MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2010001: ENGINEERING MATHEMATICS- I

I Year B.Tech. MECH I – Sem. **L T P C**

3 1 0 4

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Device Physics

Course Objectives:

- Types of matrices and their properties, Concept of a rank of the matrix and applying this conceptto 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.
- Geometrical approach to the mean value theorems and their application to the mathematicalproblems.
- Partial differentiation, concept of total derivative, finding maxima and minima of function of twoand three variables.
- The evaluation of Multiple integration and its applications

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

- Write the matrix representation of a set of linear equations and to analyse the solution of thesystem of equations
- Solve the applications on the mean value theorems.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes for
- cubes, sphere and rectangular parallelepiped

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Skew-symmetric; orthogonal matrices; rank of a matrix by Echelon form, 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.

Learning outcomes:

- Understand the matrix representation of a set of linear equations
- Explain the Normal form and Echelon form.
- Apply elementary operations to find the rank
- Analyse the solution of the system of Linear equations
- Evaluate the rank of the matrix.

UNIT-II: Eigen values and Eigen vectors

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 up to three variables. Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Learning outcomes:

- Understand how to find the eigen values and eigen vectors of a matrix.
- Explain the quadratic form to canonical form using orthogonal transformations.
- Apply Cayley Hamilton theorem to find inverse and powers of the matrix
- Analyse the nature of the quadratic form.
- Evaluate the powers of matrix.

UNIT-III: Calculus of single variable.

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's and Maclaurin theorems with remainders (without proof). Beta and Gamma functions and their applications.

Learning outcomes:

- Understand the concept of mean value theorem.
- Explain the nature of functions by using mean value theorems.
- Apply Taylor's or Maclaurin's series to find the series expansion for the functions.
- Analyse the geometrical interpretation of mean value theorem.
- Evaluation of the slopes at any point on the curve

UNIT-IV: Multivariable Calculus.

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.

Learning outcomes:

- Understand the concept of partial differentiation.
- Explain the functional dependence using Jacobian.
- Apply Lagrange's method to find Maxima and minima.
- Analyse concept of Lagrange multipliers.
- Evaluate the maximum and minimum value of functions of two variables.

UNIT-V: Multiple integrals& applications:

Evaluation of Double integrals (Cartesian and polar coordinates); Change of order of integration (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: finding the area of a region using double integration and volume of a region using double and triple integration.

Learning outcomes:

- Understand the concept of double integrals.
- Explain the polar form of double integral and triple integral.
- Apply double integration techniques in evaluating areas bounded by region.
- Analyse the centre of mass of a Lamina
- Evaluation of double integrals interns of volumes

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TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2010007: ENGINEERING PHYSICS

B. Tech. I Year I Semester.

L	T	P	C
3	1	0	4

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 and transmission 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.

Learning Outcomes:

- **Understand** the rotation transformation of vectors and scalars.
- **Explain** the form invariance of Newton's second law.
- **Apply** Polar coordinates on Newton's laws of motion.
- **Analyze** the various forces in nature.
- **Evaluate** the Newton's equations of motion in polar 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, Steady state motion of forced damped harmonic oscillator, Power observed by oscillator.

Learning Outcomes:

- **Understand** the fundamental notation of Simple Harmonic Oscillations.
- **Explain** about the Damped and Forced oscillators.
- **Apply** knowledge of various damping conditions.
- **Analyze** the difference between damped and forced oscillators.

UNIT-III: Acoustics

Introduction, basic requirements for the acoustically good halls, reverberation and time of reverberation, transmission of sound and transmission loss, factors affecting the architectural acoustics and their remedy, sound absorbing materials, sabine formulae, absorption coefficients, stadium seating, movie theater, acoustic quieting.

Learning Outcomes:

- After the completion of this chapter, the student will be able to
- **Identify** the requirements for acoustically good hall.
- **Analyze** the various remedial methods to overcome factors affecting acoustically good hall.
- **Gain** knowledge about sound absorbing materials.

UNIT-IV: Interference and Diffraction

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, Frunhofer diffraction at a single slit, Diffraction grating- resolving power.

Learning Outcomes:

- After the completion of this chapter, the student will be able to
- **Classify** the types of Interference.
- **Outline** the working of Interferometer.
- **Identify** the diffraction and conditions for maxima and minima.
- **Gain** knowledge Grating and its Resolving power.

UNIT-V: Lasers and Fibre Optics

Lasers: Introduction to Lasers, Coherence, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Semiconductor laser; Applications of laser.

Fibre Optics: Introduction, Block diagram of fiber optic communication system, Total internal reflection, Acceptance angle and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

Learning Outcomes:

The students will be able to

- **Study** about Laser and fiber optics for understanding an advanced communication systems.
- **Explain** the working principle of laser and optical fibers.
- **Classify** optical fibers based on refractive index profile and mode of propagation.
- **Identify** the applications of optical fibers in medical, communication and other fields.
- **Apply** the laser and fiber optic concepts in various fields.

Text Books:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. G. Main, “Vibrations and waves in physics’, 3rd Edn, Cambridge University Press, 2018.
   Ajoy Ghatak, “ Optics”, McGraw Hill Education, 2012

References:

1. H. J. Pain, “The physics of vibrations and waves”, Wiley, 2006
2. O. Svelto, “Principles of Lasers” “Introduction to Mechanics”, M.K.Verma, Universities pres

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2010501: PROGRAMMING FOR PROBLEM SOLVING

I Year B.Tech. MECH I – Sem.

L	T	P	C
3	1	0	4

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..
- Searching and sorting problems.

Unit - 1: Introduction to Programming

Introduction to computers: disks, primary and secondary memory, processor, operating system, compilers, creating and running of program, Number systems, Pseudo code, algorithm, flowchart.

Introduction to C Programming Language: Basic structure of C program, Syntax and Logical Errors in compilation, 'C' tokens: Identifiers, variables, Data types, Operators(Arithmetic, Relational, Logical, Bit-wise, Increment and Decrement, size of, Conditional operator, Assignment, Special operator), expressions and precedence, Expression evaluation, Precedence and Associativity, type conversion, Command line arguments.

Unit - II: Control statements, Arrays

Conditional statements: Writing and evaluation of conditionals and consequent branching withif, if-else, nested if-else and switch statements.

Iterative Statements: while, do-while, for, Nested loops

Jumping Statements: break, continue and goto

I/O: Simple input and output with scanf and printf, formatted I/O, stdin, stdout,stderr.

Arrays: Types of arrays, creating, accessing and manipulating elements of arrays.

Unit - III: Strings, Structures and Unions, Pointers

Strings: Introduction to strings, handling strings as array of characters, string I/O functions,string handling functions, arrays of strings

Structures and unions: Defining structures, Initializing structures, Array of structures, nestedstructures, Bit Fields, unions.

Pointers: Defining pointers, Address and Indirection operators, pointers to arrays and structures,use of pointers in self-referential structures, Enumeration Data types

Unit - IV: Functions 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, call by reference, void function, Structure to functions, Some C standard functions and libraries, Storage classes (auto, extern, static and register)

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: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.

Files: Text and Binary files, File structure, Creating, Reading and Writing text and binary files, Appending data to existing files, Writing and Reading structures using binary files,File Status functions, File Positioning functions.

TEXT BOOKS:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
2. Let us C by YashavantKanetkar BPB publications (16th Edition)

REFERENCE BOOKS:

1. Programming in ANSI C by Balaguruswamy,(7th Edition)
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
4. Programming in C, Stephen G. Kochan, Fourth Edition,Pearson Education HerbertSchildt, C: The Complete Reference, McGrawHill, 4th Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2010072: ENGINEERING PHYSICS LAB

I Year B.Tech. MECH I – Sem.

L	T	P	C
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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. Coupled Oscillator:
   To determine the spring constant by coupled oscillator.

4. Newton's rings:
   To determine the radius of curvature of the lens by forming Newton's rings.

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

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

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

8. LASER:
   To study the V-I characteristics of LASER sources.

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

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

Note: Any 8 experiments are to be performed.

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2010571: PROGRAMMING FOR PROBLEM SOLVING LAB

I Year B.Tech. MECH I – Sem. **L T P C**

0 0 3 1.5

[Note: The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:
Code Lite: https://codelite.org/ Code::Blocks: http://www.codeblocks.org/
DevCpp :http://www.bloodshed.net/devcpp.html Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

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 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
- Able to develop programs based on condition checking
- Implement pyramid programs
- Able to perform matrix applications
- Modularize the code with functions so that they can be reused
- Create, read and write to and from simple text and binary files

Simple numeric problems:

- Write a program for the simple, compound interest.
- Write a program for calculating area, perimeter of a rectangle, triangle and square.
- Write a program for calculating area and perimeter of a circle.
- Write a program to implement bit-wise operators.
- Write a program for converting Fahrenheit to Celsius.
- Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.
- Write a simple program to find largest of two and three numbers using conditional operator.
- Write a program for swapping two numbers with and without using third variable and using bitwise operators.

Condition branching and statements:

- Write a program for finding largest of three numbers.

- Write a program that declares Class awarded for a given percentage of marks, where marks<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
- Write a C program to find the roots of a Quadratic equation.
- 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)

Condition branching and loops:

a. Write a program to find whether the given number is a prime or not.
b. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
c. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, number=5 and no. of rows = 3, the output should be:

5 x 1 = 5
5 x 2 =10
5 x 3 =15

d. Write a program that shows the binary equivalent of a given positive number between 0 to 255.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequenceare 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 valuesupplied by the user.
g. Write a C program to calculate the following, where x is a fractional value.$1-x/2+x^2/4-x^3/6$
h. Write a C program to read in two numbers, x and n, and then compute the sum of this
geometric progression:$1+x+x^2+x^3+\ldots.+x^n$. For example: if n=3 and x=5, then the program compute 1+5+25+125.
i. Write a C program to construct a pyramid of numbers as follows:

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

j. Write a C program to find given number is Armstrong number or not.
k. Write a C program to find given number is Perfect number or not.

Arrays, Strings, Pointers and Structures:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a program to compute Mean, Variance, Standard Deviation,Sorting of n elements in single dimension array.
c. Write a C program that perform the following:
d. Addition of Two Matrices
e. Multiplication of Two Matrices

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

f. Write a C program that sorts a given array of names.

g. Write a C program that perform the following operations:
   i. To insert a sub-string in to a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

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

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

j. Write a program through pointer variable to sum of n elements from array.

k. Write a program to implement student information by using structure to function.

l. Write a program to sort student id or name using structures.

Functions:

a. Write a C program to find factorial of a given number using functions.

b. Write a C program to perform swapping using functions.

c. Write a C program to find LCM, GCD of two numbers using functions.

d. Write a C program to implement sorting using functions.

e. Write a C program to create and print two dimensional array using functions.

f. Write a C program to find factorial of a given number using recursion.

g. Write a C program to find Fibonacci series using recursion

h. Write a C program to implement Towers of Hanoi problem using recursion.

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 upper case equivalents.

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

d. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Reference Books

1. Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
2. Let us C by YashavantKanetkar BPB publications (16th Edition)
3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
5. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, and Pearson Education.
7. Herbert Schildt, C: The Complete Reference, McGrawHill, 4thEdition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2010371: Engineering Drawing Practice

I Year B.Tech. MECH I – Sem. **L T P C**

1 0 4 3

Pre-requisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

Course Objectives:

- The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation.
- To prepare the student to use the technique s, skills, and modern engineering tools necessary for engineering practice.
- To get exposure to a CAD package.

Course Outcomes:

- Familiarize with BIS standards and conventions used in engineering graphics.
- Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g., plain and diagonal scale.
- Develop the lateral surfaces of simple solids
- Ability to draw orthographic projections and isometric projections of given engineering components.
- Visualize different views like elevation and plan for a given line, plane figures or solid objects.
- Apply drafting techniques and use 2D software e.g., AutoCAD to sketch 2D plane figures.

UNIT – I

Introduction To Engineering Drawing

Principles of Engineering Graphics and their Significance-Drawing Instruments and their Uses-Conventions in Drawing-BIS -Lettering and Dimensioning.

Geometrical Constructions: Bisecting a Line, Arc. Dividing A Line into 'N' Equal Parts, Construction of Polygons, Division of Circle into Equal Parts (8 And 12)

Construction of Scales: Plain, Diagonal and Vernier Scale.

Conic Sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola- General Methods only.

Engineering Curves: Cycloid, Epicycloid, Hypocycloid

Involutes: For Circle, Triangle, Square, Pentagon and Hexagon.

Learning Outcomes:

- To understand the basic standards, conventions of engineering drawing and how to use theinstruments in drawing.
- Learn and draw the various types of curves used in engineering application.

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UNIT – II

Orthographic Projections

Principles- Assumptions- Different Angles of Projection.

Projections of Points- orientation in all the quadrants

Projections of Lines- Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Projections of Planes: Surface Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Learning Outcomes:

- knowledge in various planes of projections
- To draw the front view, top view and side views of the given geometrical elements

UNIT – III

Projections Of Solids

Classification of solids- Axis- Parallel, Perpendicular, Inclined to one plane and Inclined to bothplanes- Prisms, Pyramids, Cylinder and Cone

Learning Outcomes:

- To understand the various solid types
- To draw all the views of the given solid in all possible orientations.

UNIT – IV

Section Of Solids And Development Of Surfaces

Types of Section Planes, Sectioning Prisms, Pyramids, Cylinders and Cones using various planes. Development of surfaces of right Regular Solids- Parallel Line Method, Radial Line Method.

Learning Outcomes:

- To identify the cut surfaces and represent the sectional views graphically when the solid issectioned.
- To develop the surfaces of solid using various methods.

UNIT – V

Isometric Projections And Perspective Projections

Principles, Isometric Views of Planes, Solids- Box Method, Offset Method, Compound solids,Sectioned Solids.

Conversion of Isometric to Multi view projection. And vice versa.

Learning Outcomes:

- Knowledge in principles of isometric projection
- Conversion of isometric to orthographic and vice-versa.
- To use the computer as tool in drafting.
- Using CAD in drawing the isometric and orthographic views of the given object.

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TEXT BOOKS:

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers,2012.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2nd Edition -McGraw-Hill Education(India) Pvt.Ltd.

REFERENCE BOOKS:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers Engineering Drawing- Johle/Tata Macgraw Hill.
2. K.Veenugopal, –Engineering Drawing and Graphics + Autocad New Age International Pvt.Ltd, 2011

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020002: ENGINEERING MATHEMATICS - II

I Year B.Tech. MECH II – Sem. **L T P C**

3 1 0 4

Pre-requisites: Nil

Course Objectives:

- Methods of solving the differential equations of 1st and higher order.
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, etc.
- Concept of Sequence and nature of the series.
- 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: At the end of this course, students will 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.
- Analyze the nature of sequence and series.
- Apply the del operator to vector and scalar valued functions.
- Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT– I

First Order and First-Degree ODE and its applications

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 p, equations solvable for y, equations solvable for x and Clairaut's type.

Learning Outcomes: At the end of this unit, the student will be able to

- Identify whether the given differential equation of first order is exact or not.
- Apply the concept of differential equation to real world problems.
- Understand the concepts of linear and Nonlinear differential equations.
- Analyze Exact and Non-Exact differential equations.
- Explain formation of differential equations, Homogeneous equations.

UNIT – II

Higher Order Linear Differential equations: Linear differential equations of second and higher order with constant coefficients, RHS term of the type e^{ax}, Sin ax, Cos ax, and x^n , e^{ax} V(x), x^n V(x), method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

Learning Outcomes: At the end of this unit, the student will be able to

- Identify essential characteristics of linear differential equations with constant coefficients.
- Apply higher order DE's for solving some real-world problems.
- Understand the differential equations with constant coefficients by appropriate method.

- Analyze Legendre's equation and Cauchy-Euler equation.
- Explain Method of variation of parameters.

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, logarithmic test; Cauchy's Integral test; Cauchy's root test; Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

Learning Outcomes: At the end of this unit, the student will be able to

- Identify the Sequence, types of sequences.
- Apply the concept of sequence and series to real world problems.
- Understand the logical knowledge of forming the series.
- Analyze the nature of sequence and series.
- Explain Alternating series.

UNIT – IV

Vector Differential Calculus: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives. Solenoidal and Irrotational vectors, Scalar potential functions. Vector Identities.

Learning Outcomes: At the end of this unit, the student will be able to

- Identify scalar and vector point functions.
- Apply Del to scalar and vector point functions.
- Understand the concepts of Solenoidal and irrotational vectors.
- Analyze the physical interpretation of Gradient, Divergence and curl.
- Explain vector identities

UNIT – V

Vector Integral Calculus: Line Integral-Work done, Surface Integrals-Flux of a vector valued function and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Learning Outcomes: At the end of this unit, the student will be able to

- Identify the work done in moving a particle along the path over a force field.
- Apply Greens, Stokes and Divergence theorems in evaluation of double and triple integrals.
- Understand the concepts of Line Integral.
- Analyze the Flux of a vector valued function.
- Explain Vector valued theorems to real world problems.

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics," Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, "Advanced Engineering Mathematics," 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry," 9thEdition, Pearson, Reprint,2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

REFERENCES:

1. Paras Ram, “Engineering Mathematics,” 2nd Edition, CBS Publishes
2. S. L. Ross, “Differential Equations,” 3rd Ed., Wiley India, 1984.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020008: ENGINEERING CHEMISTRY

I Year B.Tech. MECH II – Sem.

L	T	P	C
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Pre-requisites: Nil

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to becomea perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makesthe student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which areessential 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 understandingreaction pathways

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

- The knowledge of atomic, molecular and electronic changes, band theory related toconductivity.
- 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 andother fields.
- The knowledge of configurational and conformational analysis of molecules and reactionmechanisms.

UNIT– I

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals / Introduction of VBT. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2, O2 and CO molecules. π molecular orbitals of 1,3-butadiene. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in tetrahedral, octahedral and square planar geometries. Applications of CFT. Band structure of solids and effect of doping on conductance.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the Schrodinger wave equation to hydrogen and particle in a box.
- Explain the molecular orbital energy level diagram of different molecular species.
- Apply the band theory of solids for conductors, semiconductors and insulators.
- Analyze discuss the magnetic behavior and colour of complexes.
- Evaluate the Crystal Field theory and Splitting of d- orbital’s

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UNIT – II

Water and its treatment: Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method, Numerical Problems on hardness of water. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler troubles-scale and sludge, caustic embrittlement, priming and foaming. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the differences between temporary and permanent hardness of water.
- Explain the principles of reverse osmosis and Ion-Exchange processes.
- Apply the drinking water with BIS and WHO standards.
- Analyze problems associated with hard water - scale and sludge.
- Evaluate the Internal and external treatment of water.

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 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).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Proper Design, Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroplating and electroless plating of Nickel.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the Nernst equation for calculating electrode and cell potentials.
- Explain the corrosion prevention methods and factors affecting corrosion.
- Apply the Pilling Bed worth rule for corrosion and corrosion prevention.
- Analyze the Dry and Wet corrosion and its Mechanism.
- Evaluate the Corrosion control methods

UNIT – IV

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, symmetry and chirality. Enantiomers, diastereomers, optical activity and configurational nomenclatures (D,L and R,S configurations) Conformational analysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and

anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO4.Reduction reactions: reduction of carbonyl compounds using LiAlH4.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the 3-dimension structures of organic chemistry
- Explain the symmetry, chirality of the organic molecule
- Apply the Markownikoff and anti Markownikoff's additions; Grignard additions conformations of n-butane
- Analyze the reaction mechanism of different compounds.
- Evaluate the synthesis of aspirin, paracetamol

UNIT – V

Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy and IR Spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift, spin-spin splitting Introduction to Magnetic resonance imaging.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the. Principles of. spectroscopy and its selection rules
- Explain the concepts of nuclear magnetic resonance spectroscopy
- Apply the chemical shift values for the different compounds
- Analyze the different structures of organic compound
- Evaluate the vibrational and rotational spectroscopy

TEXT BOOKS:

1. P.C.Jain & M.Jain, "Engineering Chemistry," Dhanpat Rai Publishing Company (P) Ltd., NewDelhi.
2. Jaya Shree Anireddy "Engineering chemistry" Wiley Publications.
3. Prasanth Rath,B.Rama Devi and Ch.Venkata Ramana Reddy, "Engineering Chemistry," Cengage Publication 2019.

REFERENCES:

1. Morrison and Boyd, "Organic reaction Mechanism".
2. C.N.Banwell, "Fundamentals of Molecular Spectroscopy"
3. J.D.Lee, "Inorganic Chemistry"

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020009: COMMUNICATIVE ENGLISH

I Year B.Tech. MECH II – Sem. **L T P C**

2 0 0 2

Pre-requisites: Nil

Course Objectives:

- Improve language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.
- Analyze a variety of texts and interpret them to demonstrate in writing or speech.
- Write clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.
- Develop language components to communicate effectively in formal and informal situations.

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

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts in their profession.
- Acquire basic proficiency in English including LSRW skills.
- Use prewriting techniques to develop ideas and produce multiple drafts of different types ofparagraphs.
- Recognize and incorporate basic grammar, mechanics, and sentence variety in writing.

UNIT– I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by CambridgeUniversity Press

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar: Common Errors: Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the concept of word formation, root words and their usage in English.
- Know the types of sentences and analyze the sentence structure
- Use articles and prepositions appropriately
- Use punctuation marks correctly in writing
- Understand the techniques of effective reading
- Write paragraphs effectively

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UNIT – II

Writing Skills.

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

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, and Job Application with Resume.

Learning Outcomes: At the end of this unit, the student will be able to Enrich their vocabulary using

- synonyms and antonyms
- Noun, pronoun and subject verb agreement accurately
- Understand the techniques of reading comprehension
- Write formal letters in various context

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

.

Learning Outcomes: At the end of this unit, the student will be able to

- Use Prefixes and Suffixes from Foreign Languages in English
- Understand the use misplaced modifiers and uses of tenses
- Skim and scan the given text appropriately
- Write definitions, descriptions and classifications

UNIT – IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published byCambridge 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.

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Learning Outcomes: At the end of this unit, the student will be able to

- understand the importance of food pyramid in your daily life.
- explain the Active and passive Voice Subject Verb Agreement (Concord)
- apply the One word Substitutes in your every day vocabulary.

- analyze the Intensive and Extensive reading skills.
- evaluate the importance of Technical Report Writing, and E-mail 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

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats-Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the Technical Vocabulary and their Usage.
- Avoid common errors in English
- Read any text using the sub skills of reading
- Write technical reports using manual script format.

TEXT BOOKS:

1. Sudarshan, N. P. and Savitha, C. "English for Engineers", Cambridge University Press, 2018.
2. Wren & Martin. "High School English Grammar and Composition" Book, S Chand Publishing,2017.

REFERENCES:

1. Murphy, R. (2015). "Essential Grammar in Use." Cambridge University Press.
2. R. P Sinha, "Current English Grammar and Usage with Composition"
3. Wood, F.T. "Remedial English Grammar." Macmillan. 2007
4. Swan, M. "Practical English Usage." Oxford University Press, 2016
5. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020502: DATA STRUCTURES

I Year B.Tech. MECH II – Sem. **L T P C**

3 0 0 3

Course Objectives

- Exploring basic data structures such as linked list, stacks and queues.
- Describes searching and sorting techniques.
- Introduces trees and graphs.

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for searching and sorting.
- Design programs using a variety of data structures- lists, stacks, queues, trees and graphs.

UNIT - I Introduction to Data Structures, Linear list – singly linked list, Doubly linked list, Circular linked list - operations and its applications

UNIT-II

Stacks- Introduction, Operations, array and linked representations of stacks, stack applications (Infix to postfix conversion and postfix evaluation), Queues-Introduction, operations, array and linked representations of queues and its applications.

UNIT - III

Searching: Linear Search and Binary Search and its applications.
Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and its applications.

UNIT-IV

Trees - Introduction, Types of trees, Binary tree, recursive and non- recursive Traversals of Binary Tree,Binary search tree- Operations and its applications.

UNIT - V

Graphs: Introduction, Types of graphs, Representation of graphs, Graph Traversal Methods, comparisonbetween trees and graphs and its applications.

Text Books

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearsoneducation.

REFERENCES

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition,Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, Pearson.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2020073: ENGINEERING CHEMISTRY LABORATORY

I Year B.Tech. MECH II – Sem. **L T P C**

0 0 2 1

Course Objectives:

- 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 an 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: At the end of the laboratory work, students will be able to

- Understand various procedures for performing the experiments.
- Explain the different measuring devices and meters to record the data
- Apply the mathematical concepts and equations to obtain quality results.
- Analyze the analytical techniques and graphical analysis to the experimental data.
- Evaluate the various parameters for different experiments accurately

List of experiments/demonstrations:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry

Conductometric titrations

3. Strong acid vs strong base
4. Weak acid vs strong base

Potentiometric titrations

5. Strong acid vs strong base
6. Redox titration: -Fe2+ using KMnO4
7. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography- calculation of Rf values. eg: ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
12. Determination of surface tension of a give liquid using stalagmometer

REFERENCES

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)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2020074: COMMUNICATIVE ENGLISH LANGUAGE LABORATORY

I Year B.Tech. MECH II – Sem. **L T P C**

0 0 2 1

The Communicative English 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:

- Facilitate computer-assisted multi-media instruction enabling individualized and independentlanguage learning.
- Enhance English language skills, communication skills and to practice soft skills.
- Improve fluency and pronunciation intelligibility by providing an opportunity for practice in speaking.
- Train students in different interview and public speaking skills such as JAM, debate, role
- play, group discussion etc.
- Instill confidence and make them competent enough to express fluently and neutralize theirmother tongue influence.

Course Outcomes: By the end of the course students will be able to-

- Better perception of nuances of English language through audio- visual experience.
- Neutralization of accent for intelligibility.
- Participate in group activities.
- Speaking skills with clarity and confidence which in turn enhances their employability.
- Apply effective communication skills in a variety of public and interpersonal settings

Communicative English Language Lab (CELL) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening

a. Enable students develop their listening skills to appreciate its role in the LSRW skills approach tolanguage and improve their pronunciation.
b. Equip students with necessary training in listening so that they can comprehend the speech ofpeople of different backgrounds and regions.
   Students should be given practice in listening to the sounds of the language, to be able to recognize themand 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 SkillsObjectives

a. Involve students in speaking activities in various contexts.
b. Enable students express themselves fluently and appropriately in social and professional contexts.

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- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people
- Role play – Individual/Group activities
- Group Discussions
- Debate

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. *Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab: *Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context. *Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms inContext.

ICS Lab: *Understand:* Features of Good Conversation – Non-verbal Communication. *Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

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.

REFERENCES:

1. Kumar, S. & Lata, P. (2011). Communication Skills. Oxford University Press.
2. Balasubramanian, T. (2008). A Text book of English Phonetics for Indian Students, Macmillan.
3. Thorpe, E. (2006). Winning at Interviews, Pearson Education.
4. Sethi, J. et al. (2005). A Practical Course in English Pronunciation (with CD), Prentice Hall ofEffective Technical Communication by M Ashraf Rizvi

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2020372: ENGINEERING WORK SHOP

I Year B.Tech. MECH II – Sem. **L T P C**

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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

Course Outcomes:

- Explain the design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. (L4)
- Demonstrate the design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit. (L4)
- Understand to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder. (L4)
- Demonstrate the design and model various basic prototypes in the trade of Welding. (L4)
- Explain to make various basic prototypes in the trade of Black smithy such as J shape, and S shape. (L4)
- Understand to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. (L4)

UNIT I - CARPENTRY & FITTING

- Carpentry – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- Fitting – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

Learning Outcomes: Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)
- Evaluate the applications of carpentry and fitting. (L4)

UNIT II - TIN SMITHY AND BLACKSMITHY

- Tin-Smithy – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- Blacksmithy- Introduction, Blacksmithy tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Learning Outcomes: Students should be able to,

- Understand the oldest manufacturing methods. (L2)

- Describe the sequence of operations involved. (L3)
- Explain the safety precautions and tools usage. (L4)

UNIT III - HOUSE WIRING AND WELDING

- House-wiring – Introduction, Electrical wiring tools, sequence of operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- Welding Practice – Introduction, electrode, welding tools, and sequence of operations. Advantages and applications (Arc Welding & Gas Welding)

Learning Outcomes:

- Students should be able to,
- Discuss the topic of Heat engines.(L3)
- Identify types of Heat engines cycles.(L5)
- Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

Text Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

References:

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020572: DATA STRUCTURES LABORATORY

I Year B.Tech. MECH II – Sem.	L	T	P	C
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Prerequisites: A Course on “Programming for problem solving”

Course Objectives:

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes

- Ability to develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queuesand linked lists.
- Ability to Implement searching and sorting algorithms

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.: i)Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.: i)Creation ii) Insertion iii) Deletion
3. Write a program that uses functions to perform the following operations on circular linkedlist: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers
5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.
7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a program that implements the following sorting methods to sort a given list of integers inascending order i) Bubble sort ii) Selection sort iii) Insertion sort
9. Write a program that implements the following sorting methods to sort a given list of integers inascending order i) Merge sort ii) Quick sort
10. Write a program that use both recursive and non-recursive functions to perform the followingsearching operations for a Key value in a given list of integers: i) Linear search ii) Binary search
11. Write a program to implement the tree traversal methods using both recursive and non-recursive.
12. Write a program to implement the graph traversal methods.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020021: ENVIRONMENTAL SCIENCE

(MANDATORY COURSE)

I Year B.Tech. MECH II – Sem.	L	T	P	C
	3	0	0	0

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

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turnhelps 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

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment

methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

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- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon lifestyle.

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.

REFERENCES:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL LearningPrivate Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt.Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030202: BASIC ELECTRICAL AND ELECTRONIC ENGINEERING

II Year B. Tech. MECH I – Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concepts of electrical circuits and itscomponents
- To understand magnetic circuits, DC circuits and AC single phase & three phasecircuits
- To study and understand the different types of DC/AC machines andTransformers.
- To import the knowledge of various electricalinstallations.
- To introduce the concept of power, power factor and itsimprovement.
- To introduce the concepts of diodes & transistors,and
- To impart the knowledge of various configurations, characteristics andapplications.

Course Outcomes:

- To analyze and solve electrical circuits using network laws andtheorems.
- To understand and analyze basic Electric and Magneticcircuits
- To study the working principles of ElectricalMachines
- To introduce components of Low Voltage ElectricalInstallations
- To identify and characterize diodes and various types oftransistors.

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

Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, TorquesequationsandSpeedcontrolofThree- phaseinductionmotor. Constructionand working principl eofsynchronousgenerators.

UNIT - IV:

PN JUNCTIONANDZENERDIODE: PrincipleofOperationDiodeequation,Volt-Ampere characteristics, Temperaturedependence,Idealversuspractical,Staticanddynamicresistances, Equivalentcircuit,Zener diode characteristics andapplications.

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:

BIPOLAR JUNCTION TRANSISTOR (BJT): Construction, Principle of Operation, AmplifyingAction, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

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 OxfordUniversity
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw HillEducation

REFERENCES:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed,2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e,1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford UniversityPress-2004.
5. Network Theory by N. C. Jagan & C. Lakshminarayana, B.S.Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli,TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson,2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,1989

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2020301: ENGINEERING MECHANICS

II Year B. Tech. MECH I – Sem

L	T	P	C
3	1	-	4

PRE-REQUISITES: Intermediate Mathematics and Physics.

Course Objectives:

- To solve the resultant of any force system.
- To analyze the types of frication for moving bodies and problems related to friction.
- To determine the centroid of an area and center of gravity of body.
- To understand the concept of area moment and mass moment about any axes.
- Understand the work-energy principle

Course Outcomes:

After completion of the course the student is able to

- Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces (L_1)
- Analyze the bodies on rough horizontal and inclined planes and connected Bodies(L_4)
- Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)
- Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies (L_3)
- Apply work-energy principle to solve the rigid body problems (L_3)

UNIT– I

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Learning Outcomes:

- Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L_1)

UNIT–II

Friction: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Simple Screw Jack

Learning Outcomes:

- Analyze the bodies on rough horizontal and inclined planes and connected Bodies(L_4)

UNIT–III

Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity - Center of gravity of composite bodies.

Learning Outcomes:

- Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)

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UNIT–IV

Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration – Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies – Product of Inertia.

Learning Outcomes :

- Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L_3)

UNIT–V

Kinetics of Rigid Bodies: Types of motion, D'Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; kinetic of rigid body rotation.

Learning Outcomes:

- Understanding basic laws and principles of kinetics of particle and rigid body.(L_2)
- Apply work-energy principle to solve the rigid body problems.(L_3)

TEXT BOOK :

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy and J.Suresh
   a. Kumar / BSP/3rd Edition
2. Engineering Mechanics/ Irving Shames, G.Krishna Mohan Rao / Prentice Hall./ 4th Edition

REFERENCE BOOK :

1. Engineering Mechanics/ Bhattaharyya/ Oxford./2nd Edition
2. Tayal A.K.(2010), Engineering Mechanics. Umesh Publications./2014th Edition
3. Engg. Mechanics by S.S. Bhavikati & K.G. Rajasekharappa/2012th Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030311: THERMODYNAMICS

II Year B. Tech. MECH I – Sem	L	T	P	C
PRE-REQUISITES: Engineering Physics & Mathematics	3	1	-	4

Course Objectives:

- To impart the knowledge of basic concepts of thermodynamics.
- To illustrate the concept of first law of thermodynamics and applications.
- To illustrate the concept of second law of thermodynamics.
- To facilitate the students to know the concepts of pure substance and their properties.
- To help the students learn the properties of gas mixtures and power cycles.

Course Outcomes:

After completion of the course the student is able to

- Explain the fundamental definitions used in thermodynamics (L_1).
- Outline the temperature principles of thermometry (L_3)
- Apply first law of thermodynamics to various thermodynamic systems (L_3)
- Analyze the concepts of second law of thermodynamics (L_3)
- Estimate the quality of steam subjected to various thermodynamic process (L_3)
- Compare various power cycles (L_3)

Tables/Codes:Steam Tables and Mollier Chart

UNIT – I

Introduction: Basic concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process,Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Constant Volume and Pressure – gas Thermometer – Scales of Temperature, Ideal Gas Scale

Learning Outcomes:

- Restate definition of system, surrounding, closed and open system, extensive and intensive Properties (L2)
- Calculate absolute and gage pressure, and absolute temperature(L3)

UNIT – II

First law of thermodynamics: Joule's Experiments- First law of thermodynamics, PMM-I, Corollaries- First law applied to a Process, applied to a system, Steady Flow Energy Equation, throttling and free expansion processes.

Learning Outcomes:

- Apply first law of thermodynamics for closed systems and construct conservation of mass and energy equations (L3)
- Apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves (L3)

UNIT – 3

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Second law of thermodynamics: Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump , Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermo dynamics.

Learning Outcomes:

- Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat Pumps (L3)
- Apply the concept of Entropy, Calculate heat, work and other important thermodynamics (L3)

UNIT – 4 :

Properties of Pure Substances: Pure substance, P-V-T surfaces, T-S & h-s diagrams, Mollier charts, phase transformations, triple point, at critical state properties during the change of phase, dryness fraction, Clausius Clapeyron equation property tables.

Properties of Gas Mixtures: Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and thermodynamic processes,energy transfer, steam calorimetry. volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour

Learning Outcomes:

- Generate mass and energy balance equations for gas-vapor mixtures (L3).
- Determine changes in internal energy and enthalpy for ideal gases (L3).

UNIT – 5 :

Power Cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation, Bell-Coleman cycle, Vapour compression cycle- performance Evaluation.

Learning Outcomes:

- To calculate efficiencies of gas power cycles (L3).
- To calculate coefficient of performance of refrigeration cycles (L3).

TEXT BOOK :

1. Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Publishers/ 5th Edition.
2. Thermodynamics: An Engineering Approach Y.A. Cengel and M.A. Boles, Tata Mc-Graw Hill Publishers/6th Edition

REFERENCE BOOK :

1. Fundamentals of Engineering Thermodynamics, R Yadav, Central Book Depot, Allahabad/ 7th Edition.
2. Fundamentals of Classical Thermodynamics, G. Van Wylan& R.E. Sonntag, John Wiley Publication/6th Edition.
3. Engineering Thermodynamics, Dr.K.Ramakrishna, Anuradha Publications/ 2nd Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030005: PROBABILITY DISTRIBUTIONS& COMPLEX VARIABLES

II Year B. Tech. MECH I – Sem

L	T	P	C
3	1	0	4

Course Objectives:

- The ideas of probability and random variables and various discrete and continuous probability distributions and theirproperties.
- 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'sseries.

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 analyzing experimental data.
- Analysethecomplexfunctionwithreferencetotheiranalyticity,integrationusingCauchy'sintegral and residuetheorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT - I: BasicProbability

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

Learning Outcomes:

- Understand the sample space and events
- Explain the notion of random variable, distribution functions and expected value.
- Apply Baye's theorem to real time problems
- Analyse the mean and variance of random variables
- Evaluate the probability of event for more complex outcomes.

UNIT - II: Probabilitydistributions

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

Learning Outcomes:

- Understand the concept of Probability distribution.
- Explain discrete probability distributions
- Apply Binomial, Poisson and Geometric distributions for real data to compute

Probabilities, theoretical frequencies.

- Analyse the properties of Binomial, Poisson and Geometric distributions and its applications.
- Evaluate probabilities, theoretical frequencies.

UNIT - III: Testingof 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

Learning Outcomes:

- Understand the concept of testing of hypothesis
- Explain the single proportions and difference of proportions.
- Apply the concept of hypothesis testing for large samples.
- testing hypothesis for small samples to draw the inference.
- Evaluate single mean and difference of means for small samples.

UNIT - IV: ComplexVariables(Differentiation)

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; Milne-Thomson method for constructing analytic functions.

LEARNING OUTCOMES:

- Understand the basic theory of complex functions
- Explain the concepts of limit, continuity, differentiability, analyticity.
- Apply C-R equations to different complex functions
- Analyse the harmonic functions
- Evaluate theBilinear Transformation.

UNIT - V: ComplexVariables(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.(All theorems are without proof)

LEARNING OUTCOMES:

- Understand the concept of complex integration.
- Explain the Cauchy's integral theorem
- Apply Complex integration over the stream flow functions
- Analyse the contour Integration.
- Evaluation of a line integral along a path.

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(AUTONOMOUS)

2030506: PYTHON PROGRAMMING

II Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

Course Objectives:

- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Understand FILES, Multithread programming in Python.

Course Outcomes:

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
- Demonstrate proficiency in handling Strings and File Systems.
- Create run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.

UNIT - I

Python Introduction, History & Installing of Python, Python basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.
Control structures

UNIT - II

Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.
Iterators, List comprehensions, Generator Expressions

UNIT-III

FILES: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

UNIT-IV

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Modules and Files, Namespaces, Importing Modules, Importing Module Attributes,
Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT – V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs
Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

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TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030374: MACHINE DRAWING PRACTICE

II Year B. Tech. MECH I – Sem

L	T	P	D	C
0	0	4	0	2

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 :

After completion of the course the student is able to

- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs,ribs. (L1)
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usuallysectioned. (L2)
- Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and taperedfeatures.(L3)
- Title boxes, their size, location and details - common abbreviations and their liberalusage. (L1)
- Types of Drawings – working drawings for machineparts. (L3)
- 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.(L2)

PART - A

Drawing of Machine Elements and simple parts

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage
5. Types of Drawings – working drawings for machine parts. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, setscrews. Limits, Fits – Tolerancing of individual dimensions. Keys, cottered joints and knucklejoint. Riveted joints forplates Shaft coupling, spigot and socket pipejoint. Journal, pivot and collar and foot stepbearings.

LEARNING OUTCOME:

- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs,ribs. (L1)
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usuallysectioned. (L2)

PART -B

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Assembly Drawings:

Drawings of assembled views for the part drawings of thefollowingusing conventions and easy drawingproportions.

1. Steam engine parts – stuffing boxes, cross heads,Eccentrics.
2. Machine tool parts: Tail stock, Tool Post, MachineVices.
3. Othermachineparts-Screwsjacks,Petrolengineconnectingrod,Plummerblock,FuelInjector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and aircock.

LEARNING OUTCOME:

- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usuallysectioned. (L2)
- 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.(L2)

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

TEXT BOOKS :

1. Machine Drawing by K.L.Narayana, Wiley Eastern/ 5th Edition
2. Machine Drawing by N.D. Bhatt / Charotar/50th edition

REFERENCE BOOKS :

1. Machine Drawing by / Bhattacharyya / Oxford/4th edition
2. Machine Drawing by Ajeet Singh / Mc Graw Hill/2nd edition
3. Machine Drawing byP.S.Gill/S.K.Kataria & Sons /2nd edition

NOTE: Question paper consists of PART-A and PART –B

1. PART -A consists of Part drawing
2. PART – B consists of Assembly drawing.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030272: Basic Electrical and Electronics Engineering Lab

Pre-requisites: Basic Electrical and Electronics Engineering

Course Objectives:

- To introduce the concepts of electrical circuits and itscomponents
- To understand magnetic circuits, DC circuits and AC single phase & three phasecircuits
- To study and understand the different types of DC/AC machines andTransformers.
- To import the knowledge of various electricalinstallations.
- To introduce the concept of power, power factor and itsimprovement.
- To introduce the concepts of diodes & transistors,and
- To impart the knowledge of various configurations, characteristics andapplications.

Course Outcomes:

- To analyze and solve electrical circuits using network laws andtheorems.
- To understand and analyze basic Electric and Magneticcircuits
- To study the working principles of ElectricalMachines
- To introduce components of Low Voltage ElectricalInstallations
- To identify and characterize diodes and various types oftransistors.

List of experiments/demonstrations:

PART A: ELECTRICAL

1. Verification of KVL andKCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-PhaseTransformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta- star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phasecircuit
4. Performance Characteristics of a Separately Excited DC ShuntMotor
5. Performance Characteristics of a Three-phase InductionMotor
6. No-Load Characteristics of a Three-phaseAlternator

PART B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv)CRO.
2. PN Junction diodecharacteristics
3. Zener diode characteristics and Zener as voltageRegulator
4. Input & Output characteristics of Transistor in CB / CEconfiguration
5. Full Wave Rectifier with & withoutfilters
6. Input and Output characteristics of FET in CSconfiguration

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar OxfordUniversity
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw HillEducation

REFERENCES:

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1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed,2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e,1998.
   Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
3. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
4. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
5. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
6. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
7. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
8. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030273: FUELS AND LUBRICTION LAB

II Year B. Tech. MECH I – Sem

L	T	P	C
-	-	2	1

14. Pre-requisites: Engineering Physics & Chemistry

COURSE OBJECTIVES:

- To Understand the fuels and lubricants Properties
- To present a problem oriented in depth knowledge of automobile fuels and lubricants.

COURSE OUTCOMES : After completion of the course the student is able to

- Illustrate the viscosity of liquid lubricants..
- Understand the calorific values of solid and gaseous fuels..
- Analyze the flash and fire points of liquid fuels.
- Observe the carbon residue for fuels
- Compare the depth penetration for different lubricants.

LIST OF EXPERIMENTS :

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus.
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens
3. Apparatus.
4. Carbon residue test: Liquid fuels.
5. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer.
6. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer –I.
7. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer – II.
8. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer.
9. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
10. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
11. Drop point and Penetration Apparatus for Grease.
12. ASTM Distillation Test Apparatus.
13. Cloud and Pour point Apparatus.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030575: PYTHON PROGRAMMING LAB

II Year B. Tech. MECH I – Sem **L T P C**
0 0 3 1.5

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 -Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow -Continued

a) Find the sum of all the primes below two million.
b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
c) 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
d) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file

Exercise - 6 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
b) Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
c) If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
d) Find mean, median, mode for the given set of numbers in a list.

Exercise - 7 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 8 - Functions - Problem Solving

a) Write a function cumulative_ product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 9 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 10 GUI, Graphics

a) Write a GUI for an Expression Calculator usingtk
b) Write a program to implement the following figures using turtle

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030022: Gender Sensitization

II Year B. Tech. MECH I – Sem

L	T	P	C
0	0	3	0

Course Objectives:

- 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.

Course 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.

UNIT – I

UNDERSTANDINGGENDER

Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals:* Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT - II

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals:* Unit -10)
Two or Many? Struggles with Discrimination.

UNIT - III

GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals:* Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals:* Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT - IV

ISSUESOFVIOLENCESexual Harassment: Say No! (*Towards a World of Equals:* Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

DomesticViolence: Speaking Out (*Towards a World of Equals:* Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence

UNIT – V

GENDER: CO - EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK:

All the five Units in the Textbook, **"*Towards a World of Equals: A Bilingual Textbook on Gender*"** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030312: MECHANICS OF SOLIDS

II Year B. Tech. MECH II – Sem

L	T	P	C
3	1	-	4

PRE-REQUISITES: Basics of Engineering mechanics

COURSE OBJECTIVES:

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.

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COURSE OUTCOMES :

At the end of the course, the student will be able to

- Determine the resistance and deformation in member's subjected to axial, flexural and torsional loads. Evaluate the forces in pin joint – plane frames. (L3)
- Determine the deflections of beams using different methods. Analyze and design thin, thick cylinders and springs (L2,L3)

UNIT – 1

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock
loadings.

LEARNING OUTCOME:

- Restate definition of stress, strain, strain energy and resilience (L2)
- Calculate stress and relation between the elastic moduli temperature stresses(L3)

UNIT – 2

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.

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LEARNING OUTCOME:

- Apply shear force and bending moment concepts on cantilever, simply supported and overhanging beams (L3)
- State the behavior of beams under different loadings (L1)

UNIT – 3

FLEXURAL STRESSES:

Theory of simple bending – Assumptions Derivation of bending equation: M/I=f/y=E/R Neutral axis – Determination bending stresses – section modules of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

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

LEARNING OUTCOME:

- Calculate bending stresses for the following rectangular and circular cross-section(L4)
- Illustrate shear stress distribution for cross-section rectangular, circular, triangular, I, and T angle sections (L3)

UNIT – 4

ANALYSIS OF PIN-JOINTED PLANE FRAMES: Determination of Forces in members of plane, pin- joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses – by method of joints and method of sections.

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

LEARNING OUTCOME :

- To identify zero-force member in a structure (L1)
- Analyze the mathematical expression to determine the slope and deflection of cantilever and simply supported beams subjected to different types of loads. (L3)

UNIT – 5

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: T/J = q/r = Nθ/L- Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

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.

LEARNING OUTCOME :

- To calculate torsion problems in bars (L4)
- Analyze the mathematical expression for circumferential and longitudinal stresses in thin cylinders (L3)

TEXT BOOK :

1. Strength of Materials by Ramamruthan / 4th Edition / Dhantatrai publishers
2. Strength of Materials – Bhavikatti/ 4th Edition / Vikas publishers

REFERENCE BOOK :

1. Strength of Materials by Bansal / 6th Edition / Lakshmi Publications
2. Strenght of Mateirals by Rajput / 5th Edition/ S.Chand publishers
3. Strength of Materials by Sadhu Singh / 9th Edition / Khanna publishers

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040313: METALLURGY AND MATERIAL SCIENCE

II Year B. Tech. MECH II – Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES: Basic knowledge of Engineering Physics and Chemistry

COURSE OBJECTIVES

- To understand of the correlation between the internal structure of the materials their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
- To provide a detailed interpretation of equilibrium phase diagram.
- To learn about heat treatment methods to tailor the properties of Fe-C alloys.
- To introduce various materials related to properties and applications.

COURSE OUTCOMES :

- Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.(L4)
- Understand concept of mechanical behavior of materials and calculations of same using appropriate equations.(L1)
- Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.(L2)
- Analyze the binary phase diagrams of alloys including Fe-Fe3C, brass, and bronze.(L4)
- Understand and suggest the heat treatment process (L2,L4)
- Understand the properties of smart materials, piezoelectric materials, biomaterials, composite materials etc.(L1)

UNIT – 1

Structure of metals: Lattices, basic idea of symmetry. Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number. Imperfections in solids: point defects, line defects, surface defects. Grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size.

Constitution of alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

LEARNING OUTCOMES:

- To understand the types of crystal structures and relate it to the final properties. (L2)
- Compare among different of crystal imperfections. (L3)

UNIT – 2

Equilibrium diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid-state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of Fe-Fe3C, equilibrium phase diagram**.**

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LEARNING OUTCOMES:

- Understand the concept of solid solutions and types.(L2)
- Apply the principles of Tie-line rule and Lever rule to find the composition of the phases present and their weight percentages. (L3)

UNIT – 3

Cast irons and steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, tool and die steels.

Non-ferrous metals and alloys: Structure and properties of copper and its alloys, Aluminium and its alloys. Titanium and its alloy.

LEARNING OUTCOME:

- Understand the Fe-C diagram with invariant reactions, critical temperatures& equilibrium phases. (L2)
- Apply the principles of Tie-line rule and Lever rule to find the composition of the phases present and their weight percentages. (L3)

UNIT – 4

Heat treatment of alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface hardening methods, Age hardening treatment, Cryogenic treatment of alloys. Special metals and alloys- Super alloys maraging steels.

LEARNING OUTCOME:

- Suggest suitable heat treatment process for a particular requirement. (L2 ,L4)
- Distinguish between the major heat treatment processes. (L4)

UNIT – 5

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials - definition, properties and applications.

Composite materials: Classification of composites, particle - reinforced materials, fibre reinforced materials, metal ceramic mixtures, metal matrix composites and C – C composites.

LEARNING OUTCOME :

- Acquire knowledge about composite materials, types, manufacturing methods & its applications. (L2, L3)
- Suggest suitable materials for the modern world. (L3)

TEXT BOOK :

1. Introduction to Physical Metallurgy by Sidney H. Avener, Tata McGraw hill education (P) Ltd, New Delhi, India./ 2nd edition
2. Materials Science and Engineering by V. Raghavan (2015), PHI Learning Private Ltd, India./ 6thEdition,

REFERENCE BOOK :

1. Mechanical Metallurgy by Dieter, George Ellwood, Copyright © 1988 McGraw-Hill Book Company (UK) Limited./3rd Edition

2. Engineering Materials properties & selection by Kenneth G, G.Budiniski /Prentice hall of India/8th edition.
3. Mechanics of composite materials, ROBERT M. JONES, Taylor & Francis ,U.S.A Balram Gupta et al Aerospace Materials, S B Chand & Company Ltd, January 2009./2nd edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040314: KINEMATICS OF MACHINERY

II Year B. Tech. MECH II – Sem

L	T	P	C
3	1	-	4

PRE-REQUISITES: Basic principles of Mechanics

COURSE OBJECTIVES:

- To study the relative motion, velocity and accelerations of the various elements in a mechanism.
- Analyze the mechanisms and their inversions
- To study about different straight line motion mechanisms and steering mechanisms
- To Analyze the motion of cams, gears& gear trains.

COURSE OUTCOMES:

After completion of the course the student is able to

- Understand the relative motions obtained in different type of components used in mechanical Engineering.(L2)
- Understand different mechanisms (L2)
- Draw the trajectories of various kinematic objects (L3)

UNIT – 1

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 mechanism – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage, Intermittent motion Mechanism, Ratchet & Pawl Geneva Mechanism.

LEARNING OUTCOME:

- Differentiate between types of links (L1)
- Learn about mechanisms and their inversions(L1)

UNIT – 2

VELOCITY AND ACCELERATION DIAGRAMS, AND ANALYSIS OF MECHANISMS:

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity andacceleration – 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.

LEARNING OUTCOME:

- Learn to find velocities and accelerations of links in a mechanism (L1)

- Will be able to apply graphical method to find velocities and accelerations of various links in a mechanism (L3)

UNIT – 3

STRAIGHT LINE MOTION MECHANISMS, STEERING GEARS, HOOKE'S JOINT:

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 Steeringgear.

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

LEARNING OUTCOME:

- 1. Identify different straight-line motion mechanisms (L1)
- 2. Understand conditions of correct steering in an automobile (L1)

UNIT – 4

CAMS, ANALYSIS OF MOTION OF FOLLOWERS:

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.

LEARNING OUTCOME :

- Identify types of cams and followers (L1)
- Understand different motions of the follower (L2)

UNIT – 5

HIGHER PAIRS, GEAR TRAINS:

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocityratio 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 avoidinterference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & RackArrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train.Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box – Differential gear for an automobile

LEARNING OUTCOME :

- . Derive the law of gear (L3)
- . Identify the types of gears and their profile (L2)

TEXT BOOK :

1.. Kinematic analysis and synthesis of mechanisms: by Mallik, A. K., Ghosh, A., & Dittrich/ G CRC Press/ 10th Edition, 2008.

2. Theory of Machines by Rattan.S.S. McGraw-Hill Education (India) Pvt Ltd./ 6th Edition/ 2013.

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REFERENCE BOOK :

1. The theory of machines: A Text-Book for Engineering Students: by Bevan T/ Pearson Education/ 4th Edition/ 2013.
2. Fundamentals of kinematics and dynamics of machines and mechanisms: by Vinogradov, O. G./ CRC Press/ 2nd Edition/ 2014.
3. Theory of Machines :Kinematics and Dynamics by Sadhu Singh/Pearson Education/3th Edition/2018.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040315: THERMAL ENGINEERING – I

II Year B. Tech. MECH II – Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES: Thermodynamics

COURSE OBJECTIVES

- To impart the knowledge on working of IC engine and the various losses.
- To teach the basic concepts of combustion phenomenon and knocking in S.I. and C.I. Engines.
- To enable the students to calculate the performance of S.I and C.I Engines.
- . To make students learn about different types of compressors and to calculate power and efficiency.

COURSE OUTCOMES :

After completion of the course the student is able to

- Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance(L_2)
- Calculate the performance test on IC engines. (L_3)
- Explain the classification and working principle of various types of air compressors. (L_2)

UNIT – 1

Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, air – Standard, air-fuel and actual cycles and their analysis-fuels.

LEARNING OUTCOMES:

- .Recognize and define basic elements and subsystems of an IC Engine with their functions.(L_3)
- Ability to recognize and define operational modes of a piston-piston rod-crank mechanism, some related parameters such as compression ratio, some volumes, TC, BC etc. and carry out basic mathematical analysis.(L_3)

UNIT – 2

Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

LEARNING OUTCOMES:

- Able to know the working principle of various types of engine systems, Fuel injection system, lubrication system and cooling systems of IC engines.(L_2)

UNIT – 3

Combustion in SI & CI Engines:

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines. Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and

combustion induced turbulence Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

LEARNING OUTCOME:

- Able to carry out some elementary analysis on combustion chemistry and associated effect on engine performance through the combustion efficiency.(L_3)
- Able to know about different models of thermodynamic properties and also be able to read these
  Properties from thermodynamic charts for unburned and burned gas.(L_3)

UNIT – 4 Measurements, Testing and Performance:

Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

LEARNING OUTCOME :

- Realize the importance of cycle approximations as engineering approaches, assumptions included and their effect on the performance calculation.(L_2)
- Recognize and define important points of a real cycle process and also to get some knowledge about how a good engine performance is achieved by design and adjustment.(L_3)
- Describe effect of atmospheric and operational conditions and design properties on volumetric efficiency of a 4-stroke engine and on scavenging parameters of a 2-stroke engine.(L_3)

UNIT – 5

Need for alternate fuel: Availability and properties of alternate fuels, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels,

Electric, Hybrid, Fuel Cell And Solar Cars : Concept of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, high energy and power density batteries, fuel cell vehicles, solar powered vehicles – Working operations.

LEARNING OUTCOME :

- Calculation of theoretical compression work and power distinguishing.(L_3)
- principles of rotary compressors: single and multiple vane, Roots, screw and scroll.(L_2)
- Compression cycle and volumetric performance due to real compressor properties, compressor capacity(L_3).

TEXT BOOK :

1. I.C. Engines by V. Ganesan, TMH/4th Edition
2. Thermal Engineering by Rajput, Lakshmi Publications/8th Edition

REFERENCE BOOK :

1. IC Engines by Mathur& Sharma – DhanpathRai& Sons./1st Edition
2. Engineering fundamentals of IC Engines by Pulkrabek, Pearson, PHI/2ndEdition
3. Alternate Fuels – Dr. S. S. Thipse – Jaico Publications./1st Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040316: PRODUCTION TECHNOLOGY

II Year B. Tech. MECH II – Sem

L	T	P	C
3	-	-	3

PRE REQUESTS: Material Science.

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 :

- Understand the idea for selecting materials for patterns. Know Types and allowances of patterns used in casting and analyze the components of moulds. (L1)
- Design core, core print and gating system in metal casting processes.(L4)
- Understand the arc, gas, solid state and resistance welding processes. (L1)
- Develop process-maps for metal forming processes using plasticity principles.(L4)
- Identify the effect of process variables to manufacture defect free products.(L2)
- Communicate effectively with industry personnel by developing a manufacturing-centric vocabulary.(L1)

UNIT – 1

Casting: Steps involved in making a casting and its applications; Design of Patterns - Types, pattern allowances; Types and Properties of moulding sands,Cores. Methods of Melting - Crucible melting and cupola operation. Design of gating systems and riser design. Different Casting processes - Centrifugal casting, die- casting, Investment casting, Solidification of casting – Directional Solidification. Defects in castings.

LEARNING OUTCOME :

- Recognize the different types of casting process. (L2)
- Design of riser and gating system.(L4)

UNIT – 2

Welding: Classification – Types of welds and welded joints; Welding Positions - Gas welding – Types of flames, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding,Thermit welding. Inert Gas Welding _ TIG Welding, MIG welding, Friction Stir

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.

LEARNING OUTCOME :

- Select suitable fabrication process for typical components.(L4)
- Describe the various welding process.(L2)

UNIT – 3

Metal Forming: Hot working, cold working, strain hardening. Recrystallisation, Grain growth Sheet metal Operations, Strip layout, Hot and cold spinning – Bending, forming-stretch forming and deep drawing. Rolling fundamentals, types of Rolling mills and products. Drawing and its types – Types of presses and press tools.

LEARNING OUTCOME :

- Select suitable manufacturing process for typical components.(L4)
- Judge the concept of rolling process, stamping and drawing.(L4)

UNIT – 4

Extrusion of Metals: Basic extrusion process and its characteristics. Forward extrusion and backward extrusion – Impact extrusion –Tube extrusion - Hydrostatic extrusion. Forces in extrusion

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers- forging defects. Forces in forging operations.

LEARNING OUTCOME :

- Identify the different types of extrusion processes.(L4)
- Explain the various types of operations carried out in forging.(L2)

UNIT – 5

Powder Metallurgy: Introduction- Powder production methods, steps in powder metallurgy processes, cold and hot isostatic pressing, typical industrial applications.

Additive Manufacturing: Need for Additive Manufacturing, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Classification of AM process, Distinction between AM and CNC, other related technologies.

LEARNING OUTCOME :

- Understand other than basic AMT method(L2)
- Apply the new method in Various application(L2)
- Conclude the process parameter using in various AMT method(L3)

TEXT BOOK :

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill /3rd Edition.
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson/5th Edition.
3. Production technology / R.K.Jain/Khanna Publishers/18th Edition.

REFERENCE BOOK :

1. Production Technology /P.c.Sharma/S.Chand/3rd Edition.

2. Amitabh Ghosh & Mallick, “Manufacturing Science”, Assoc. East west Press Pvt. Ltd/ 4th Edition.
3. Workshop Technology (vol.1)/Hajra Chowdary/Asia Publishing House/5th Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040375: PRODUCTION TECHNOLOGY LAB

II Year B. Tech. MECH II – Sem

L	T	P	C
0	0	2	1

PRE REQUESTS: Production Technology

COURSE OBJECTIVE :

- Know about the basic Physical, Chemical Properties of materials.
- Know about 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.
- Measure a given manufactured part to evaluate its size, tolerances and surface
- 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.
- Understanding the various metal forming processes like stamping, drawing etc.,
- Basic idea of press working tools
- Performs moulding studies on plastics and their products.

LIST OF EXPERIMENTS :

1. Preparation of green sand by using sand Muller to measure permeability of green sand specimen by using permeability meter and to measure compatibility of green sand specimen.
2. To measure the hardness of green sand specimen by using hardness tester (before heating and after heating) and to measure the sheer strength and compression strength of green sand.
3. Preparation of wooden pattern (stepped pulley) by using wood turning lathe machine.
4. Preparation of mould cavity by using dumbbell & stepped pulley pattern.
5. Melting of aluminum and casting in the prepared mould cavity.
6. Arc Welding –Butt joint & Lap joint.
7. Spot welding –Lap joint & Plasma welding, Plasma cutting.
8. Gas Welding & Brazing.
9. MIG Welding & TIG Welding.
10. Preparation of blanking component by using fly press , extruded part by using hydraulic press , lever by using power press.
11. Preparation of key chain by using Injection moulding machine.
12. Preparation of bottle by using Blow moulding machine.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040376: MATERIAL SCIENCE AND MECHANICS OF SOLIDS LAB

II Year B. Tech. MECH I – Sem

L	T	P	C
-	-	2	1

PRE-REQUISITES: Engineering Physics & Chemistry LAB

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 centered cubic, face centered 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.
4. Study of the Microstructures of Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys.
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS LAB

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.

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040377: THERMAL ENGINEERING LAB

II Year B. Tech. MECH II – Sem

L	T	P	C
-	-	2	1

Pre-requisites: Thermodynamics

COURSE OBJECTIVES:

- To provide the knowledge to the student about working of IC Engines.
- To train the student to conduct performance and heat balance test on IC Engines
- To practice the student to calculate the frictional losses in an IC Engine
- To impart practical exposure on performance of Reciprocating air compressor.
- To make the student to understand the working principle of various types of boilers.

COURSE OUTCOMES :

After completion of the course the student is able to

- Identify the various parts of an IC Engine.
- Sketch the Valve and Port Timing diagrams for IC Engines
- Determine the performance of various types of IC Engines.
- Prepare the heat balance sheet for various types of IC Engines.
- Calculate the frictional power in various types of IC Engines
- Analyze the performance of reciprocating air compressor.

LIST OF EXPERIMENTS :

1. Draw the valve and port timing diagrams for four and two stroke engines.
2. Evaluate the performance of 4 –stroke Diesel engines.
3. Evaluate the performance of 2-stroke Petrol engine.
4. Evaluate the performance of 4 –stroke Petrol engines.
5. Evaluation of frictional power by conducting Morse test on 4-stroke multi cylinder petrol engine.
6. Draw the heat balance sheet for 4-stroke Single cylinder Diesel engine.
7. Draw the heat balance sheet for 4- stroke multi cylinder petrol engine.
8. Calculate the performance of variable compression ratio engines.
9. Performance test on reciprocating air compressor unit.
10. Study of Steam boilers.
11. Disassembly / assembly of engines.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040023: CONSTITUTION OF INDIA

II Year B. Tech. MECH II – Sem

L	T	P	D	C
3	0	0	0	0

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
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2040024 : OOPS through C++Lab

II Year B. Tech. MECH II – Sem

L	T	P	D	C
0	0	2	0	0

Objectives:

- To strengthen problem solving ability by using the characteristics of an object-oriented approach.
- To design applications using object oriented features
- To handle Exceptions in programs.

Week 1: Write C++ programs for demonstrating arithmetic ,logical, relational and bitwise operators .

Week2: a) Write a C++ program to find the sum of individual digits of a positive integer.
b) Write a C++ program to print even and odd numbers up to given number.

Week 3: a) Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
b) Write a C++ program to find both the largest and smallest number in a list of integers.

Week 4: a) Write a C++ program to sort a list of numbers in ascending order.
b) Write a Program to illustrate New and Delete Keywords for dynamic memory allocation

Week 5: Write a C++ a program Illustrating Class Declarations, Definition, and Accessing Class Members.

Week 6: Write a C++ program to demonstrate scope resolution operator

Week 7: Write a C++ Program to illustrate default constructor, parameterized constructor and copy constructors

Week 8: Write a C++ Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.

Week 9: Write a C++ Program to Demonstrate Friend Function and Friend Class.

Week 10: Write a C++ program to demonstrate single and Multilevel Inheritance

Week 11: Write a C++ program to demonstrate Multiple and Hybrid Inheritance

Week 12: Write a C++ program to demonstrate Exception handling

Text Books:

1. C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.
2. Object Oriented Programming with C++ by Balagurusamy

References:

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050317: Design of Machine Members-I

III Year B. Tech. MECH I – Sem.

L	T	P	C
3	0	0	3

PRE-REQUISITES: Study of engineering mechanics and theory of machines.

COURSE OBJECTIVES

The main learning objective of this course is to prepare the students for:

- Designing machine members subjected to static and variable loads.
- Designing shafts and couplings for various applications.
- Analyzing bolted and welded joints for various kinds of loads.
- Designing helical and leaf springs for various applications.
- Analyzing Riveted and cotter joints for various kinds of loads.

COURSE OUTCOMES:

The main learning objective of this course is to prepare the students for:

- Designing machine members subjected to static and variable loads.
- Designing shafts and couplings for various applications.
- Analyzing bolted and welded joints for various kinds of loads.
- Designing helical, leaf springs and flywheels for various applications.
- Designing of Riveted and cotter joints for various kinds of loads.
- Knowledge on using design data book.

Note: (Use of standard Design Data Book is permitted in the University examination)

UNIT – I

FUNDAMENTAL CONCEPTS IN DESIGN: Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers- Direct, Bending and torsional loading - Factor of safety – Combined loads – Principal stresses – Eccentric loading –theories of failure – Design based on strength and stiffness – stress concentration – Fluctuating stresses – Endurance limit- Gerber's curve– Goodman's line– Soderberg's line. –Design for finite and infinite life under variable loading.

LEARNING OUTCOME:

After successful completion of the unit, students will be able to

- Understand importance of design concept. (L2)
- Understand the design process and various theories given by experts. (L2)

UNIT – II

TEMPORARY AND PERMANENT JOINTS- I: Riveted Joints: Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.

Power screws: – types of screw - Design of screw fasteners – screw subjected to initial tightening- screw subjected to external load, tensile load, shear load, combined load - Design of joints under eccentric loading – lockingdevices.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for various joints. (L2)
- Make use of those design procedures in modelling components.(L3)

UNIT – III

TEMPORARY AND PERMANENT JOINTS- II: 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.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for various joints. (L2)
- Make use of those design theories in modelling components in design softwares.(L3)

UNIT – IV

SPRING: Types of springs, design of helical and concentric springs–surge in springs, Design of laminated springs. Design of leaf springs.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for various springs. (L2)
- Make use of those design theories in modelling springs in design softwares.(L3)

UNIT – V

SHAFTS AND COUPLINGSCLASSES: Shafts and Axles - Design of solid and hollow shafts based on strength, rigidity and critical speed – Rigid coupling- Muff, Clamp and Flange couplings and flexible couplings -Bushed Pin.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for shafts and couplings. (L2)
- Make use of those design theories in assembling shafts and couplings in design soft wares.(L3)

TEXT BOOKS:

1. Shigley. J., Mischke. C., Budynas, R., and Nisbett. K., “Mechanical Engineering Design”, /10 th Edition, Tata McGraw-Hill, 2014.
2. Bhandari V, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2014 R2. New Technology – Bhattacharya A, The Institution of Engineers, India 1984/ 15th Reprint,

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REFERENCE BOOKS:

1. Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine component Design”/6th Edition, Wiley, 2017.
2. Md. Jalaludeen , Machine Design, Volume II, Design of Transmission Systems/ 4th edition, Anuradha Publications, 2014.
3. C.S.Sharma, KamleshPurohit, “Design of Machine Elements”, Prentice Hall of India,Pvt. Ltd., 2003./ 4th edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050318: METROLOGY AND MACHINE TOOLS

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Production technology

COURSE OBJECTIVES

- Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.
- Understand working of lathe, shaper, planer, drilling, milling and grinding machines
- To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms
- Acquire the knowledge of Engineering metrology and its practice which is having increasing importance in industry

COURSE OUTCOMES:

- After completion of the course the student is able to
- Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting (L1)
- Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine (L3)
- Comprehend speed and feed mechanisms of machine tools (L3)
- Select a machining operation and corresponding machine tool for a specific application in real time. (L5)
- Identify techniques to minimize the errors in measurement(L3)
- Student will have the knowledge of various methods and devices for measurement of length, angle, gear& thread parameters, surface roughness and geometric features of parts (L3)

UNIT – I

Metal cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips. Mohrs cricle, Merchant cricle, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

Engine lathe – Principle of working, types of lathe, specifications.Taper turning– Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts

LEARNING OUTCOME:

- Mechanism of chipformation (L2)
- Recognize various lathe machines(L2)

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.

LEARNING OUTCOME:

Select appropriate machines for producing various components (L4)
Differentiate various working mechanisms of machines (L2)

UNIT – III

Milling machines – Principles of working – Types of milling machines – Geometry of milling cutters – methods of indexing. Operations on milling machine.
Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, honing and broaching machines, comparison and Constructional features, - Gear cutting, gear hobbing and gear shaping – gear finishing methods.

LEARNING OUTCOME:

- Apply the method of indexing to divide the parts periphery (L3)
- Select the appropriate finish operations for given components (L3)

UNIT – IV

Limits, fits and tolerances- Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly. Limit Gauges: Taylor's principle, Design of GO and NO GO gauges Measurement of angles, Bevel protractor, Sine bar. Measurement of flat surfaces, straight edges, surface plates, optical flat and auto collimator.

LEARNING OUTCOME:

- Will be able to identify best practice to measure various physical entities . (L3).
- To measure various inclinations of the components.Determine roughness of the given surface (L2).

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. Lasers in metrology - Advantages of lasers – Laser scan micrometers; Laser interferometers – Applications – Straightness, Alignment; Ball bar tests.

LEARNING OUTCOME:

- Determine roughness of the given surface (L3).
- Difference between conventional and unconventional process (L2).

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TEXT BOOKS:

1. Production Technology by R.K. Jain and S.C. Gupta /17th Edition
2. Engineering Metrology by I C Gupta., Danpath Rai/5th Edition

REFERENCE BOOKS:

1. Production Technology by H.M.T. (Hindustan Machine Tools)/1st Edition
2. Metrology and measurements by Anand k bewoor, Tata mc grawhill Publishers/1stEdition
3. Production technology by O.P. khanna, Danpath Rai publications/1st Edition

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MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050319: DYNAMICS OF MACHINERY

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Kinematics of Machinery

COURSE OBJECTIVES

- To impart the knowledge of basic concepts on gyroscopic couple and its effect on aero plane, ship, two and four wheel drive.
- To illustrate the mathematical models used in static and dynamics of machinery.
- To Impart the knowledge of Various Governors, Brakes and operation of Dynamometers.
- To facilitate the students to know the concepts of balancing of rotating masses and reciprocating masses.
- To introduce mathematical models and solution methods to study Vibration of the mechanical systems.

COURSE OUTCOMES:

- After completion of the course the student is able to
- Analyze complete motion analysis of machines in running condition and able to know friction and its effect on mechanical efficiency.(L2)
- Outline various mechanisms of machines which were used in real life and explain how to get equilibrium condition of machine members while the machine is in running condition.(L2)
- Apply the knowledge regarding use of turning moment diagram and energy fluctuations with in systems.(L3)
- Explain how to balance forces and moments produced by rotating or reciprocating masses of machine members.(L2)
- Analyze the vibrations, which is the major disturbance in machines while in the running condition and also precautions to reduce vibration. (L4)
- Illustrate various Governors, Brakes and operation of Dynamometers. (L2)

UNIT – I

Gyroscopes:Introduction,Precision,angular motion, Gyroscopic couple,effect of gyroscopic couple on an aeroplane, effect of gyroscopic couple on a naval ship during steering, gyroscopic couple on a naval ship during pitching, Gyroscopic couple on a naval ship during rolling, stability of a four wheel drive moving in a curved path, stability of a two wheel vehicle taking a turn.

LEARNING OUTCOME:

- Discuss basic concepts on gyroscopic couple and its effect on aero plane, ship, two and four wheel drive.(L1).
- Applying concepts in calculating precision and determining the effect of gyroscope.(L3).

UNIT – II

Static Force Analysis: Introduction, Static Equilibrium, Equilibrium of Two force and three force members, Member with Two force

Dynamic Force Analysis: Introduction, D'Alemberts principle, Dynamic analysis of Four bar and Single slider mechanisms, Piston effort, Turning moment on crankshaft, Inertia of connecting rod, Inertia forces in reciprocating Engines.

LEARNING OUTCOME:

- Apply D'Alemberts principle for dynamic analysis in calculating forces on engine. (L3)
- Apply two force and three force equilibrium in calculating forces in static condition. (L3)

UNIT – III

Governors: Introduction, types of governors, Watt governor, Porter governor, Proell governor, Hartnell governor, Sensitiveness of governor, Hunting, Isochronism, Stability, effort of governor, Power of governor

Brakes and Dynamometers: Types of brakes: Simple block brake,band and block brake,internal expanding shoe brake-effect of braking of a vehicle. Dynamometers-absorption and transmission types. General description and methods of operation.

LEARNING OUTCOME:

- Calculate the effectiveness of various governors and understand its applications(L3)
- Understand the concept of dynamometers and its working (L2)

UNIT – IV

Balancing of Rotating Masses: Introduction-Balancing of single rotating mass in same and different plane,balancing of several masses rotating in same and different plane.

Balancing of Reciprocating Masses:Primary,Secondary,and higher balancing of reciprocating masses, graphical methods.Unbalanced forces and couples,examination of"V"multi cylinder inline and radial engines for primary and Secondary balancing, locomotive balancing Hammer blow, Swaying couple, variation of tractive efforts.

LEARNING OUTCOME:

- Calculating balancing of rotary and reciprocating masses. (L3).
- Understand the concept of balancing various engines. (L2).

UNIT – V

Vibrations: Free Vibration of mass attached to vertical spring–Transverse loads–vibrations of beams with concentrated and distributed loads.Dunkerly's method. Whirling of shafts–critical speed–torsional vibrations–one,two and three rotor systems.

LEARNING OUTCOME:

- To analyze torsional vibrations occur during running condition (L3).

- To understand various disturbances in machines during vibrations and precautions to reduce it.(L2).

TEXTBOOKS:

1. Theory of Machines/S.SRatan/Mc.GrawHillPubl./ 5th Edition.
2. Theory of machines/Khurmi/S.Chand./ 14th Edition.

REFERENCE BOOKS:

1. Theory of Machines by Thomas Bevan/CBS/ 3rd Edition.
2. Theory of Machines/R.K Bansal/ 4th Edition.
3. Theory of Machines Sadhu Singh Pearson's/ 3rd Edition.
4. Mechanism and Machine Theory/JSRao and RVDukkipati/NewAge/2nd Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050320: THERMAL ENGINEERING-II

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUESTS: Thermodynamics

COURSE OBJECTIVES:

- To develop basic knowledge of students on Rankine cycles.
- To provide sufficient knowledge on Boilers and chimneys to the students.
- To enable student knowledge on steam nozzles and steam turbines.
- To improve the knowledge of students on steam formation process.
- To provide sufficient knowledge to the students on gas turbine plant.

COURSE OUTCOMES:

- After completion of the course the student is able to
- Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants(L1)
- Apply the laws of Thermodynamics to analyze thermodynamic cycles(L4)
- Student will be able to design the blades and impeller for impulse and reacrtion turbine.
- Differentiate between vapour power cycles and gas power cycles (L3)
- Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants(L3)
- Understand the functionality of major components of jets and rocket to do the analysis of these components(L1)

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.

Boilers: Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance – Draught- Classification – Height of chimney for given draught and discharge- Condition for maximum discharge- Efficiency of chimney.

LEARNING OUTCOME:

- Describe basic components of Rankine cycle (L2)
- Restate boilers and its components(L2)

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

LEARNING OUTCOME:

- Understand the concept of nozzle and diffuser (L1).
- Summarizes the properties of steam and apply it to nozzle flow analysis (L3).

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 Turbines: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency. .

LEARNING OUTCOME:

- Principle, Classification and compounding of steam turbine (L3)
- Analyze the concepts of velocity diagram and design of impulse steam turbine by both analytical and graphical approach. (L4).

UNIT – IV

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts

LEARNING OUTCOME:

- Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components (L1).
- Concept of reheat factor in turbine expansion and to understand the various governing system in steam turbine (L3).

UNIT – V

Jet Propulsion: Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

LEARNING OUTCOME:

- Understand the working of various jets and rockets engines.. (L1).

- Understand the functionality of major components of Jets and rockets and to do the analysis of these components (L2)

TEXT BOOKS:

1. Thermal Engineering / Mahesh M Rathore/ Mc Graw Hill/5th Edition
2. Thermal Engineering/ Rajput/ Lakshmi Publications/ 10th Edition

REFERENCE BOOKS:

1. Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers/ Pearson/6th Edition
2. Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI /2nd Edition
3. Gas Turbines – V. Ganesan /Mc Graw Hill/3rd Edition

Note: Steam tables Data Book R.S.Khurmi is used to analyze the various process parameters in rankine cycle.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050321: FLUID MECHANICS AND HYDRAULICS MACHINERY

III Year B. Tech. MECH I – Sem

L	T	P	C
3	1	0	4

PRE-REQUISITES: Engineering Mathematics I

COURSE OBJECTIVES:

- To impart the knowledge of fluid and its properties, manometer, hydrostatic forces.
- To illustrate the concept of basic laws of fluids, flow patterns, viscous flow through ducts.
- To illustrate the concept related to boundary layer theory, flow separation, velocity profiles, dimensionless numbers and dimensional analysis.
- To facilitate the students to know the concepts of hydrodynamic forces acting on vanes and their performance.
- To help the students learn the importance, function and performance of hydro machinery.

COURSE OUTCOMES:

- After completion of the course the student is able to
- Explain the effect of fluid properties on a flow system (L1)
- Identify type of fluid flow patterns and describe continuity equation (L2)
- Analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design (L3)
- Select and analyze an appropriate turbine with reference to given situation in power plants (L3)
- Estimate performance parameters of a given Centrifugal and Reciprocating pump (L3)
- Demonstrate boundary layer concepts (L3)

Tables/Codes: Steam Tables

UNIT – I

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

LEARNING OUTCOME:

- Restate definition of fluids, physical properties, different pressures and laws (L2)
- Calculate viscosity, surface tension, absolute and vacuum pressures (L3)

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. Measurement of flow: pitot tube, venturimeter, and orifice meter, Flow nozzle.

LEARNING OUTCOME:

- Apply one and three dimensional flow equations for studying laminar and turbulent flows (L3)
- Apply the Euler's and Bernouli's equations for flow along stream line for pipe bends (L3)

UNIT – III

Closed conduit flow: Reynold's experiment - Darcy Weisbach equation - Minor losses in pipes - pipes in series and pipes in parallel - total energy line - hydraulic gradient line.

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.

LEARNING OUTCOME:

- Calculate the flow along pipes by Reynold's, Darcy Weisbach equations for series and parallel (L3)
- Apply the concept of boundary layer for laminar and turbulent flows(L3)

UNIT – IV

Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

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.

LEARNING OUTCOME:

- Generate velocity diagrams for stationary, moving, inclined and curved vanes (L3).
- Determine efficiencies in changes of heads for different turbines (L3)

UNIT – V

Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

Centrifugal pumps: Classification, working, work done – barometric head losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, discharge, slip, indicator diagrams.

LEARNING OUTCOME:

- To calculate performance of hydraulic turbines and pumps (L3).
- To determine speed losses and efficiencies of centrifugal and reciprocating pumps (L3).

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH/22nd Edition-2014
2. Fluid mechanics and hydraulic machines by Rajput/ S Chand & Co Ltd publications/4th Edition-2015

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines by Domkundwar & Domkundwar/publication Dhanpatrai & Co./3rd Edition-2017
2. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons/9th Edition-2015
3. Fluid mechanics and machinery by D. Rama Durgaiah, New age international//1st Edition-2016
4. Hydraulic machines by Banga and Sharma, Khanna publishers/8th Edition-1995

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050341: UNCONVENTIONAL MACHINING PROCESS
(Professional Elective I)

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Engineering Physics, Mathematics, Engineering chemistry, Mechanics of solids& Metallurgy and material science

COURSE OBJECTIVES:

- Understand the need and importance of non-traditional machining methods and process selection.
- Gain the knowledge to remove material by thermal evaporation, mechanical energy process.
- 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.
- Summarize the principle and processes of abrasive jet machining.
- Understand the principles, processes and applications of thermal metal removal processes.
- Identify the principles, processes and applications of EBM.
- Understand the principles, processes and applications of Plasma Machining.
- Knowledge of electric equipment required for effective running of EDM with the complexity of power losses and economy.

Tables/Codes: Steam Tables and Mollier Chart

UNIT – I

Introduction – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications. Ultrasonic machining – Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development. Abrasive Jet Machining, Water Jet Machining and Abrasive Water Jet Machining: Basic principles, equipment, process variable, and mechanics of metal removal, MRR, application and limitations.

LEARNING OUTCOME:

- To understand the abrasive jet machining water and water jet machining process (L2)
- Classify the modern machining process (L2)

UNIT – II

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring processes, metal removal

rate in ECM, Tool design, Surface, Finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate. Chemical machining.

LEARNING OUTCOME:

- Examine electro chemical process (L4)
- To solve the problems in metal removal rate for ECM process (L2)

UNIT – III

Thermal Metal Removal Processes: Principles, equipments, effect of process parameters, applications, advantages and limitations of Electric discharge machining, Wire electric discharge machining, Laser beam machining, Plasma arc machining, Electron beam machining, Ion beam machining.

LEARNING OUTCOME:

- To gain knowledge on thermal metal removal process like electric discharge machining, wire electric discharge machining and laser beam machining (L3)
- Describe the process of EBM and Ion beam machining. (L1)

UNIT – IV

Principles, equipments, effect of process parameters, applications, advantages and limitations of Abrasive flow machining – Chemo mechanical polishing, Magnetic abrasive finishing, Magnetorheological is finishing, Magneto rheological abrasive flow finishing.

LEARNING OUTCOME:

- Compare the process of abrasive flow machining and magnetic abrasive finishing (L4).
- Ability to analyze Magnetorheological finishing and Magnetorheological abrasive flow finishing. (L4).

UNIT – V

Introduction - Various hybrid non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Selection and comparison of different non-traditional machining processes.

LEARNING OUTCOME:

- Study the various hybrid non-traditional machining processes its advantages and limitations (L2)
- Compare different non-traditional machining process. (L4)

TEXT BOOKS:

1. Advanced Machining Processes / VK Jain / Allied publishers / 1st Edition
2. Modern Machining Processes - P. C. Pandey, H. S. Shan/ Mc Graw Hill / 1st Edition

REFERENCE BOOKS:

1. Fundamentals of machining process/ Hassan Abdel-Gawad El-Hofy / 2nd EditionAdvanced Methods of Machining/ J.A. McGeough/ Springer International /1st Edition
2. Non-Traditional Manufacturing Processes/ Benedict G.F./ CRC Press/1st Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050342: TOTAL QUALITY MANAGEMENT
(Professional Elective I)

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To explain the concept of Total Quality Management (TQM).
- To analyse the customer focus and satisfaction.
- To outline the organizing for Total Quality Management related to system approach, quality implementation.
- To understand the cost of quality, accounting system and quality management.
- To gain knowledge on the universal standards of quality.
- To outline the management of process quality.

COURSE OUTCOMES: After completion of the course the student is able to

- Understanding of product Inspection vs Process control. (L2)
- Knowledge on role of marketing and sales. (L1)
- Capability to understanding the evolution of bench marking. (L3)
- Knowledge to make the transition from a traditional to a TQM organization. (L2)
- Knowledge of quality pertaining to documentation, services and the cost of certification. (L3)
- Students are expected to have a good command over Total Quality Management.(L2)

UNIT – I

Introduction: The concept of TQM, Quality and Business Performance, Attitude and Involvement of Top Management, Communication, Culture and Management Systems. Management of Process Quality: Definition of Quality, Quality Control, a Brief History, Product Inspection Vs Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

LEARNING OUTCOME:

- Evaluate the quality management and the whole process of quality control. (L4)
- Understand the history of total quality management to have an excellent business performance. (L2)

UNIT – II

Customer Focus and Satisfaction: Process Vs Customer, Internal Customer Conflict, Quality Focus, Customer Satisfaction, Role of Marketing and Sales, Buyer – Supplier Relationships. Bench Marking: Evolution of Bench Marking, Meaning of Bench Marking, Benefits of Bench Marketing, the Bench Marking Procedure, Pitfalls of Bench Marketing.

LEARNING OUTCOME:

- Identify the buyer – supplier relationships. (L1)
- Importance of bench marketing. (L2)

UNIT - III

Organizing for TQM: The Systems Approach, Organizing for Quality Implementation, Making the Transition from a Traditional to a TQM Organization, Quality Circles, Seven Tools of TQM: Stratification, Check Sheet.

- **LEARNING OUTCOME:**
- Develop the system approach. (L4)
- Categorize the quality circles and seven tools of TQM. (L5)

UNIT – IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.

LEARNING OUTCOME:

- Analyze the quality costs and measuring quality costs. (L4)
- Knowledge of the cost of quality. (L1)

UNIT – V

ISO9000: Universal Standards of Quality: ISO Around the World, The ISO9000 ANSI/ASQC Q-90, Series Standards, Benefits of ISO9000 Certification the Third Party Audit, Documentation ISO9000 and Services, the Cost of Certification Implementing the System.

LEARNING OUTCOME:

- Comparsion of universal standards of quality in terms of ISO around the world. (L2)
- Importance of ISO 9000 certification. (L2)

TEXT BOOKS:

1. Total Quality Management/Joel E.Ross/Taylor AND Franscis Limited 3rd Edition
2. Total Quality Management/P.N.Mukharjee/PHI 3rd Edition

REFERENCE BOOKS:

1. Beyond TQM/Robert L.Flood, 1st Edition
2. Statistical Quality Control / E.L. Grant, 12th Edition
3. Total Quality Management: A Practical Approach/H.Lal, 1st Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050343: OPERATIONAL RESEARCH
(Professional Elective I)

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: None

COURSE OBJECTIVES:

- This course will advance the students development of the following broad capabilities:
- To impart knowledge in concepts and tools of Operations Research
- To understand mathematical models used in Operations Research
- To apply these techniques constructively to make effective business decisions
- To apply various optimization techniques for decision making.
- To Understand the mathematical importance of development of model in a particular optimization model for the issue and solving it.

COURSE OUTCOMES: At the end of the course, the student will be able to

- Understanding the problem, identifying variables & constants, Formulation of optimization model and applying appropriate optimization technique (L2, L3)
- Solve Linear Programming Problems (L3)
- Solve Transportation and Assignment Problems (L3)
- Understand the usage of game theory and its applications. (L3)
- Understand the concept of sequencing and replacement policies(L3)
- Understand the dynamic programming applications to solve LPP. (L3)

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications

ALLOCATION: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Big-M method, Two–phase method.

LEARNING OUTCOME:

- Understanding the basic concepts of operations research. (L2)
- Formulation of LPP and solving its methods. (L3)

UNIT – II

TRANSPORTATION PROBLEM: Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem: Formulation – Optimal solution - Variants of Assignment Problem; Travelling Salesman problem.

LEARNING OUTCOME:

- Formulation of Transportation problem and finding the degeneracy (L3)

- Solving the variations of Assignment problems (L3)

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.

LEARNING OUTCOME:

- Solving the different types of sequencing problems (L3)
- Understanding the replacement policies and items replacement. (L2, L3)

UNIT – IV

THEORY OF GAMES: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

INVENTORY: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

LEARNING OUTCOME:

- Applying game theory to different applications (L3)
- Understanding the importance of inventory and finding the different cost (L2,L3)

UNIT – V

WAITING LINES: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

DYNAMIC PROGRAMMING: Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

LEARNING OUTCOME:

- Applying the waiting lines methods to different applications. (L3)
- Applying the bellman's principles to different applications. (L3)

TEXT BOOKS:

1. Operation Research by J.K.Sharma/4th Edition/ MacMilan.
2. Operations Researchby ACS Kumar/1st Edition/ Yesdee

REFERENCE BOOKS:

1. Introduction to OR/Taha/10th Edition/PHI
2. Operations Research/NVS Raju/3rd Revised Edition /SMS Education
3. Operations Research/M.V. Durga Prasad, K.Vijaya Kumar Reddy, J. Suresh Kumar/1st Edition /Cengage

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050344: NON-DESTRUCTIVE EVALUATION
(Professional Elective I)

III Year B. Tech. MECH I – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: None

COURSE OBJECTIVES:

- To make the students to understand the importance of NDT in quality assurance
- To imbibe the students the basic principles of various NDT techniques, its applications,
- limitations, codes and standards.
- To equip the students with proper competencies to locate a flaw in various materials,
- products.
- To make the students to be ready to use NDT techniques for in-situ applications too.
- To inculcate the knowledge of selection of the right NDT technique for a given
- application

COURSE OUTCOMES:

The students will be able

- To compare the differences between the various visual inspection techniques and apply the same to the components to be inspected.
- To recognise the importance of Penetrant testing in NDT with the understanding of the procedures involved in the Penetration methods
- To interpret the images and the results obtained from the Thermographic technique and the Eddy current testing
- To evaluate and interpret the results obtained in the Ultrasonic inspection and Acoustic Emission technique
- To explain the techniques involved in the Radiographic testing and the various advancements in Radiography.

UNIT – I

INTRODUCTION & VISUAL INSPECTION METHODS: NDT versus Mechanical testing, Need for NDT, Relative merits and limitations, various physical characteristics of materials and their applications in NDT. Visual Inspection -Unaided, Aided- Borescopes -Videoscopes, Special features in Borescopes, Selection of borescopes, Optical sensors, Microscopes & replication Microscopy Technique and applications.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Understand the importance of NDT inspection methods. (L2)
- Develop the testing procedures of visual inspection.(L3)

UNIT – II

LIQUID PENETRANT TESTING& MAGNETIC PARTICLE TESTING: LPT - Principle, types, Procedures, Penetrants and their characteristics, Emulsifiers, Solvent Cleaners / Removers, Developers- properties and their forms, Equipments, Advantages and limitations, Inspection and Interpretation, Applications and case study. MPT-Principle, Theory of Magnetism, Magnetising current, Magnetisation methods, Magnetic particles, Procedure, Interpretation, Relevant and Non-relevant indications, Residual magnetism, Demagnetisation – need, methods, Advantages and Limitations, Applications, Magnetic Rubber Inspection, Magnetic Printing, Magnetic Painting.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Understand the importance of NDT inspection methods. (L2)
- Develop the testing procedures of NDT inspection method. (L3)

UNIT – III

THERMOGRAPHY & EDDY CURRENT TESTING: Thermography – Introduction, Principle, Contact & Non-Contact inspection methods, Active & Passive methods, Liquid Crystal – Concept, example, advantages & limitations. Eddy current Testing – Principle, properties of eddy currents, Eddy current sensing elements, probes, Instrumentation, Types of arrangement, Advantages & Limitations, Interpretation of Results& applications.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Understand the importance of NDT inspection methods. (L2)
- Develop the testing procedures of NDT inspection method. (L3)

UNIT – IV

ULTRASONIC TESTING & ACOUSTIC EMISSION TESTING: Ultrasonic Testing-Principle, Basic Equipment, Transducers, couplants, Ultrasonic wave, Variables in UT, Transmission and Pulse-echo method, Straight beam and angle beam, A-Scan, B-Scan & C-Scan, Phased Array Ultrasound& Time of Flight Diffraction, Advantages & Limitations, Interpretation of Results& Applications.

Acoustic Emission Technique – Introduction, Types of AE signal, AE wave propagation, Source location, Kaiser effect, AE transducers, Principle, AE parameters, AE instrumentation, Advantages & Limitations, Interpretation of Results, Applications.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Understand the importance of Ultrasonic inspection method. (L2)
- Develop the testing procedures of Ultrasonic inspection method. (L3)

UNIT – V

RADIOGRAPHY: Introduction, Principle, X-ray Production, Gamma ray sources, tubing materials, X-ray tubing characteristics, Interaction of X-ray with matter, Imaging, Film

techniques, Filmless techniques, Types and uses of filters and screens, Real time radiography, geometric factors, inverse square law, characteristics of film, graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Digital Radiography – Film Digitisation, Direct Radiography &Computed Radiography, Computed Tomography, Gamma ray Radiography, Safety in X- ray and Gamma Ray radiography.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Understand the importance of radiography inspection method. (L2)
- Develop the testing procedure of radiography inspection method. (L3)

TEXT BOOKS:

1. Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley/2nd edition New Jersey, 2005
2. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.

REFERENCE BOOKS:

1. Ravi Prakash, “Non-Destructive Testing Techniques”, New Age International Publishers/1st revised edition,2010.
2. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA, 200/Volume-17.
3. ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbook,Vol. 1, Leak Testing, Vol. 2, Liquid Penetrant Testing, Vol. 3, Infrared and Thermal Testing Vol. 4, Radiographic Testing, Vol. 5, Electromagnetic Testing, Vol. 6, Acoustic Emission Testing, Vol. 7, Ultrasonic Testing

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050378: KINEMATICS AND DYNAMICS OF MACHINERY LAB

III Year B. Tech. MECH I – Sem

L	T	P	C
0	0	2	1

PRE-REQUISITES: Kinematics of Machinery

COURSE OBJECTIVES:

- To impart the knowledge of basic concepts on kinematics and dynamics of mechanical elements.
- To illustrate the effect of gyroscope for different motions.
- To Impart the knowledge of various Governors.
- To facilitate the students to know the concepts of balancing of rotating masses and reciprocating masses.
- To iintroduce mathematical models and solution methods to study torsional vibration .

COURSE OUTCOMES:

- After completion of the course the student is able to
- Understand types of motion. (L2)
- Analyze forces and torque of components in linkages.(L3)
- Understand forward and inverse kinematics of open loop mechanisms.(L2)
- Illustrate how to balance forces and moments produced by rotating or reciprocating masses of machine members.(L2)
- Understand concept of whirling of shafts to determine critical speed for n conditions (L2).
- Illustrate various Governors, cam and followers. (L2)

LIST OF EXPERIMENTS (A minimum of 10 experiments to be conducted)

- To determine the state of balance of machines for primary and secondary forces
- To determine the frequency of torsional vibration of a given rod
- Determine the effect of varying mass on the centre of sleeve in porter and proell governor
- Find the motion of the follower if the given profile of the cam
- The balance masses statically and dynamically for single rotating mass systems
- Determine the critical speed of a given shaft for different n-conditions
- For a simple pendulum determine time period and its natural frequency
- For a compound pendulum determine time period and its natural frequency
- Determine the effect of gyroscope for different motions
- Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.
- Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
- Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050379: METROLOGY AND MACHINE TOOLS LAB

III Year B. Tech. MECH I – Sem

L	T	P	C
0	0	2	1

PRE-REQUISITES: Production Technology

COURSE OBJECTIVES

- To import practical exposure to the metrology equipment & Machine tools
- To conduct experiments and understand the working of the same.
- To learn the measurement of bores by internal micrometers and dial bore indicators.
- To learn the measurement of the Angle and taper s by Bevel protractor, Sine bars, etc.
- To learn the Step turning and taper turning and thread cutting Drilling and Tapping on lathe machine
- To the operations of Shaping and milling

COURSE OUTCOMES: After completion of the course the student is able to

- Student will be able to use different measuring instruments towards quality control. (L2)
- Measure the angle and taper using Bevel protractor and Sine bar. (L4)
- Measure screw thread parameters. (L4)
- Perform step turning, taper turning, thread cutting, drilling and tapping operations on lathe. (L3)
- Perform operations on shaper and milling machine. (L3)
- Perform various operation on slotting, shaper and planning machines.(L3)

LIST OF EXPERIMENTS: (A minimum of 10 experiments to be conducted)

1. Step turning and taper turning on lathe machine
2. Thread cutting and knurling on lathe machine
3. Machining of groves using slotter and shaper machines
4. Machining of holes using Drilling and boring machines.
5. Gear cutting on the Milling machine
6. Grinding of Tool angles using Cylindrical / Surface Grinding
7. Measurement of lengths, heights, diameters by vernier calipers, micrometers.
8. Measurement of bores by internal micrometers and dial bore indicators.
9. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear
10. Angle and taper measurements by bevel protractor and sine bars.
11. Thread measurement by 2-wire and 3-wire methods.
12. Surface roughness measurement by Tally Surf.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050380: FLUID MECHANICS AND HYDRAULICS MACHINERY LAB

III Year B. Tech. MECH I – Sem

L	T	P	C
-	-	2	1

PRE-REQUISITES: Engineering Mathematics I

COURSE OBJECTIVES

- To learn about different measuring devices, working Principles and their performances
- To calculate Cd, cc, cv and Coefficient of impact of various hydraulic systems
- To learn about different characteristics of Turbines.
- Student's exposure to study various operating characteristics of Centrifugal pump and Reciprocating pump.
- Student's exposure to study various operating characteristics of Kaplan, Francis and Pelton Wheel turbines.

COURSE OUTCOMES: After completion of the course the student is able to

- Develop procedure for standardization of experiments. (L1)
- Calibrate flow discharge measuring device used in pipes channels and tanks.(L3)
- Determine fluid and flow properties. (L2)
- Compute drag coefficients. (L2)
- Test the performance of pumps and turbines.(L3)
- Estimate performance parameters of a given centrifugal and reciprocating pump (L3)

LIST OF EXPERIMENTS: (*Any ten of the above experiments are to be covered*_)

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.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050027: DATA SCIENCE

III Year B. Tech. MECH I – Sem

L	T	P	C
0	3	0	0

COURSE OBJECTIVES:

- The fundamental of basic data science
- Basic concepts in the specification and analysis of R
- Principles for good program design, especially the uses of Machine Learning
- Qualities of a social network qualities and data visualization

LEARNING OUTCOMES:

- At the end of the course, students should be able to:
- Describe what Data Science is and the skill sets needed to be a data scientist.
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
- Use R to carry out basic statistical modeling and analysis.
- Explainthesignificanceofexploratorydataanalysis(EDA)indatascience.
- Describe the Data Science Process and how its components interact.
- Create effective visualization of given data (to communicate or persuade).

UNIT- I

Introduction: What is Data Science ,Big Data and Data Science hype–and getting past the hype, Why now? –Datafication, Current landscape of perspectives, Statistical Inference: Populations and samples: Statistical modeling, probability distributions, fitting a model, Intro to R.

UNIT-II

Exploratory Data Analysis and the Data Science Process, Three Basic Machine Learning: Algorithms: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm), Linear Regression, k-Nearest Neighbors(k-NN) k-means, Motivating application: Filtering Spam, Naive Bayes, Data Wrangling.

UNIT-III

Logistics Regression, Timestamp and financial Modelling:

Thought Experiments, Classifiers , M6D Logistic Regression Case Study, Kyle Teague and Get Glue, Timestamps, Cathy O'Neil, Thought Experiment, Financial Modeling, The Kaggle Model: Feature Generation and Feature Selection, Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests

UNIT-IV

Mining Social-Network Graphs and Data Visualization:

Social networks as graphs, clustering of graphs, direct discovery of communities in graphs, partitioning of graphs, Neighborhood properties in graphs: Data Visualization, Basic principles, ideas and tools for data visualization

UNIT-V

Data Engineering, Data Science and Ethical Issues:

Map Reduce, Pregel and Hadoop, Ethical Issues: Discussions on privacy, security, ethics.

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.2014.

REFERENCES BOOKS:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (freeonline)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020.2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009.(free online)
5. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of DataScience.
6. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)
7. MohammedJ.ZakiandWagnerMieraJr.DataMiningandAnalysis:FundamentalConcepts and Algorithms. Cambridge University Press.2014.
8. JiaweiHan, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790.2011.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060010: Business Economics & Financial Analysis

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

PRE REQUESTS: Not required

COURSE OBJECT:

- To learn the basic Business types, impact of the Economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

COURSE OUTCOMES:

After Completion of Syllabus 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 analyzing the Financial Statements of a Company.

UNIT – I

Introduction to Business and Economics: Business: Structure of Business Firm, Types of Business Entities, Limited Liability Companies, Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

LEARNING OUTCOME:

- By going through this unit, technical students can have the scope of learning about different economic concepts, business cycles and nature of business economists.

UNIT – II

Demand Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

LEARNING OUTCOME:

- By going through this content, student can learn about different types of demand, its determinants and elasticity of demand concepts thoroughly and how to forecast the demand of different things by using different agreed upon techniques.

UNIT –III

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

LEARNING OUTCOME:

- By reading this chapter, student can learn different pricing techniques in different market structures and different cost functions that determine products life cycle in a long term basis.

UNIT – IV

Capital Budgeting: Importance of Capital Budgeting, methods of Capital Budgeting: Traditional Methods: Pay Back Period, Accounting Rate of Return, and Discounting Methods: Net Present Value, Profitability Index, Internal Rate of Return; Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

LEARNING OUTCOME:

- By going thoroughly through this unit, students can have the scope of learning about different techniques by which a project can be evaluated from financials perspective and utilization of ratios at different times to assess the business position for decision making.

UNIT – V

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

LEARNING OUTCOME:

Students can learn the methodology of accounting cycle which is valid from stakeholders' point of view and they can learn the comparison of the different firms at a time, so that they can take appropriate decision of either investment or to become an entrepreneur.

TEXT BOOK:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. I.M. Pandey, Financial Management, 11th Edition, Kindle Edition, 2015.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013

WEB REFERENCES:

1. www. accounting for management
2. www. skoda minotti blog.in
3. www. the economist.in

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060322: HEAT TRANSFER

III Year B. Tech. MECH II – Sem

L	T	P	C
3	1	-	4

PRE-REQUESTS: Mathematics & Thermodynamics

COURSE OBJECTIVES:

- To make the student understand the heat transfer through conduction.
- To make the student calculate the heat transfer rate in convection.
- To make the student determine the overall heat transfer coefficient in heat exchangers.
- To enable the student to understand the phenomena of two stage heat transfer.
- To make the student to evaluate the heat transfer by radiation.

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

- Estimate the heat transfer rate through conduction in various bodies.(L5)
- Determine the convective heat transfer coefficient in various bodies.(L4)
- Analyze the heat transfer rate through free convection invarious bodies.(L4)
- Calculate the heat transfer coefficient during boiling and condensation and also the performance of heat exchanger.(L4)
- Evaluate the shape factor and heat transfer rate throughradiation.(L5)
- Design of heat exchangers using LMTD and NTE methods.(L5)

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

LEARNING OUTCOME:

- Understand the basic laws of heat transfer. (L2)
- Analyze problems involving steady state heat conduction in simple geometries.(L4)

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

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi infinite body.

LEARNING OUTCOME:

- Understand the fundamentals of convective heat transfer process.(L2)
- Evaluate heat transfer coefficients for forced convection inside ducts and exterior surfaces.(L5)

UNIT – III

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers .

Forced convection: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

LEARNING OUTCOME:

- Obtain numerical solutions for thermal boundary layer.(L5)
- Evaluate heat transfer coefficients for natural convection.(L5)

UNIT – IV

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

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

LEARNING OUTCOME:

- Evaluation of heat transfer through pipes and plates.(L5)
- Analyze heat exchanger performance by using the method of heat exchanger effectiveness. (L4)

UNIT – V

RADIATION HEAT TRANSFER: Heat Transfer with Phase Change: Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling

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.

Radiation Heat Transfer : Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks

LEARNING OUTCOME:

- Calculate radiation heat transfer between black body surfaces.(L3)
- Calculate radiation heat exchange between gray body surfaces.(L3)

TEXT BOOKS:

1. Fundamentals of Engg. Heat and Mass Transfer, R.C.Sachdeva, NewAge International Publications/5thedition.
2. Heat Transfer, P.K.Nag, TMH Publications/3rdedition.

REFERENCE BOOKS:

1. Heat Transfer, J. P. Holman, TMH Publications/ Special Indianedition.
2. Principles of Heat Transfer, Frank Kreith, R. M. Manglik& M. S. Bohn, Cengage learning publisher/ Specialedition.
3. Heat and Mass Transfer, D.S.Kumar, S.K.Kataria& Sons Publications/3rd edition.
4. Note: Heat and Mass transfer Data Book by C P Kothandaraman and Subrahmanyan is used to design and analyze various thermal processes and thermal equipment

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060323: DESIGN OF MACHINE MEMBERS-II

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Study of engineering mechanics, design of machine members-I and theory of machines.

COURSE OBJECTIVES:

- The main learning objective of this course is to prepare the students for:
- Designing flexible elements like belt, ropes and chain drives for engineering applications.
- Designing spur and helical gear drives for power transmission.
- Designing bevel and worm drives for power transmission.
- Designing multi speed gear box for machine tool and automotive applications.
- Designing bearings for engineering applications.

COURSE OUTCOMES:

- Upon completion of this course, the students will be able to:
- Design flexible elements like belt, ropes and chain drives for engineering applications.
- Design spurs and helical gear drives for power transmission.
- Design bevel and worm drives for power transmission.
- Design multi speed gear box for machine tool and automotive applications.
- Design bearings for engineering applications.
- Knowledge on using design data book.

Note: (Use of standard Design Data Book is permitted in the University examination)

UNIT – I

Transmission of power by Belt and Rope Drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives. Design of Transmission Chains and Sprocket.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for belt and rope drives. (L2)
- Make use of those design theories in manufacturing components. (L3)

UNIT – II

Gear materials - Design of straight tooth spur & helical gears based on speed ratios, number of teeth, Fatigue strength, Factor of safety, strength and wear considerations. Force analysis –Tooth stresses - Helical gears – Module - normal and transverse, Equivalent number of teeth – forces.

Straight bevel gear: Gear materials - Tooth terminology, tooth forces and stresses, equivalent number of teeth, estimation of dimensions of straight bevel gears. Worm Gear: Gear materials - Tooth terminology, Thermal capacity, forces and stresses, efficiency, estimation of dimensions of worm gear pair.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for various gears. (L2)
- Make use of those design theories in design soft wares.(L3)

UNIT – III

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

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for bevel and worm gears. (L2
- Make use of those design theories in design soft wares.(L3)

UNIT – IV

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box (6,9,12 speed gear box) for machine tool applications- Constant mesh gear box - Speed reducer unit. – Variable speed gear box.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for assembling gear box. (L2)
- Make use of those design theories in assembling gearbox in design soft wares (L3)

UNIT – V

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi & Boyd graphs - Selection of Rolling Contact bearings.

LEARNING OUTCOME:

After successful completion of the unit, students can

- Illustrate design procedures for various bearings. (L2
- Make use of those design theories in design soft wares.(L3)

TEXT BOOKS:

1. Shigley. J., Mischke. C., Budynas, R., and Nisbett. K., “Mechanical Engineering Design”/ 10 th Edition, Tata McGraw-Hill, 2014.
2. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2003/reprint

REFERENCE BOOKS:

1. Bhandari V, “Design of Machine Elements”, 15th Reprint, Tata McGraw-Hill Book Co, 2014 R2. New Technology – Bhattacharya A, The Institution of Engineers, India 1984.
2. Md. Jalaludeen , Machine Design, Volume II, Design of Transmission Systems/ 4th edition,
3. Anuradha Publications, 2014.
4. C.S.Sharma, KamleshPurohit, “Design of Machine Elements”, Prentice Hall of India,Pvt. Ltd.,
5. 2003./ 4th edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060302: ELEMENTS OF MECHANICAL ENGINEERING
(Open Elective – I)

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Basic machine elements.
- Sources of Energy and Power Generation.
- Various manufacturing processes.
- Power transmission elements, material handling equipment.
- The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation.
- It shall provide the fundamental principles of materials, fuels, Steam, I.C. Engines, and transmission systems that usually exist in any process plant.

COURSE OUTCOMES:

After completion of the course the student is able to

- Understand basics Concepts and usage of various engineering Materials. (L1)
- Apply cam terminologies for design of cam profiles. (L3)
- Explain the fundamental definitions used in thermodynamics. (L2)
- To Gain Knowledge about IC Engines, general principles and requirement for refrigeration, manufacturing. (L1)
- Apply the knowledge of various manufacturing processes; identify various processes like welding, Brazing and soldering. (L4)
- Use the knowledge gained by the study of Metal Removal process, using Lathe Drilling Milling Robotics and Automation. (L5)

Tables/Codes: Steam Tables and Mollier Chart

UNIT – I

Introduction to engineering materials-Metals, ceramics, composites-Heat treatment of metals.

Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints - eccentrically loaded riveted joints.

Machine Elements: Cams: Types of cams and followers

LEARNING OUTCOME:

- Knowledge of physical properties of materials. (L1)
- Apply cam terminologies for design of cam profiles. (L3)

UNIT – II

Power Transmission Elements: Gears terminology of spur, helical and bevel gears, gear trains. Belt drives (types). Chain drives.

Material Handling equipment: Introduction to Belt conveyors, cranes, industrial trucks, bull dozers

Thermodynamics: Statements of zeroth law, 1st, 2nd and 3rd Laws of thermodynamics with their applications.

LEARNING OUTCOME:

- Apply first law of thermodynamics for closed systems and construct conservation of mass and energy equations (L3)
- Understand the standard geometry, application, failures of Spur and Helical Gear and Design and Developed effectively Gears for different loading conditions. (L4)

UNIT – III

Energy: Power Generation: External and internal combustion engines (layouts, element/component description, advantages, disadvantages, applications).

Refrigeration: Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation –calculation of COP.

Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

LEARNING OUTCOME:

- To acquire knowledge of thermal efficiency and coefficient of performance for heat engine, refrigerators. (L2)
- Students will demonstrate an understanding of the basic concepts of conduction, radiation, and convection heat transfer. (L3)

UNIT – IV

Manufacturing Processes: Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages).

Welding: Types – Equipments –Techniques employed –welding positions-defects-applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

LEARNING OUTCOME:

- Understand different tools used in sheet metal work process based on industrial applications. (L3).
- Apply knowledge to select appropriate welding process based on the type of industrial application. (L3)

UNIT – V

Casting: Types, equipments, applications.

Machine Tools: Introduction to lathe, drilling machine, milling machine, grinding machine-Operations performed.

LEARNING OUTCOME:

- Analyze the use of casting processes in manufacturing. (L4)

- Knowledge gained by the study of Metal Removal process, using Lathe Drilling and Milling. (L5)

TEXT BOOKS:

1. Kumar, T., Leenus Jesu Martin and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai /Ist Edition 2007.
2. K.R, Gopalakrishna Sudhir, Gopalakrishna S.C, Sharma, Elements of Mechanical Engineering /9th Edition 2005.

REFERENCE BOOKS:

1. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, SciTech Publications, Chennai/ 7th Edition 2000.
2. Hajra Choudhary, S.K. and Hajra Choudhary, A. K., Elements of Workshop Technology Vols. I & II, Indian Book Distributing Company Calcutta/ 12th Edition 2007.
3. Nag, P.K., Power Plant Engineering, Tata McGraw-Hill, New Delhi, 2008. 4. Rattan, S.S., Theory of Machines, Tata McGraw-Hill, New Delhi/4th Edition 2010.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070303: FABRICATION PROCESS
(Open Elective – I)

III Year B. Tech. MECH II – Sem

L	T	P	C
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COURSE OBJECTIVES:

- To gain knowledge on the basic concepts of Fabrication processes and also to know the accuracy, precision and recognize the importance of manufacturing processes.
- To understand the performance manufacturing processes like casting, welding.
- To provide foundation in manufacturing processes.
- To analyze forging, extrusion, cold working operations.
- To explain the latest fabrication processes.

COURSE OUTCOMES:

After completion of the course the student is able to

- To understand the casting processes.(L1)
- To discuss the fundamentals of welding, different processes.(L2)
- To explain the hot working and cold working operations. (L2)
- To analyze the concept of Basic extrusion process of metals. (L4)
- To gain knowledge on the Forging processes, Rotary forging, forging defects and forging operations.(L1)
- To acquire the knowledge of production techniques, to estimate time, resources to complete the course. (L1)

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

LEARNING OUTCOME:

- Understanding of casting process and casting defects.(L2)
- knowledge of working methods of mouldings and gating systems(L1)

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG 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

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(AUTONOMOUS)

LEARNING OUTCOMES:

- Outline technology that is used in submerged are welding and explosive welding.(L1)
- List and explain the welding defects causes and remedies.(L2)

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallization, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

LEARNING OUTCOME:

Ability to analyse the cold working and hot working process.(L4)
Identify the different types of manufacturing process.(L2)

UNIT – IV

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 and pipe making, Hydrostatic extrusion. Forces in extrusion

LEARNING OUTCOME:

- Understand the concept and differences between Hot working and Cold working.(L2)
- Describe the process of tube extrusion, Hydrostatic extrusion and pipe making.(L3)

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations

LEARNING OUTCOME:

- Categorize the different methods of forging.(L4)
- Discuss the forging tools and forging operations.(L2)

TEXT BOOKS:

1. Manufacturing Technology / PN Rao/Mc grow hill. Vol 1-4th Edition, vol 2/3rd Edition
2. Manufacturing Technology – P.N Rao; TMH, Edition/vol 4th Edition

REFERENCE BOOKS:

1. Manufacturing Processes for Engineering Materials – Serope Kalpakjian and Steven R Schmid, Pearson Pub /5th Edition
2. Process and materials of manufacturing – Lindberg /PE. /4th Edition
3. Principles of Metal Castings – Roenthal/ 2nd Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080304: ALTERNATIVE ENERGY SOURCES
(Open Elective – I)

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

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 analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
- Understand the various forms of conventional energy and renewable energy resources.
- Learn the present energy scenario and the need for energy conservation.
- Outline division aspects and utilization of renewable energy sources for both domestics and industrial application.

COURSE OUTCOMES:

After completion of the course the student is able to

- Understanding of renewable energy sources.(L1)
- Understand the principles that underlie the ability of various natural phenomena to deliver solar energy.(L2)
- Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.(L3)
- Knowledge of working principle of wind energy systems.(L2)
- The students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.(L4)
- Capability to carry out basic design of renewable energy systems.(L5)

UNIT – I

Introduction: Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

LEARNING OUTCOME:

- Understanding of renewable energy sources.(L1)
- Knowledge of working principle of various energy systems.(L2)

UNIT – II

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

LEARNING OUTCOME:

- Outline the technologies that are used to harness the power of solar energy.(L1)
- Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment.(L2)

UNIT – III

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

LEARNING OUTCOME:

- Ability to analyze the viability of wind energy projects.(L4)
- Capability to integrate various options and assess the business and policy environment regarding wind energy projects.(L6)

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.

LEARNING OUTCOME:

- Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.(L2)
- To increase the renewable energy production from biogas with small-scale. (L3)

UNIT – V

Other Renewable Energy Sources:

1. 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.

2. 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.
3. Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

LEARNING OUTCOME:

- Acquire the knowledge wave power, tidal power and geothermal principles and applications.(L2)
- Discuss the environmental effects of hydropower installations.(L2)

TEXT BOOKS:

1. Renewable Energy Sources / Twidell, J.W. and Weir, A. / EFN Spon Ltd., 1986.3rd Edition.
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers. 5th Edition.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012. 1st Edition.
2. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996. 3rd Edition.
3. Efstathios E (Stathis) Michaelides, Alternative Energy Sources, Springer, Berlin, Heidelberg, 2010. 2nd Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060345: MACHINE TOOL DESIGN
(Professional Elective II)

III Year B. Tech. MECH II – Sem

L	T	P	C
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PRE-REQUISITES: Machine Design, Machine Tools

COURSE OBJECTIVES:
- To gain the knowledge of different drives and mechanisms used in machine tools
- To gain the knowledge of design of gear boxes & feed boxes used in machine tools
- To gain the knowledge of design of structures, guideways, spindles of machine tools
- To gain the knowledge of various control systems used in machine tools

COURSE OUTCOMES:
After completion of the course the student is able to
- Understand various driving mechanisum of machine .
- Design and analyze systems for specified speeds and feeds.
- Design machine tool structures.
- Design of various spindle sytems for machines..
- Design machine tool guide ways and power systems..
- Understand various dynamics of machines.

UNIT – I
Introduction to Machine Tool Drives and Mechanisms: Introduction to the course, Working and Auxiliary Motions in Machine Tools, Kinematics of Machine Tools, Motion Transmission.

LEARNING OUTCOME:
- Auxiliary Motion in machine tools (L2)
- Recognize various motion transmission (L2)

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

LEARNING OUTCOME:
- Acquiring the Knowledge of speed regulation. (L2)
- Students will be able to design speed gear boxes (L4)

UNIT – III
Design of Machine Tool Structures: Functions of Machine Tool Structures and their Requirements, Design for Strength, Design for Rigidity, Materials for Machine Tool Structures, Machine Tool Constructional Features, Beds and Housings, Columns and Tables, Saddles and Carriages.

LEARNING OUTCOME:

- Understand the importance of tool structures. (L2)
- Select the appropriate method for designing machine tool structure. (L3)

UNIT – IV

Design of Guideways, Power Screws and Spindles: Functions and Types of Guideways, Design of Guideways, Design of Aerostatic Slideways, Design of Anti-Friction Guideways, Combination Guideways, Design of Power Screws.

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

LEARNING OUTCOME:

- Will acquire knowledge of designing guide ways and power screws. (L2).
- Will be able to design spindles and its supports(L2).

UNIT – V

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

LEARNING OUTCOME :

- To know the methods of testing stiffness. (L2).
- Difference between elastic and synamic system. (L2).

TEXT BOOKS:

1. Machine Tool Design and Numerical ControlbyN.K. Mehta, TMH/3rd Edition.
2. Principles of Machine Toolsby G.C. Sen and A. Bhattacharya, New Central Book Agency/ revised 1st Edition

REFERENCE BOOKS:

1. Machine Tool Designby N. S. Acherkhan, Vol. I, II, III and IV, MIR publications/ Revised 1st Edition
2. Tool Design by Cyril Donaldson, Mc Graw Hill./ 5th Edition,
3. Design of Machine Toolsby D. K Pal, S. K. Basu, Oxford IBH/5thEdition,

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060346: FINITE ELEMENT METHOD
(Professional Elective II)

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: MECHANICS OF SOLIDS

COURSE OBJECTIVES:

- The aim of the course is to provide the participants an overview on Finite Element Method, Material models, and Applications in material 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.
- Modeling of engineering systems .
- Importance of interfaces and joints on the behavior of engineering systems.
- Implementation of material model in finite element method and applications.

COURSE OUTCOMES:

- After completion of the course the student is able to
- Apply finite element method to solve problems in solid mechanics, fluid mechanics
- Formulate and solve problems in one dimensional structures including trusses, beams.
- Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, and axi- symmetric problems.
- Formulate FE characteristic equations in heat transfer applications
- Formulate FE characteristic equation for dynamic analysis.
- Knowledge on FEM softwares ANSYS,NASTRAN etc

UNIT – I

Introduction: Introduction to Finite Element Methods: General Procedure – Engineering Applications –

Stress – strain relations and strain- displacement relations: Finite Elements: 1- Dimensional, 2 – Dimensional, 3-Dimensional Elements

One Dimensional Problems: 1-D Linear bar 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 for bar element.

LEARNING OUTCOME:

- After successful completion of the unit, students will be able to
- Explain the shape function concept and make use of it in solving one dimensional linear elements (L2).
- Apply numerical methods on one dimensional bar elements for obtaining displacements, stresses, strains and reaction forces (L3).

- Understand the concept of FEM and its engineering applications in various areas of study.(L2)

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, simple problems on Load Vector, Deflection.

LEARNING OUTCOME:

- After successful completion of the unit, students will be able to
- Explain the shape function concepts on trusses and beams for enriching knowledge on stiffness matrixr (L2).
- Apply numerical methods on truss and beam elements for obtaining displacements, stresses, strains. (L3).
- Make use of shape functions for obtaining stiffness matrix and load vector on truss and beam elements.(L3)

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 and two dimensional four noded isoparametric elements.

LEARNING OUTCOME:

- After successful completion of the unit, students will be able to
- Recall the fundamental structural concepts of stress-strain relations and strain displacements for solving 2D and 3D elastic problems. (L1)
- Illustrate finite element modelling of triangular, axi-symmetric and four noded elements for obtaining shape functions of two dimensional elements. (L2)
- Male use of shape functions for developing stiffness matrix of triangular, axisymmetric and four noded elements (L3)

UNIT – IV

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two-dimensional heat conduction analysis of thin plate.

LEARNING OUTCOME :

- After successful completion of the unit, students will be able to
- Explain the basics of heat transfer for 1D, fin and thin plate for developing mathematical models.(L2) Apply numerical methods on heat transfer problems for developing thermal stiffness matrix and thermal load vector.(L3)

UNIT – V

Dynamic Analysis: Formulation of finite element model, lumped and consistent mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation and its techniques, introduction to softwares such as ANSYS, ABAQUS, NASTRAN

LEARNING OUTCOME:

- After successful completion of the unit, students will be able to
- Illustrate the concepts of stepped bar for obtaining the Eigen values and Eigen vectors of various structural problems. (L2)
- Make use of modern tools such as ANSYS, NASTRAN for solving 3D structural and heat transfer problems (L3).
- Understand the concept of mesh generation and its importance. (L2)

TEXT BOOKS:

1. Finite Element Methods: Basic Concepts and applications/Alavala/PHI/3rd Edition
2. Introduction to Finite Elements in Engineering,/ Chandrupatla, Ashok and Belegundu /Pearson/4th Edition

REFERENCE BOOKS:

1. An Introduction to the Finite Element Method / Edition-4/J. N. Reddy/ Mc Graw Hill/4th Edition
2. Finite Element Analysis / SS Bhavikatti / New Age/3rd Edition
3. Finite Element Method/Dixit/Cengage/4th Edition
4. The Finite Element method in Engineering/Singiresu S.Rao/5th Edition

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MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060347: MECHATRONICS
(Professional Elective II)

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Basic Electronics Engineering

COURSE OBJECTIVES:

- To explain the concept of Mechatronics
- Understand & Elements of sensors, transducers & displacement of characteristics.
- To analyse the PN junction diode, BIT, FET, DIA and TRIAC and its significance.
- To gain the Knowledge about Hydraulic and Pneumatic acting system in industrial application.
- Understand the concept of PLC system and significance of PLC control
- Detailed study of system and in its facing data.

COURSE OUTCOMES :

After completion of the course the student is able to

- Develop a simulation model for simple physical systems and explain mechatronics design process.(L4)
- Knowledge of working principle of various energy systems Outline appropriate sensors and actuators for an engineering application.(L1)
- Time and Frequency domain analysis of system model (for control application).(L4)
- Implement Mechatronic System/Process which is Environment Friendly with appropriate Consideration for Public Health and Safety.(L3)
- Explain linearization of nonlinear systems and elements of data acquisition.(L2)
- Development of PLC ladder programming and implementation of real life system.(L5)

UNIT – I

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion , acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

LEARNING OUTCOME:

- Identification of key elements of mechatronics system and its representation in terms of block diagram.(L2)
- Develop a simulation model for simple physical systems and explain mechatronics design process.(L5)

UNIT – II

Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

LEARNING OUTCOME:

- Describe the principle and analyze the operation of p-n diodes, BJTs. (L2)
- Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.(L1)

UNIT – III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydrop neumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

LEARNING OUTCOME:

- Outline appropriate sensors and actuators for an engineering application.(L3)
- Development of PLC ladder programming and implementation of real life system.(L4)

UNIT – IV

Digital electronics and systems, digital logic control, microprocessors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control

LEARNING OUTCOME:

- PLC implementation on real time systems.(L4)
- Explain various applications of design of mechatronic systems.(L2)

UNIT – V

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends.

LEARNING OUTCOME:

- Exhibit Effective Project Management Skills to Conceive and Develop a Project Plan. (L4)
- Apply Knowledge of Math, Science, and Mechatronic Engineering disciplines to Solve Real Life Industrial Problems.(L5)

TEXT BOOKS:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran & GK Vijaya Raghavan/WILEY India Ist Edition/2008
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering? W Bolton/ Pearson Education Press/3rd edition, 2005.

REFERENCE BOOKS: Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai. 3rd edition

1. Mechatronics N. Shanmugani /Anuradha Agencies Publishers. 1st edition
2. Mechatronics System Design I Devdas shey/RichardIThomson, 2nd edition

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2060348: MECHANICAL VIBRATIONS
(Professional Elective II)

III Year B. Tech. MECH II – Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Engineering Mechanics

COURSE OBJECTIVES:
- To impart the knowledge of vibration on various levels.
- To understand remedies for vibrations at various levels.
- To impart the knowledge on single degree of freedom systems.
- To impart the knowledge on two degree of freedom systems
- To understand the working and use of vibration measuring instruments.

COURSE OUTCOMES:
After completion of the course the student is able to
- Understand the causes and effects of vibration in mechanical systems (L2)
- Outline various schematic models for physical systems and formulate governing equations of motion. (L2)
- Analyze rotating and reciprocating systems and compute critical speeds .(L3)
- Analyze and design machine supporting structures, vibration isolators and absorbers. .(L3)
- Understand the role of damping, stiffness and inertia in mechanical systems (L2)
- Demonstrate various vibration measuring instruments. (L2)

UNIT – I
Introduction: Introduction to vibrations & basic concepts, Damped Single Degree Freedom System: Damping Models- Viscous Damping, Structural Damping, Coulomb Damping Single Degree Freedom System with Damping- Over Damped, Under Damped, Critically Damped, Logarithmic Decrement.

LEARNING OUTCOME:
- Discuss basic concepts on vibration. (L2).
- Calculate natural frequency and damped frequency for the single-degree-of freedom system.(L3).

UNIT – II
Single Degree Freedom System – Forced Vibrations: Response to harmonic excitations, solution of differential equation of motion, Vector approach, Magnification factor Resonance, Rotating/reciprocating unbalances, Force Transmissibility, Motion Transmissibility, Critical Speed of shaft.

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LEARNING OUTCOME:

- Discuss the equation of motion of a single-degree-of-freedom system using different methods such as Newton's second law, D'Alembert's principle, and the principle of conservation of energy. (L2)
- Calculate the equation of motion for the different types of initial conditions. (L3)

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.

LEARNING OUTCOME:

- Discuss linear vibratory models of dynamic systems with changing complexities(L2)
- calculate the differential equations of motion of vibratory systems (L3)

UNIT – IV

Continuous system: Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Torsional vibrations of shafts.

Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.

LEARNING OUTCOME:

- Able to calculate critical speeds with and without damping. (L3).
- Understand the concept of free vibration in continous systems. (L2).

UNIT – V

Vibration measurements: Vibrometers, velocity meters & accelerometers, seismic instruments

Numerical Methods: Rayleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods

Acoustics and Noise Control: Acoustic wave equation, Acoustic energy and sound intensity. Propagation of sound, Concept of Acoustic impedance. Sound power transmission, Transmission Loss. Human Response and ratings, Sound measuring instruments

LEARNING OUTCOME:

- To formulate numerical methods for multi degree freedom of systems(L3).
- To understand various instruments used to measure vibration.(L2).

TEXTBOOKS:

1. Elements of Vibration Analysis / Meirovitch/ Mc Graw Hill / 2nd Edition
2. Principles of Vibration / Benson H. Tongue/Oxford / 2nd Edition

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REFERENCE BOOKS:

1. Mechanical Vibrations by G.K. Groover./8 th Edition
2. Mechanical Vibrations / SS Rao / Pearson/4th Edition.
3. Mechanical Vibration /Rao V. Dukkipati, J Srinivas/ PHI/ / 2nd Edition

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(AUTONOMOUS)

2060075: ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

III Year B. Tech. MECH II – Sem

L	T	P	C
0	0	2	1

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:

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.

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

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

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.
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
P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
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:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.

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7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

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(AUTONOMOUS)

2060381: HEAT TRANSFER LAB

III Year B. Tech. MECH II – Sem

L	T	P	C
0	0	3	1.5

PRE-REQUESTS: Mathematics & Thermodynamics

COURSE OBJECTIVES

- To demonstrate the concepts discussed in the Heat Transfer course
- To experimentally determine thermal conductivity and heat transfer coefficient through various materials..
- To experimentally measure effectiveness of heat exchangers.
- To experimentally measure Stefan Boltzmann constant...

COURSE OUTCOMES:

- Applications of concepts of Conduction Convection &Radiation Principles.
- Calculation of thermal conductivity Heat Transfer Coefficient of various experiments.
- Calculation of Heat Transfer Coefficient of various experiments.
- Analyzing the Performance parameters of Heat Exchanger.
- Evaluation of Emissivity of Real Surfaces.
- Assessment of Stefen Boltz's mann Constant.

LIST OF EXPERIMENTS:

1. Determination of overall heat transfer co-efficient of a composite slab
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of heat transfer rate through a concentric sphere
4. Determination of thermal conductivity of a metal rod.
5. Determination of efficiency of a pin-fin
6. Determination of heat transfer coefficient in forced convection
7. Determination of heat transfer coefficient in natural convection.
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzmann constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Demonstration of heat pipe.
14. Determination of Heat transfer coefficient and instantaneous heat transfer for transient heat conduction.

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2060382: CADD AND MATLAB

III Year B. Tech. MECH II – Sem

L	T	P	C
0	0	3	1.5

PRE-REQUISITES: Familiar with MATLAB and AUTOCAD

COURSE OBJECTIVES

- To impart the knowledge of basic concepts on engineering process of design.
- To illustrate basic analytical fundamentals used to create geometry models.
- To Impart the knowledge of drafting and 3D modeling systems.
- To provide experience in using CAD tools and develop simple projects.
- To introduce solving of engineering problems using MATLAB.

COURSE OUTCOMES:

After completion of the course the student is able to

- Apply computer methods for solving wide range of engineering problem.(L3)
- Can use computer engineering software to present various drafting designs.(L3)
- Understand computer skills to enhance learning and performance in other engineering and science sources(L2)
- Use computer engineering software to solve and present problem solutions in a technical format.(L3)
- Illustrate use of programming language software in solving basic engineering problems.(L2)
- Understand the use of various cad tools for editing and creating designs.(L2)

LIST OF EXPERIMENTS USING CADD: (A minimum of 6 experiments to be conducted)

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Creations of various 2D drafting using CAD tools.
4. Representation of dimensioning and tolerances scanning and plotting.
5. Drawing of front view and top view of simple solids and dimensioning.
6. Drawing sectional views for simple 3D designs.
7. Drawing of front view and top view and side view of objects for the given pictorial views
8. Drawing isometric projection of simple objects.
9. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.
10. Assembling of part models using constraints
11. LIST OF EXPERIMENTS USING MATLAB (A minimum of 6 experiments to be conducted)
12. Write MATLAB commands to analyze arithmetic, logical and Boolean operations.

13. Write MATLAB commands to analyze vector operations and magic matrix's.
14. Write a MATLAB program to demonstrate if and else if statement for comparing Two
15. numbers.
16. Analyze the following operations in MATLAB.
    a) Colon operator b) Line Plotting c) 2D plotting
17. Write MATLAB code to observe Regression and Polynomial functions.
18. Generate an array of random numbers between 1 to 100. Arrange them in
    (a) Ascending and descending order
    (b) Pick the numbers divisible by 2 using suitable commands.
19. Write a program to multiply 3X3 matrix and obtain inverse of the resultant matrix.
20. Generate an array of random numbers between 1 to 50 and
    (a) Convert them into binary numbers
    (b) Normalize the numbers between 0 and 1 using suitable formula
21. Write a MATLAB program to obtain smallest and largest values of integers.
22. Write a MATLAB program to obtain smallest and largest of floating point numbers.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060028: MACHINE LEARNING

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

PRE-REQUISITES: Knowledge on Data Structures, and Statistical methods

COURSE OBJECTIVES:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

COURSE OUTCOMES:

At the end of this course, students will be able

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT-I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning, supervised versus unsupervised learning. Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, FIND-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT–II

Artificial Neural Networks– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm, Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT–III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve.

Bayes classifier, an example: learning to classify text, Bayesian belief networks. Computational learning theory – Introduction, probably learning an approximately correct (PAC) hypothesis, the mistake bound model of learning.
Instance-Based Learning- Introduction, k-nearest neighbour (KNN) algorithm, locally weighted
regression, radial basis functions, remarks on lazy and eager learning.

UNIT–IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, Genetic programming.
Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.
Reinforcement Learning – Introduction, the learning task, Q–learning.

UNIT - V

Analytical Learning- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.
Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis, Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

TEXTBOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS::

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060025: PROFESSIONAL ETHICS

III Year B.Tech. MECH II – Sem.

L	T	P	C
2	0	0	0

Prerequisite: Nil

COURSE OBJECTIVES:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession.

COURSE OUTCOMES:

- To understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
- To learn the rights and responsibilities as an employee, team member and a global citizen

UNIT - I

Professional Practice and Ethics: Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders

UNIT - II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT - III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

UNIT - IV

Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other - Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

UNIT - V

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016.

REFERENCE BOOKS:

1. RERA Act, 2017.
2. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
4. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070324: CAD/CAM

B.Tech. IV Year I Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES:To learn the importance and use of computer in design and manufacture

COURSE OBJECTIVES : To impart knowledge on

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

COURSE OUTCOMES:

- Understand geometric transformation techniques in CAD.
- Develop mathematicalmodels to represent curves and surfaces.
- Model engineering components using solid modelingtechniques.
- Develop programs for CNC to manufacture industrial components.
- Understand theapplication of computers in various aspects of Manufacturing viz
- Manufacturing cost, Layout & Material Handling system.

UNIT – 1 INTRODUCTION

Fundamentals of CAD, CAM, Automation, design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software- definition of system software and application software, CAD database and structure.

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and Bspline.

LEARNING OUTCOME:

1. Ffundamental of CAD (L2)
2. Identify the various wire frame modelling methods(L2)

UNIT – 2SURFACE & SOLID MODELING CLASSES:09

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.

LEARNING OUTCOME:

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- Identify the various surface modelling methods(L2)
- Characteristics of CSG (L2)

UNIT- 3 NC CONTROL PRODUCTION SYSTEMS

Numerical control, Elements of NC system, NC part programming:
Methods of NC part programming, manual part programming, Computer assisted part programming,
Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

LEARNING OUTCOME:

- Understand the NC programming (L2)
- Post processing of CNC, DNC and ACS (L3)

UNIT – 4 GROUP TECHNOLOGY CLASSES :08

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

LEARNING OUTCOME:

- Application of Group technology (L4).
- Identify the MRP-I and MRP-II (L3).

UNIT – 5 FLEXIBLE MANUFACTURING SYSTEM

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefitsof 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.

LEARNING OUTCOME:

- Characteristics of FMS (L3).
- Learn the about the automated inspection system (L4).

TEXT BOOK:

1. CAD/CAM Concepts and Applications / Alavala / 2nd edition/PHI
2. CAD/CAM Principles and Applications / P. N. Rao / 3rd edition/Mc Graw Hill

REFERENCE BOOK:

1. 1. CAD/CAM/ Groover M.P/ 4th edition/ Pearson.
2. 2. CAD/CAM/CIM/ Radhakrishnan and Subramanian / 2nd edition/ New Age.
3. Harold Belofsky, Plastics, Product Design and Process Engineering, 3rd edition/Hanser Publishers, 2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070325: INSTRUMENTATION AND CONTROL SYSTEMS

B.Tech. IV Year I Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES:-Nil

COURSE OBJECTIVES

- Understanding the basic characteristics of a typical instrument. Identifying errors and their
- types that would occur in a instrument.
- Identifying properties used for evaluating the thermal systems.
- The concept of transducer and Various types and their characters of Engineering metrology and its practice which is having increasing importance in industry

COURSE OUTCOMES : After completion of the course the student is able to

- To identify and analyze various errors that would occur in instruments(L3).
- Identify the different displacement measurement techniques and temperature measurement techniques, used in industries (L4).
- To know the working principles of various instruments to measure level (L2).
- Students will be able differentiate between mechanical electrical tachometers.(L3)
- Student will be able select appropriate device for the measurement of parameters like humidity,strain,force and torque(L4)
- Suggest control systems for speed, position and control in practical applications(L4)

UNIT – 1

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples.Static and Dynamic performance characteristics – sources of errors, Classification and elimination of errors.

LEARNING OUTCOME:

- Characteristics of instruments (L2)
- Recognize various errors(L2)

UNIT – 2

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance.

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;

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.

LEARNING OUTCOME:

- Select appropriate instrument for measuring distance (L4)
- 2. Differentiate various working mechanisms manometers (L2)

UNIT – 3

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators – Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer.

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non- contact type- Stroboscope

Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

LEARNING OUTCOME:

- Classify various instruments for measuring level (L2)
- Differentiate between mechanical electrical tachometers (L2)

UNIT – 4

Stress-Strain measurements: Various types of stress and strain measurements - electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter.

Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

LEARNING OUTCOME :

- Will be able to identify best practice to measure stress . (L3).
- To determine humidity at a place (L2).

UNIT – 5

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(AUTONOMOUS)

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems

LEARNING OUTCOME :

- Classification of various control systems. (L2).
- Difference between open and closed loop systems (L2).

TEXT BOOK :

- Instrumentation mechanical measurements and control by A.k.tayal,Galogtia publications/2nd Edition
- Mechanical measurements & control byDr D.S.Kumar,metropolitan book co pvt ltd/1st Edition

REFERENCE BOOK :

- Control systems by A.nagoor kani,RBA Publications/1st Edition
- Instrumentation Measurements and Analysis by B.C. Nakra, Tata mc grawhill Publishers/3rd Edition
- Electric Measurements & Instrumentation byk K.Lal kishore,Pearson publications/1st Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070349: RENEWABLE ENERGY SOURCES

IV Year B.Tech. MECH I – Sem. **L T P C**

3 0 0 3

Pre-requisites: -

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 analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
- Understand the various forms of conventional energy and renewable energy resources.
- Learn the present energy scenario and the need for energy conservation.
- Outline division aspects and utilization of renewable energy sources for both domestics and industrial application.

COURSE OUTCOMES: After completion of the course the student is able to

- Understanding of renewable energy sources. (L1)
- Understand the principles that underlie the ability of various natural phenomena to deliver solar energy. (L2)
- Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. (L3)
- Knowledge of working principle of wind energy systems. (L2)
- The students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources. (L4)
- Capability to carry out basic design of renewable energy systems. (L5)

UNIT – 1

Introduction: Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

LEARNING OUTCOME:

- Understanding of renewable energy sources. (L1)
- Knowledge of working principle of various energy systems. (L2)

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UNIT – 2

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

LEARNING OUTCOME:

- Outline the technologies that are used to harness the power of solar energy. (L1)
- Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment. (L2)

UNIT – 3

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind speed monitoring, classification of wind-characteristics, applications of wind turbines, Betz limit, site selection, wind energy conversion devices. Wind mill component design. Safety and environmental aspects, wind energy potential and installation in India..

LEARNING OUTCOME:

- Ability to analyze the viability of wind energy projects. (L4)
- Capability to integrate various options and assess the business and policy environment regarding wind energy projects.(L6)

UNIT – 4

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.

LEARNING OUTCOME:

- Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications. (L2)
- To increase the renewable energy production from **biogas** with small-scale. (L3)

UNIT – 5

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(AUTONOMOUS)

Other Renewable Energy Sources:

1. 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.

2. 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.

3. Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

LEARNING OUTCOME:

- Acquire the knowledge wave power, tidal power and geothermal principles and applications. (L2)
- Discuss the environmental effects of hydropower installations. (L2)

TEXT BOOKS:

1. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers
2. Renewable Energy Sources / Twidell, J.W. and Weir, A./ EFN Spon Ltd., 1986.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012
2. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070350: ROBOTICS

IV Year B.Tech. MECH I – Sem. **L T P C**

3 0 0 3

Pre-requisites: Basic principles of Kinematics and mechanics

COURSE OBJECTIVES

- To familiarize the students with the concepts and techniques in robotic engineering.
- To understand manipulator kinematics, dynamics and control, chose, and incorporaterobotic 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 projectsand 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: After completion of the course the student is able to

- Understand the basic components of robots. (L1)
- Understand the Differentiate types of robots and robot grippers. (L2)
- Modeling of forward and inverse kinematics of robot manipulators. (L3)
- Knowledge of working principle of wind energy systems. (L2)
- Analyze forces in links and joints of a robot. (L4)
- Programme a robot to perform tasks in industrial applications and Design intelligent robots using sensors.(L3)

UNIT – 1

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. **Components of the Industrial Robotics:** common types of arms. Components, Architecture, number of degrees offreedom – Requirements and challenges of end effectors, Design of end effectors, **Precision of Movement:** Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

LEARNING OUTCOME:

- Knowledge on Architecture, Design end effectors. (L2)

UNIT – 2

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices.Homogeneous transformations as applicable to rotation and translation – problems. **Manipulator Kinematics:** H notation-H method of Assignment of frames-H Transformation Matrix, joint

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coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulators.

LEARNING OUTCOME:

- Understanding the motion analysis and manipulator kinematics. (L1)

UNIT – 3

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Eulerformations – Problems
Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight linemotion.

LEARNING OUTCOME:

- Understanding the transformation of manipulators and Euler formulations, trajectory planning. (L4)

UNIT – 4

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors,
comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools

LEARNING OUTCOME:

- Knowledge on Robot Actuators and feedback components. (L2)

UNIT – 5

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.

LEARNING OUTCOME:

- Acquire the knowledge on application in Manufacturing. (L2)

TEXT BOOKS:

- Industrial Robotics / Groover M P /Mc Graw Hill
- Introduction to Industrial Robotics / Ramachandran Nagarajan / Pearson.

REFERENCE BOOKS:

- Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
- Robot Analysis and control / Asada, Slotine / Wiley Inter-Science
- Robotics – Fu et al / TMH Publications.

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(AUTONOMOUS)

2070351: COMPUTATIONAL FLUID DYNAMICS

IV Year B.Tech. MECH I – Sem. **L T P C**

3 0 0 3

Pre-requisites: Basic principles of Kinematics and mechanics

COURSE OBJECTIVES

- 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: After completion of the course the student is able to

- Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques. (L1)
- Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM. (L3)
- Understand and to appreciate the need for validation of numerical solution. (L3)

UNIT – 1 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 Mathematical behavior of Partial Differential Equations (Governing Equations): Classification of linear/ quasi linear PDE – Examples - Physical Processes: Wave Equations and Equations of Heat Transfer and Fluid Flow – Mathematical Behavior - General characteristics – Its significance in understanding the physical and numerical aspects of the PDE – One way and Two Way variables – Well posed problems – Initial and Boundary Conditions Solution of Simultaneous Algebraic Equations: Direct Method – Gauss Elimination – LU Decomposition – Pivoting – Treatment of Banded Matrices – Thomas Algorithm Iterative Method: Gauss Seidel and Jordan Methods - Stability Criterion.

LEARNING OUTCOME:

- Understanding of governing equations. (L1)
- Knowledge on Mathematical behavior of Partial Differential Equations. (L2)

UNIT – 2

Finite Difference Method: Basic aspects of Discretization – Finite Difference formulae for first order and second order terms – Solution of physical problems with Elliptic type of Governing Equations for different boundary conditions - Numerical treatment of 1D and 2D problems in heat conduction, beams etc., - Solutions –Treatment of Curvelinear coordinates – Singularities – Finite Difference Discretization – Solution of 1D heat conduction problems in Heat conduction in curve linear coordinates.

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LEARNING OUTCOME:

- Understanding of Finite Difference Method. (L1)
- Ability to analyze different boundary conditions. (L2)

UNIT – 3

FDM: Solution of physical problems with Parabolic type of Governing Equations – Initial Condition – Explicit, implicit and semi implicit methods – Types of errors – Stability and Consistency – Von Neumann Stability criterion– Solution of simple physical problems in 1D and 2D – Transient Heat conduction problems- ADI scheme - Simple Hyperbolic type PDE - First order and Second order wave equations – Discretization using Explicit method - Stability criterion – Courant Number – CFL Condition - Its significance - Treatment of simple problems

LEARNING OUTCOME:

- Ability to analyze the 1D and 2D problems. (L2)
- Capability to apply different techniques to solve 1D and 2D problems (L3)

UNIT – 4

Finite Difference Solution of Unsteady Inviscid Flows: Lax – Wendroff Technique – Disadvantages – Maccormack's Technique
Fluid Flow Equations – Finite Difference Solutions of 2D Viscous Incompressible flow problems – Vorticity and Stream Function Formulation – Finite Difference treatment of Lid Driven Cavity Problem - Application to Cylindrical Coordinates with example of flow over infinitely long cylinder and sphere – Obtaining Elliptic Equations

LEARNING OUTCOME:

Knowledge on different techniques to apply unsteady Inviscid flows. (L3)

UNIT – 5

Finite Difference Applications in Fluid flow problems: Fundamentals of fluid Flow modeling using Burger's Equation – Discretization using FTCS method with respect to Upwind Scheme and Transport Property – Upwind Scheme and Artificial Viscosity
Solutions of Navier Stokes Equations for Incompressible Fluid Flows: Staggered Grid – Marker and Cell (MAC) Formulation – Numerical Stability Considerations – Pressure correction method - SIMPLE Algorithm

LEARNING OUTCOME:

Acquire the knowledge on FDA methods to fluid flow problems. (L2)

TEXT BOOKS:

1. Computational Fluid Dynamics: The basics with applications/ John D Anderson/McGraw Hill Publications
2. Numerical Heat Transfer and Fluid Flow/ S.V. Patankar/ Mc Graw Hill

REFERENCE BOOKS:

1. Computational Fluid Flow and Heat Transfer / K Muralidharan and T Sudarajan/ Narosa Publishers
2. Computational Methods for Fluid Dynamics / Firziger & Peric/ Springer
3. Computational Fluid Dynamics/ Chung T. J./Cambridge/Second Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070352: TURBO MACHINERY

B.Tech. IV Year I Sem

L	T	P	C
3	0	0	3

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.

COURSE OUTCOMES: After completion of the course the student is able to

- Ability to design and calculate different parameters for turbo machines. (L1)
- Prerequisite to CFD and Industrial fluid power courses. (L3)
- Ability to formulate design criteria. (L3)
- Ability to understand thermodynamics and kinematics behind turbo machine

UNIT – 1

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

LEARNING OUTCOME:

- Understand the basic principles of Turbomachinery. (L1)

UNIT – 2

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, Stanitzand 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.

LEARNING OUTCOME:

- Knowledge on the Fundamental Concepts of axial and radial Machines. (L1)

UNIT – 3

Gas Dynamics: Fundamental thermodynamic concepts, isentropic conditions, mach numbers, and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas. Supersonic flow, oblique shock waves. Normal shock recoveries, detached shocks, Aerofoil theory.

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

LEARNING OUTCOME:

- Understand the basic concepts of gas dynamics and centrifugal compressor

UNIT – 4

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

Cascade Analysis: Geometrical and terminology. Blade force, Efficiencies, Losses, Free end force, Vortex Blades.

LEARNING OUTCOME:

- Understand the working principles of Axial flow compressors and cascade Analysis

UNIT – 5

Axial Flow Gas Turbines: Work done. Velocity triangle and efficiencies, Thermodynamic flow analysis, Degree of reaction, Zweifels relation, Design cascade analysis, Soderberg, Hawthrone, Ainley, Correlations, Secondary flow, Free vortex blade, Blade angles for variable degree of reaction. Actuator disc, Theory, Stress in blades, Blade assembling, Material and cooling of blades, Performances, Matching of compressors and turbines, off design performance.

LEARNING OUTCOME:

- Knowledge on working principles of axial flow gas turbine (L1)

TEXT BOOKS:

1. Principles of Turbo Machines/DG Shepherd / Macmillan/Second Edition
2. Turbines, Pumps, Compressors/Yahya/ Mc Graw Hil/ Third Edition

REFERENCE BOOKS:

1. A Treatise on Turbo machines / G. Gopal Krishnan and D. Prithviraj/ SciTech
2. Gas Turbine Theory/ Saravanamuttoo/ Pearson
3. Turbo Machines/ A Valan Arasu/ Vikas Publishing House Pvt. Ltd.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070353: REFRIGERATION AND AIRCONDITIONING

B.Tech. IV Year I Sem

L	T	P	C
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PRE-REQUISITE: THERMODYNAMICS

COURSE OBJECTIVES:

- To know the various methods of refrigeration and to introduce vapour compression.
- Refrigeration cycle, analysis and methods for improving performance.
- To know the operation of vapour absorption system.
- To know the various components of refrigeration system and their working principles.
- To design air conditioning systems by cooling load calculations.
- To know the various applications of refrigeration and air conditioning systems.

COURSE OUTCOMES:

- The students will get the knowledge about the principle of refrigeration, different methods of refrigeration. (L2)
- Able to know the various components of refrigeration system and their working principles.(L1)
- Able to understand what is meant by air conditioning and various psychrometric properties and processes and know the usage of Psychrometric chart.(L1)
- Know how to provide required environment to suit various needs of day to day requirements like comfort air conditioning, water cooling , storage of perishable food etc.,(L4)
- Able to understand cooling and heating loads in an air conditioning system.(L5)
- Enable them to do simple design calculations and analysis of these systems.(L6)

UNIT – 1

Introduction to refrigeration: Necessity and applications, UNIT ofrefrigeration and C.O.P, Mechanical refrigeration, types Reversed Carnot cycle ofrefrigeration.

Air Refrigeration: Bell Coleman cycle, Open and Dense air systems, Actualrefrigeration system. Necessity of aircraft refrigeration, Aircraft refrigeration systems-Types.

LEARNING OUTCOME :

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At the end of this unit, the students will be able to

- Familiarize with the terminology associated withRefrigeration and Air conditioning.(L4)
- Illustration of bell coleman cycle and its working.(L3)

UNIT – 2

Refrigerants: Refrigerants Classification, desirable properties, commonly usedrefrigerants, nomenclature, Alternate refrigerant.

Vapour Compression Refrigeration: Working principle, essential components of plant,simple vapor compression refrigeration cycle, modifications, Use of P - h charts.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Choose various types of refrigerants and its applications, global warming, Ozone depletion potential.(L4)
- Describe the analysis of sub cooled, super heat, sensible, latent heat and COP calculations, different types of refrigeration systems.(L2)

UNIT – 3

System Components: Compressors-types, Condensers - classification, working,Evaporators - classification, working, Expansion devices - types, working.

Vapour Absorption System: Calculation of max COP, description and Workingof NH3-water system, Li-Br,H2O system, principle of operation of three fluidabsorption system and salient features.

LEARNING OUTCOME :

At the end of this unit, the students will be able to

- Design and understand the function of each of the major refrigeration system components: evaporator, compressor, condenser, and metering device.(L5)
- Study the working principles of vapor absorption systems.(L2)

UNIT – 4

Steam Jet Refrigeration System: Principle of working, application merits anddemerits.

Non-Conventional Refrigeration Methods: Principle and operation ofthermoelectric refrigerator and Vortex tube or Hirsch tube.

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(AUTONOMOUS)

Psychrometry: Introduction, Psychrometric properties and relations, Pcyhrometricchart. Psychrometric processes, Sensible, Latent and Total heat, Sensible Heat Factor(SHF), Bypass factor.

LEARNING OUTCOME :

At the end of this unit, the students will be able to

- Identify different types of air properties (DBT, WBT, DPT, and Humidity) and predict relative cooling load calculations in Air conditioning system.(L4)
- Analyze the air conditioning processes using principles of Psychrometry

UNIT – 5 AIR CONDITIONING SYSTEMS

Introduction to Air Conditioning: Need for ventilation, infiltration, concepts of RSHF,ASHF, ESHF &ADP, concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning requirements, air conditioning load calculations.

Air Conditioning Systems: Introduction, components of Air conditioning system, Classification of Air conditioning systems, Central and Unitary, Summer, Winter and Year round systems.

LEARNING OUTCOME :

At the end of this unit, the students will be able to

- Identify different types of air properties (DBT, WBT, DPT, and Humidity) and predict relative cooling load calculations in Air conditioning system.(L4)
- Study the working principles of Air conditioning systems.(L2)

TEXT BOOK :

1. Refrigeration and air conditioning – R.S. Khurmi& Gupta, 3rd edition.
2. Refrigeration and air conditioning – C.P Arora, 4th edition.
3. Refrigeration and air conditioning- Manohar Prasad. 2nd edition.
4. A Course in refrigeration and air conditioning a– S.C Arora &Domkundwar. 3rdedition..

REFERENCEBOOK :

1.Principles of Refrigeration -- Dossat, 5th edition

2. Refrigeration and air conditioning –Stoecker, 2ndedition.

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WEB REFERENCES:

1. http://www.refrigerationbasics.com/index.htm
2. http://www.howstuffworks.com/ac.htm
3. http://www.ashrae.org
4. http://www.taftan.com/thermodynamics/AIRCOND.HTM
5. http://www.wisegeek.com/how-does-air-conditioning-work.htm

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070354: AUTOMOBILE ENGINEERING

B.Tech. IV Year I Sem

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for

- Classifying the types of chassis and identify different class of automobiles
- Outline the engine systems and their emission control.
- Illustrating the functions of various transmission systems.
- Imparting the working of different braking and steering systems.
- Understanding the working of electrical and electronic components.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

- Distinguish the different types of automobiles and chassis.
- Interpret the various types of engines and their emission control.
- Select the appropriate transmission systems.
- Compare the braking and steering systems.
- Infer the functions of different electrical and electronic components.

UNIT – 1

INTRODUCTON TO AUTOMOBILE AND TYPES: An overview of different types of automobiles and their power sources. Specifications, Performance Parameters, Types of power delivery, Safety standards, Trends in automobile design. Two and Types, Regulations, Car body construction. Bus Body Details, General consideration relating to chassis layout. Introduction to MV Act, Pollution Norms.

LEARNING OUTCOME:

- Describe the types Of Automobile Engines.(L2)
- Show the details of bus body and body construction of automobile engineering. (L3)

UNIT – 2

POWERTRAIN AND FUEL MANAGEMENT SYSTEMS: Reciprocating Engine systems, Hybrid systems. Pollutant emissions and their control; Catalytic converter systems, Electronic Engine Management systems for SI and CI engines. Liquid and gaseous alternate fuels - Alcohol, LPG, CNG, and Hydrogen.

LEARNING OUTCOME:

- Explain electric engine management system for spark ignition and compression ignition engine. (L2)
- Discuss the types of pollutant emission and there control in automobile system. (L2)

UNIT – 3

CLUTCH AND TRANSMISSION SYSTEMS: Clutch system and types, Gear box and types - manual, automatic, and AMT, propeller shafting, Differential, Axles - function, and types, Wheels, Tyres - types, construction and specification, suspension system - types and functioning.

LEARNING OUTCOME:

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- Identify the working principle in different types of clutch.(L1)
- Outline the suspension system and its function in automobile engine .(L1)

UNIT – 4

BRAKING SUSPENSION AND ELECTRONIC SYSTEMS: Braking system - requirements and types, Steering system - working, types and steering geometry parameters. Wheel balancing & Alignment, Introduction to Battery, Alternator, and Starter Motor systems, working principle, and circuitry, Safety systems - seat belts, air-bag, Modern electronic features in vehicles like tyre pressure monitoring, Electronic Stability Program, Electronic Brake force Distribution, Automatic headlamp ON, Rain sensing wipers, speed sensing auto locking, OBD. HVAC system.

LEARNING OUTCOME :

- Identify different types of brakes and its working conditions. (L4)
- Compare ackerman steering mechanism and davis steering mechanism. (L4)

UNIT – 5

ELECTRICAL VEHICAL: Electric Vehicle – Need - Types – Cost and Emissions – End of life. Electric Vehicle Technology – layouts, cables, components, Controls. Batteries – overview and its types. Battery plug-in and life. Ultra-capacitor,Charging – Methods and Standards. Alternate charging sources – Wireless & Solar.

LEARNING OUTCOME :

- Demonstrate electric vehicle technology and its layout.(L3)
- Study the different types of alternative charging source like wireless and solar. (L2)

TEXT BOOK :

1. Jack Erjavek, “Automotive Technology – A Systems Approach”, Thomson Learning, 3rd Edition, 1999.
2. William H. Crouse and Donald L. Anglin, “Automotive Mechanics”, Tata McGraw Hill, 10th Edition,2004.

REFERENCE BOOK :

1. Gill P.S., “A Textbook of Automobile Engineering – Vol. I, II and III”, S.K.Kataria and Sons, 2ndEdition, 2012.
2. Giri, N.K., “Automotive Technology”, Khanna Publishers, 2nd Edition, 2002.
3. Kirpal Singh, Automobile Engineering Volume I and II, Standard Publishers &Distributors, 14th Edition,2017.
4. Kumar D.S., “Automobile Engineering”, S.K.Kataria and Sons, 2nd Edition, 2017.
5. Robert Bosch GmbH, “Automotive Handbook”, Robert Bosch, 2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070355: IC ENGINES AND GAS TURBINES

B.Tech. IV Year I Sem

L	T	P	C
3	0	0	3

PRE-REQUISITE: THERMODYNAMICS

COURSE OBJECTIVES:

- Explain the Components of IC Engines and systems.
- Analyze the stages of combustion to improve the performance of IC engines with respect to fuel economy and control of emissions in global, environmental and social context.
- Understand and evaluate the performance analysis of the major components and systems of IC engines and their applications.
- Analyze the components and working principles of rotary, reciprocating, dynamic and axial Compressors
- Understand the significance of gas turbines in real context in power generation.

COURSE OUTCOMES:

- Elaborate the working principles of IC Engine systems and its classification. (L3)
- Explore the combustion stages of SI and CI engines, and factors influence for better combustion. (L3)
- Evaluate the testing and performance parameters of IC engines. (L4)
- Able to analyze the concept of Knocking in IC engines. (L4)
- Explain the function and working principles of rotary, reciprocating, dynamic axial compressors.(L2)
- Able to know the working principle of gas turbine and its classification with thermodynamic analysis.(L3)

UNIT – 1

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

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LEARNING OUT COME :

At the end of this unit, the students will be able to

- Familiarize with the terminology associated withIC Engines. (L3)
- Illustration of IC engines components and its working. (L3)

UNIT – 2

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating.

LEARNING OUTCOME :

At the end of this unit, the students will be able to

- Analyze the combustion stages of SI and CI engines, and factors influence for better combustion. (L4)
- Illustration of working of various combustion chambers in SI and CI engines. (L2)

UNIT – 3

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

LEARNING OUTCOME:

At the end of this unit, the students will be able to

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- Understand the principles of various performance parameters in IC engines. (L1)
- Study the working principles of various compressors. (L2)

UNIT – 4

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

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

LEARNING OUTCOME :

At the end of this unit, the students will be able to

- Understand the working of various rotary and dynamic flow compressors.(L1)
- Analyze the working of various Axial flow compressors. (L4)

UNIT – 5

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant-Brief Concepts.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components (L1).
- Concept of reheat factor in turbine expansion and to understand the various governing system in steam turbine (L3).

TEXT BOOK :

1. I.C. Engines, V. Ganesan, 4th Edition, Mc Graw Hill
2. Thermal Engineering, Mahesh M Rathore, 2nd EditionTata Mc Graw Hill, 2010

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REFERENCE BOOK :

1. Applied Thermodynamics for Engineering Technologists, Eastop & McConkey, Pearson 5th edition
2. Fundamentals of Classical Thermodynamics, Vanwylen G.J., Sonntag R.E., Wiley Eastern. 6th edition

3. Internal Combustion Engines Fundamentals, John B. Heywood, McGraw Hill Ed.9th edition

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(AUTONOMOUS)

2070356: JETPROPULUSION AND ROCKET ENGINEERING

B.Tech. IV Year I Sem

L	T	P	C
3	0	0	3

PRE-REQUESTS: Thermodynamics

COURSE OBJECTIVES

- To develop basic knowledge of students on Rankine cycles.
- To provide sufficient knowledge on Boilers and chimneys to the students.
- To enable student knowledge on steam nozzles and steam turbines.
- To improve the knowledge of students on steam formation process.
- To provide sufficient knowledge to the students on gas turbine and power plants.

COURSE OUTCOMES: After completion of the course the student is able to

- Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants(L1)
- Apply the laws of Thermodynamics to analyze thermodynamic cycles(L4)
- Differentiate between vapour power cycles and gas power cycles (L3)
- Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants(L3)
- Understand the functionality of major components of steam, gas turbine plants and power plant to do the analysis of these components(L1)

UNIT – 1

Boilers: Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent
Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.
Evaporation, Efficiency and Heat balance – Draught- Classification – Height of chimney for given draught and discharge- Condition for maximum discharge- Efficiency of chimney.

LEARNING OUTCOME:

- Describe basic components of Rankine cycle (L2)
- Restate boilers and its components(L2)

UNIT – 2

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(AUTONOMOUS)

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

LEARNING OUTCOME:

- Understand the concept of nozzle and diffuser (L1).
- Summarizes the properties of steam and apply it to nozzle flow analysis (L3).

UNIT – 3

Reaction Turbines: Mechanical details – Principle of operation, Thermodynamic analysis of a

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.
stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency. .

LEARNING OUTCOME:

- Principle, Classification and compounding of steam turbine (L3)
- Analyze the concepts of velocity diagram and design of impulse steam turbine by both analytical and graphical approach. (L4).

UNIT – 4

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.
Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant-Brief Concepts

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(AUTONOMOUS)

LEARNING OUT COME :

- Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components (L1).
- Concept of reheat factor in turbine expansion and to understand the various governing system in steam turbine (L3).

UNIT – 5

Jet Propulsion: Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines

Layout of power plant: Layout of Steam, hydel, diesel, MHD, nuclear and Gas-turbine power plants – Combined power cycles – Comparison and selection.

LEARNING OUTCOME :

- Understand the operation of various power plant and its components. (L1).
- Student can recognize the importance of power suited to the demand(L2)

TEXT BOOK :

1. Thermal Engineering / Mahesh M Rathore/ Mc Graw Hill , 4th edition.
2. Gas Turbines – V. Ganesan /Mc Graw Hill, 3rd edition.

REFERENCE BOOK :

1. Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers/ Pearson, 2nd edition.
2. Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI . 3rdedition.
3. Thermal Engineering/ Rajput/ Lakshmi Publications. 4th edition.

Note: Steam tables Data Book R.S.Khurmi is used to analyze the various process parameters in rankine cycle.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070383: CAD/CAM LAB

B.Tech. IV Year I Sem

L	T	P	C
0	0	2	1

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 impart the students with necessary computer aided design skills.
- To impart the students with necessary computer aided analysis skills.
- To analyze the various mechanical components.
- Simulation of mechanical components.
- To impart the knowledge on CNC programming

COURSE OUT COMES : After completion of the course the student is able to

- Able to solve simple problems using FEA software
- Generate freeform shapes in part mode to visualize components
- Create complex engineering assemblies using appropriate assembly constraints.
- Develop G and M codes for turning and milling components.
- Generate automated tool paths for a given engineering component

LIST OF EXPERIMENTS :

1. Sketching: Development of part drawings for various components in the form of orthographic. Representation of dimensioning and tolerances.
2. Part Modelling: Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modelling. Study of various standard Translators. Design of simple components.
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)
6. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
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.
9. Development of manufacturing defects and tool management systems.
10. Study of various post processors used in NC Machines.
11. Development of NC code for free form and sculptured surfaces using CAM software.
12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070384: INSTRUMENTION AND CONTROL SYSTEMS LAB

B.Tech. IV Year I Sem

L	T	P	C
0	0	2	1

PRE-REQUISITES: -

COURSE OBJECTIVES

- Impart an adequate knowledge and expertise to calibrate instruments available in an Industry.
- Impart knowledge on various working principles and design of Instruments.
- Understand calibration of measuring instruments for temperature.
- Understand the functioning of strain gauges for measuring pressure, load and vibrations.
- Apply calibration of measuring instruments of flow and speed measurement.

COURSE OUTCOMES : After completion of the course the student is able to

- Analyse errors, integrate and interpret different types of measurements (L3
- Understand how physical quantities are measured and how they are converted to electrical or other forms.(L2)
- Evaluate the measurement of speed in engineering applications and importance of speed measurement in instrumentation(L4).
- Visualize the areas affected with pressure in equipment and calibrate the pressure measuring devices(L3).
- Comprehend the level of liquid in any container and the various applications of measurement of flow (L4)
- Able to analyse Instrumentation and Control systems and their applications of various industries(L4)

LIST OF EXPERIMENTS (A minimum of 10 experiments to be conducted)

1. . Calibration of pressure gauges
2. Calibration of transducer for temperature measurements
3. Study and calibration of LVDT transducer for displacement measurements
4. Calibration of strain gauge
5. .Calibration of thermocouple for temperature measurements
6. . Calibration of capacitive transducer for angular displacement
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurements
9. Study and calibration of Rota meter for flow measurement
10. Study and use of a Seismic pick up for the measurement of vibration
11. Study and calibration of McLeod gauge for low pressure
12. . Measurement And Control Of **Temperature Loop** Of A Process Using Resistance Temperature Detector With SCADA

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080357: ADDITIVE MANUFACTURING TECHNOLOGIES

B.Tech. IV Year II Sem

L	T	P	C
3	0	0	3

PRE-REQUISITES: Manufacturing Process

COURSE OBJECTIVES:

- To provide in depth knowledge in different types of Rapid Prototyping systems and their applications in various fields.
- Understand the need of digital fabrication.
- Understand about Two dimensional layer by layer techniques.
- Know about extrusion based systems, post processing and the software issues involved in digital fabrication.
- Know the applications of digital fabrication.

To design and generate supporting structures for criticalcomponents

COURSE OUTCOMES:

1. An ability to identify thebasic concepts of Rapid Prototyping, its development and applications (L3).
2. Basic understanding ofprinciple behind different types of Rapid Prototyping methods (L2).
3. To innovative solutions for designing of supporting structures and to use standard practices (L4).
4. Distinguish between the various types of file problem (L3).
5. Summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems (L4).
6. Summarize typical rapid tooling processes for quick batch production of plastic and metal parts (L4).

UNIT – 1 INTRODUCTION

Need for Rapid Prototyping - Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital Prototyping - Classification of RP process- Virtual Prototyping- Rapid Tooling - Benefits- Applications

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Summarize the basic of AMT(L4)
- Explain the benefits of AMT (L3)

UNIT – 2LIQUID BASED ADDITIVE MANUFACTURING SYSTEMS

Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle,

photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Identify the different types of liquid based AMT (L5)

Explain the various types of liquid based AMT (L2)

UNIT-3 SOLID BASED ADDITIVE MANUFACTURING SYSTEMS

Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Explain the various types of solid based AMT (L2)
- Apply the LOM & FDM Process (L5)

UNIT – 4 POWDER BASED ADDITIVE MANUFACTURING SYSTEMS

Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Laser Engineered Net Shaping (LENS): Process, materials, products, advantages, limitations and applications– Case Studies.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Identify the different types of powder based AMT (L4)
- Apply the SLS & LENS Process (L5)

UNIT – 5 OTHER RAPID PROTOTYPING TECHNOLOGIES

Three-dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Shape Deposition Manufacturing (SDM): Introduction, basic process, shape decomposition, Mould SDM and applications.Selective Laser Melting, Electron Beam Melting – Rapid manufacturing.

LEARNING OUTCOME:

At the end of this unit, the students will be able to

- Understand other than basic AMT method (L2)
- Apply the new method in Various application (L3)

TEXT BOOK:

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

1. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", II[nd] edition, World Scientific Publishers, 2003.
2. Ali K. Kamrani, Emad Abouel Nasr, "Rapid Prototyping: Theory and practice", 3[rd] edition Springer, 2006.

REFERENCE BOOK:

1. D.T. Pham and S.S. Dimov, Rapid Manufacturing,1[st]edition Springer.
2. PaulF.Jacobs, Rapid Prototyping and Manufacturing,2[nd] edition, ASME.
3. Peter D.Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", 3[rd] edition, CRC press, 2000.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080358: FLEXIBLE MANUFACTURING SYSTEMS (FMA)

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES : None

COURSE OBJECTIVES

- Understanding of modern trends in design and manufacturing using CAD/CAM.
- Apply performance analysis techniques.
- Understand preventive maintenance procedures in manufacturing.
- Design models for manufacturing systems
- Apply the concept of system design procedures to different levels of production.

COURSE OUTCOMES:

- Describe the basic concepts of FMS (L2)
- Explain the FMS computer control (L2)
- Illustrate the computer control of the work center and assembly lines (L3)
- Interpret the simulation software (L3)
- Knowledge on group technology (L3)
- Applications of FMS in various fields (L3)

UNIT – 1

Introduction to FMS– development of manufacturing systems – benefits – major elements – types of flexibility – FMS application and flexibility –single product, single batch, n – batch scheduling problem – knowledge based scheduling system.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Describe the developments of manufacturing systems(L2)

Explain the importance of FMS (L2)

UNIT – 2

Introduction – composition of FMS– hierarchy of computer control –computer control of work center and assembly lines – FMS supervisory computer control – types of software specification and selection – trends.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Analyze the FMS computer control (L4)

Describe the software specifications of FMS (L2)

UNIT – 3

Application of simulation – model of FMS– simulation software – limitation – manufacturing data systems – data flow – FMS database systems – planning for FMS database.

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(AUTONOMOUS)

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Explain the simulation model for FMS (L2)
- Describe FMS database systems (L2)

UNIT – 4

Introduction – matrix formulation – mathematical programming formulation –graph formulation – knowledge based system for group technology – economic justification of FMS- application of possibility distributions in FMS systems justification.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Describe the mathematical programming formulation(L2)
- knowledge on group technology (L3)

UNIT – 5

FMS application in machining, sheet metal fabrication, prismatic component production – aerospace application – FMS development towards factories of the future – artificial intelligence and expert systems in FMS – design philosophy and characteristics for future.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Applications of FMS in various fields(L3)
- Assess the future of FMS(L5)

TEXT BOOK:

1. Jha, N.K. “Handbook of Flexible Manufacturing Systems”, Academic Press Inc., 1991.
2. Radhakrishnan P. And Subramanyan S., “CAD/CAM/CIM”, Wiley Eastern Ltd., New AgeInternational Ltd., 1994.

REFERENCE BOOK:

1. Raouf, A. And Ben-Daya, M., Editors, “Flexible Manufacturing Systems: Recent Development”, Elsevier Science, 1995.
2. Groover M.P., “Automation, Production Systems And Computer Integrated Manufacturing”,
3. Prentice Hall Of India Pvt., New Delhi, 1996.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080359: AUTOMATION IN MANUFACTURING

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES: None

COURSE OBJECTIVES:

- Lower Cost and Improve Time-to-Market
- Automation investment life-cycle analysis
- Empowered teams of talented employees
- Partnering with automation suppliers
- On-line process analysis
- Procedural process control
- Information integration and data warehousing

COURSE OUTCOMES: At the end of the course, the student will be able to

- Illustrate the basic concepts of automation systems (L3)
- Analyze the production Concepts and Mathematical Models (L4)
- Describe the importance of automated material handling and storage systems (L1)
- Analyze various automated flow lines, Explain assembly systems and line balancing methods(L4)
- Analyze the transfer lines and their applications (L4)
- Interpret the importance of Automated Assembly Systems (L3**)**

UNIT – 1

Introduction to Automation: Automation in Production Systems-Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies. Manufacturing operations, Production Concepts and Mathematical Models. Costs of anufacturing Operations, Basic Elements of an Automated Systems, Advanced Automation Functions,Levels of automation.

LEARNING OUTCOME:

After successful completion of the unit, students can able to

- Analyze the process of automation and types of automations (L4)
- Describe the functions of automation (L3)

UNIT – 2

Introduction to Material Handling: Overview of Material Handling Equipment, Considerations in Material Handling System Design, the 10 Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems. Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.

LEARNING OUTCOME:

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(AUTONOMOUS)

After successful completion of the unit, students can able to understand

- Design the Material Handling and storage systems (L5)
- Analysis the Material Transport Systems (L4)

UNIT – 3

Manual Assembly Lines: Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Designfor Assembly, Analysis of Single Model Assembly Lines, Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Design of material handling systems (L5)
- Describe automated storage and retrieval systems (L3)

UNIT – 4

Transfer lines: Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lineswith Storage Buffers.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Demonstrate the automated production lines (L3)
- Analysis of transfer lines (L4).

UNIT – 5

Automated Assembly Systems: Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi-Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Describe Assembly Systems (L1)
- Design of assembly systems (L5)

TEXT BOOK:

1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover/ PearsonEduction. 1st Edition.
2. CAD CAM: Principles, Practice and Manufacturing Management / Chris Mc Mohan, Jimmie Browne /Pearson edu. (LPE) 1st Edition.

REFERENCE BOOK:

1. Automation, Buckinghsm W, Haper& Row Publishers, New York, 1961
2. Automation for Productivity, Luke H.D, John Wiley & Sons, New York, 1972.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080360: PLANT LAYOUT MATERIAL HANDLING

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

Pre-requisites: -

COURSE OBJECTIVES

- Understand and be able to complete the following charts with regard to a specific Product, assembly chart,route sheet, operations process chart, from-to chart, and activity relationship chart.
- Identify equipment requirements for a specific process.
- Understand the benefit of an efficient material handling system.
- Understand the effect of process layout in the material handling system.
- Recommend improvements to existing plant layouts from the standpoint of material handling and productflow.

COURSE OUTCOMES :

- Understand the types of layouts, selection of layout type in a given scenario, ensuring flow of materials in aplant.(L2)
- Identify the role that each department plays in achieving the goals of an organization (L4)
- Explain the problems in organizing, planning and controlling the use of men, money, materials and machinesfor industrial production. (L2)
- Apply industrial engineering principles to solve the problems in organizing, planning and controlling the useof men, money, materials and machines for industrial production. (L3)
- Apply the group technology, and use of software for designing layouts.(L3)
- Understand proper material handling engineering techniques regarding hoisting and conveying equipment.(L2)

UNIT – 1

Plant Layout: Introduction- Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout. Process layout & Product layout: Selection, specification, Implementation and follow up, comparison of product and process layout.

LEARNING OUTCOME:

- Explain various types of plant layout (L2)
- Distinguish working principle of product and process layout.(L2)

UNIT – 2

Heuristics for Plant layout: – Automated design layout design program , Computerized Relationship Layout Planning,Computerized Relative Allocation of Facilities technique, Group Layout, Fixed position layout- Quadratic assignment model. Branch and bound method

LEARNING OUTCOME:

- Apply the knowledge of branch and bound method. (L3)
- Compare branch and bound method in material handling system. (L4)

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UNIT – 3

Material handling: Objectives of Material Handling, Material handling principles, Material handling equipment,systems and their classification, Relationship of material handling to plant layout.

LEARNING OUTCOME:

- 1.Explain various applications of material handling systems.(L2)
- 2.Describe the relationship of material handling to plant layout.(L1)

UNIT – 4

Basic Material Handling systems: Selection and Design of Handling System, Factors Affecting the selection of Materials Handling Equipment , Material Handling method- path, Method Oriented Systems , function oriented systems.

LEARNING OUTCOME :

- Discuss about material handling system and its real-time application. (L2)
- Examine material handling equipment and its functions.(L4)

UNIT – 5

Methods to minimize cost of material handling: Maintenance of Material Handling Equipment's, Safety in handlingErgonomics of Material Handling equipment. Design, Miscellaneous equipment's.

LEARNING OUTCOME :

- Compute methods to minimize cost of material handling. (L3)
- Outline the safety in material handling and ergonomics of material handling. (L1)

TEXT BOOK :

1. Operations Management/ PB Mahapatra/PHI First Edition
2. Plant Layout and Material Handling, James M. Apple, John Wiley & Sons, 1973. Second Edition

REFERENCE BOOK :

1. Facility Layout & Location an analytical approach/ RL Francis/ LF Mc Linnis Jr, White/ PHI. Fourth Edition.
2. Production and Operations Management/ R Panneerselvam/ PHI.
3. Introduction to Material handling/ Ray, Siddhartha/ New Age.
4. Plant Layout and Material Handling/RB Chowdary/Khanna Publishers.
5. Plant Maintenance and Reliability Engineering/NVS Raju/Cengage Learning.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080361: POWDER METALLURGY

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES: None

COURSE OBJECTIVES

- Importance of powder metallurgy and different powder production techniques
- Powder characteristics such as shape, size, and surface area
- Different compaction techniques
- Sintering mechanisms and treatment of powder metallurgy components
- Various applications of powder metallurgy components

COURSE OUTCOMES:

- Describe various ways of producing metal powders. (L2)
- The knowledge of metal powder characterization. (L3)
- Describe the various powder compaction process (L2)
- Select appropriate sintering techniques based on the requirement.(L1)
- Estimate the role of powder metallurgy component in various fields (L6)

UNIT – 1

Introduction: Importance of powder metallurgy. Comparison of powder metallurgy with other manufacturing techniques. Its scope and limitations. Methods of Powder Production: chemical reduction (tungsten, iron), carbonyl decomposition (iron, nickel), atomization (pure metal and multi component alloy powders), milling (oxides), electrolysis (elemental powders).

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Compare powder metallurgy with other manufacturing techniques (L4)
- Explain the methods for the production of metal powders (L2)

UNIT – 2

Characterization of Powders: Importance. Determining powder characteristics: particle shape, size and size distribution, specific surface area, apparent and tap density, angle of repose, green strength. compressibility / compatibility, powder conditioning.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Describe the Particle morphology: size, shape, characterization(L2)
- Explain Green strength and compatibility(L2)

UNIT – 3

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(AUTONOMOUS)

Consolidation of Metal Powders I - Compaction: Theory of consolidation; Pressure less powder shaping, pressure transmission in powders. Pressure dependence of densification. Die compaction and Isostatic pressing

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Describe the consolidation/shaping processes (L2)
- Calculate the density measurements of PM samples (L4)

UNIT – 4

Consolidation of Metal Powders II- Sintering: Mechanisms of solid state and liquid phase sintering. Factors affecting sintering. Properties of sintered parts. Hot isostatic pressing. Sinter forging. Defects in P/M route and their control, Treatment of powder metallurgy components.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Illustrate the mechanism of sintering (L3)
- Explain defects and treatment of PM components (L2)

UNIT – 5

Testing and quality control, metallic and ceramic P/M components: Applications of P/M products: Porous parts, self-lubricating bearings, dispersion strengthened materials, cermets, electrical materials, magneticmaterials.

LEARNING OUTCOME:

After successful completion of the unit, students can able to understand

- Applications of PM components in various fields (L3)
- Describe the components produced by PM route (L2)

TEXT BOOK:

1. Powder Metallurgy: science, technology and materials – Anish Upadhyaya, G.S. Upadhyaya,Universities Press (2011)
2. Power Metallurgy: science, technology and materials – P.C. Angelo, R. Subramanian, PrenticeHall India Learning Pvt. Ltd., (2008)

REFERENCE BOOK:

1. Volume 7: Powder Metallurgy, ASM Handbook – P.K. Samal and J. W. Newkird, ASM (2015)
2. Powder Metallurgy Science – R.M. German, Metal Powder Industry (1994)

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080362: COMPOSITE MATERIALS

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES: Manufacturing Process

COURSE OBJECTIVES

To impart knowledge on

- To understand the fundamentals, types and applications of composite materials and its mechanical behavior.
- To develop the knowledge incomposites and its processing techniques.
- To study composite mechanics and know the analysis of composite materials using FEM and optimization techniques.
- To develop the knowledge in nano composites and its processing techniques
- To understand the recent applications in composite materials.

COURSE OUTCOMES:

- An ability to identify the properties of various composites (L3).
- Demonstrate manufacturing techniques for various composites (L4).
- Basic understanding of composite mechanics for laminates (L1).
- Appreciate recent developments in nano composites, including metal polymer and ceramic matrix composites (L2).
- Distinguish between the various forms of fibres (L3).
- Describe the various uses of composite materials (L5).

UNIT – 1 BASIC OF COMPOSITE MATERIALS

Definition-Classification of composites based on reinforcement & matrix-Reinforcements -Types of fibers(Glass fibre, kevlarfibre, Carbon fibre, Organic fibre, whiskers)-Matrix Materials-Polymers(Thermoplastic and Thermosets).

LEARNING OUTCOME:

- Characteristics of composites (L2)
- Identify the various fibres (L2)

UNIT – 2 MANUFACTURING OF COMPOSITES-I

Processing of Polymer Matrix Composite-Hand layup & Spray technique - Filament winding – Pultrusion – Resin transfer moulding. Advantages and limitations of respective processes

LEARNING OUTCOME:

- Will be able to understand the various manufacturing process (L2)
- Characteristics of polymer composites (L2)

UNIT-3 MANUFACTURING OF COMPOSITES-II

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Metal Matrix Composite - Liquid-State Processes, In Situ Processes- Ceramic Matrix Composite-Cold Pressing and Sintering, Hot Pressing, Infiltration, Direct Oxidation, In Situ Chemical Reaction Techniques – Solgel – Advantages and limitations of respective processes.

LEARNING OUTCOME:

- Characteristics of metal matrix composites (L2)
- Understand the various processing technique (L3)

UNIT – 4 NANO COMPOSITES

Carbon/carbon composites-processing-properties-Nano Composites-Polymer clay nano composites- CNT basedcomposites - Self healing composites- Bio Composites-Hybrid composites - core-shell structure- sandwichcomposites.

LEARNING OUTCOME:

- Application of Nano composites (L4).
- Processing of bio composites (L3).

UNIT – 5 RECENT APPLICATIONS

Manufacturing defects & inspection - Applications in aircraft, Space, automotive & commercial; Carbon, CNT,graphene-based composites applications- Optimization of composites - Application of FEM for design and analysis ofcomposites – a case study.

LEARNING OUTCOME:

- Identify the manufacturing defects (L3).
- Learn the optimization methods (L4).

TEXT BOOK:

1. Krishnan K Chawla, Composite Materials: Science and Engineering, International Edition, Springer, 2012, ISBN:978-0-387-74364-6.
2. Mallick P.K., Fiber Reinforced Composites: Materials, Manufacturing and Design, 2nd edition, CRC press, New Delhi, 2010, ISBN:0849342058.

REFERENCE BOOK:

4. Jamal Y. Sheikh-Ahmad, Machining of Polymer Composites, 3rd edition, Springer, USA, 2009. ISBN: 978-0-387-35539-9.
5. Mallick, P.K. and Newman.S., Composite Materials Technology, 2nd edition, Hanser Publishers, 2003.
6. Harold Belofsky, Plastics, Product Design and Process Engineering, 3rd edition, Hanser Publishers, 2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080363: SURFACE ENGINEERING

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES: Manufacturing Process

COURSE OBJECTIVES: To impart knowledge on

- To explain the concept of Surface Engineering .
- Understand the importance of geometrical and mechanical of non – metallic coatings, i.e., Galvanizing, Spray and cladded coatings.
- To gain the Knowledge about chemical composition, physical vapor deposition and electronic vapor deposition.
- Understand the importance of Thin film coating technology and Plasma process.
- Detailed study of Surface engineering solution to specific problems.

COURSE OUTCOMES: After completion of the course the student is able to

- To understand the need of the surface coatings, enhancement of wear resistance and prevention of corrosion.
- To learn surface roughness and porosity measurement.
- To use the knowledge for aluminized, chromized and siliconized coatings.
- To explore the possible research, their applications in society and health core unit.
- Able to learn and understand the surface coatings.
- Development of design guidelines for surface preparation and its specific problems.

UNIT – 1 Development of Surface Engineering

Development of surface engineering, Solid surface, Geometrical and mechanical concepts, Types of Wear, Abrasive wear, Erosion wear, Corrosion wear, Surface roughness, Metallographic structure, Need for surface coatings, Enhancement of wear resistance and prevention of corrosion.

LEARNING OUTCOME:

- Identification of coating characteristics, hardness and surface roughness (L2)
- Classify the surface engineering process and metallographic structure(L5)

UNIT – 2 Concepts of Coatings

Concepts of coatings, Metallic and non-metallic coatings, Galvanizing, Spray and cladded coatings, Principal parameters of coatings, Coating thickness measurement, Physical and chemical parameters of coatings, , Surface roughness measurement, Profilometer, and porosity measurement..

LEARNING OUTCOME:

- Describe the metallic and non –metallic coatings. (L2)
- Compare the electron beam technology and its principles (L1)

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UNIT-3 DIFFUSION COATINGS

Process fundamentals, advantages, limitations and applications of carburizing liquid nitriding, carbonitriding, nitro carburizing, and boronizing. Aluminized, chromized, and siliconized coatings.

LEARNING OUTCOME:

- Explain various process fundamentals, advantages, limitations and applications of diffusion coatings.(L3)
- Development the carburizing liquid nitriding, carbo nitriding and nitro carburizing.(L4)

UNIT – 4 THIN FILM COATING TECHNOLOGY & PLASMA PROCESS

Thin Film Coating Technology: Chemical vapor deposition (CVD); Physical Vapor Deposition (PVD); Electron beam evaporation; magnetron sputtering; diamond like carbon coating technology; sol – gel coating technologies.

Plasma Processes: Plasma carburizing and plasma nitriding; plasma immersed ion implantation; plasma enhanced physical vapor deposition; plasma enhanced chemical vapor deposition

LEARNING OUTCOME:

- Application of diamond like carbon coating technology and sol – gel coating technologies.(L4).
- Processing of plasma enhanced chemical vapour deposition. (L3).

UNIT – 5 GENERAL DESIGN PRINCIPLESCLASSES:09

General design principles related to surface engineering, design guidelines for surface preparation, surface engineering solution to specific problems.

LEARNING OUTCOME:

- Learn the design guidelines for surface preparation. (L3).
- To learn specific problem of surface engineering solution (L4).

TEXT BOOK:

1. K G Budinski, Surface Engineering for wear resistance, Prentice Hall, New Jersey, 1998.
2. Surface Engineering, Process fundamentals and applications, Vol I and II, Lecture Notes of SERC school of Surface Engineering.

REFERENCE BOOK:

1. Howard E. Boyer (Editor), Case Hardening of Steel, ASM International, metals Park, OH 44073.
2. Surface Modification Technologies Vol. XI and XII, Editors: T. Sudarshan et al – TMS Conference Proceedings.
3. Plasma Surface Engineering, (2004), Proceedings of DAE-BRNS workshop.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2080364: NANO MATERIALS

B.Tech. IV Year II SEM

L	T	P	C
3	0	-	3

PRE-REQUISITES: Manufacturing Process

COURSE OBJECTIVES: To impart knowledge on

- Understand and use the properties of Nano-materials in diverse fields.
- Gain knowledge about the Nanomaterials, their properties, behaviour, interaction and use of them over many discipline of science.
- The emphasis of the course is to understand the physics of Nanomaterials in detail and to explore the wide application.
- Highlights of the course is to provided virtual way of understanding the courses materials. Specially the application-based approach.

COURSE OUTCOMES: After completion of the course the student is able to

- Understand the constituents of matter, nanomaterials, properties and usefulness.
- Able to learn and understand the basic behaviour of Nanomaterials.
- Able to compete with Nanomaterials in detail and to explore the wide application.
- Able to use the knowledge for higher study and research.
- Able to explore the possible physics research, their applications in society and health care unit.
- Understand the process of Nano-electromechanical systems, Nano sensors and Nano Optics.

UNIT – 1 FUNDAMENTALS OF NANOMATERIALS

Introduction to Nanomaterials, Definition of Nano, Atomic Structure and atomic size, significance of nano material over micro/macro, size dependent properties. Importance of surface at Nanoscale, Significance of Particle shape and Size in Nanomaterials, Surface to Volume Ratio, Particle orientation.

LEARNING OUTCOME:

- Characteristics of composites (L2)
- Identify the various fibres (L2)

UNIT – 2 ENERGIES AT THE NANOSCALE

Surface energy, surface energy of Liquids, surface energy of solids, Surface energy of crystallographic planes in fcc & bcc, surface energy minimization mechanism.

LEARNING OUTCOME:

- Will be able to understand the various manufacturing process (L2)
- Characteristics of polymer composites (L2)

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UNIT-3 NANOSTRUCTURED MATERIALS

Zero Dimensional: Nano particles through homogenous nucleation; Nano particles through heterogeneous nucleation, Quantum Dots; One Dimensional: Nano wires and nano rods, Two dimensional: Fundamentals of film growth; Carbon Nanotubes. Hierarchal structure, Quantum size effect and scaling law.

LEARNING OUTCOME:

- Characteristics of metal matrix composites (L2)
- Understand the various processing technique (L3)

UNIT – 4 NANO COMPOSITESCLASSES :09

Carbon/carbon composites-processing-properties-Nano Composites-Polymer clay nano composites- CNT basedcomposites - Self healing composites- Bio Composites-Hybrid composites - core-shell structure- sandwichcomposites

LEARNING OUTCOME:

- Application of Nano composites (L4).
- Processing of bio composites (L3).

UNIT – 5 ESSENTIALS OF NANOSCIENCE

Nano-electromechanical systems, Nano sensors, Nano Optics, Nano-electronics, Nano medicine, environmental, health and safety issues.

LEARNING OUTCOME:

- Identify the manufacturing defects (L3).
- Learn the optimization methods (L4).

TEXT BOOK:

1. Nanostructured materials: Processing, Properties and Potential Applications. Edited by C.C. Koch, Nayes Publications(2002)
2. Structural nanocrystalline Materials: Fundamentals & Applications , by C.C.Koch I.A. Ovidika, S.Seal , and S.Veprek, Vambridge University Press(2011).

REFERENCE BOOK:

1. K G Budinski, Surface Engineering for wear resistance, Prentice Hall, New Jersey, 1998.
2. Surface Engineering, Process fundamentals and applications, Vol I and II, Lecture Notes of SERC school of Surface Engineering.
3. Howard E. Boyer (Editor), Case Hardening of Steel, ASM International, metals Park, OH 44073.