JNTUH COLLEGE OF ENGINEERING HYDERABAD (AUTONOMOUS)
Integrated Dual Degree Programme (IDP)
(B.Tech +M.Tech) (Thermal Engineering)
(MECHANICAL ENGINEERING)
COURSE STRUCTURE

I Year I Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	BSC	Matrix Algebra and Calculus	3	1	0	4
2	BSC	Engineering Physics	3	1	0	4
3	ESC	Programming For Problem Solving	3	0	0	3
4	ESC	Classical Mechanics	3	1	0	4
5	BSC - LC	Engineering Physics Lab	0	0	3	1.5
6	ESC – LC	Programming For Problem Solving Lab	0	0	3	1.5
Total Credits						18

I Year II Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	BSC	Applied & Multi Variable Calculus	3	1	0	4
2	BSC	Engineering Chemistry	3	1	0	4
3	ESC	Engineering Graphics	1	0	3	2.5
4	HSMC	English	2	0	0	2
5	BSC –LC	Engineering Chemistry Lab	0	0	2	1
6	ESC- LC	Engineering Workshop Practice	0	0	3	1.5
7	HSMC - LC	English Language and Communication Skills Lab	0	0	2	1
8	ESC	Applied Python Programming Lab	0	1	2	2
Total Credits						18

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COURSE STRUCTURE

II Year I Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	BSC	Probability Distributions and Complex Variables	3	1	0	4
2	PCC – 1	Mechanics of Solids	3	0	0	3
3	PCC – 2	Material Science & Metallurgy	3	0	0	3
4	PCC – 3	Manufacturing Technology	3	0	0	3
5	PCC – 4	Thermodynamics	3	1	0	4
6	ESC – LC	Machine Drawing Practice	1	0	2	2
7	LC – 1	Manufacturing Technology Lab	0	0	2	1
8	LC – 2	Material Science & Mechanics of Solids Lab	0	0	2	1
9	*MC	Environmental Science	2	0	0	0
Total Credits						21

II Year II Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	ESC	Basics of Electrical & Electronics Engineering	3	0	0	3
2	PCC - 5	Kinematics of Machinery	3	1	0	4
3	PCC - 6	Thermal Engineering-I	3	0	0	3
4	PCC - 7	Fluid Mechanics and Hydraulic Machinery	3	0	0	3
5	PCC - 8	Instrumentation & Control Systems	3	0	0	3
6	LC - 3	Instrumentation & Control Systems Lab	0	0	2	1
7	ESC - LC	Basics of Electrical & Electronics Engineering Lab	0	0	2	1
8	LC - 4	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	1
9	ESC	Numerical Methods using MATLAB	1	0	2	2
10	*MC	Constitution of India	2	0	0	0
Total Credits						21

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III Year I Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	PCC - 9	Metrology & Machine Tools	3	0	0	3
2	PCC - 10	Design of Machine Elements - I	3	0	0	3
3	PCC - 11	Dynamics of Machinery	3	1	0	4
4	PCC - 12	Thermal Engineering - II	3	0	0	3
5	PEC - 1	Professional Elective - I	3	0	0	3
6	HSMC	Business Economics and Financial Analysis	3	0	0	3
7	LC - 5	Thermal Engineering - I Lab	0	0	2	1
8	LC - 6	Metrology & Machine Tools Lab	0	0	2	1
9	LC - 7	Kinematics & Dynamics Lab	0	0	2	1
10	*MC	Introduction to Artificial Intelligence	2	0	0	0
Total Credits						22

III Year II Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	PCC - 13	Industrial Management	3	0	0	3
2	PCC - 14	CAD /CAM	3	0	0	3
3	PCC - 15	Heat Transfer	3	1	0	4
4	PCC - 16	Design of Machine Elements - II	3	0	0	3
5	PEC - 2	Professional Elective – II	3	0	0	3
6	OEC - 1	Open Elective – I	3	0	0	3
7	LC – 8	Heat Transfer Lab	0	0	2	1
8	LC – 9	Thermal Engineering – II Lab	0	0	2	1
9	HSMC - LC	Advanced English Communication Skills Lab	0	0	2	1
10	*MC	Introduction to Cyber Security	2	0	0	0
Total Credits						22

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COURSE STRUCTURE

IV Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	OE-C (UG)	Open Elective -2	3	0	0	3
2.	PCC (UG)	Automation in Manufacturing	3	0	0	3
3.	PEC-III (UG)	Additive Manufacturing Tribology Geometric Modeling	3	0	0	3
4.	MINI UG	Mini Project / Summer Internship	0	0	2	2
5.	PROJ	Project Stage –I	0	0	6	3
6.	LC-CE-9	Material Testing and Evaluation Lab	0	0	2	1
7.	PC (PG)-1	Advanced Thermodynamics	3	0	0	3
8.	PEC-4 (UG)	Power Plant Engineering Automobile Engineering Renewable Energy Sources	3	0	0	3
9.	PEC-5 (UG)	Industrial Management Concurrent Engineering Composite Materials	3	0	0	3
10.	PG (LAB) -1	Advanced Thermal Engineering Lab	0	0	4	2
Total Credits						**26**

IV Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PC (PG)-2	Computational Fluid Dynamics	3	0	0	3
2.	PC (PG)-3	Advanced IC Engines	3	0	0	3
3.	PE (PG) –1	Equipment Design for Thermal Systems Electric and Hybrid Vehicles Fuels and Combustion	3	0	0	3
4.	PE (PG) – 2	Advanced Fluid Mechanics Gas Dynamics Advanced Materials for Thermal Systems	3	0	0	3
5.	PE (PG) -3	Finite Element Analysis Advanced Power Plant Systems Computer Simulation of IC Engines	3	0	0	3
6.	UG	Project Stage-II	0	0	16	8
7.	PG (Lab)- 2	Computational Fluid Dynamics Lab	0	0	4	2
8.	MC	Research Methodologies & IPR	2	0	0	2
Total Credits						27

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(Thermal Engineering) COURSE STRUCTURE

V Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PC (PG) – 4	Advanced Refrigeration and Air Conditioning	3	0	0	3
2.	PE (PG) – 4	Cryogenic Engineering	3	0	0	3
		Experimental Methods in Thermal Engineering				
		Energy Conservation and Management				
3.	OEC (PG)-1	Open Elective -1 (PG)	3	0	0	3
4.	PG	Dissertation Phase-I	0	0	20	10
5.	PG (LAB)-3	Advanced R & A/C Lab	0	0	4	2
Total Credits						21

V Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PG	Project Stage – 2	0	0	32	16
Total Credits						16

Professional Elective-I

1. Industrial Robotics
2. Mechanical Vibrations
3. Tribology

Professional Elective –II

1. Unconventional Machining Processes
2. Machine Tool Design
3. Operations Research

Professional Elective –III

1. Additive Manufacturing
2. Automation in Manufacturing
3. MEMS

Professional Elective-IV

1. Power Plant Engineering
2. Automobile Engineering
3. Renewable Energy Sources

Professional Elective –V

1. Computational Fluid Dynamics
2. Turbo Machinery
3. Refrigeration & Air Conditioning

Professional Elective –VI

1. Production Planning & Control
2. Industrial Engineering Practices
3. Total Quality Management

Open Elective-I

1. Hybrid And Electric Vehicles

Open Elective-II

1. Quality Management & Six Sigma Applications

Open Elective-III

1. Smart Materials

Open Elective (PG)

1. Waste to Energy

MATRIX ALGEBRA AND CALCULUS

I Year B.Tech. I-Sem

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge of 12^{th} / Intermediate level

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigenvalues and Eigenvectors and to reduce the quadratic form to canonical form
- Methods of solving the differential equations of first and higher order.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.

Course Outcomes:

After learning the contents of this paper, the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigenvalues and Eigenvectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- 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
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions

Evaluation of improper integrals using Beta and Gamma functions.

UNIT-I: Matrices

Matrices: Rank of a matrix: Echelon form, Normal form. System of linear equations: solving system of Homogeneous and Non-Homogeneous equations, Gauss-elimination method, LU Decomposition method.

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties, Eigenvalues and Eigenvectors of Symmetric, Hermitian, Skew-Symmetric, Skew-Hermitian, Orthogonal and Unitary matrices.

UNIT-II: Diagonalization of a Matrix

Diagonalization of a matrix. Cayley - Hamilton Theorem (without proof), Finding inverse and power of a matrix by Cayley - Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms: Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Mean value theorems and Beta, Gamma functions

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. (All Theorems without proof).

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV: First Order ODE

Exact differential equations, converting non-exact equations to exact equations, Linear and Bernoulli's differential equations. Applications: Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories and electrical circuits. First order equations with higher degree: solvable for the differential coefficient, dependent variable and Independent variable.

UNIT-V: Ordinary Linear Differential Equations of Higher Order

Second order linear differential equations with constant coefficients - Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$ - method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation. Applications: Electrical circuits.

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.

References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010

ENGINEERING PHYSICS

I Year B.Tech. I-Sem

L	T	P	C
3	1	0	4

Course Objectives:

The course enables the students to understand:

1. Fundamental properties of free, damped and forced harmonic oscillators.
2. The concepts of wave optics for the exploration of inference, diffraction and polarization.
3. Lasing action and study various types of lasers and to learn fundamental principles of Optical fibres.
4. The concepts of various theories of solids and the classification of materials into three groups.
5. Principles, fabrication and characterization of nano materials.

Course Outcomes:

The student should be able to gain knowledge on:

1. Formulation of differential equations that describe the behaviour of oscillators under various conditions.
2. The Principle of optical phenomenon like interference, diffraction and polarization of light.
3. Various types of lasers and transmission characteristics of fibre optics.
4. Classical, Quantum and band theories on electrical behavior of solids and their classifications.
5. Origin, fabrication and characterization of nano materials.

UNIT-I: OSCILLATIONS & WAVES

Oscillations: Introduction, Oscillations-Simple harmonic oscillations, Simple harmonic motion–Energy function, Simple harmonic motion-Equation, Oscillations of a spring, Torsional pendulum, Projection of a uniform circular motion, Combination of simple harmonic motions, Damped harmonic motion, Forced oscillations, Resonance.

Waves: Mechanical waves and types of waves, Travelling wave equation, Wave speed – Dimensional method, Wave speed-Mechanical method, Power and intensity of a wave, Standing waves, Waves in string-Laws of transverse vibration, Verification of laws of transverse vibration-Sonometer, Melde's apparatus

UNIT-II: OPTICS

Interference and Diffraction: Introduction, Huygen's principle, Superposition of waves, Interference of light by wave front splitting- Young's double slit experiment, Amplitude splitting-Newton's rings, Fresnel and Fraunhofer diffractions, Fraunhofer diffraction at a single slit and double slit, Diffraction grating.

Polarization: Introduction to polarization, Polarized and unpolarised light, Types of polarization: Plane polarized, Circularly polarized and Elliptically polarized light, Polarizer and Analyser: Production and Detection of linearly polarized light, Malus law.

UNIT-III: LASERS AND FIBRE OPTICS

Lasers: Introduction, Laser Beam Characteristics, Interaction of light with matter and the three Quantum Processes, Einstein Coefficients and their relations, Light Amplification, Components of Laser, Three requirements for Lasing Action, Pumping Methods, Types of Lasers: Ruby Laser, He-Ne Laser, Semiconductor Laser, Applications of laser.

Fibre Optics: Introduction to Optical Fibre, Total Internal Reflection, Construction of optical fibre, Acceptance angle - Numerical Aperture, Classification based on materials, Refractive index profile and mode propagation, Losses in Optical Fibre, Fibre Optic Communication System, Merits of Optical Fibres, Applications.

UNIT-IV: ELECTRON THEORY OF SOLIDS

Classical and Quantum theories: Introduction, Free electron theory of metals, Classical and quantum free electron theory, Estimation of Fermi energy, Dependence of Fermi level on temperature, Density of states

Band theory of solids: Bloch's theorem, Kronig – Penny model, E-K diagram, Effective mass of electron, Origin of energy bands, Classification of materials on the basis of energy bands.

UNIT-V: NANOMATERIALS

Introduction, nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up Fabrication: Sol-Gel, Precipitation, Combustion Methods, Top-Down Fabrication: Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques: XRD, SEM &TEM, Applications of nanomaterials.

Text Books:

1. Principles of Physics, Jearl Walker, David Halliday and Robert Resnick- Wiley publications.
2. A textbook of Engineering Physics, Dr. M.N. Avadhanulu, Dr. P.G Kshirsagar – S.Chand.
3. Engineering Physics, R.K. Gaur - S.L.Gupta, Dhanpat Rai & Sons

References:

1. Introduction to Solid State Physics by Charles Kittel, Wiley student edition.
2. Ajoy Ghatak, "Optics", Mc Graw-Hill Education, 2012.
3. Applied Physics by P.K.Mittal, I.K.International.
4. Introduction to Nanotechnology, Charles P.Pode, Jr.Frank J.Owens, Wiley-India Edition.

PROGRAMMING FOR PROBLEM SOLVING

I Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

Prerequisites: Nil

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

Course Outcomes:

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test, a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs. Searching and sorting problems.

UNIT – I:

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

Introduction to C Language: Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT – II:

Statements: if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

Designing Structured Programs: Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

UNIT – III:

Arrays and Strings: Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

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UNIT – IV:

Pointers: Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Input and Output: Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

UNIT – V:

Derived types: Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

SortingandSearching: Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

Text Books:

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in Cby J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

Reference Books:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

CLASSICAL MECHANICS

I Year B.Tech. I-Sem

L	T	P	C
3	1	0	4

Course Objectives:

- To understand the resolving forces and moments for a given force system.
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid and second moment of area

Course Outcomes:

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

- Resolve forces and moments for a given system.
- Analyze the friction for moving bodies.
- Determine centroid and second moment for a given area of a body.

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.

UNIT-II:

Friction: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions - Motion of Bodies-Wedge Screw, Screw-jack and differential screw –jack

UNIT-III:

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

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, Product of Inertia, Transfer Formula for Product of Inertia.

UNIT-V:

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.

TEXT BOOKS:

1. Singer's Engineering Mechanics Statics and Dynamics by K. Vijaya Kumar Reddy and J. Suresh Kumar, BS Publications, 3rd Edition (SI Units) Fifth impression 2013.
2. Engg. Mechanics by Irving Shames, G. Krishna Mohan Rao, Prentice Hall

REFERENCE BOOKS:

1. Engineering Mechanics by Timoshenko & Young
2. Engineering Mechanics by Umesh Regl, Tayal.
3. A text of Engineering Mechanics by YVD Rao, K. Govinda Rajulu, M. Manzoor Hussain, Academic Publishing Company
4. Text Book in Applied Mechanics by Malhotra, Subramanian, Gahlot and Rathore, New Age.
5. Engineering Mechanics by KL Kumar, Tata McGraw Hill.
6. Engineering. Mechanics by M.V. Seshagiri Rao & D Rama Durgaiah.
7. Engineering Mechanics by S.S. Bhavikati & K.G. Rajasekharappa

ENGINEERING PHYSICS LAB

I Year B.Tech. I-Sem

L	T	P	C
0	0	3	1.5

Course Objectives:

The course enables the students to understand:

1. The concepts of mechanical waves and their resultant phenomena.
2. The phenomena of interference using Newton's rings and diffraction phenomena using diffraction grating.
3. The electrical resonance using LCR circuit.
4. The band concept of semiconductor diode and light phenomenon of Lasers and Optical fibres.

Course Outcomes:

By the end of the course students will be able to:

1. Understand the mechanical waves concepts and elastic properties.
2. Understand the light phenomena such as interference and diffraction.
3. Confirm the resonance produced by electrical waves.
4. Understand the band gap of semiconductor and certain characteristics of lasers and optical fibres.

List of Experiments:

1. Melde's experiment: Determination of the frequency of a vibrating bar or turning fork using Melde's arrangement.
2. Torsional pendulum: Determination of the rigidity modulus of the material of the given wire using torsional pendulum.
3. Newton's rings: Determination of the radius of curvature of the lens by forming Newton's rings.
4. Diffraction grating: Determination of the number of lines per inch of the grating.
5. Dispersive power: Determination of the dispersive power of prism by using spectrometer.
6. Coupled Oscillator: Determination of the spring constant by single coupled oscillator.
7. LCR Circuit: Determination of quality factor and resonant frequency of LCR circuit.
8. LASER: The characteristics of LASER sources.
9. Optical fibre: Determination of the bending losses of Optical fibres.
10. Optical fibre: Determination of the Numerical aperture of a given fibre.
11. Sonometer: Determination of the AC frequency.
12. Energy gap of PN Junction diode: determination energy gap of a semiconductor diode

Note: Any 8 experiments are to be performed by each student

PROGRAMMING FOR PROBLEM SOLVING LAB

I Year B.Tech. I-Sem

L	T	P	C
0	0	3	1.5

Course Objectives

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

Course Outcomes

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.

   Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. 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)

Week 3:

9. Write a C program to find both the largest and smallest number in a list of integers. 10.Write a C program that uses functions to perform the following:

   i) Addition of Two Matrices

   ii) Multiplication of Two Matrices

Week 4:

11. Write a C program that uses functions to 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.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+ \quad +x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

Week 6:

18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

20. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers

    (Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.

ii) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

22. i)Write a C program to display the contents of a file.

ii) 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)

Week 9:

i) Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort

Week 10:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
i) Linear search ii) Binary search

TEXT BOOKS:

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in Cby J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI, Pearson Education

REFERENCE BOOKS:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

APPLIED AND MULTI VARIABLE CALCULUS

I Year B.Tech. II-Sem

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge of 12^{th} / Intermediate level

Course Objectives: To learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course Outcomes**:**

After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: Laplace transforms:

Laplace Transforms; Laplace Transform of standard functions, first shifting theorem,Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions,Inverse Laplace transform by different methods, convolution theorem (without proof), solving Initial value problems by Laplace Transform method.

UNIT-II: Partial Derivatives and applications

Definitions of Limit and continuity. Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence, Maxima and minima of functions of two variables and three variables, method of Lagrange multipliers.

UNIT-III: Multiple Integration

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form). Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

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. M Apostol , Calculus vol-2, John Wiley & Sons

References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
   S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984

ENGINEERING CHEMISTRY

I Year B.Tech. II-Sem

L	T	P	C
3	1	0	4

Course Objectives**:**

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To acquire the knowledge of water treatment, electrochemistry and corrosion which are essential for the Engineers and in industry.
3. To acquire the skills pertaining to Polymers and Energy sources to apply them for various engineering fields etc.
4. To impart then knowledge of Engineering materials and their aspects useful for understanding material chemistry.

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

1. Differentiate hard and soft water; solve the related problems on water purification and its significance in industry and daily life.
2. Understand the principles, concepts of electrochemistry and causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.
3. The required skills to get clear concepts on polymers and energy sources and their applications to various engineering fields etc.
4. The knowledge of engineering materials such as Portland cement, white cement, concrete and lubricants etc

Unit-1: 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. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination, breakpoint chlorination, Ozonisation. Boiler troubles - Scale, Sludge, Priming, Foaming and Caustic embrittlement. Treatment of boiler feed water by Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water- Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems based on Determination of hardness of water.

Unit-2: Electrochemistry And Corrosion:

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. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. 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. Numerical problems.

Unit-3: Polymeric Materials:

Polymers: Definition, Monomer, functionality and degree of polymerisation. Classification – Types of Polymerisation - Addition & Condensation – Mechanisms of Polymerisation. Plastics: Definition, characteristics - Compounding and fabrication- Methods of Moulding - Thermoplastics and Thermosets – Preparation, properties and applications– PVC, Teflon and Bakelite. Fibres: Definition, Characteristics. Preparation, Properties and applications of Terylene, Nylon 6:6. Elastomers: Definition and characteristics. Natural rubber- structure, processing of latex, Vulcanisation. Preparation, properties and applications of BuNa-S and Butyl rubber. Conducting Polymers- Definition, Classification. Mechanism of conduction in Polyacetylene, Polyaniline & Applications. Biodegradable polymers - Concept, Synthetic and Natural polymers, Polylactic acid, Poly Vinyl alcohol, Nylon-2 and Nylon – 6. Applications and advantages of biodegradable polymers.

Unit-4: Energy Sources:

Fuels: Definition, classification with examples. Calorific value. Determination of calorific value by Junker's gas Calorimeter. Characteristics of good fuel. Coal: Types- Analysis of coal-proximate analysis. Petroleum- Refining- Fractional distillation- composition, properties and uses of petrol, diesel and kerosene. Cracking-types, Moving bed catalytic cracking. Knocking - Octane and Cetane rating, Composition, characteristics and uses of LPG, CNG. Biodiesel-Transesterification. Advantages. Hydrogen fuel- Production, storage, advantages and limitations. Combustion - Definition, Calculation of air required for the combustion of fuel, numerical problems related to calorific value and combustion

Unit-5: Engineering Materials:

Portland cement: Composition and constituents. Setting and hardening of cement, special cements- properties and uses of High alumina cement, White cement and water proof cement. RCC, Decay of Concrete. Refractories: Classification, Properties - Refractoriness, RUL, Chemical inertness and porosity. Characteristics of a good refractory. Engineering Applications. Failure of a refractory. Lubricants: functions of lubricants, Classification, Mechanism of Lubrication, Properties - Viscosity, Acid value, Flash & Fire point, Cloud & Pour point, Aniline point.

Text Books:

1. Engineering Chemistry – PC Jain and M Jain – Dhanpath Rai and Sons, New Delhi.

Reference Books:

1. Text book of Engineering Chemistry by Ramadevi, Venkata Ramana Reddy & Prashanth Rath, Cengage learning publications.
2. A text book of Engineering Chemistry by Thirumala Chary, Laxminarayana, Shashikala. Pearson Publications.

ENGINEERING GRAPHICS

I Year B.Tech. II-Sem

L	T	P	C
1	0	3	2.5

Pre-requisites: Nil

Course objectives:

- To provide basic concepts in engineering drawing
- To impart knowledge about standard principles of orthographic projection of objects
- To draw sectional views and pictorial views of solids

Outcomes:

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

- Prepare working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT–I:

INTRODUCTION TO ENGINEERING DRAWING:

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain, Diagonal and Vernier Scales.

UNIT-II:

ORTHOGRAPHIC PROJECTIONS:

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

UNIT–III:

Projections of Regular Solids – Auxiliary Views.

UNIT–IV:

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT–V:

ISOMETRIC PROJECTIONS:

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only

TEXT BOOKS:

1. Engineering Drawing by N.D. Bhatt, Charotar
2. Engineering Drawing and Graphics by Rane and Shah, Pearson Edu.

REFERENCE BOOKS:

1. A Text Book of Engineering Drawing by Dhawan R K, S. Chand
2. Engineering Graphics with Auto CAD by James D Bethune, Pearson Edu.
3. Engineering Graphics by K R Mohan, Dhanpat Rai.
4. Text book on Engineering Drawingby KL Narayana, P Kannaih, Scitech

ENGLISH

I Year B.Tech. II-Sem

L	T	P	C
2	0	0	2

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

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

Course Objectives

The course will help students to

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

Course Outcomes

Students should be able to

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

(Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open- ended, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the class.)

Unit –I

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

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.

Unit –II

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, Job Application with Resume.

Unit –III

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: Writing Introduction and Conclusion - Essay Writing.

Unit –IV

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading.

Writing: Writing Practices---Précis Writing.

Unit –V

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.

Note: Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.

References:

i. Practical English Usage. Michael Swan. OUP. Fourth Edition 2016.

ii. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2018.

iii. English: Context and Culture by Board of Editors published by Orient BlackSwan Pvt. Ltd.

iv. Remedial English Grammar. F.T. Wood. Macmillan.2007.

v. On Writing Well. William Zinsser. Harper Resource Book. 2001

vi. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.

vii. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press

ENGINEERING CHEMISTRY LAB

I Year B.Tech. II-Sem

L	T	P	C
0	0	2	1

I. Volumetric Analysis:

1. Estimation of Ferrous iron by Dichrometry method.
2. Estimation of Ferrous iron by Permanganometry method.
3. Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry:

1. Estimation of the concentration of an acid by Conductometry.

III. Potentiometry:

1. Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. *p*H Metry:

1. Determination of an acid concentration using *p*H meter.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon-6.

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation Saponification value of a lubricant oil.
3. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion:

1. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

Recommended Books:

1. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
2. Laboratory Manual of Engineering Chemistry by Y. Bharathi Kumari & Jyotsna C, VGS Booklinks, Vijayawada, 2009.
3. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).
4. Engineering Chemistry Lab Manual by Cengage Publications.

ENGINEERING WORKSHOP PRACTICE

I Year B.Tech. II-Sem

L	T	P	C
0	0	3	1.5

Pre-requisites: Practical skill

Course Objectives: The objectives of this course is to acquire knowledge on the

i. To impart hands-on practice on Carpentry trade and skills.
ii. To impart hands-on practice on Fitting trade and skills
iii. To impart hands-on practice on Black Smithy trade and skills
iv. To impart hands-on practice on House Wiring trade and skills
v. To impart hands-on practice on Tin Smithy trade and skills
vi. To impart hands-on practice on Plumbing trade and skills

Note: At least two exercises to be done from each trade.

A. Carpentry
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint

B. Fitting
1. Vee Fit
2. Square Fit
3. Half Round Fit

C. Black Smithy
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring

D. House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting

E. Tin Smithy
1. Taper Tray
2. Open Scoop
3. Funnel

F. Plumbing
1. Coupling Joint
2. Elbow Joint
3. T Joint

TEXT BOOKS:

1. Workshop Practice by B.L.Juneja Cengage Learning
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I Year B.Tech. II-Sem

L	T	P	C
0	0	2	1

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives

 To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

 To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm

 To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking

 To improve the fluency of students in spoken English and neutralize their mother tongue influence

 To train students to use language appropriately for public speaking and interviews

Course Outcomes

Students will be able to attain

 Better understanding of nuances of English language through audio- visual experience and group activities

 Neutralization of accent for intelligibility

 Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

Listening Skills

Objectives

1. To enable students, develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right

- Intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

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

 The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab**)**

Exercise – I:

CALL Lab:

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

ICS Lab:

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

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 in Context.

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:

1. Introduction to Interview Skills.
2. Common errors in speaking.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

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

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

APPLIED PYTHON PROGRAMMING LAB

I Year B.Tech. II-Sem

L	T	P	C
0	1	2	2

Cycle - 1

1. **Downloading and Installing Python and Modules**
   a) **Python 3 on Linux**
   Follow the instructions given in the URL https://docs.python-guide.org/starting/install3/linux/
   b) **Python 3 on Windows**
   Follow the instructions given in the URL https://docs.python.org/3/using/windows.html
   (Please remember that Windows installation of Python is harder!)
   c) **pip3 on Windows and Linux**
   Install the Python package installer by following the instructions given in the URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) **Installing numpy and scipy**
   You can install any python3 package using the command pip3 install <packagename>
   e) **Installing jupyterlab**
   Install from pip using the command pip install jupyterlab
2. **Introduction to Python3**
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. **Defining and Using Functions**
   a) Write a function to read data from a file and display it on the screen
   b) Define a boolean function *is palindrome*(<input>)
   c) Write a function *collatz(x)* which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$
   d) Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that computes the Normal distribution
4. **The package** numpy
   a) Creating a matrix of given order $m \times n$ containing *random numbers* in the range 1 to 99999
   b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
   c) Write a program to solve a system of n linear equations in n variables using matrix inverse
5. **The package** scipy **and** pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through a set a data points using *polyfit* function
   d) Plotting a histogram of a given data set
6. **The** strings **package**
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all n letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi
   a) Installation using PiImager
   b) Installation using image file
      - Downloading an Image
      - Writing the image to an SD card
        - using Linux
        - using Windows
      - Booting up

   Follow the instructions given in the URL
   https://www.raspberrypi.com/documentation/computers/getting-started.html
8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
      First, update your repositories list:
      sudo apt update
      Then install the package for Python 3:
      sudo apt install python3-gpiozero
   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED

      Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
   a) DHT Sensor interface
   - Connect the terminals of DHT GPIO pins of Raspberry Pi.
   - Import the DHT library using ***import Adafruit_DHT***
   - Read sensor data and display it on screen.

PROBABILITY DISTRIBUTIONS AND COMPLEX VARIABLES

II Year B.Tech. I-Sem

L	T	P	C
3	1	0	4

Pre-requisites: Mathematics courses of first year of study.
Objectives: To learn

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

Course outcomes:

After learning the contents of this paper the student must be able to

- Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
- Apply concept of estimation and testing of hypothesis to some case studies.
- Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- Taylor's and Laurent's series expansions of complex function

UNIT-I: Basic Probability

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

UNIT-II: Probability Distributions

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

UNIT-III: Estimation & Tests of Hypothesis

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

UNIT-IV: Complex Differentiation

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

UNIT-V: Complex 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 without Proof)

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability And Statistics For Engineers And Scientists, 9th Edition, Pearson Publications.
3. A First Course In Complex Analysis , D Zill,

References

1. Fundamentals of Mathematical Statistics, Khanna Publications, S C Guptha and V.K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

MECHANICS OF SOLIDS

II Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

Pre-requisites: Basics of Engineering Mechanics

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.
- Determine the deflections of beams using different methods. Analyze and design thin, thick cylinders and springs

UNIT-I:

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.

UNIT-II:

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads , uniformly distributed load, uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III:

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.

UNIT-IV:

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 cantilevers and simply.

– supported trusses – by method of joints, method of sections and tension coefficient methods.

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.

UNIT-V:

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

Thick Cylinders – lame's equation – cylinders subjected to inside and out side pressures – compound cylinders.

TEXT BOOKS:

1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman
2. Strength of Materials by Jondar : Galgotia Publications

REFERENCE BOOKS:

1. Strength of Materials by Bansal, Lakshmi Publications
2. Strenght of Mateirals by S. Tumoshenko
3. Strength of Materials by R.S. Khurmi; S. Chand & Co. 2005.

MATERIAL SCIENCE & METALLURGY

II Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

Prerequisites: Basic idea of bonding nature in solids and different properties of elements

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

- Understand and analyze the crystal structure and classification of materials and determining mechanical properties and their suitability for applications.
- Classify cast irons and study their applications. Interpret the phase diagrams of materials.
- Select suitable heat-treatment process to achieve desired properties of metals and alloys.
- Understand the ceramics and composite materials and their properties.

Course outcomes:

The student an able to understand basic idea of the the different material properties and heat treatment process of ferrous and non-ferrous alloys with respect to phase diagrams.

UNIT – I:

Structure of Metals: Bonds in Solids – Metallic bond - crystallization of metals, 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.

UNIT –II:

Equilibrium of 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 important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT –III:

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 plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV:

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe_3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

UNIT – V:

Ceramic materials: Crystalline ceramics, glasses, ceramets, abrasive materials, nanomaterials – definition, properties and applications of the above.

Composite materials: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C
– C composites.

TEXT BOOKS:

1. Introduction to Physical Metallurgy by Sidney H. Avener.
2. Material science & Metallurgy by Kodgire

REFERENCE BOOKS:

1. Science of Engineering Materials by Agarwal
2. Materials Science by Vijendra Singh
3. Elements of Material science by V. Rahghavan
4. An introduction to material science by W.g.vinas & HL Mancini
5. Material science & material by C.D.Yesudian & harris Samuel

Engineering Materials and Their Applications by R. A Flinn and P K Trojan, Jaico Books

MANUFACTURING TECHNOLOGY

II Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

Pre-requisites: Classical Mechanics, Engineering Workshop Practice

Course Outcomes: The student will be able to:

- Select the appropriate Manufacturing Process as per the functional and product requirements.
- Recommend the cost-effective option in terms of Material choice.
- Analyze the effect of process variables in order to manufacture defect free products.
- Design Gating Systems for Casting Problems and Welds as per the Strength requirements.
- Calculate the Power and Force requirements pertaining to the Bulk & Sheet Metal Forming Processes**.**

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. Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds. - Adhesive Bonding

UNIT – III

Plastic Deformation & Yield Criteria – Fundamentals of Hot working, cold working - Strain hardening, Recovery, Recrystallisation and Grain Growth. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements - Stamping, forming and other cold working processes.

Extrusion of Metals: Extrusion Process - 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.

UNIT – IV

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.

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. – Deep Drawing – Stretch Forming - Forces and power requirement in the above operations. – Forming Limit Diagrams.

UNIT – V

Plastics – Thermosets and Thermoplastics – Comparison –Factors affecting choice of Plastics – Form, Cost, Lead Time, Materials - Types of Plastics - Manufacturing Processes for Plastics – Polymer Casting – Roto moulding – Thermoforming – Examples of Products – Applications. Injection Moulding – Process – Equipment – Defects in Injection Moulding – Remedies - Blow Moulding–Process & Equipment – Defects associated with Blow Molded Components - Remedies

Principles of Powder Metallurgy –Processes – Raw Materials – Blending & Mixing - Compaction – Sintering – Optional Secondary Manufacturing Processes – Sizing – Repressing – Infiltration – Oil Impregnation– Finishing Processes for PM Products – Applications.

TEXT BOOKS :

1. Manufacturing Technology / P.N. Rao/TMH
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

REFERENCE BOOKS :

1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /

THERMODYNAMICS

II Year B.Tech. I-Sem

L	T	P	C
3	1	0	4

Pre-requisite: Engineering Chemistry and Physics

Course Objective: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics for the analysis of thermal equipment

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

- Differentiate between different thermodynamic systems and processes
- Apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis
- Analyze the Thermodynamic cycles and evaluate performance parameters

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

UNIT–I:

Introduction: Basic Concepts:

System, Surrounding, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process– Point and Path functions, ZerothLaw of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Constant Volume and Pressure - gas Thermometer – Scales of Temperature, Ideal Gas Scale

First law of Thermodynamics – Corollaries – First law applied to a Closed System – applied to a flow system –Steady Flow Energy Equation. Limitations of the First Law – First Law applied to a cycle.

UNIT-II:

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

UNIT–III:

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy and entropy – Throttling and Free Expansion Processes – Flow processes- Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts

UNIT-IV:

Mixtures of perfect Gases – 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.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart – Psychrometric processes - Cooling Towers.

UNIT–V:

Power Cycles**:** Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Brayton – Description and representation on P–V and T-S diagram, Thermal Efficiency– comparison of Cycles.

Refrigeration Cycles: Bell-Coleman cycle– Basic Concepts

TEXT BOOKS:

1. Thermodynamics – An Engineering Approach by YunusCengel& Boles, TMH
2. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub.
3. Engineering Thermodynamics by PK Nag, TMH, III Edition

REFERENCE BOOKS:

1. Thermodynamics – J.P.Holman by McGrawHill
2. Engineering Thermodynamics by Jones & Dugan
3. Thermodynamics by Achutan, PHI.
4. An introduction to Thermodynamics by YVC Rao, New Age
5. Thermodynamics & Heat Engines by Yadav, Central Book Depot, Allahabad.
6. Thermodynamics by G.C. Gupta, Pearson Publications.

MACHINE DRAWING PRACTICE

II Year B.Tech. I-Sem

L	T	P	C
1	0	2	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: At the end of the course, the student will be able to

- Prepare of engineering and working drawings with dimensions and bill of material during design and development.
- Develop assembly drawings using part drawings of machine components.

Question Paper Pattern:

Question paper will consist of Part-A and Part-B. Part one has five questions out of which answer three (each 10 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

PART-A:

Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

Types of sections – Selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their size, location and details - common abbreviations and their liberal usage Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and Simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

i. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
ii. Keys, cottered joints and knuckle joint.
iii. Rivetted joints for plates, Shaft coupling, spigot and socket pipe joint.
iv. Journal, pivot and collar and foot step bearings.

PART-B:

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportion.

i. Steam Engine Parts – Stuffing Box, Cross Heads And Eccentric Assembly.
ii. Machine Tool Parts: Tail Stock, Tool Post, Machine Vices.
iii. Other Machine Parts - Screws Jack, Petrol Engine Connecting Rod, Plummer Block

Simple design of Steam Stop Valve, Spring Loaded Safety Valve, Feed Check Valve and Air Cock.

TEXT BOOKS:

1. Machine Drawing by K.L.Narayana, Wiley Eastern.
2. Machine Drawing by Junnarkar N.D., Pearson Edu.

REFERENCE BOOKS:

1. Machine Drawing by P.S.Gill.
2. R. K. Dhawan – 'A Textbook of Machine Drawing' S. Chand – 2nd Revised Edition
3. N. D. Bhat, V M Panchal – 'Machine Drawing' – Charotar Publication House – 2014

MANUFACTURING TECHNOLOGY LAB

II Year B.Tech. I-Sem

L	T	P	C
0	0	2	1

Pre-requisites: Manufacturing Technology

Course Outcomes:

- To measure the properties of moulding sands and pattern making.
- To fabricate joints using gas welding and arc welding.
- To evaluate the quality of welded joints.
- To use press working tools and perform moulding studies on plastics.

1.Design and making of pattern Single piece pattern
2.Design and making of pattern Split pattern
3. Manual metal arc welding i. Lap joint ii. Butt joint iii. Spot welding iv. Brazing and soldering
4. Blanking & Piercing operation & Study of simple Compound and progressive press tools.
5. Hydraulic Press: Deep Drawing and Extrusion Operations.
6. Bending and other operations.
7. Injection Molding
8. Blow Molding
9. Simple models using sheet metal operations
10. Melting & Casting - Demonstration

MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

II Year B.Tech. I-Sem

L	T	P	C
0	0	2	1

Pre-requisites: Chemistry & Physics

Objectives:

In this laboratory, students will have the opportunity to apply loads to various materials under different equilibrium conditions. The student will perform tests on materials in tension, compression, torsion, bending, and impact. These conditions and/or constraints are designed to reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report. The machines and equipment used to determine experimental data include universal testing machines, torsion equipment, spring testing machine, compression testing machine, impact tester, hardness tester, etc. Data will be collected using Dial indicators, extensometers, strain gages and strain indicator equipment, as well as load and strain readouts on the machinery and graphing capabilities to print relevant plots for analysis.

- Provide the student hands-on experiences in materials science through laboratory experiments that explore the properties of materials and the interplay between processing and performance.
- Provide the student practical experience in the search, retrieval, and analysis of technical/scientific information.
- Provide the student practical experience in the acquisition, analysis and reporting of experimental results
- Instruct students in methodologies for materials selection to student-led projects.

Course Outcomes:

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

- Conduct tension test on steel, aluminum, copper and brass.
- Perform compression tests on spring and wood.
- Determine elastic constants using flexural and torsion tests.
- Determine hardness of metals

MATERIAL SCIENCE LAB

1. Preparation and study of Crystal models.
2. Study of: Specimen cutting machine Specimen mounting press Grinding and polishing equipment
3. Study of various Metallurgical Microscopes and use of leveling press
4. Metallographic preparation of ferrous specimen for microscopic examination
5. Preparation of non-ferrous specimen for Metallographic examination
6. Preparation and Metallographic study of pure metals like Iron, Copper and Aluminum.
7. Measurement of lattice parameters of various crystal structures and calculation of packing factors and size of vacancies.
8. Identification of Microstructures of steels.
9. Estimation of Carbon content of steels using metallurgical microscope and Spark test. Thermal analysis.

MECHANICS OF SOLIDS LAB

List of Experiments:

1. To study the stress -strain characteristics of (a) Mild Steel and (b) Tor steel by conducting tension test on U.T.M

2. To study the stress - strain characteristics of (a) Copper and (b) Aluminum by conducting tension test on Hounsfield Tensometer

3. To find the Compressive strength of wood and punching shear strength of G.I. sheet by conducting relevant tests on Housfield Tensometer

4. To find the Brinnell's and Vicker's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper by conducting hardness test.

5. To determine the Modulus of rigidity by conducting Torsion test on (a) Solid shaft (b) Hollow shaft

6. To find the Modulus of rigidity of the material of a spring by conducting Compression test.

7. To determine the Young's modulus of the material by conducting deflection test on a simply supported beam.

8. To determine the Modulus of elasticity of the material by conducting deflection test on a Propped Cantilever beam.

9. To determine the Modulus of elasticity of the material by conducting deflection test on a continuous beam

10. Ductility test for steel

11. Shear test on Mild Steel rods

ENVIRONMENTAL SCIENCE

II Year B.Tech. I-Sem

L	T	P	C
2	0	0	0

Prerequisites: NIL

Course Objectives:

- Creating the awareness about environmental problems among students.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating students to participate in environment protection and environment improvement.

Course Outcomes:

At the end of the course, it is expected that students will be able to:

- Identify and analyze environmental problems as well as the risks associated with these problems
- Understand what it is to be a steward in the environment
- Studying how to live their lives in a more sustainable manner

UNIT-I:

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

UNIT–II:

ECOSYSTEMS: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT–III:

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

UNIT–IV:

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

UNIT–V:

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; itsproblems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies -Wasteland reclamation. –Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING

II Year B.Tech. II-Sem

Pre-requisites: None

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes:

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

After this course, the student will be able

- To analyze and solve problems of electrical circuits using network laws and theorems.
- To identify and characterize diodes and various types of transistors.

UNIT-I:

Electrical Circuits: R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis, **Single Phase AC Circuits**: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation

UNIT-II:

Resonance: Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

UNIT-III:

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

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-IV:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. Transistor Biasing And Stabilization – Operating point, DC and AC load lines, Biasing – Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in VBE and β, Bias Compensation using Diodes and Transistors.

Transistor Configurations: BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT-V:

Junction Field Effect Transistor: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET. **Special Purpose Devices**: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

TEXT BOOKS:

- Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
- Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education

REFERENCE BOOKS:

- Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
- Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
- Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
- Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
- Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.
- Network Theory by Sudhakar, Shya

KINEMATICS OF MACHINERY

II Year B.Tech. II-Sem

L	T	P	C
3	1	0	4

Prerequisites: Basic principles of Mechanics

Course Objectives:

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

Course outcomes: At the end of the course, the student will be able to

- To evaluate the relative motions obtained in all the above type of components used in mechanical Engineering.
- To analyze different mechanisms
- To draw the trajectories of various kinematic objects

UNIT – I:

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

Mechanism and Machines: Mobility of Mechanisms: Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage, Intermittent motion Mechanism, Rutchet & Paul Geneva Mechanism.

UNIT – II:

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

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

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

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

UNIT – III:

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

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

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

UNIT – IV:

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

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

UNIT – V:

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

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

TEXT BOOKS:

1. Theory of Machines by S.S.Rattan, Tata McGraw Hill Publishers.
2. Kinematics & Dynamics Of machinerybyNorton, TMH

REFERENCE BOOKS:

1. Theory of Machines by Thomas Bevan, CBS
2. Theory of Machines by Sadhu Singh, Pearson.
3. Theory of Machines by Shigley, Oxford
4. Mechanism and Machine Theory by JS Rao and RV Duggipati, New Age
5. Theory of Machines by R.K. Bansal, Lakshmi Publications.

THERMAL ENGINEERING – I

II Year B.Tech. II-Sem
Pre-requisite: Thermodynamics

L	T	P	C
3	0	0	3

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

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

- Evaluate the performance of IC engines and compressors under the given operating conditions
- Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles
- Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance

UNIT–I:

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 and their analysis-fuels. 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.

UNIT-II:

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

UNIT–III:

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

UNIT-IV:

Air Compressors-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

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors, Axial flow Compressers, Principle of Operation.

UNIT-V:

Refrigeration and Air Conditioning: Mechanical Refrigeration and types, units of refrigeration - NCRS - Calculation of COP - effect of Superheating and Sub Colling, desired Properties of Refrigerants and common refrigerants, Vapour Absorption System - Working Principle, Maximum COP.

Concepts of Psychometry - properties of moist air- use of psychrometric chart - calculation of moist air properties, Air conditioning Processes, types of air - conditioning Systems.

TEXT BOOKS:

1. I.C. Engines by V. Ganesan, TMH
2. Thermal Engineering by Mahesh V Rathore Tata MA Grahill.
3. Thermal Engineering by P.K.Nag.
4. R& AC by CP. Arora & Domakundeshwar.

REFERENCE BOOKS:

1. IC Engines by Mathur& Sharma – DhanpathRai& Sons.
2. Engineering fundamentals of IC Enginesby Pulkrabek, Pearson, PHI
3. Thermal Engineering by Rudramoorthy, TMH
4. Thermodynamics & Heat Engines by B. Yadav, Central Book Depot., Allahabad
5. I.C. Engines by Heywood, McGrawHIll.
6. Thermal Engineering by R.S. Khurmi&J.K.Gupta, S.Chand

FLUID MECHANICS & HYDRAULIC MACHINERY

II Year B.Tech. II-Sem

L	T	P	C
3	0	0	3

Pre-requisites: Engineering Mathematics I

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

- Understand and apply thebasic static, kinematic and dynamic principles and conservation laws to simple potential fluid flow problems in engineering applications.
- Design experimental procedure for physical model studies and hydraulic machines
- Compute drag and lift coefficients using the theory of boundary layer flows.

UNIT-I:

Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension- vapor pressure and their influence on fluid motion-atmospheric, gauge and vaccum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT-II:

Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady &un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

Fluid dynamics: Surface & body forces Euler's & Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

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 derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

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.

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.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd

REFERENCE BOOKS:

1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers
4. Theory and Applications of Fluid Mechanics by K. Subramanya, McGraw Education

INSTRUMENTATION AND CONTROL SYSTEMS

II Year B.Tech. II-Sem

L	T	P	C
3	0	0	3

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

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.

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

- To know the constructional details and working principles of various instruments and their purpose.
- To identify and analyze various errors that would occur in instruments.
- To understand static and dynamic characteristics of instrument and should be able to determine loading response time.
- To specify transducer, for given range of displacement and loading time of that transducer.

UNIT–I:

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.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT–II:

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge. Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges; Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

UNIT–III:

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, Laser Doppler Anemometer (LDA).

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.

UNIT–IV:

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

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.

UNIT–V:

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

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems by Alavala, Cengage Learning
2. Instrumentation, Measurement & Analysis by B.C.Nakra & K.K.Choudhary, TMH
3. Mechanical Measurements & Controls by D.S. Kumar

REFERENCE BOOKS:

1. Measurement Systems: Applications & design by E.O.Doebelin, TMH
2. Experimental Methods for Engineers by Holman
3. Mechanical and Industrial Measurements by R.K. Jain, Khanna Publishers.
4. Mechanical Measurements by Sirohi and Radhakrishna, New Age International.

INSTRUMENTATION AND CONTROL SYSTEMS LAB

II Year B.Tech. II-Sem

L	T	P	C
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Pre-requisites: Mathematics-I, Thermodynamics, Basic of Electrical and Electronics Engineering.

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

- Characterize and calibrate measuring devices.
- Identify and analyze errors in measurement.
- Analyze measured data using regression analysis.
- Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

1. Calibration of transducer for temperature measurement.
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge for temperature measurement.
4. Calibration of thermocouple for temperature measurement.
5. Calibration of capacitive transducer for angular displacement.
6. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
7. Calibration of resistance temperature detector for temperature measurement.
8. Study and calibration of a rotameter for flow measurement.
9. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
10. Study and calibration of McLeod gauge for low pressure.

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING LAB

II Year B.Tech. II-Sem

L	T	P	C
0	0	2	1

Pre-requisites: Basic Electrical Engineering

Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

Basic Electrical Engineering Laboratory-I List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

Basic Electronics Engineering Laboratory-I

• There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to be organized.
• 3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

II Year B.Tech. II-Sem

L	T	P	C
0	0	2	1

Pre-requisites: None

Course Outcomes:

- Develop procedure for standardization of experiments.
- Calibrate flow discharge measuring device used in pipes channels and tanks.
- Determine fluid and flow properties.
- Compute drag coefficients.
- Test the performance of pumps and turbines.

1. Calibration of Venturi meter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch.
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aero foil model.

(Any ten of the above experiments are to be covered)

NUMERICAL METHODS USING MATLAB

II Year B.Tech. II-Sem

L	T	P	C
1	0	2	2

Numerical Methods MATLAB

Pre Requisites: Mathematics I

Objectives:

- The aim of this lab is to develop programming skills in C for the numerical methods and allied problems. More emphasis will be on writing programs with minimum possible code.

Course Outcomes:

- After completion of this lab course, student will be well acquainted with the programming skills in C and able to write the codes for the problems they come across in engineering courses

UNIT- I: Interpolation:

Programming Tasks: Using MATLAB

1. A) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Newton's interpolation both forward and backward)

B) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Lagrange 's interpolation)

C) Write a program to determine y for a given x, if two arrays of x and y of same size are given. (using Gauss interpolation) (Selection criteria of the interpolation formula are important.)

UNIT- II: Curve Fitting:

Programming Tasks:

2. A) Write a program to find a line of best fit from the given two arrays of x and y of same size.

B) Write a program to find a curve of the form $y = Ae^{Bx}$ from the given two arrays of x and y of same size.

C) Write a program to find a curve of the form $y = Ax^B$ from the given two arrays of x and y of same size.

D) Write a program to find a curve of the form $y = Ax^2 + Bx + C$ from the given two arrays of x and y of same size.

UNIT- III: Solution of Algebraic and Transcendental Equations

Programming Tasks:

3. A) Write a program to find the root of a given equation using bisection method. (Write this program such that the initial values given to the system are not usable, then the system should ask us to give new set of initial values)

B) Write a program to find the root of a given equation using method of false position(regula false position)

C) Write a program to find the root of a given equation using iteration method

D) Write a program to find the root of a given equation using Newton Rophson method

UNIT- 1V: Linear system of equations

Programming Tasks:

4. A) Write a program to find the solution of given system of linear equations using L- U decomposition method

   B) Write a program to find the solution of given system of linear equations using jacobi's method

   C) Write a program to find the solution of given system of equations using Gauss sidel iteration method

   D) Write a program to find the solution of given system of equations using Gauss Jordan elimination method

UNIT- V: Numerical Differentiation, Integration, and Numerical solutions of First order differential equations: Programming Tasks:

5. A) Write a program to evaluate definite integral using trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.

   B) Write a program to solve a given differential equation using Taylor's series

   C) Write a program to solve a given differential equation Euler's and modified Eulers method

   D) Write a program to solve a given differential equation using Ruge-Kutta method.

CONSTITUTION OF INDIA
(Mandate Course)

II Year B.Tech. II-Sem

L	T	P	C
2	0	0	0

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956

UNIT – I:

History of Making of the Indian Constitution:

- History
- Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution:

- Preamble
- Salient Features

UNIT – II:

Contours of Constitutional Rights &Duties:

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT – III:

Organs of Governance:

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions

Executive:

- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

UNIT – IV:

Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
- Panchayati raj: Introduction, PRI: Zila Panchayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

UNIT – V:

Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
4. M. P. Jain, Indian Constitution Law, 7th Ed., Lexis Nexis, 2014.