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
List of Experiments:

1. Melde’s experiment:
   To determine the frequency of a vibrating bar or turning fork using Melde’s arrangement.

2. Torsional pendulum:
   To determine the rigidity modulus of the material of the given wire using torsional pendulum.

3. Newton’s rings:
   To determine the radius of curvature of the lens by forming Newton’s rings.

4. Diffraction grating:
   To determine the number of lines per inch of the grating.

5. Dispersive power:
   To determine the dispersive power of prism by using spectrometer.

6. Coupled Oscillator:
   To determine the spring constant by single coupled oscillator.

7. LCR Circuit:
   To determine quality factor and resonant frequency of LCR circuit.

8. LASER:
   To study the characteristics of LASER sources.

9. Optical fibre:
   To determine the bending losses of Optical fibres.

10. Optical fibre:
    To determine the Numerical aperture of a given fibre.

Note: Any 8 experiments are to be performed
Course Objectives: The students will learn the following:
- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:
- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:

a. Write a simple program that prints the results of all the operators available in C (including pre/post increment, bitwise and/or/not, etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70% = First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f. 5 x 2 = 10
g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.
Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula \( s = ut + \frac{1}{2}at^2 \) where \( u \) and \( a \) are the initial velocity in m/sec (\( = 0 \)) and acceleration in m/sec\(^2\) (\( = 9.8 \text{ m/s}^2 \)).

b. 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)

c. Write a program that finds if a given number is a prime number

d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first \( n \) terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and \( n \), where \( n \) is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where \( x \) is a fractional value.

i. \( 1 - \frac{x}{2} + \frac{x^2}{4} - \frac{x^3}{6} \)

j. Write a C program to read in two numbers, \( x \) and \( n \), and then compute the sum of this geometric progression: \( 1 + x + x^2 + x^3 + \cdots + x^n \). For example: if \( n \) is 3 and \( x \) is 5, then the program computes \( 1 + 5 + 25 + 125 \).

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a functions to compute mean, variance, Standard Deviation, sorting of \( n \) elements in single dimension array.

c. Write a C program that uses functions to perform the following:

d. Addition of Two Matrices

e. ii. Multiplication of Two Matrices

f. iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

g. Write C programs that use both recursive and non-recursive functions

h. To find the factorial of a given integer.

i. ii. To find the GCD (greatest common divisor) of two given integers.

j. iii. To find \( x^n \)

k. Write a program for reading elements using pointer into array and display the values using array.

l. Write a program for display values reverse order from array using pointer.

m. Write a program through pointer variable to sum of \( n \) elements from array.

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:

   It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)

   Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)

   The program should then read all 10 values and print them back.
Strings:
   a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
   b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
   c. Write a C program that uses functions to perform the following operations:
      d. To insert a sub-string into a given main string from a given position.
      e. ii. To delete n Characters from a given position in a given string.
   f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both
directions with or without a meaning like madam, civic, noon, abcba, etc.)
   g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn’t
      contain ch.
   h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:
   a. Write a menu driven C program that allows a user to enter n numbers and then choose between
      finding the smallest, largest, sum, or average. The menu and all the choices are to be functions.
      Use a switch statement to determine what action to take. Display an error message if an invalid
      choice is entered.
   b. Write a C program to construct a pyramid of numbers as follows:

```
      1
     1 2
    1 2 3
   * * *
   1 2 3 4 5 6
   * * * * * *
   4 4 4 4 4
    * *
```

Sorting and Searching:
   a. Write a C program that uses non recursive function to search for a Key value in a given
   b. list of integers using linear search method.
   c. Write a C program that uses non recursive function to search for a Key value in a given
   d. sorted list of integers using binary search method.
   e. Write a C program that implements the Bubble sort method to sort a given list of
   f. integers in ascending order.
   g. Write a C program that sorts the given array of integers using selection sort in descending order
   h. Write a C program that sorts the given array of integers using insertion sort in ascending order
   i. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:
   i. Byron Gottfried, Schaum’s Outline of Programming with C, McGraw-Hill
   ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd
      Edition)
   iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
   iv. Hall of India
   v. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
*MC109ES: ENVIRONMENTAL SCIENCE*

B.Tech. I Year I Sem.  

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Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

Course Outcomes:
- Based on this course, the Engineering graduate will understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

UNIT-I

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

**Natural Resources:** Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV


UNIT-V

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

**TEXT BOOKS:**
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.
MA201BS: MATHEMATICS - II

B.Tech. I Year II Sem.  

Course Objectives: To learn
- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes: After learning the contents of this paper the student must be able to
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE
Exact, linear and Bernoulli’s equations; Applications: Newton’s law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for y, equations solvable for x and Clairaut’s type.

UNIT-II: Ordinary Differential Equations of Higher Order
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax$, polynomials in $x$, $e^{ax}V(x)$ and $x V(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre’s equation, Cauchy-Euler equation.

UNIT-III: Multivariable Calculus (Integration)
Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelopiped).

UNIT-IV: Vector Differentiation

UNIT-V: Vector Integration
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:
REFERENCE BOOKS:

CH102BS/CH202BS: CHEMISTRY

B.Tech. I Year II Sem.  

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**Course Objectives:**

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways.

**Course Outcomes:** The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

**UNIT - I:**

**Molecular structure and Theories of Bonding:** Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N\(_2\), O\(_2\) and F\(_2\) molecules. \(\pi\) molecular orbitals of butadiene and benzene.


**UNIT - II:**


**UNIT - III:**

**Electrochemistry and corrosion:** Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

UNIT - IV:

UNIT - V:
Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy, vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

TEXT BOOKS:
1. Physical Chemistry, by P.W. Atkins
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
ME203ES: ENGINEERING MECHANICS

B.Tech. I Year II Sem.

Course Objectives: The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

Course Outcomes: At the end of the course, students will be able to

- Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

UNIT-I:

UNIT-II:
Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;
Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus

UNIT-III:
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; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem

UNIT-IV:
Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).
UNIT-V:
Kinetics of Rigid Bodies - 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

TEXT BOOKS:

REFERENCE BOOKS:
ME105ES/ME205ES: ENGINEERING WORKSHOP

B.Tech. I Year II Sem.  

Pre-requisites: Practical skill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:
- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:
At least two exercises from each trade:
I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:
1. Workshop Practice /B. L. Juneja / Cengage

REFERENCE BOOKS:
2. Workshop Manual / Venkat Reddy/ BSP
INTRODUCTION
In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

Learning Objectives: The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

Course Outcomes: Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

UNIT –I
‘The Raman Effect’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.

UNIT –II
‘Ancient Architecture in India’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
UNIT –III
‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.
Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-skills of Reading- Skimming and Scanning
Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

UNIT –IV
‘What Should You Be Eating’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Practices- Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT –V
‘How a Chinese Billionaire Built Her Fortune’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.
Vocabulary: Technical Vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice

TEXT BOOK:

REFERENCE BOOKS:
### Course Objectives:
The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as a function of time.
- The measurement of physical properties like adsorption and viscosity.
- To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

### Course Outcomes:
The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of $R_f$ values of some organic molecules by TLC technique.

### List of Experiments:
1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe$^{2+}$ by Potentiometry using KMnO$_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of $R_f$ values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald’s viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.

### Reference Books:
1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:
- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students’ pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Learning Outcomes: Students will be able to attain
- Better understanding of nuances of English language through audio-visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:
- a. Computer Assisted Language Learning (CALL) Lab
- b. Interactive Communication Skills (ICS) Lab

Listening Skills
Objectives
1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills
Objectives
1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice: Just A Minute (JAM) Sessions
The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab.

Exercise – I
CALL Lab:
*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.
*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:
*Understand:* Communication at Work Place- Spoken vs. Written language.

Exercise – II
CALL Lab:
*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:
*Understand:* Features of Good Conversation – Non-verbal Communication.

Exercise - III
CALL Lab:
*Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:
*Understand:* How to make Formal Presentations.
*Practice:* Formal Presentations.

Exercise – IV
CALL Lab:
*Understand:* Listening for General Details.
*Practice:* Listening Comprehension Tests.

ICS Lab:
*Understand:* Public Speaking – Exposure to Structured Talks.
*Practice:* Making a Short Speech – Extempore.

Exercise – V
CALL Lab:
*Understand:* Listening for Specific Details.
*Practice:* Listening Comprehension Tests.

ICS Lab:
*Understand:* Interview Skills.
*Practice:* Mock Interviews.
Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:
The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
  i) Computers with Suitable Configuration
  ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:
The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.
MA301BS: PROBABILITY AND STATISTICS & COMPLEX VARIABLES

B.Tech. II Year I Sem.  

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy’s integral formula and Cauchy’s residue theorem.
- Expansion of complex functions using Taylor’s and Laurent’s series.

Course outcomes: After learning the contents of this paper the student must be able to
- Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
- Analyse the complex function with reference to their analyticity, integration using Cauchy’s integral and residue theorems.
- Taylor’s and Laurent’s series expansions of complex function.

UNIT - I: Basic Probability

Probability spaces, conditional probability, independent events, and Bayes’ theorem.
Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables

UNIT - II: Probability distributions

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution
Continuous random variables and their properties, distribution functions and density functions,
Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: Testing of Hypothesis

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region.
Large sample test for single proportion, difference of proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances

UNIT - IV: Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - V: Complex Variables (Integration)

Line integral, Cauchy’s theorem, Cauchy’s Integral formula, Zeros of analytic functions, Singularities, Taylor’s series, Laurent’s series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties.
TEXT BOOKS:

REFERENCE BOOKS:
ME302PC: MECHANICS OF SOLIDS

B.Tech. II Year I Sem.  L  T/P/D  C
3  1/0/0  4

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

This course will advance the students’ development of the following broad capabilities:

- Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
- Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
- Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
- Students will understand how to calculate normal and shear stresses

Course Outcomes:

- Analyze the behavior of the solid bodies subjected to various types of loading;
- Apply knowledge of materials and structural elements to the analysis of simple structures;
- Undertake problem identification, formulation and solution using a range of analytical methods;
- Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning

UNIT – I

UNIT – II
Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III
Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT - IV
Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses
Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**Theories of Failure**: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

**UNIT - V**


**Thin Cylinders**: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

**TEXT BOOKS:**
2. Solid Mechanics, by Popov

**REFERENCE BOOKS:**
7. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
ME303PC: MATERIAL SCIENCE AND METALLURGY

B.Tech. II Year I Sem.  

UNIT – I  
Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

UNIT – II  
Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron

UNIT –III  
Heat treatment of Steel: Annealing, Normalising, Hardening, Tempering and Spheroidising, Isothermal transformation diagrams for Fe-C alloys and microstructures development.

UNIT – IV  
Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT – V  
Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys (Brass, bronze and cupro-nickel)- Aluminium and Al-Cu – Mg alloys- Titanium alloys

TEXT BOOKS:

REFERENCE BOOKS:
ME304PC: PRODUCTION TECHNOLOGY

B.Tech. II Year I Sem.  

Pre-requisites: None

Course Objectives:
- To teach the process-level dependence of manufacturing systems through tolerances
- To expose the students to a variety of manufacturing processes including their suitability and capabilities.
- To teach the important effects that manufacturing processes may have on the material properties of the processed part with a focus on the most common processes.
- To teach the thermal and mechanical aspects, such as force, stress, strain and temperature of the most common processes.
- To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances.
- To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

Course Outcomes: Student will be able to:
- Understand the idea for selecting materials for patterns.
- Know Types and allowances of patterns used in casting and analyze the components of moulds.
- Design core, core print and gating system in metal casting processes.
- Understand the arc, gas, solid state and resistance welding processes.
- Develop process-maps for metal forming processes using plasticity principles.
- Identify the effect of process variables to manufacture defect free products.

UNIT – I

UNIT – II
Welding: Classification – Types of welds and welded joints; Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III
Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – IV
Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping,Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces
in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing –. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V
Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

TEXT BOOKS:
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson

REFERENCE BOOKS:
1. Metal Casting / T.V Ramana Rao / New Age
2. Production Technology / G. Thirupathi Reddy / Scitech
ME305PC: THERMODYNAMICS

B.Tech. II Year I Sem.  

Pre-requisite: Engineering Chemistry and Physics

Course Objective: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes: At the end of the course, the student should be able to Understand and differentiate between different thermodynamic systems and processes. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I

UNIT - II

UNIT – III

UNIT - IV
Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier’s Equation – Psychrometric chart.

UNIT - V

Refrigeration Cycles:

TEXT BOOKS:
1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics for Engineers / Kenneth A. Kroos ; Merle C. Potter/ Cengage

REFERENCE BOOKS:
1. Engineering Thermodynamics / Chattopadhyay/ Oxford
2. Engineering Thermodynamics / Rogers / Pearson
ME306PC: PRODUCTION TECHNOLOGY LAB

B.Tech. II Year I Sem.  

Pre-requisites: Production Technology

Course Objectives:
- Know about the basic Physical, Chemical Properties of materials
- Explain why some material(s) are better to be used in a product for given design requirements
- Learn the basic operation of various manufacturing processes
- Learn how various products are made using traditional, non-traditional, or Electronics manufacturing processes
- Design simple process plans for parts and products
- Understand how process conditions are set for optimization of production
- Learn how CNC machines work
- Write and execute CNC machining programs to cut parts on a milling machine
- Measure a given manufactured part to evaluate its size, tolerances and surface finish
- Design and fabricate a simple product

Course Outcomes: Understanding the properties of moulding sands and pattern making. Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and performs moulding studies on plastics.

Minimum of 12 Exercises need to be performed

I. Metal Casting Lab:
1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. Welding Lab:
1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises
   (Water Plasma Device)

III. Mechanical Press Working:
3. Bending and other operations

IV. Processing Of Plastics
1. Injection Moulding
2. Blow Moulding

REFERENCE BOOK:
ME307PC: MACHINE DRAWING PRACTICE

B.Tech. II Year I Sem.  

L  T/P/D  C  
0  0/2/0  1

Pre-requisites: Engineering graphics

Course objectives: To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

Course Outcomes:
- Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- Title boxes, their size, location and details - common abbreviations and their liberal usage
- Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts
Selection of Views, additional views for the following machine elements and parts with every drawing proportion.
1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawings:
Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.
1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
3. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

REFERENCE BOOKS:
ME308PC: MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

B.Tech. II Year I Sem. L T/P/D C 0 0/2/0 1

MATERIAL SCIENCE:
Course Objective: The purpose of this course is to make the students learn the concepts of Metallurgy and Material Science role in all manufacturing processes which convert raw materials into useful products adapted to human needs.

Course Outcomes: The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application. Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries. Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.

List of Experiments:
1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
5. Study of the Microstructures of Non-Ferrous alloys.
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS:
Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

The students will advance the students' development of the following broad capabilities:
- Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
- Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
- Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
- Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End

Course Outcomes
- Analyze the behavior of the solid bodies subjected to various types of loading.
- Apply knowledge of materials and structural elements to the analysis of simple structures.
- Undertake problem identification, formulation and solution using a range of analytical methods
- Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning.
List of Experiments:
1. Direct tension test
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test/ Rockwell hardness test
6. Test on springs
7. Izod Impact test/ Charpy Impact test
The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21
Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:
- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

UNIT - I:
D.C. CIRCUITS
Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. CIRCUITS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:
ELECTRICAL INSTALLATIONS
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:
ELECTRICAL MACHINES

UNIT - IV:
P-N JUNCTION AND ZENER DIODE: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.
RECTIFIERS AND FILTERS: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, π-section Filters.
UNIT - V:


FIELD EFFECT TRANSISTOR (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:
1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University

REFERENCES:
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
Prerequisites: Basic principles of Mechanics

Course Objectives: The objective is to study the relative motion, velocity, and accelerations of the various elements in a mechanism. In mechanical Engineering we come across number of mechanisms such as four bar/slider crank/double slider crank/straight line motion mechanism etc. Mechanism deals with only relative motions. Once we make a study considering for us also there it is called kinetics. The first course deals with mechanisms, their inversions straight line motion mechanisms steering mechanisms etc. Also study of cams/gears & gear trains & belts are also introduced.

Course Outcomes: The main purpose is to give an idea about the relative motions obtained in all the above type of components used in mechanical Engineering.

UNIT – I
Mechanisms: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained.

Mechanism and Machines – Mobility of Mechanisms: Grubler’s criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II
Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration

Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III
Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff’s and Robert Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman’s steering gear.

Hooke’s Joint: Single and double Hooke’s joint –velocity ratio – application – problems.

UNIT – IV
Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

UNIT – V
Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding
Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements – Introduction to Helical – Bevel and worm gearing


**TEXT BOOKS:**
1. Theory of Machines and Mechanisms/Joseph E. Shigley/ Oxford

**REFERENCE BOOKS:**
1. Theory of Machines / Sadhu Singh / Pearson.
2. Theory of Machines / Thomas Bevan/CBS.
B.Tech. II Year II Sem.  

Pre-requisite: Thermodynamics

Course Objective: To apply the laws of Thermodynamics to analyze air standard cycles and to understand and evaluate the performance analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

Course Outcomes: At the end of the course, the student should be able to evaluate the performance of IC engines and compressors under the given operating conditions. Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance.

UNIT – I

UNIT – II

UNIT - III


UNIT – IV


Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.
UNIT – V

TEXT BOOKS:
1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill

REFERENCE BOOKS:
1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson
ME404PC: FLUID MECHANICS AND HYDRAULIC MACHINES

B.Tech. II Year II Sem.  
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Course Objectives: The objectives of the course are to enable the student;
- To understand the basic principles of fluid mechanics
- To identify various types of flows
- To understand boundary layer concepts and flow through pipes
- To evaluate the performance of hydraulic turbines
- To understand the functioning and characteristic curves of pumps

Course Outcomes:
- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
- To select and analyze an appropriate turbine with reference to given situation in power plants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Able to demonstrate boundary layer concepts.

UNIT I
Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT II
Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.
Fluid dynamics: Surface and body forces –Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III
Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

UNIT IV
Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.
Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.
Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.
UNIT - V
Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.
Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:
1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCES:
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
ME405PC: INSTRUMENTATION AND CONTROL SYSTEMS

B.Tech. II Year II Sem.  

Prerequisite: Mathematics-I, Thermodynamics, Basic of Electrical and Electronics Engineering.

Course Objectives:
- Understanding the basic characteristic of a typical instrument.
- Identifying errors and their types that would occur in an instrument.
- Identifying properties used for evaluating the thermal systems.
- The concept of transducer and Various types and their characters.

Course Outcome:
- To identify various elements and their purpose in typical instruments, to identify various errors that would occur in instruments.
- Analysis of errors so as to determine correction factors for each instrument.
- To understand static and dynamic characteristics of instrument and should be able to determine loading response time.
- For given range of displacement should be able to specify transducer, it accurate and loading time of that transducer.

UNIT – I

UNIT – II
Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals. Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

UNIT – III

UNIT – IV
Stress-Strain measurements: Various types of stress and strain measurements –Selection and installation of metallic strain gauges; electrical strain gauge – gauge factor – method of usage of
resistance strain gauge for bending, compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.


UNIT – V
Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems - Transfer functions- First and Second order mechanical systems

TEXT BOOKS:
1. Principles of Industrial Instrumentation & Control Systems, - Alavala, - Cengage Learning

REFERENCE BOOKS:
1. Measurement Systems: Applications & design, E. O. Doebelin, TMH
2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH
3. Experimental Methods for Engineers / Holman
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International.
EE409ES: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

B.Tech. II Year II Sem. 

Pre-requisites: Basic Electrical and Electronics Engineering 

Course Objectives: 

- To introduce the concepts of electrical circuits and its components 
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits 
- To study and understand the different types of DC/AC machines and Transformers. 
- To import the knowledge of various electrical installations. 
- To introduce the concept of power, power factor and its improvement. 
- To introduce the concepts of diodes & transistors, and 
- To impart the knowledge of various configurations, characteristics and applications. 

Course Outcomes: 

- To analyze and solve electrical circuits using network laws and theorems. 
- To understand and analyze basic Electric and Magnetic circuits 
- To study the working principles of Electrical Machines 
- To introduce components of Low Voltage Electrical Installations 
- To identify and characterize diodes and various types of transistors. 

List of experiments/demonstrations: 

PART A: ELECTRICAL 

1. Verification of KVL and KCL 
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer 
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer 
4. Performance Characteristics of a Separately Excited DC Shunt Motor 
5. Performance Characteristics of a Three-phase Induction Motor 
6. No-Load Characteristics of a Three-phase Alternator 

PART B: ELECTRONICS 

1. Study and operation of 
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO. 
2. PN Junction diode characteristics 
3. Zener diode characteristics and Zener as voltage Regulator 
4. Input & Output characteristics of Transistor in CB / CE configuration 
5. Full Wave Rectifier with & without filters 
6. Input and Output characteristics of FET in CS configuration 

TEXT BOOKS: 

1. Basic Electrical and electronics Engineering – M S Sukija TK Nagasarkar Oxford University 

REFERENCE BOOKS: 

6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
ME407PC: FLUID MECHANICS AND HYDRAULIC MACHINES LAB

B.Tech. II Year II Sem. L T/P/D C 0 0/2/0 1

Course Objectives:
- To understand the basic principles of fluid mechanics.
- To identify various types of flows.
- To understand boundary layer concepts and flow through pipes.
- To evaluate the performance of hydraulic turbines.
- To understand the functioning and characteristic curves of pumps.

Course Outcomes:
- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
- To select and analyze an appropriate turbine with reference to given situation in power plants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Able to demonstrate boundary layer concepts

List of Experiments:
1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli’s Theorems.
ME408PC: INSTRUMENTATION AND CONTROL SYSTEMS LAB

B.Tech. II Year II Sem.  L  T/P/D  C
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Pre-requisites: Basic principles of Instrumentation and control systems

Course Outcomes: At the end of the course, the student will be able to Characterize and calibrate measuring devices. Identify and analyze errors in measurement. Analyze measured data using regression analysis. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

LIST OF EXPERIMENTS:
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detector with SCADA.
*MC409/*MC309: GENDER SENSITIZATION LAB
(An Activity-based Course)

B.Tech. II Year II Sem. L T/P/D C
0 0/2/0 0

COURSE DESCRIPTION
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:
- To develop students’ sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:
- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER
UNIT – II: GENDER ROLES AND RELATIONS
Two or Many? - Struggles with Discrimination - Gender Roles and Relations - Types of Gender Roles - Gender Roles and Relationships Matrix - Missing Women - Sex Selection and Its Consequences - Declining Sex Ratio. Demographic Consequences - Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

UNIT – IV: GENDER - BASED VIOLENCE

UNIT – V: GENDER AND CULTURE

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.


ASSESSMENT AND GRADING:
• Discussion & Classroom Participation: 20%
• Project/Assignment: 30%
• End Term Exam: 50%
ME501PC: DYNAMICS OF MACHINERY

B.Tech. III Year I Sem. 

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Pre-requisite: Kinematics of Machinery

Course Objectives: The objective is to introduce some of the components mainly used in IC Engines and make analysis of various forces involved. Subjects deals with topics like inertia forces in slider crank mechanism; IC Engine components & the analysis like governors is introduced. It also deals with balancing of rotating & reciprocating parts. Studies are made about balancing of multi cylinder engines, Radial engines etc. study of primary & secondary forces are considered while balancing. Finally they are introduced to the topic of vibrations. The study deals with linear, longitudinal, & torsional vibrations. The idea is to introduce the concept of natural frequency and the importance of resonance and critical speeds.

Course Outcome: the study of KOM & DOM are necessary to have an idea while designing the various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts.

UNIT – I
Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

UNIT – II
Turning Moment Diagram and Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram – fluctuation of energy – flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.-.

UNIT – III

UNIT – IV

UNIT – V
TEXT BOOKS:
2. Theory of Machines / Sadhu Singh / Pearson

REFERENCE BOOKS:
1. Theory of Machines and Mechanisms / Joseph E. Shigley / Oxford
ME502PC: DESIGN OF MACHINE MEMBERS - I

B.Tech. III Year I Sem.  

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**Note:** Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

**Pre-requisites:** Engineering mechanics, mechanics of solids, manufacturing processes, metallurgy and material science.

**Course Objectives:**
- To understand the general design procedures and principles in the design of machine elements.
- To study different materials of construction and their properties and factors determining the selection of material for various applications.
- To determine stresses under different loading conditions.
- To learn the design procedure of different fasteners, joints, shafts and couplings.

**Course Outcomes:**
- The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.
- Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading.
- Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.

**UNIT – I**
**Introduction:** General considerations in the design of Engineering Materials and their properties – selection – Manufacturing consideration in design. Tolerances and fits – BIS codes of steels.

**Design for Static Strength:** Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

**UNIT – II**

**UNIT – III**

**UNIT – IV**
**Keys, Cotters and Knuckle Joints:** Design of keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, Gib and cotter joints-Knuckle joints.
UNIT – V

**Shafts:** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. - Gaskets and seals (stationary & rotary)

**Shaft Couplings:** Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Flange coupling (Modified).

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Design of Machine Elements / V. M. Faires / Macmillan
2. Design of Machine Elements-I / Kannaiah, M.H / New Age
ME03PC: METROLOGY AND MACHINE TOOLS

B.Tech. III Year I Sem.  

L T P C  
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Pre-requisites: None

Course Objectives: The course content enables students to:

- Acquire the knowledge of Engineering metrology and its practice which is having increasing importance in industry.
- Specifically make the student to improve applications aspect in the measurements and control of process of manufacture
- Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.
- Train in knowing the fundamental parts of various machine tools and their kinematic schemes.
- Discuss various principles of jigs and fixtures which will be used to hold and guide the work pieces and cutting tools in various machine tools

Course Outcome: At the end of the course, the student would be able to

- Identify techniques to minimize the errors in measurement.
- Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
- Understand working of lathe, shaper, planer, drilling, milling and grinding machines.
- Comprehend speed and feed mechanisms of machine tools.
- Estimate machining times for machining operations on machine tools

UNIT – I

UNIT – II
Drilling and Boring Machines – Principles of working, specifications, types, operations performed; twist drill. Types of Boring machines and applications. Shaping, slotting and planing machines – Principles of working – machining time calculations.

UNIT – III

UNIT – IV
Limits, fits and tolerances- Types of Fits - Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly.

UNIT – V
Surface Roughness Measurement: Roughness, Waviness. CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines. Coordinate Measuring Machines: Types and Applications of CMM.

TEXT BOOKS:

REFERENCE BOOKS:
2. Fundamentals of Dimensional Metrology / Connie Dotson / Thomson
SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. III Year I Sem.  

**Course Objective:** To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm’s financial position by analysing the Financial Statements of a Company.

**UNIT – I: Introduction to Business and Economics**
- **Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**UNIT – II: Demand and Supply Analysis**
- **Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
- **Supply Analysis:** Determinants of Supply, Supply Function & Law of Supply.

**UNIT – III: Production, Cost, Market Structures & Pricing**
- **Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
- **Cost analysis:** Types of Costs, Short run and Long run Cost Functions.
- **Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.
- **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.


**TEXT BOOKS:**
REFERENCE BOOKS:

ME505PC: THERMAL ENGINEERING - II

B.Tech. III Year I Sem.

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Note: Steam Table book Permitted.
Pre-requisite: Thermodynamics

Course Objective: To apply the laws of Thermodynamics to analyze steam and gas turbine cycles and to perform analysis of the major components of steam and gas turbine plants and their applications.

Course Outcomes: At the end of the course, the student should be able to
- Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
- Apply the laws of Thermodynamics to analyze thermodynamic cycles
- Differentiate between vapour power cycles and gas power cycles
- Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants
- Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components

UNIT – I
Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

UNIT – II
Steam Nozzles: Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT – III
Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed-Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.
Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson’s reaction turbine – Condition for maximum efficiency.

UNIT - IV
UNIT – V

TEXT BOOKS:
1. Thermal Engineering / Mahesh M Rathore/ Mc Graw Hill
2. Gas Turbines – V. Ganesan /Mc Graw Hill

REFERENCE BOOKS:
1. Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers/ Pearson
2. Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI
3. Thermal Engineering/ Rajput/ Lakshmi Publications
ME506PC: OPERATIONS RESEARCH

B.Tech. III Year I Sem. 

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Prerequisites: None

Course Objectives: Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

Course Outcome: Understanding the problem, identifying variables & constants, Formulation of optimization model and applying appropriate optimization technique

UNIT - I
Development-definition-characteristics and phases-Types of models-Operations Research models-applications.


UNIT - II
Transportation problem - Formulation-Optimal solution, unbalanced transportation problem-Degeneracy.


UNIT - III
Sequencing- Introduction-Flow-Shop sequencing- n jobs through two machines – n jobs through three machines- Job shop sequencing-two jobs through ‘m’ machines

Replacement: Introduction- Replacement of items that deteriorate with time- when money value is not counted and counted- Replacement of items that fail completely- Group Replacement.

UNIT - IV
Theory of Games: Introduction- Terminology- Solution of games with saddle points and without saddle points. 2 x 2 games- dominance principle- m x 2 & 2 x n games- Graphical method.

Inventory: Introduction- Single item, Deterministic models- purchase inventory models with one price break and multiple price breaks- Stochastic models Demand may be discrete variable or continuous variable- single period model and no setup cost.

UNIT - V
Waiting lines: Introduction- Terminology- Single channel- Poisson arrivals and Exponential service times with infinite population.


TEXT BOOK:
1. Operations Research/ J. K. Sharma4e./ MacMilan
2. Introduction to OR/ Hillier & Libemann/TMH

REFERENCE BOOKS:
1. Introduction to OR/Taha/PHI
2. Operations Research/NVS Raju/SMS Education/3rd Revised Edition
ME507PC: THERMAL ENGINEERING LAB

B.Tech. III Year I Sem.  L   T   P   C
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Pre-Requisite: Thermodynamics & Thermal Engineering - I

Objective: To understand the working principles of IC Engines, Compressors.

List of Experiments
1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines
4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engine Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

Note: Perform any 10 out of the 12 Exercises.
ME508PC: METROLOGY AND MACHINE TOOLS LAB

B.Tech. III Year I Sem.  

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| 1. To import practical exposure to the metrology equipment & Machine Tools  
| 2. To conduct experiments and understand the working of the same.  
|  
| Prerequisites: Theoretical exposure to Metrology and machine tools.  
|  
| List of Experiments: | L T P C  
|---------------------|--------  
| 1. Step turning on lathe machine | 0 0 2 1  
| 2. Taper turning on lathe machine |  
| 3. Thread cutting and knurling on lathe machine (2 exercises) |  
| 4. Measurement of cutting forces on lathe |  
| 5. Machining of holes using Drilling and boring machines. |  
| 6. Gear cutting on the Milling machine |  
| 7. Grinding of Tool angles using Cylindrical / Surface Grinding |  
| 10. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear. |  
| 11. Angle and taper measurements by bevel protractor and sine bars. |  
| 12. Thread measurement by 2-wire and 3-wire methods. |  
| 13. Surface roughness measurement by Tally Surf. |  
| 14. Use of mechanical comparator |  
ME509PC: KINEMATICS AND DYNAMICS LAB

B.Tech. III Year I Sem.  

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Pre-requisites:  
Prerequisites for the graduate-level course are Kinematics, Dynamics, differential equations, motion simulation, displacement, velocity, acceleration, force, torque, power, Newton’s motion laws, vibration, Gyroscopic Effect, Cams, Bearings.

Course Objectives: The objective of the lab is to understand the kinematics and dynamics of mechanical elements such as linkages, gears, cams and learn to design such elements to accomplish desired motions or tasks.

Course Outcomes: Upon successful completion of this lab, students should be able to:
- Understand types of motion
- Analyze forces and torques of components in linkages
- Understand static and dynamic balance
- Understand forward and inverse kinematics of open-loop mechanisms

Experiments: (A Minimum of 10 experiments are to be conducted)
1. To determine the state of balance of machines for primary and secondary forces
2. To determine the frequency of torsional vibration of a given rod
3. Determine the effect of varying mass on the centre of sleeve in porter and proell governor
4. Find the motion of the follower if the given profile of the cam
5. The balance masses statically and dynamically for single rotating mass systems
6. Determine the critical speed of a given shaft for different n-conditions
7. For a simple pendulum determine time period and its natural frequency
8. For a compound pendulum determine time period and its natural frequency
9. Determine the effect of gyroscope for different motions
10. Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.
11. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
12. Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems
**MC510: INTELLECTUAL PROPERTY RIGHTS**

B.Tech. III Year I Sem.  

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**UNIT – I**  
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**  
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**  
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.  
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**  
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.  
Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**  
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.  
International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

**TEXT BOOKS & REFERENCE BOOKS:**  
1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.  
Note: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Pre-requisites: Study of engineering mechanics, design of machine members-I and theory of machines.

Course objectives:
- To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs, belts, gears etc.
- To design the components using the data available in design data books.

Course Outcomes:
- Knowledge about journal bearing design using different empirical relations.
- Estimation of life of rolling element bearings and their selection for given service conditions.
- Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.

UNIT – I

UNIT – II
Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – III
Engine Parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV
Belts & Pulleys: Transmission of power by Belt and Rope Drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V
Gears: Spur gears& Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:
1. Design of Machine Elements / Spotts/ Pearson
2. Machine Design / Pandya & Shah / Charothar

REFERENCE BOOKS:
1. Design of Machine Elements-II / Kannaiah / New Age
2. Design of Machine Elements / Sharma and Purohit/PHI
3. Design Data Book/ P.V. Ramana Murti & M. Vidyasagar/ B.S. Publications
ME602PC: HEAT TRANSFER

B.Tech. III Year II Sem.  

Note: Heat Transfer Data Book is permitted.

Pre-requisite: Thermodynamics

Course Objectives: To provide knowledge about application of conduction, convection and radiation heat transfer concepts to different practical applications

Course Outcome: At the end of this course, student will be able to
- Understand the basic modes of heat transfer
- Compute one dimensional steady state heat transfer with and without heat generation
- Understand and analyze heat transfer through extended surfaces
- Understand one dimensional transient conduction heat transfer
- Understand concepts of continuity, momentum and energy equations
- Interpret and analyze forced and free convective heat transfer
- Understand the principles of boiling, condensation and radiation heat transfer
- Design of heat exchangers using LMTD and NTU methods

UNIT – I
Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer – General discussion about applications of heat transfer.
Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady, and periodic heat transfer – Initial and boundary conditions
One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders, and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation

UNIT – II
One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity – systems with heat sources or Heat Generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

UNIT – III

UNIT – IV
Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.


UNIT - V
Heat Transfer with Phase Change:
Condensation: Film wise and drop wise condensation –Nusselt’s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

TEXT BOOKS:
2. Heat and Mass Transfer / Altamush Siddiqui/ Cengage

REFERENCE BOOKS:
1. Essential Heat Transfer - Christopher A Long / Pearson
ME603PC: CAD & CAM

B.Tech. III Year II Sem.  

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Pre-requisites: To learn the importance and use of computer in design and manufacture

Course objectives: To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture. To understand the need for integration of CAD and CAM

Course Outcomes: Understand geometric transformation techniques in CAD. Develop mathematical models to represent curves and surfaces. Model engineering components using solid modeling techniques. Develop programs for CNC to manufacture industrial components. To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT – I

Geometric Modeling: Wire frame modeling, wire frame entities, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT - II
Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions, parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface.  B-spline surface, Regenerative surface and pathological conditions. 

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

UNIT – IV
Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design. 

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning

UNIT – V
Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM
TEXT BOOKS:
1. CAD/CAM Concepts and Applications / Alavala / PHI
2. CAD/CAM Principles and Applications / P. N. Rao / Mc Graw Hill

REFERENCE BOOKS:
1. CAD/CAM/ Groover M.P/ Pearson
2. CAD/CAM/CIM/ Radhakrishnan and Subramanian / New Age
ME611PE: UNCONVENTIONAL MACHINING PROCESSES (Professional Elective - I)

B.Tech. III Year II Sem.  

Course Overview: The objective of this course is to introduce the student to more advanced topics in the machining processes. To bring out the need for Unconventional Machining Processes which will overcome the difficulties associated with Traditional Machining.

Course Objectives:
- To teach the modeling technique for machining processes
- To teach interpretation of data for process selection
- To teach the mechanics and thermal issues associated with chip formation
- To teach the effects of tool geometry on machining force components and surface finish
- To teach the machining surface finish and material removal rate

Course Outcomes:
- Understand the basic techniques of Unconventional Machining processes modeling
- Estimate the material removal rate and cutting force, in an industrially useful manner, for Unconventional Machining processes.

UNIT – I

UNIT - II

UNIT – III

UNIT – IV
Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT - V
Application of plasma for machining, metal removing mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining – principle - maskants - applications.
Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolyte machining.

**TEXT BOOKS:**
1. Advanced Machining Processes / VK Jain / Allied publishers

**REFERENCE BOOKS:**
1. Unconventional Manufacturing Processes/ Singh M.K/ New Age Publishers
2. Advanced Methods of Machining/ J.A. McGeough/ Springer International
ME612PE: MACHINE TOOL DESIGN (Professional Elective – I)

B.Tech. III Year II Sem. L T P C 3 0 0 3

Pre-requisites: Machine Design, Machine Tools and Metrology, Machining Science

Course Objectives: This course is designed to:

- Implement the tool design process when designing tooling for the manufacturing of a product.
- Apply Geometric Tolerancing principles in the designs of tooling.
- Evaluate and select appropriate materials for tooling applications.
- Design, develop and evaluate cutting tools and work holders for a manufactured product.
- Design, develop and evaluate appropriate Gauging systems to define limits and specifications of a work piece during the manufacturing process.
- Design, develop, and evaluate tooling for various joining processes.
- Apply ANSI standards to tool design drawings and layouts.
- Use CAD and conventional techniques in creating tooling drawings.

Course Outcomes: At the end of the course, the student will be able to, understand basic motions involved in a machine tool, design machine tool structures, design and analyze systems for specified speeds and feeds, select subsystems for achieving high accuracy in machining, understand control strategies for machine tool operations and apply appropriate quality tests for quality assurance.

UNIT - I

UNIT - II
Regulation of Speeds and Feeds: Aim of Speed and Feed Regulation, Stepped Regulation of Speeds, Multiple Speed Motors, Ray Diagrams and Design Considerations, Design of Speed Gear Boxes, Feed Drives, Feed Box Design.

UNIT - III

UNIT - IV
Design of Spindles and Spindle Supports: Functions of Spindles and Requirements, Effect of Machine Tool Compliance on Machining Accuracy, Design of Spindles, Antifriction Bearings.

UNIT - V
Dynamics of Machine Tools: Machine Tool Elastic System, Static and Dynamic Stiffness Acceptance Tests

TEXT BOOKS:
REFERENCE BOOKS:
3. Metal Cutting and Tool Design/ Ranganath B.J./ Vikas Publishers
4. Fundamentals of Tool Design/ ASTME, PHI
5. Tooling Data/ Joshi P.H./ Wheeler Publishing
ME613PE: PRODUCTION PLANNING AND CONTROL (Professional Elective – I)

B.Tech. III Year II Sem.  

Pre-requisites: Management Science & Productivity.

Course Objectives: Understand the importance of Production planning & control. Learning way of carrying out various functions so as to produce right product, right quantity at right time with minimum cost.

Course Outcomes: At the end of the course, the student will be able to understand production systems and their characteristics. Evaluate MRP and JIT systems against traditional inventory control systems. Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies. Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems.

UNIT – I
Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.

Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II
Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only. Aggregate planning – Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III
Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV

UNIT – V
Dispatching: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.
Follow up: definition – types of follow up – expediting – definition – expediting procedures-Applications of computers in planning and control.

TEXT BOOKS:

REFERENCE BOOKS:
1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production Planning and Control- Jain & Jain – Khanna publications
ME604PC: FINITE ELEMENT METHODS

B.Tech. III Year II Sem. L T P C 3 0 0 3

Pre-requisites: Mechanics of Solids

Course Objective: The aim of the course is to provide the participants an overview on Finite Element Method, Material models, and Applications in Civil Engineering. At the end of the course, the participants are expected to have fair understanding of:

- Basics of Finite Element Analysis.
- Available material models for structural materials, soils and interfaces/joints.
- Importance of interfaces and joints on the behavior of engineering systems.
- Implementation of material model in finite element method and applications

Course Outcomes: At the end of the course, the student will be able to, Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer. Formulate and solve problems in one dimensional structures including trusses, beams and frames. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems. ANSYS, ABAQUS, NASTRAN, etc.

UNIT – I
One Dimensional Problems: 1-D Linear and 1-D Quadratic Elements - Finite element modeling, Coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II
Analysis of Trusses: Derivation of Stiffness Matrix for Plane Truss, Displacement of Stress Calculations.
Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element, Load Vector, Deflection.

UNIT – III
Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, Estimation of Load Vector, Stresses
Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

UNIT – IV
Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two-dimensional analysis of thin plate.

UNIT – V
Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation. techniques such as semi-automatic and fully Automatic use of softwares such as ANSYS, ABAQUS, NASTRAN using Hexahedral and Tetrahedral Elements.
TEXT BOOKS:
1. Finite Element Methods: Basic Concepts and applications/Alavala/PHI
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu /Pearson

REFERENCE BOOKS:
2. Finite Element Analysis / SS Bhavikatti / New Age
3. Finite Element Method/ Dixit/Cengage
ME605PC: HEAT TRANSFER LAB

B.Tech. III Year II Sem.                                  L   T   P   C
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Pre-requisite: Thermodynamics

Course Objectives: To enable the student to apply conduction, convection and radiation heat transfer concepts to practical applications

Course Outcome: At the end of the lab sessions, the student will be able to

- Perform steady state conduction experiments to estimate thermal conductivity of different materials
- Perform transient heat conduction experiment
- Estimate heat transfer coefficients in forced convection, free convection, condensation and correlate with theoretical values
- Obtain variation of temperature along the length of the pin fin under forced and free convection
- Perform radiation experiments: Determine surface emissivity of a test plate and Stefan-Boltzmann’s constant and compare with theoretical value

Minimum twelve experiments from the following:
1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
14. Film and Drop wise condensation apparatus
ME606PC: CAD & CAM LAB

B.Tech. III Year II Sem.  

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Pre-requisites: To give the exposure to usage of software tools for design and manufacturing. To acquire the skills needed to analyze and simulate engineering systems.

Course Objectives: To be able to understand and handle design problems in a systematic manner. To be able to apply CAD in real life applications. To be understand the basic principles of different types of analysis.

Course Outcomes: To understand the analysis of various aspects in of manufacturing design

Note: conduct any TEN exercises from the list given below:
1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.
3. Determination of deflection and stresses in 2D and 3D trusses and beams.
4. Determination of deflections, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
5. Determination of stresses in 3D and shell structures (at least one example in each case)
7. Study state heat transfer analysis of plane and axi-symmetric components.
8. Development of process sheets for various components based on Tooling and Machines.
10. Study of various post processors used in NC Machines.
12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.
EN608HS: ADVANCED COMMUNICATIONS SKILLS LAB

B.Tech. III Year II Sem.  

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1. INTRODUCTION:
The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.
The proposed course should be a laboratory course to enable students to use ‘good’ English and perform the following:
- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:
This Lab focuses on using multi-media instruction for language development to meet the following targets:
- To improve the students’ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:
The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. Activities on Reading Comprehension – General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.


4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.

5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening
strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:
The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:
The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner’s Compass, 7th Edition
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

REFERENCE BOOKS:
Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

Course Outcomes:
Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I
Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II
Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

UNIT - V
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

**TEXT BOOKS:**
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**
ME701PC: REFRIGERATION AND AIR CONDITIONING

B.Tech. IV Year I Sem.  

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Pre-requisite: Thermodynamics

Course Objective: To apply the principles of Thermodynamics to analyze different types of refrigeration and air conditioning systems and to understand the functionality of the major components.

Course Outcomes: At the end of the course, the student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems. Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.

UNIT – I

UNIT – II

UNIT - III

UNIT - IV

UNIT – V
TEXT BOOKS:
1. Refrigeration and Air conditioning / CP Arora / Mc Graw Hill
2. Refrigeration and Air-Conditioning / RC Aora / PHI

REFERENCE BOOKS:
1. Principles of Refrigeration - Dossat / Pearson
2. Basic Refrigeration and Air-Conditioning / Ananthanarayanan / Mc Graw Hill
ME711PE: ADDITIVE MANUFACTURING (PE - II)

B.Tech. IV Year I Sem.  
L T P C 3 0 0 3

Pre-requisites: Manufacturing Processes, Engineering Materials

Course Objectives:
- To understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.
- To classify various types of Additive Manufacturing Processes and know their working principle, advantages, limitations etc.
- To have a holistic view of various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

Course Outcomes:
- Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation.
- Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting.
- Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modelling and subdivision surface fitting.
- Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
- Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts.

UNIT - I

UNIT - II

UNIT - III
UNIT - IV

UNIT - V

TEXT BOOKS:
2. Rapid Manufacturing /D.T. Pham and S.S. Dimov/Springer

REFERENCE BOOKS:
2. Rapid Prototyping and Manufacturing /PaulF.Jacobs/ASME
ME712PE/MT821PE: AUTOMATION IN MANUFACTURING (PE – II)

B.Tech. IV Year I Sem. L T P C
3 0 0 3

UNIT - I
Introduction: Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and tool changing and machine tool control transfer the automaton.

UNIT - II
Automated flow lines: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.
Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT - III
Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT - IV
Automated material handling: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems. Automated storage systems, Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT - V
Fundamentals of Industrial controls: Review of control theory, logic controls, sensors and actuators, Data communication and LAN in Manufacturing. Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE.

TEXT BOOK:

REFERENCE BOOKS:
ME713PE: MEMS (PE – II)

B.Tech. IV Year I Sem.  

Pre-requisites: Fluid Mechanics

Course Objectives: At the end of this course the student will be able to
- Integrate the knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- Understand the rudiments of Micro fabrication techniques.
- Identify and understand the various sensors and actuators’ different materials used for MEMS
- Applications of MEMS to disciplines beyond Electrical and Mechanical engineering

Course Outcomes:
- Students will be able to understand working principles of currently available micro sensors, actuators, and motors, valves, pumps, and fluidics used in Microsystems.
- Students will be able to apply scaling laws that are used extensively in the conceptual design of micro devices and systems. Students will be able to differentiate between the positive and negative consequences of scaling down certain physical quantities that are pertinent to Microsystems.
- Students will be able to use materials for common micro components and devices.
- Students will be able to choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.
- Students will be able to understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
- Students will be able to consider recent advancements in the field of MEMS and devices.
- Students will be able communicate their results and findings orally via formal presentations and in writing through reports.

UNIT – I

UNIT - II

UNIT - III

UNIT - IV
UNIT - V

TEXT BOOKS:
1. MEMS & Microsystems Design and Manufacture/ Tai-Ran Hsu/ Tata Mc Graw Hill
2. Microelectromechanical Systems / Bhattacharyya / Cengage

REFERENCES BOOKS:
1. Foundations of MEMS /Chang Liu / Pearson
2. MEMS/ Mahalik/ Mc Graw Hill
3. MEMS and MOEMS Technology and Applications/ PHI
4. Microsystems Design/ Stephen D. Senturia /Springer
5. Introductory MEMS – Fabrication and Applications/ Thomas M. Adams and Richard A Layton/ Springer
6. Microelectronic Devices/ Dipankar Nagchaudhuri/ Pearson Education Asia
ME721PE: POWER PLANT ENGINEERING (PE – III)

B.Tech. IV Year I Sem.          L   T   P   C
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Pre-Requisites: None

Course Objective: The goal of this course is to become prepared for professional engineering design of conventional and alternative power-generation plants. The learning objectives include

- Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
- A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
- Awareness of the economic, environmental, and regulatory issues related to power generation.

Course Outcomes: At the end of the course students are able to:

- Understand the concept of Rankine cycle.
- Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
- Analyze the flow of steam through nozzles
- Evaluate the performance of condensers and steam turbines
- Evaluate the performance of gas turbines

UNIT – I
Introduction to the Sources of Energy – Resources and Development of Power in India.
Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

UNIT – II

UNIT – III
Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

UNIT – V
Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve.

**TEXT BOOKS:**
2. Power Plant Engineering / Hegde / Pearson.

**REFERENCES BOOKS:**
1. Power Plant Engineering / Gupta / PHI
2. Power Plant Engineering / A K Raja / New age
UNIT - I
Introduction: Layout of automobile – introduction chassis and body components. Types of Automobile engines. – Power unit – Introduction to engine lubrication – engine servicing

UNIT - II
Ignition System: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser, and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.
Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT - III
Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

UNIT - IV
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.
Steering System: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT - V

TEXT BOOKS:
1. Automobile Engineering / William H Crouse
REFERENCE BOOKS:
2. Automotive Mechanics / Heitner
3. Automotive Engineering / Newton Steeds & Garrett
4. Automotive Engines / Srinivasan
5. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International
ME723PE: RENEWABLE ENERGY SOURCES (PE – III)

B.Tech. IV Year I Sem.  
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Course Objectives:
- To explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

Course Outcomes:
- Understanding of renewable energy sources
- Knowledge of working principle of various energy systems
- Capability to carry out basic design of renewable energy systems

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT-V
Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.
1. Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
2. Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.
TEXT BOOKS:
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers

REFERENCE BOOKS:
ME731PE: COMPUTATIONAL FLUID DYNAMICS (PE – IV)

B.Tech. IV Year I Sem.

Pre-requisite: Heat Transfer and Fluid Mechanics

Course Objective: To apply the principles of Heat Transfer and Fluid Mechanics to formulate governing equations for physical problems and to solve those using different numerical techniques

Course Outcomes: At the end of the course, the student should be able to:

- Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
- Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM.
- Understand and to appreciate the need for validation of numerical solution.

UNIT - I:
Basic Aspects of the Governing Equations – Physical Boundary Conditions – Methods of solutions of Physical Problems – Need for Computational Fluid Dynamics – Different numerical/CFD techniques – FDM, FEM, FVM etc., - Main working principle - CFD as a research and design tool – Applications in various branches of Engineering
Iterative Method: Gauss Seidel and Jordan Methods - Stability Criterion

UNIT - II:

UNIT - III:

UNIT - IV:
Finite Difference Solution of Unsteady Inviscid Flows: Lax – Wendroff Technique – Disadvantages – Maccormack’s Technique
UNIT - V:

TEXT BOOKS:

REFERENCE BOOKS:
2. Computational Methods for Fluid Dynamics / Firziger & Peric/ Springer
ME732PE: TURBO MACHINERY (PE – IV)

B.Tech. IV Year I Sem.  L  T  P  C
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Pre-requisites: Thermal Engineering, Heat Transfer

Course Objectives:
- Provide students with opportunities to apply basic flow equations
- Train the students to acquire the knowledge and skill of analyzing different turbo machines.
- How to compare and choose machines for various operations

Course Outcomes:
- Ability to design and calculate different parameters for turbo machines
- Prerequisite to CFD and Industrial fluid power courses
- Ability to formulate design criteria
- Ability to understand thermodynamics and kinematics behind turbo machines

UNIT - I
Introduction to Turbomachinery: Classification of turbo-machines, second law of thermodynamics applied to turbine and compressors work, nozzle, diffuser work, fluid equation, continuity, Euler's, Bernoulli's, equation and its applications, expansion and compression process, reheat factor, preheat factor

UNIT - II
Fundamental Concepts of Axial and Radial Machines: Euler's equation of energy transfer, vane congruent flow, influence of relative circulation, thickness of vanes, number of vanes on velocity triangles, slip factor, Stodola, Stanitz and Balje's slip factor, suction pressure and net positive suction head, phenomena of cavitation in pumps, concept of specific speed, shape number, axial, radial and mixed flow machines, similarity laws.

UNIT - III
Centrifugal compressor: Types, Velocity triangles and efficiencies, Blade passage design, Diffuser and pressure recovery. Slip factor, Stanitz and Stodola's formula's, Effect of inlet mach numbers, Pre whirl, Performance

UNIT - IV
Axial Flow Compressors: Flow Analysis, Work, and velocity triangles, Efficiencies, Thermodynamic analysis. Stage pressure rise, Degree of reaction, Stage Loading, General design, Effect of velocity, Incidence, Performance

UNIT - V
TEXT BOOKS:
1. Principles of Turbo Machines / DG Shepherd / Macmillan
2. Turbines, Pumps, Compressors / Yahya / Mc Graw Hill

REFERENCE BOOKS:
1. A Treatise on Turbo machines / G. Gopal Krishnan and D. Prithviraj / SciTech
2. Gas Turbine Theory / Saravanamutto / Pearson
**ME733PE: FLUID POWER SYSTEMS (PE – IV)**

B.Tech. IV Year I Sem. 

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**Pre-requisites:** Fluid Mechanics and Hydraulics Machinery

**Course outcomes:** After doing this, student should be able to

- Understand the Properties of fluids, Fluids for hydraulic systems,
- governing laws. distribution of fluid power, Design and analysis of typical hydraulic circuits.
- Know accessories used in fluid power system, Filtration systems and
- maintenance of system.

**UNIT- I**
Introduction to oil hydraulics and pneumatics, their structure, advantages and limitations. ISO symbols, energy losses in hydraulic systems. Applications, Basic types and constructions of Hydraulic pumps and motors. Pump and motor analysis. Performan curves and parameters.

**UNIT- II**

**UNIT- III**
Proportional control valves and servo valves. Nonlinearities in control systems (backlash, hysteresis, dead band and friction nonlinearities). Design and analysis of typical hydraulic circuits. Regenerative circuits, high low circuits, Synchronization circuits, and accumulator sizing.

**UNIT- IV**
Intensifier circuits Meter-in, Meter-out and Bleed-off circuits; Fail Safe and Counter balancing circuits, accessories used in fluid power system, Filtration systems and maintenance of system. Components of pneumatic systems; Direction, flow and pressure control valves in pneumatic systems. Development of single and multiple actuator circuits. Valves for logic functions; Time delay valve; Exhaust and supply air throttling;

**UNIT- V**
Examples of typical circuits using Displacement – Time and Travel-Step diagrams. Will-dependent control, Travel-dependent control and Time dependent control, combined control, Program Control, Electropneumatic control and air-hydraulic control, Ladder diagrams. Applications in Assembly, Feeding, Metal working, materials handling and plastics working.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
2. “Fluid Power with applications”/ Anthony Esposito / Pearson Education.
ME811PE: INDUSTRIAL ROBOTICS (PE – V)

B.Tech. IV Year II Sem.  

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Pre-requisites: Basic principles of Kinematics and mechanics

Course Objectives: The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, choose, and incorporate robotic technology in engineering systems.

- Make the students acquainted with the theoretical aspects of Robotics
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

Course Outcomes: At the end of the course, the student will be able to understand the basic components of robots. Differentiate types of robots and robot grippers. Model forward and inverse kinematics of robot manipulators. Analyze forces in links and joints of a robot. Programme a robot to perform tasks in industrial applications. Design intelligent robots using sensors.

UNIT – I
Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II
Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

UNIT – III
Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT - IV

UNIT V
Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.
TEXT BOOKS:
1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Industrial Robotics / Ramachandran Nagarajan / Pearson

REFERENCE BOOKS:
1. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2. Robot Analysis and control / Asada, Slotine / Wiley Inter-Science
ME812PE: MECHANICAL VIBRATIONS (PE – V)

B.Tech. IV Year II Sem.

Pre-requisites: Engineering Mechanics

Course objectives: Understand various levels of vibrations and remedies for each of them.

Course Outcomes: At the end of the course, the student will be able to, Understand the causes and effects of vibration in mechanical systems. Develop schematic models for physical systems and formulate governing equations of motion. Understand the role of damping, stiffness and inertia in mechanical systems Analyze rotating and reciprocating systems and compute critical speeds. Analyze and design machine supporting structures, vibration isolators and absorbers.

UNIT - I
Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

UNIT - II
Single degree of Freedom systems - II: Response to Non-Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT - III
Two-degree freedom systems: Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers;
Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

UNIT - IV
Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.
Numerical Methods: Rayleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.
Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT - V
Sound level and subjective response to sound: Subjective response to sound, frequency dependent human response to sound, sound-pressure dependent human response, the decibel scale, relationship among sound power, sound intensity and sound pressure level, relationship between sound power level and sound intensity, relationship between sound intensity level and sound pressure level, sound measuring instruments.

TEXT BOOKS:
1. Elements of Vibration Analysis / Meirovitch/ Mc Graw Hill
REFERENCE BOOKS:
1. Mechanical Vibrations / SS Rao / Pearson
2. Mechanical Vibration / Rao V. Dukkipati, J Srinivas / PHI
3. Mechanical Vibrations/ G.K. Grover/ Nemchand & Brothers
MM813PE: COMPOSITE MATERIALS (PE – V)

B.Tech. IV Year II Sem.                             L T P C
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Course objectives:
- Develop understanding of the structure of ceramic materials on multiple length scales.
- Develop knowledge of point defect generation in ceramic materials, and their impact on transport properties.
- To describe key processing techniques for producing metal, ceramic-, and polymer-matrix composites.
- To demonstrate the relationship among synthesis, processing, and properties in composite materials.

Course Outcomes:
- Knowledge of the crystal structures of a wide range of ceramic materials and glasses.
- Able to explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
- Able to select matrices for composite materials in different applications.
- Able to describe key processing methods for fabricating composites.

UNIT - I
Introduction: Definition, Classification of Composite materials based on structure, based on matrix, Advantages of composites, Applications of composites, Functional requirements of reinforcement and matrix.

UNIT - II

UNIT - III
Fabrication of Polymeric Matrix Composites, Structure and properties of Polymeric Matrix Composites, Interface in Polymeric Matrix Composites, Applications; Fabrication of Ceramic Matrix Composites, Properties of Ceramic Matrix Composites, Interface in Ceramic Matrix Composites, Toughness of Ceramic Matrix Composites Applications of Ceramic Matrix Composites.

UNIT - IV
Fabrication of Metal Matrix Composites: Solid state fabrication, Liquid state fabrication and In-situ fabrication techniques; Interface in Metal Matrix Composites: Mechanical bonding, Chemical bonding and Interfaces in In-situ Composites; Discontinuously reinforced Metal Matrix Composites, Properties and Applications. Fabrication of Carbon fiber composites, properties, interface and applications.

UNIT - V

TEXTS BOOKS:
REFERENCE BOOKS:

ME821PE: INDUSTRIAL MANAGEMENT (PE – VI)

B.Tech. IV Year II Sem.  
Prerequisites: None

Course objectives:
- Understand the philosophies of management gurus
- Understand the various types of organization structures and their features, and Their advantages and disadvantages.
- Learning various Industrial Engineering Practices like Operations Management techniques, work study, statistical quality control techniques, Job evaluation techniques and network analysis techniques.

Course outcomes:
- Able to apply principles of management
- Able to design the organization structure
- Able to apply techniques for plant location, design plant layout and value analysis
- Able to carry out work study to find the best method for doing the work and establish standard time for a given method
- Able to apply various quality control techniques and sampling plans
- Able to do job evaluation and network analysis.

UNIT - I

UNIT - II
Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT - III
Operations Management: Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT - IV:
Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, - Attributes- Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.
UNIT - V


TEXT BOOKS

REFERENCE BOOKS
1. Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by ILO.
2. Human factors in Engineering & Design/Ernest J McCormick /TMH.
3. Production & Operation Management /Paneer Selvam/PHI.
5. Industrial Engineering Hand Book/Maynard.
ME822PE: PRODUCTION AND OPERATIONS MANAGEMENT (PE – VI)

B.Tech. IV Year II Sem. L T P C

Prerequisites: None

Course objectives:
- Learn the importance of studying the subject: Production and Operations Management.
- Learn the characteristics of various types of production systems and understand the current issues of operations Management.
- Understand the procedure for product design & approaches for product development.
- Learn the procedure to carry out value analysis by different methods
- Learn the methods for location of plant and plant layouts
- Understand the procedures for aggregate planning, MRP and JIT
- Learn the procedures for scheduling
- Learning the techniques for network analysis.

Course Outcomes:
- Able to execute operations management functions
- Able to carry out value analysis
- Able to carry out aggregate planning and implement MRP Or JIT
- Able to schedule the jobs so as to complete them in minimum makespan time
- Able to carry out network analysis.

UNIT - I

UNIT - II

UNIT - III

UNIT - IV
UNIT - V

TEXT BOOKS:
1. Operations Management/ Chase/ TMH
2. Production and Operations Management/ S.N. Chary/ TMH

REFERENCE BOOKS:
1. “Operations Management / E.S. Buffs/ Wiley
4. “Production and Operations Management /Panner Selvam/ PHI
5. “Production and Operations Analysis/ Nahima/
ME833PE: TRIBOLOGY (PE – VI)

B.Tech. IV Year II Sem.  L   T   P   C

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Pre-requisites: Fluid mechanics, Design of machine members-II

Course Objectives:
- To expose the student to different types of bearings, bearing materials,
- To understand friction characteristics and power losses in journal bearings.
- To learn theory and concepts about different types of lubrication.

Course Outcomes:
- Understanding friction characteristics in journal bearings.
- Knowledge about different theories of lubrication to reduce friction and wear.

UNIT – I
Study of various parameters: Viscosity, flow of fluids, viscosity and its variation, absolute and kinematic viscosity, temperature dependent variation, viscosity index, determination of viscosity, different viscometers used.
Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT – II
Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro-dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti-friction bearing.

UNIT – III
Friction and power losses in journal bearings: Calibration of friction loss, friction in concentric bearings, bearing modulus, Sommer-field number, heat balance, practical considerations of journal bearing design

UNIT – IV

UNIT- V
Types of bearing oil pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings -externally pressurized bearings. Bearing materials: General requirements of bearing materials, types of bearing materials.

TEXT BOOK:
1. Engineering Tribology/ Gwidon W. Stachowiak & Andrew W. Batchelor/ Elsevier
2. Engineering Tribology/ Prasanta Sahoo / PHI

REFERENCE BOOKS:
1. Tribology – B.C. Majumdar
2. Fundamentals of Tribology, Basu, Sen Gupta and Ahuja/PHI
3. Tribology in Industry: Sushil Kumar Srivatsava, S. Chand &Co.