COURSE STRUCTURE (2023-24)

FIRST YEAR (FIRST SEMESTER)

Sl. No.	CATEOGORY	COURSE CODE	Circuit Branch	Non-Circuit Branch	Contact Hrs. L-T-P	Credit	University Marks	Internal Evaluation
Theory								
1	BS	23BS1001	Mathematics - I	Mathematics – I	3-0-0	3	100	50
2	BS	23BS1002 / 23BS1003	Physics	Chemistry	3-0-0	3	100	50
3	ES	23ES1001 / 23ES1002	Basic Electrical Engineering	Basic Electronics	2-0-0	2	100	50
4	ES	23ES1003 / 23ES1004	Programming in C and Data Structure	Engineering Mechanics	3-0-0	3	100	50
5	ES	23ES1005 / 23ES1006	Basic Civil Engineering	Basic Mechanical Engineering	2-0-0	2	100	50
6	HS	23HS1001 / 23HS1002	Universal Human Values	English for Technical Writing	2-0-0	2	100	50
Sessional / Practical								
7	BS	23BS1201 / 23BS1202	Physics Laboratory	Chemistry Laboratory	0-0-3	1.5	-	100
8	ES	23ES1201 / 23ES1202	Basic Electrical Engineering Lab.	Basic Electronics Lab.	0-0-3	1.5	-	100
9	ES	23ES1203 / 23ES1204	Programming Lab.	Communicative English & Report Writing Lab.	0-0-3	1.5	-	100
10	ES	23ES1205 / 23ES1206	Engineering Graphics & Design Lab.	Workshop & Digital Manufacturing Lab.	0-0-3	1.5	-	100
11	MC	23MC1201	Sports / Yoga / NCC / NSS		0-0-2	1	-	100
Total					15-0-14	22	600	800

FIRST YEAR (SECOND SEMESTER)

Sl. No.	CATEOGORY	COURSE CODE	Circuit Branch	Non-Circuit Branch	Contact Hrs. L-T-P	Credit	University Marks	Internal Evaluation
Theory								
1	BS	23BS1001	Mathematics - II	Mathematics - II	3-0-0	3	100	50
2	BS	23BS1003 / 23BS1002	Chemistry	Physics	3-0-0	3	100	50
3	ES	23ES1002 / 23ES1001	Basic Electronics	Basic Electrical Engineering	2-0-0	2	100	50
4	ES	23ES1004 / 23ES1003	Engineering Mechanics	Programming in C and Data Structure	3-0-0	3	100	50
5	ES	23ES1006 / 23ES1005	Basic Mechanical Engineering	Basic Civil Engineering	2-0-0	2	100	50
6	HS	23HS1002 / 23HS1001	English for Technical Writing	Universal Human Values	2-0-0	2	100	50
Sessional / Practical								
7	BS	23BS1202 / 23BS1201	Chemistry Laboratory	Physics Laboratory	0-0-3	1.5	-	100
8	ES	23ES1202 / 23ES1201	Basic Electronics Lab.	Basic Electrical Engineering Lab.	0-0-3	1.5	-	100
9	ES	23ES1204 / 23ES1203	Communicative English & Report Writing Lab.	Programming Lab.	0-0-3	1.5	-	100
10	ES	23ES1206 / 23ES1205	Workshop & Digital Manufacturing Lab.	Engineering Graphics & Design Lab.	0-0-3	1.5	-	100
11	MC	23MC1202	Sports / Yoga / NCC / NSS		0-0-2	1	-	100
Total					15-0-14	22	600	800

Subject Code		**Total Contact Hour**	**40 hrs**
Semester	FIRST	**Total Credit**	**3**
Subject Name	**MATHEMATICS-I**		
Pre-requisites			

Course Objective	The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering and also other disciplines.	
Syllabus		**Contact Hour**
Module - I	**Basic Calculus:** Applications of definite integrals to evaluate length of curves, areas of surfaces and volumes of surfaces of revolution, Improper integral (Definition and Elementary Examples),Beta and Gamma functions and their properties.	**8 hrs**
Module - II	**Single-variable Calculus (Differentiation):** Rolle's Theorem, Mean value theorem (Statement and applications), First derivative test for local extreme values of functions. Power series, Taylor and Maclaurin series.	**8hrs**
Module - III	**Multivariable Calculus (Differentiation):** Partial derivatives. Jacobians, Hessian Matrix. Maxima, Minima and saddle points. Method of Lagrange multipliers.	**8 hrs**
Module - IV	**Linear Algebra:** Vector Space, Basis and dimension, Linear Systems of Equations, Gauss elimination, Linear Dependence and Independence, Rank of a Matrix.	**8 hrs**
Module - V	**Linear Algebra:** Inverse of a matrix (Gauss-Jordan). Symmetric, skew-symmetric and orthogonal matrices. Eigen values and eigenvectors. Caley-Hamilton Theorem (Statement only)	**8 hrs**

Essential Reading:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Supplementary Reading:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, 2016.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

Course Outcomes:

CO1: To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

CO2: The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

CO3: The tool of power series for learning advanced Engineering Mathematics.

CO4: To deal with functions of several variables that are essential in most branches of engineering.

CO5: Learn how to convert a real life problem into a matrix system and solve it

Subject Code		**Total Contact Hour**	**45 HR**
Semester	FIRST/SECOND	**Total Credit**	**3**
Subject Name	**PHYSICS**		
Pre-requisites			

Course Objective:
To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

Syllabus	Contact Hour
Module I: OSCILLATIONS Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, steady state motion of forced damped harmonic oscillator	**9 hrs**
Module II: WAVES AND OPTICS Concept of wave and Wave equation, Superposition of many harmonic waves, Concept of coherent sources (Division of wave front and division of amplitude), Interference in thin parallel film, Newton's ring: Determination of wavelength of light, Refractive index of liquid).Concept of diffraction (Huygen's Principle), Types of diffraction, Franhoffer diffraction due to single slit, diffraction grating (qualitatively).	**9 hrs**
Module III: ELCTROMAGNETISM **Vector calculus**: Gradient, Divergence, Curl (Mathematical concept), Gauss divergence theorem and Stoke's theorem(statement only), Derivation of Maxwell's electromagnetic equation in differential form and integral form, Electromagnetic wave equations for **E** and **B** in vacuum and conducting medium, transverse nature of EM waves.	**9 hrs**
Module IV: QUANTUM PHYSICS Wave particle duality, concept of phase velocity group velocity, relation between them, Matter waves (de Broglie hypothesis), Wave functions, Observables as operators, Eigen function and Eigen values, Normalization, Expectation values, Schrodinger equation (Time dependent and time independent), Particle in a box.	**9 hrs**
Module V: LASERS Introduction to Laser, Characteristics of Lasers, Einstein's coefficients and relation between them, Lasing action, Population inversion, Three and four level pumping schemes, Ruby Laser, He-Ne Laser.	**8 hrs**

Essential/ Supplementary Readings:
1. Ian G. Main, Oscillations and waves in physics, Cambridge University Press
2. H.J. Pain, The physics of vibrations and waves, John Wiley & Sons Ltd.
3. E. Hecht, Optics, Pearson Education Ltd.
4. A. Ghatak, Optics, McGraw Hill Publisher
5. O. Svelto, Principles of Lasers, Springer

Course Outcome: At the end of this course students will demonstrate the ability to

CO1: Demonstrate proficiency and perceptive of the basic concepts in physics.

CO2: Utilize the scientific and experimental methods to investigate and verify the concepts related tocontent knowledge.

CO3: Exploring the engineering applications and apply quantum mechanics to engineering Phenomena.

CO4: Identifying the relevant formulae and work out engineering problems.

CO5: Comprehend principle, concept, working and application of new technology and comparison ofresults with theoretical calculations.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	1	1	2	1
CO2	3	3	3	2	1	2	1	1	1	1	1	2
CO3	3	3	3	3	1	1	2	1	1	1	1	2
CO4	3	3	3	2	1	1	1	2	1	1	2	2
CO5	3	3	2	3	2	1	1	2	2	2	1	2

PHYSICS LABORATORY

List of Experiments:

1. Determination of acceleration due to gravity by using Bar pendulum
2. Determination of wave length of monochromatic light with the help of Newton's ring apparatus.
3. Determination of grating element of a diffraction grating using spectrometer
4. Study of resonance using sonometer for unknown frequency
5. Study of RLC Circuit
6. Determination of surface tension of water by capillary rise method
7. To draw the characteristics of a bipolar junction transistor
8. To determine the rigidity modulus of the material of a wire by using Barton's apparatus.
9. To determine e/m ratio
10. Magnetic field measurement from Helmholtz coil

Course Outcomes: Upon completion of the subject the students will demonstrate the ability to:

CO1	Express the idea of calculation of acceleration due to gravity at any place using the concept of oscillatory system and simple harmonic motion.
CO2	Demonstrate the working and operational technique to calculate the mechanical properties of fluid and other materials.
CO3	Evaluate the voltage, current, power and characteristics behaviour of the electronic devices.
CO4	Understanding the rigidity concept of solid materials.
CO5	Analyzing the electrical and magnetic field measurements and their applications.

Course Articulation Matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1	3	2	1	1	3	3	1	1
CO2	3	3	2	1	3	2	1	1	3	3	1	1
CO3	3	3	2	1	3	2	1	1	3	3	1	1
CO4	3	3	2	1	3	2	1	1	3	3	1	1
CO5	3	3	2	1	3	2	1	1	3	3	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

CHEMISTRY

Module–I: PERIODIC PROPERTIES (9Hours)

Periodic Properties, Effective Nuclear Charge, Penetration of Orbitals, Variations of *s*, *p*, *d* and *f* Orbital Energies of Atoms in the Periodic Table, Electronic Configurations, Atomic andIonic Sizes, Ionization Energies, Electron Affinity and Electronegativity, Polarizability, Oxidation States.

Module–II: FREE ENERGY IN CHEMICAL EQUILIBRIA (9 Hours)

Concepts of Entropy, Entropy in Physical and Chemical Changes, Free Energy Concepts, Gibbs Helmholtz Equation, Free Energy Change and Criterion of Spontaneity of Chemical Equation and Chemical Equilibrium, Van't Hoff Equation.

Module–III: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS (9 Hours)

Basic Terms and Principles of Spectroscopy

Molecular Rotational (Microwave) Spectroscopy: Basic Principle and Application toDiatomic Molecules, Selection Rules.

Molecular Vibrational (IR) Spectroscopy: Basic Principle, Types of Vibrations , VibrationalFrequency, Selection Rules.

Electronic (UV-Visible) Spectroscopy: Laws of Absorption, Basis Principle, Types ofElectronic Transitions, Chromophores and Auxochrome.

Module–IV: STEREOCHEMISTRY (9 Hours)

Structural and Stereoisomer (Geometrical and Optical), Symmetry and Chirality, Enantiomers, Diastereomers, Optical Activity, Configurational and Conformational Analysis,Representations of Three Dimensional Structures(E, Z and R,S only).

Module–V: ORGANIC REACTIONS AND SYNTHESIS (9 Hours)

Introduction to Reaction Intermediates {Carbocation, Carbanion, Free Radial (Formation, structure and stability)}, Reactions involving Substitution, Addition, Elimination (Examples and Mechanisms)

Essential Reading:

1. Engineering Chemistry: fundamental to Applications by Shikha Agarwal, CambridgeUniversity Press, Second Edition, 2019.
2. Engineering Chemistry by B. Rama Devi, P. Aparna, and PrasantaRath, CengageLearning, First Edition, 2023.

Supplementary Reading:

1. Atkins' Physical Chemistry by Peter Atkins, Julio de Paula, and James Keeler, OxfordUniversity Press, Eleventh Edition, 2018.
2. Principles of Physical Chemistry by B. R. Puri, L. R. Sharma, and Madan S. Pathania,Vishal Publishing, Forty Eighth Edition, 2021.
3. Fundamentals of Molecular Spectroscopy by C.N. Banwell and E.M. MacCash,5thEdition, McGraw-Hill Education, Fourth Edition, 2017.
4. Concise Inorganic Chemistry by J.D Lee, Oxford University Press; Fifth Edition, 2008.
5. Principles of Inorganic Chemistry by B.R. Puri, L.R. Sharma, and K.C. Kalia, VishalPublishing, Fifty Fifth Edition, 2020.
6. Stereochemistry: Conformation and Mechanism by P.S. Kalsi, New Age International,Eighth Edition, 2015.
7. Organic Chemistry Concepts and Applications by Jagdamba Singh, PragatiPrakashan,Eighth Edition, 2015.

8. Organic Chemistry byR.T. Morrison andR.N. Boyd, Pearson Education, Seventh Edition,2010.
9. Organic Chemistry: Structure and Function by P. Volhardt and N. Schore, WH Freeman;Eighth Edition, 2018.

Course Outcomes:

CO1: To demonstrate and realise the trend in various periodic properties associated withdifferent elements present in different groups and periods of modern periodic table.

CO2: To acquire the knowledge of free energy concept for the thermodynamics associatedwith chemical reactions and equilibriums.

CO3: To analyze and implement the concepts of spectroscopic techniques for identificationof various organic and inorganic compounds.

CO4: To evaluate and visualize the concept of configurations and conformations of variousorganic compounds

CO5: To assess the generation, reaction and identification of intermediates involved duringorganic reactions and their applications in different organic reaction mechanisms.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2	2	2	3
CO2	3	2	2	2	0	0
CO3	3	1	2	2	2	2
CO4	3	1	2	2	1	1
CO5	3	2	2	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix Row for this Course

	PO1	PO2	PO3	PO4	PO5	PO6
Course	3	2	2	2	1	1

CHEMISTRY LABORATORY

Chemistry Laboratory (Any Ten Experiments):

1. Determination of the alkalinity in the given water sample.
2. Determination of the temporary and permanent hardness in the given water sample by complexometric titration using EDTA as standard solution.
3. Determination of amount of available chlorine in bleaching powder.
4. Standardization of potassium permanganate using sodium oxalate
5. Determination of amount of ferrous iron present in Mohr's salt.
6. Determination of the rate constant of a chemical reaction.
7. Estimation of calcium in Limestone
8. Determination of dissolved oxygen in water sample.
9. Determination of the partition coefficient of a chemical between two immiscible liquids.
10. Determination of the strength of given HCl solution by titrating it against NaOH solutionusing p^H meter.
11. Conduct metric titration of strong acid and strong base.
12. Determination of viscosity of lubricating oil by Redwood viscometer.
13. Determination of flash point of a given oil by Pensky-Martens flash point apparatus.
14. To find out the concentration of a given potassium permanganate solution spectrophotometric method.
15. Synthesis of Aspirin/Paracetamol.

Essential Reading:

1. Practical Chemistry by D.N. Bajpai, O.P. Pandey and S. Giri, S. Chand Publishing,Revised Edition, 2010.
2. Practical Physical Chemistry by B. Vishwanathan and P.S. Raghavan, Viva Books, FirstEdition, 2012.

Course Outcomes:

CO1: To analyze the alkalinity and hardness value of the water sample.

CO2: To analyze the concentration of copper present in the solution.

CO3: to analyse kinetics of the reactions.

CO4: To gain hands-on experiences of pH meter, conductometer, and spectrophotometer.

CO5: To analyze viscosity and flash point of lubricating oils.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	2	2	2
CO2	3	2	3	2	2	2
CO3	3	2	3	2	2	2
CO4	3	2	3	2	2	2
CO5	3	2	3	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix Row for this Course

	PO1	PO2	PO3	PO4	PO5	PO6
Course	3	2	3	2	2	2

Subject Code		**Total Contact Hour**	**40 hours**
Semester	FIRST/SECOND	**Total credit**	**3**
Subject Name	**Programming in C and Data Structure**		
Pre-requisites	**Fundamentals of Computers**		

Course Objectives:

- Learn fundamentals of C programming
- Learn various steps of program development and implementation
- Learn different Data Structures for structured programming approach
- Learn relation of memory and memory referencing with the program execution
- Learn to implant small projects

Syllabus

Module I: Fundamentals of C	**Hours- 10**
Problem-solving processes: Algorithms and Flow Chart. C as a Middle-level language, Structure of C program, Character set Identifiers, Keywords, Data Types, Constant and Variables, Statements, Input and Output statements, Operators and Expressions, Precedence of operators, Control Structures (If, If-else, Switch-case, For loop, While, do-While)	
Module II: Function, Array, Structure and Union	**Hours-9**
Functions (Built-in, user-defined), Recursive function. Array: 1 – D, 2 – D, Matrix operations, String, Passing Array to Function, Structure, Union	
Module III: Pointer & Dynamic Memory Allocation	**Hours-8**
Pointer Arithmetic, Parameter passing using pointers, Call by value vs. Call by reference, Passing parameters, pointer to pointer, pointer to function, Pointer to Structure, Array and pointers, Static vs. Dynamic memory, Pointer variables, Dynamic memory allocation functions [malloc (), calloc (), realloc (), free ()]	
Module IV: Data Structures	**Hours-7**
Introduction to Data Structure, Linear Linked List: Creation, Insertion, Deletion. Stack, Stack applications (Infix to postfix, postfix evaluation), Queue (linear & circular)	
Module V: Tree, Introduction to Sorting & Searching	**Hours-6**
Binary Tree, Binary Search Tree, Sorting (Bubble Sort, Quick Sort), Searching (Linear Search, Binary Search)	

Essential Readings:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Programming in C, Pradip Dey, Manas Ghosh, Oxford Publication
3. Data Structures - (Schaum's Outlines), McGraw-Hill Education

Supplementary Readings:

1. Let us C- Yashwant Kanetkar, BPB Publications.
2. Programming with ANSI and Turbo C- Kamthane, A. N. Pearson Education
3. R. S. Salaria, Programming for Problem Solving, Khanna Publishing House
4. The C Programming Language – Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall.
5. Data Structures Using C - Amiya Kumar Rath, Alok Kumar Jagadev, Scitech Publications

Course Outcomes:

The students will learn and able to

- Remember, understand and implement simple algorithms to C programs.
- Test and execute programs using function, array, structure and union.
- Analyze the relation of memory and memory referencing with the program execution.
- Apply different Data Structures for problem solving.
- Implement different sorting and searching algorithms.

Programming Lab		0-0-3: 1.5
Sl. No.	**Expt. No.**	**Experiment Details**
1	1	Write a program to print your Bio-data.
	2	Write a program in C to test the arithmetic operators.
	3	Write a program to find out the simple interest and compound interest with the given input data.
2	1	Write a program to test the logical, bitwise, unary and ternary operators with the given input data.
	2	Write a program to check an inputted year is leap year or not.
	3	Write a program to calculate the salary of an employee given his basic pay, DA, HRA and TA. Display the output in format of salary statement.
3	1	Write a program to enter the marks of a student in 4 subjects. Then calculate the total, Aggregate %, and display the grades obtained by the student.
	2	Write a program to enter a number from 1-7 and display the corresponding day of the week using switch case statement.
	3	Write a program using switch case that read 4 nos. and display a menu thatoffers 4 options: calculate total, calculate average, display the smallest, and the largest number.
4	1	Write a program to check a given number is palindrome or not.
	2	Write a program to generate prime numbers present between two given numbers.
	3	Write a program to print the following pyramid star pattern. 
5	1	Write a program that will accept an array, and find the largest number, smallest number, sum of the elements and average of the elements present in the array.
	2	Write program that will accept an array and sort the array in ascending order. Display both the unsorted and unsorted arrays.
	3	Write a program that will insert an element at a desired position of an array. Show the array before insertion and after insertion of the new element (Array, element and position will provided by the user)
6	1	Write a program to swap the value of two inputted variable using function. Show the initial value and value after swapping.
	2	Write a program to print the Fibonacci series using function.
	3	Write a program that will accept two matrices using function and multiply them using function and show the result using function.
7	1	Write a program to find the GCD among two given number using recursion.
	2	Write a program to accept student data in a structure and display the structure elements.
	3	Check a inputted string is palindrome or not using pointer.

8	1	Write a program to read and print an array of n numbers, then find out the smallest number and its position in the array. Perform all these operations using pointer and function.
	2	Write a program to implement realloc() and free().
	3	Declare a pointer; allocate a block of memory to it using Dynamic Memory Allocation. Input a set of integers to the allocated memory block. The display the set of numbers.
9	1	Write a program to implement insertion and deletion of an element using linked list.
	2	Write a program to implement Push and Pop operations in Stack.
	3	Write a program to implement insert and delete operations in Queue.
10	1	Write a program to implement Quick Sort algorithm using C.
	2	Write a program to search an element using Linear Search algorithm.
	3	Write a program to search an element using Binary Search algorithm.

ENGINEERING MECHANICS

Module-I **(10Hours)**

Concurrent forces on a plane: Composition, resolution and equilibrium of concurrent coplanar forces, method of moment. General case of forces on a plane: Composition and equilibrium of forces in a plane, plane trusses, method of joints and method of sections.

Module-II **(6 Hours)**

Friction: Fundamentals and Problems involving friction, Ladder, Wedges. Principle of virtual work.

Module - III **(8Hours)**

Parallel forces on a plane: General case of parallel forces, center of parallel forces and center of gravity, Centroid of plane and composite figures, Theorems of Pappus and Guildins. Moment of inertia: Plane figure with respect to an axis in its plane and perpendicular to the plane, Polar moment of inertia, parallel axis theorem.

Module – IV **(8 Hours)**

Rectilinear translation: Kinematics, Principle of dynamics, D Alembert‟s Principle, Principle of work and energy for a particle and a rigid body, Conservation of energy, Principle of impulse and momentum for a particle and a rigid body, Conservation of momentum, System of rigid bodies, Impact, direct and central impact, coefficient of restitution.

Module – V **(8 Hours)**

Curvilinear translation: Kinematics, Equation of motion, Projectile, D Alembert‟s principle of curvilinear motion. Kinematics of rotation of rigid body.

Essential Reading:

1. Engineering Mechanics: S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati,5th Edition,2017 McGraw Hill.

Supplementary Reading:

1. Engineering Mechanics, Static and Dynamics, J. L. Meriam and L.G.Kraige, 9th Edition,2021, John Wiley & Sons, Inc.
2. Fundamental of Engineering mechanics, S Rajesekharan& G ShankaraSubramanium,3rd Edition, 2017, S. Chand .
3. Engineering mechanics: K. L. Kumar andVeenuKumar, 4th Edition,2017, Tata MC Graw Hill.

Upon completion of the subject the students will be able to:

CO1	Ability to analyze objects in static equilibrium including the determination of reactions, forces and moments.
CO2	Enrichfundamental concept offriction and demonstrate the analytical skills to solve the problems involving friction.
CO3	Assimilatingthe knowledge for determination of centroid and second moment of area of sectionsand their engineering applications.
CO4	To analyze the work done by forces, the energy transferred from one object to other and apply principle of work and energy conservation for realistic (/Practical) engineering problems.
CO5	Identify the various parameters in projectile motion. Apply the principle of dynamics to analyze the curvilinear motion of rigid bodies.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	-	-	-	3	1	-	1
CO2	3	3	2	1	2	-	-	-	3	1	-	1
CO3	3	3	2	1	2	-	-	-	3	1	-	1
CO4	3	3	2	1	2	-	-	-	3	1	-	1
CO5	3	3	2	1	2	-	-	-	3	1	-	1

Program Articulation Matrix Row for this Course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	3	2	1	2	-	-	-	3	1	-	1

Workshop and Digital Manufacturing Laboratory

1. Preparation of job in fitting section/Study of lathe and turning operation
2. Preparation of job in black smith section/ Study of milling machine and milling operation.
3. Preparation of job in carpentry section/milling operation on CNC milling machine.
4. Study of CNC lathe machine and turning on CNC lathe.
5. Study of Robot (Pick and place and palletizing operation).
6. Study of additive manufacturing using 3D printer and product development.

1. **Carpentry Section**: Study of different Hand tools, measuring instruments and equipments used in Carpentry work. Safety precautions.

   Preparation of Job: Carpentry job involving different types of joint.

   Includes the operations: Measuring, Marking, Sawing, Planing, Chiseling, Mortesing, Tenoning, making Half-lap joint, Mortese & Tenon joint and Nail joint.

2. **Fitting Section**: Study of different Hand tools, measuring instruments and equipments used in Fitting work. Safety precautions. Study of Drilling Machine and Grinding Machine.

   Preparation of Job: Paper Wt. / Square or Rectangular joint (male-female joint) (any one)

   Includes the operations: Measuring, Marking, Filing, Sawing, Drilling, Tapping, Dieing and Punching.

3. **Black Smith Section**:Study of different Hand tools, equipments and Open hearth furnace used in Blacksmith work. Different types of heat treatment processes. Safety precautions.

   Preparation of Job: Weeding hook/ Chisel (any one)

   Includes the operations: Measuring, Marking, Cutting, Upsetting, Drawing down, Bending, Fullering and Quenching.

4. **Turning/ Milling Section(Conventional & CNC)**
   - **A.** Study of Lathe Machine, different parts of Lathe and different applications of Lathe. Study of different measuring & marking instruments.
   - **B.** Study of Milling Machine, different parts and applications of Milling Machine. Study of different measuring & marking instruments.
   - **C.** (i) Study of CNC Lathe Machine, different parts of CNC Lathe and its operation.
     (ii) Part programming for turning operations.
   - **D.** (i) Study of CNC Milling Machine, different parts of CNC Milling Machine and its operation.
     (ii) Part programming for milling operations.

5. **Robotics Lab:**
   - **A.** Study of Robot.
   - **B.** Pick and place operation, demonstration and explanation of code.
   - **C.** Palletizing operation, demonstration and explanation of code.

6. **Additive Lab**

   Study of 3D Printer and demonstration of its operation.

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

CO1	Acquire knowledge of conventional & CNC (Lathe and Milling Machine). CNC code and part programming for Milling and Turning operations. Different types of hand tool, measuring instruments and machine tools used in Fitting, Carpentry & Smithy work.
CO2	Know about different types of operations and joints performed in different shops i.e. in Fitting and Carpentry.
CO3	Explore learning about forging temperature of different types of ferrous metals and different types of operation (e.g. upsetting, edging, flattening and bending etc.) carried out on hot metals to prepare jobs.
CO4	Acquire knowledge for the preparation of different types of jobs by using conventional/ CNC Lathe and Milling Machines (e.g. facing, step turning, knurling, drilling, boring, taper turning, thread cutting and different methods of indexing for machining gears.
CO5	Acquire skills in using different precision measuring and marking instruments. Understand the importance of safety precaution in different shops.

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	2	2	1	1	3	1	2	1
CO2	-	-	1	-	2	2	1	1	3	1	2	1
CO3					1	2	1	2	3	1	2	1
CO4					3	2	1	1	3	1	2	1
CO5	-	-	-	-	-	-	-	1	2	1	1	1

BASIC ELECTRICAL ENGINEERING

MODULE-I (6 HOURS)

D.C Networks: Kirchoff's laws, node voltage and mesh current methods, delta-star and star-delta conversions, superposition principle, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem.

MODULE-II (6 HOURS)

Single phase and three phase ac circuit: Average and effective values of sinusoids, solution of R, L, C series circuits, solution of series and parallel circuits, series -parallel resonance.
Line and phase quantities, Delta and star connections, solution of the balanced three phase circuits, measurement of power in three phase circuits.

MODULE-III (6 HOURS)

Magnet circuit & principle of electromechanical energy conversion: Review of fundamental laws of electromagnetic induction, Solution of simple magnetic circuits.
DC machine: Construction, types, emf equation of generator, torque equation of motor, speed control of DC motors

MODULE-IV (6 HOURS)

AC MACHINES: Single Phase Transformer: Construction, emf equation, no load and load operation, voltage regulation and efficiency.
Three Phase Induction Motor: Construction, principle of working, concept of slip, torque speed relation.
Principle of operation of Three Phase alternator.

MODULE-V (6 HOURS)

Introduction to Power System: General structure of electrical power systems, Concepts of Generation, Transmission and Distribution, Sources of Electrical Power

ESSENTIAL READING

[1]. G. Rizzoni, Principles and Applications of Electrical Engineering, TMH , 2017
[2]. Nagrath I.J. and D. P. Kothari, Basic Electrical Engineering, Tata McGraw Hill.

SUPPLEMENTARY READING

[1]. S. Parker Smith, "Problems in Electrical Engineering", Asia Publications, 10th Edition.
[2]. Edward Hughes (revised by Ian McKenzie Smith), "Electrical & Electronics Technology", Pearson Education Limited. Indian Reprint 2002, 10th Edition.

Course Outcomes:

Upon completion of the subject the students will demonstrate the ability to:

CO1	Implement principles of DC network, theorems and transients.
CO2	Analyze the concept of Single phase and three phase AC circuits.
CO3	Express the concept of magnetic circuit and DC machines.
CO4	Apply basic principles of AC machines and their working.
CO5	Demonstrate basic principles of power system

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	2	1	-	-	-	-	1
CO2	3	3	2	1	1	2	1	-	-	-	-	1
CO3	3	3	2	1	1	2	1	-	-	-	-	1
CO4	3	3	2	1	1	2	1	-	-	-	-	1
CO5	3	3	2	1	1	2	1	-	-	-	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course	3	3	2	1	1	2	1	-	-	-	-	1

BASIC ELECTRICAL ENGINEERING LABORATORY

List of Experiments

1. Preliminary: Preparation of symbol chart for various systems & components as per ISS, to study the constructional & operational features for Voltmeter, Ammeter, Wattmeter, Frequency meter, multi-meter and Rheostat, Study of safety rules.

2. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

3. Measurement of the armature & field resistance of D.C. Machine by volt-amp method.
4. Starting and speed control of a D.C. shunt motor
5. Study of BH Curve of ferromagnetic core.
6. Determination of open circuit characteristics (O.C.C) of D.C shunt generator when separately excited at different speeds and different excitation levels.
7. Calibration of a single-phase Energy Meter by direct loading.

8. Measurement of power & power factor of a single-phase circuit
9. Measurement of earth resistance and insulation resistance.
10. Verification of Thevenin and Norton's theorem

Course Outcomes

Upon completion of the subject the students will demonstrate the ability to:

CO1	Express the safety rules as per ISS and symbols of different electrical components and the use of various electrical instruments in the laboratory.
CO2	Demonstrate the working and operational characteristics of dc motor and dc generator.
CO3	Evaluate the voltage, current, power and power factor of choke coil and study BH curve of a ferromagnetic core.
CO4	Measure armature and field resistance of DC machines, earth resistance and insulation resistance and demonstrate the internal structure of different machines.
CO5	Analyze the connection and calibration of single phase energy meter

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	2	1	1	3	3	1	1
CO2	3	3	2	1	3	2	1	1	3	3	1	1
CO3	3	3	2	1	3	2	1	1	3	3	1	1
CO4	3	3	2	1	3	2	1	1	3	3	1	1
CO5	3	3	2	1	3	2	1	1	3	3	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course	3	3	2	1	3	2	1	1	3	3	1	1

BASIC ELECTRONICS (3-0-0) Credit-02

COURSE OBJECTIVE:

1. To impart the fundamentals of semiconductor devices and their applications to various circuits.
2. To impart the knowledge offundamentals of digital electronics and Integrated Circuits (IC).
3. To impart the knowledge of electronic measuring instruments and fundamentals of communication systems.

MODULE	CONTENT	HOURS
MODULE 1	SemiconductorPhysics:Properties of semiconductor, current flow in semiconductors, voltage -current characteristic of a p-n junctions, Rectifiers Bipolar junction Transistor (BJT): Device structure, types and modes of operation, static characteristic, BJT as a switch, BJT as an amplifier, conceptof biasing of BJT	**7**
MODULE 2	JFET: Physical structure, operation and static characteristics MOSFET: Physical structure, operation and characteristics ofD- andE-type MOSFET Integrated Circuits: Introduction to CMOS technology in VLSI,Introduction to Integrated circuits, Fabrication of monolithic IC, Integration of circuit components, Limitations of VLSI	**7**
MODULE 3	Feedback Amplifiers: General feedback structure, properties of negative feedback, four basic types of feedback topologies (Block diagram only) Operational Amplifier (OP-AMP): Ideal OP-AMP, inverting configuration, non-inverting configuration, OP-AMP Applications (Adder, Subtractor only)	**6**
MODULE 4	Digital Electronicsfundamentals-Number system (Decimal, Binary, Octal and Hexadecimal), conversion amongnumber systems, signed-binary numbers, binary addition, subtraction, multiplication and division, logic gates, laws of Boolean Algebra,simplification of expressions	**5**
MODULE 5	Electronic Instruments: Overview of CRO, DSO; principles of operation, waveform reconstruction, Comparison between CRO & DSO, applications of oscilloscope Principles of Communication Systems: Fundamentals of AM & FM, (Waveforms and general expressions only)	**5**
ESSENTIAL READING	1. Electronics Fundamentals and Applications, D. Chattopadhyay and P.C. Rakshit, New Age International Publications. (Selected portions fromchapters) 2. Electronic Devices & Circuit Theory, R.L. Boylestad and L.Nashelsky, PearsonEducation.	
SUPPLIMENTARY READING	1. Integrated Electronics, Millman and Halkias, TMHPublications. 2. Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford UniversityPress. 3. VLSI Design, Debaprasad Das, Oxford University Press. 4. Electrical & Electronics Measurement and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co(Pvt.) Ltd	

COURSE OUTCOME: After completion of the course, students should be able to

1. Understand theoperationand application of semiconductor devices.
2. Analyze characteristics of FETs.
3. Apply the Feedback Amplifiers and Operational Amplifiers.
4. Remember the fundamentals of different Digital arithmetic operations

ELECTRONICS LAB (0-0-3) Credit-1.5

SESSIONAL OBJECTIVE:

1. To provide engineering skills for circuit design on breadboard with electronic components.
2. To impart the knowledge on digital fundamentals and digital circuit design.
3. To analyze various electronic circuits such as BJT, FET, OP-AMPs etc.

Experiment No.	CONTENT
1	Familiarity with electronic components and devices(Testing of semiconductor diode, Transistor, IC Pins connection) Digital Multimeter should be used.
2	Study and use of CRO to view waveforms and measure its Amplitude and Frequency.
3	V-I Characteristics of a Semiconductor Diode
4	V-I (Output) Characteristics of N-P-N/P-N-P Transistor in CE Configuration
5	Measurement of pinch off voltage and plot transfer characteristics and drain characteristics of JFET.
6	Transfer characteristics and drain characteristics of MOSFET.
7	OP-AMP: Inverting and Non-Inverting Configuration. Record of Waveforms.
8	Verification of Truth table of Logic gates (AND, OR,NOT, NAND, NOR, EX-OR)
9	Half Wave and Full Wave Rectifier without Capacitor filter. Record of Waveforms, Measurement of Average and RMS value.
10	Implementation of digital circuit using Universal gates.
SUPPLEMENTARY BOOKS	1. Integrated Electronics, Millman and Halkias, TMH Publications. 2. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education.

SESSIONAL OUTCOME: After completion of the sessional student should be able to

1. Acquire basic knowledge on electronic devices and components
2. Design different electronics circuits using semiconductor diodes.
3. Analyze and develop the characteristics of BJT and FET Circuits
4. Implement Operational amplifier circuits.
5. Acquire knowledge on basic digital logic gates.

BASIC MECHANICAL ENGINEERING 2-0-0

MODULE-I (11 classes)
Thermodynamics: Systems, Properties, Process, State, Cycle, Internal energy, Enthalpy, Zeroth Law, First law and Second Law of Thermodynamics, Basic Concept Entropy, Properties of ideal gas, Properties of pure substances, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables. Related numerical.

MODULE-2 (8 classes)

Application of Thermodynamics: Single stage air compressor, Steam Power Plant, I.C. Engines (Brief Description on working principles with Schematic diagrams only)

Elements of Fluid Mechanics and Heat Transfer
Properties used in Fluid Mechanics, Fluid Statics, Kinematics and Dynamics (Concepts only), Heat transfer and Classifications (Concepts only)

MODULE-3 (7 Classes)

Introduction to Manufacturing: Classification of engineering materials, Material Properties, Manufacturing processes: Welding, Casting, Forming (Basics only)

MODULE-4 (4 Classes)

Basic Power transmission devices: Belt, Gear drives, clutch, brakes. (Working principle only)
Introduction to Robotics: Robot anatomy, Joints and links and common robot configurations.

Essential Reading

i. Basic Mechanical Engineering by Pravin Kumar, Pearson
ii. Basic Mechanical Engineering by A R Israni, P K Shah, BS Publications
iii. Text book of Elements of Mechanical Engineering, S T Murthy, Universities press
iv. Basic and applied Thermodynamics by P. K. Nag, Tata McGraw Hill

Supplementary reading

i. Basic Mechanical Engineering by.D. Mishra, P. KParida, S.S.Sahoo, India Tech Publishing company
ii. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey
iii. Basic Mechanical Engineering by BasantAgrawal, C M Agrawal,Willey
iv. Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press

COURSE OUTCOMES

CO1: Comprehending the Law of Thermodynamics
CO2: Being aware of how crucial thermodynamics is to IC engines, power plants, refrigerators, and Heat Pump
CO3: Being aware of fluid mechanics and heat transfer concepts
CO4: Recognizing the functions of Engineering materials
CO5: Have a fundamental understanding of welding, Casting, Forming and other manufacturing techniques.
CO6: Recognizing fundamental power transfer mechanisms and aware of the fundamental robotics system.

Basic Civil Engineering

Module-I(6 Classes)

Introduction to Civil Engineering: Various disciplines of Civil engineering, Importance of Civil engineering in infrastructure development of the country, interdisciplinary nature of construction projects.

Residential Buildings: NBC Classification, Basic Components of a building: Basic requirement. Planning and Design of buildings: fundamental requirements, selection of sites, Introduction to building design: functional and structural design.

Foundations: Classification, Bearing Capacity of Soil and related terms (definition only)

Module-II(6 Classes)

Fundamental Properties of Construction Materials: Physical, mechanical and durability properties.

Construction materials: stone, bricks, cement, aggregate, mortar, concrete, timber, steel, non-ferrous metals, paint, plastic, glass, adhesive, tiles, composites(Definition, classification and application),

Module-III(6 Classes)

Importance of Transportation, Transportation modes i.e. Highway, railway, airways, water, pipe and conveyor – Basic Characteristics, advantages and disadvantages. Indian road transport system: Types of roads, classification of highway, urban roads: basic requirements and classification. Basic Components of a Road, Rigid and Flexible pavement (comparison only)

Module-IV(6 Classes)

Quantity of water: Sources of water, Per capita demand, drinking water standards, Public Water Supply System: Necessity and Basic lay out. Conventional water treatment process: Screening, Plain Sedimentation, Sedimentation aided with Coagulation, Filtration, and Disinfection (working principles only).

Module-V(6 Classes)

Irrigation: Importance of Irrigation, Classification of Irrigation projects, Irrigation system: Types, Field water distribution, Multipurpose river valley projects, Dams: Purpose, types. Layout of canal Irrigation system: components and definitions.

Essential Reading:

- Basic Civil engineering, Gopi, S., Pearson Publication
- Basic Civil Engineering, Bhavikatti, S. S., New Age.

Course Outcomes:

- Able to understand the basics of civil engineering and fundamental aspects of building.
- Able to get the brief overview of general aspect of building material.
- Able to get brief idea about transportation modes and planning.
- Able to get brief idea about drinking water standards and water treatment plant.
- Able to get brief idea about irrigation network system.

Engineering Graphics and Design Lab (with AutoCAD)

1) Introduction to AutoCAD: Basic commands, Code provision of IS-696 regarding Lines, Lettering and Dimensioning.
2) Drawing of Scales (Plane Scales, Diagonal Scales, Vernier Scales and Scales of Chords).
3) Construction of simple geometrical figures and Engineering curves.
4) Orthographic Projections:
   i) Projection of a point situated in various quadrants.
   ii) Projections of straight lines.
   iii) Projection of plane figures.
   iv) Projection of simple solids.
   v) Section of solid and Development of surfaces.
5) Isometric projection and perspective view.

Essential Reading:

1. N. D. Bhatt, ***Geometrical Drawing***, Charotar Book Stall, 2002.

Supplementary Reading:

1. K. Venugopal, ***Engineering Drawing and Graphics + AutoCAD***, New Age International (P) Limited. 4th Reprint: June, 2008.
2. K. L. Narayana and P. Kannaiah, ***Engineering Graphics***, Tata McGraw Hill Publishing Co. Ltd.
3. J. D. Bethune, ***Engineering Graphics with AutoCAD***, Pearson Education.

Subject Code		Total Contact Hour	**30**
Semester	**1st/2nd Semester**	Total Credit	**02**
Subject Name	**English for Technical Writing (2-0-0)**		
Pre-requisites	**None**		

Course Objective:

- To develop awareness about the complexity of the communication process.
- To provide learning environment to practice listening, speaking, reading and writingskills.
- To assist the students to carry on the tasks and activities through guided instructionsand materials.
- To develop effective writing skills so as enable students to write in a clear, concise, persuasive manner
- To acquaint students with a variety of forms of writing in professional world.
- To effectively integrate English language learning with employability skills and training.

Syllabus:

Module I - Fundamentals of Technical Communication	**Hours- 06**
➢ Process of communication, types of communication (Verbal & Non Verbal) ➢ Channels of business communication ➢ Barriers to communication. ➢ Bias free language ➢ Cross-cultural communication	
Module II- Communicative Grammar	**Hours - 06**
➢ Time and Tense ➢ Passive and active voice ➢ English Conditionals	
Module III - Sounds of English	**Hours- 06**
➢ Consonant sounds of English ➢ Vowel sounds of English ➢ Stress pattern: Syllable, Stress and Intonation. ➢ Problem sounds for Indian speakers	
Module IV - Professional Communication for Workplace	**Hours 06**
▫ Paragraph writing (The Seven Cs of Good Professional Writing) ▫ Formal Letter Writing ▫ Memo and Notice writing ▫ Agenda and Minute writing ▫ Report Writing	
Module V - Professional Communication for Employment	**Hours - 06**
➢ CV writing ➢ Interview skills	

Essential Reading:

1. Effective Technical Communication by M Ashraf Rizvi (Tata McGraw Hill)
2. Better English Pronunciations By J. D.O Conner (Cambridge University Press)

3. A Communicative Grammar of English by G.N. Leech and Jan Svartik (OUP)

Supplementary Reading:

1. Business Communication Today by Bovee, Thill and Chaterjee, Pearson.
2. Technical Communication: Principles and Practice by Meenakshi Raman and SangeetaSharma, Oxford University Press.
3. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press
4. An introduction to Professional English and Soft Skills by BK Das, et.al. Foundation Books
5. Spoken English: A Manual of Speech and Phonetics by R.K. Bansal, J B Harrison, OrientBlackswan

Course Outcome: At the end of this course students will demonstrate the ability to

CO1: Understand the concept and nature of communication and the objective of TechnicalCommunication relevant for the work place as Engineers.

CO2: Use suitable vocabulary and grammar with confidence and express their ideas both inspeech and writing.

CO3: Evaluate their efficacy as fluent and efficient communicators by learning the voice-dynamics.

Subject Code		Total Contact Hour	
Semester	**1st/2nd Semester**	Total Credit	**1.5**
Subject Name	**Communicative Enlish &Report writing lab**		
Pre-requisites	**None**		

Course Objective:

The purpose of the English lab is to involve students to actively participate in language learning exercises and get more practice than the traditional classroom environment. The primary role of the lab is to create an environment where students feel comfortable speaking the language theyare learning, and where they can get the help they need in their journey to learn English as asecond language. The lab further focuses

- To provide a platform to the students to develop their language skills.
- To strengthen their professional skills and To improve fluency in spoken English, to practice correct pronunciation and neutralize their mother tongue influence.
- To provide hands-on training in Speaking, Listening, reading and writing skills.
- To improve the fluency of students in spoken English and neutralize their mother tongue influence.

Syllabus:

Assignment I
➢ Self- introduction
Assignment II
➢ Professional presentation
Assignment III
➢ Power point presentation
Assignment IV
➢ Situational conversational practice/ Role play
Assignment V
➢ Review of a book/newspaper editorial/ movie
Assignment VI
➢ Cover letter and CV writing
Assignment VII
➢ Listening Practice
Assignment VIII
➢ Group Discussion
Assignment IX
➢ Mock Interview

Assignment X
➢ Reading Practice

Course Outcome: At the end of this course students will demonstrate the

CO1: To acquire strategic competence to use both spoken and written language in range a widecommunication strategies.

CO2: To maintain good linguistic competence- through accuracy in grammar, pronunciation and

CO3: Speak English with proper pronunciation and

CO4: Make effective oral presentations by interpreting and analysing data, pictures and videos andparticipate in Group Discussion on general topics