COURSE STRUCTURE AND SYLLABUS

Circuit Branch Cluster		Non-Circuit Branch Cluster	
Section	**Branch**	**Section**	**Branch**
D	Computer Science and Engineering	A	Chemical Engineering
E and F	Electrical Engineering	B and C	Civil Engineering
G	Electrical and Electronics Engineering	K and L	Mechanical Engineering
H and I	Electronics and Telecommunication Engineering	M	Metallurgical & Materials Engineering
J	Information Technology	N	Production Engineering

COURSE STRUCTURE

FIRST YEAR (*FIRST SEMESTER*)

Sl. No.	Circuit Branches	Non-Circuit Branches	Contact Hrs. L-T-P	Credit
	Theory	**Theory**		
1	Mathematics – I	Mathematics – I	3-0-0	3
2	Physics	Chemistry	3-0-0	3
3	C and Data Structures	Engineering Mechanics	3-0-0	3
4	Basic Electrical Engineering	Basic Electronics	3-0-0	2
5	Basic Manufacturing Processes	Basic Civil Engineering	3-0-0	2
6	English for Technical Writing	Universal Human Values	2-0-0	2
Sessional		**Sessional**		
7	Physics Lab	Chemistry Lab	0-0-3	1.5
8	Programming Lab	Workshop and Digital Manufacturing Lab	0-0-3	1.5
9	Electrical Engineering Lab	Electronics Lab	0-0-3	1.5
10	Communicative English & Report Writing Lab	Engineering Graphics & Design Lab (With AutoCAD)	0-0-3	1.5
11	Sports/Yoga/NCC/NSS		0-0-2	1
		Total Credits	**17-0-14**	**22**

FIRST YEAR (*SECOND SEMESTER*)

Sl. No.	Circuit Branches	Non-Circuit Branches	Contact Hrs. L-T-P	Credit
	Theory	**Theory**		
1	Mathematics – II	Mathematics – II	3-0-0	3
2	Chemistry	Physics	3-0-0	3
3	Engineering Mechanics	C and Data Structures	3-0-0	3
4	Basic Electronics	Basic Electrical Engineering	3-0-0	2
5	Basic Civil Engineering	Basic Manufacturing Processes	3-0-0	2
6	Universal Human Values	English for Technical Writing	2-0-0	2
Sessional		**Sessional**		
7	Chemistry Lab	Physics Lab	0-0-3	1.5
8	Workshop and Digital Manufacturing Lab	Programming Lab	0-0-3	1.5
9	Electronics Lab	Electrical Engineering Lab	0-0-3	1.5
10	Engineering Graphics & Design Lab (With AutoCAD)	Communicative English & Report Writing Lab	0-0-3	1.5
11	Sports/Yoga/NCC/NSS		0-0-2	1
		Total Credits	**17-0-14**	**22**

Subject Code	**MA-1101**	**Total Contact Hour**	**30**
Semester	**1st / 2nd**	**Total Credit**	**3**
Subject Name	**MATHEMATICS - I**		
Pre-requisites	**None**		
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			
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.		**6 Hours**
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.		**6 Hours**
Module III	**Multivariable Calculus (Differentiation):** Partial derivatives. Jacobians, Hessian Matrix. Maxima, Minima and saddle points. Method of Lagrange multipliers.		**6 Hours**
Module IV	**Linear Algebra:** Vector Space, Basis and dimension, Linear Systems of Equations, Gauss elimination, Linear Dependence and Independence, Rank of a Matrix.		**6 Hours**
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)		**6 Hours**
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	**PH-1101**	**Total Contact Hour**	**30**
Semester	**1st / 2nd**	**Total Credit**	**3**
Subject Name	**PHYSICS**		
Pre-requisites	**None**		
Course Objective	To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology. 1. Graduates of engineering branches will be able to: 2. To produce future-ready engineers with a strong foundation in science, to cater to the requirements of R&D establishments focused on developing state-of-the-art and upcoming technologies. 3. Practice in professions requiring an essential perceptive of the principles of physics and engineering. 4. Preserve professional proficiency in swiftly-advancing scientific and technical areas. 5. Pursue advanced degrees in physics, engineering, and other professional fields. 6. To enhance their problem-solving skills and independent thinking through an adequate curriculum.		
SYLLABUS			
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.		**6 Hours**
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).		**7 Hours**
Module III	**Electromagnetism: 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.		**6 Hours**
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.		**7 Hours**
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.		**4 Hours**
Essential Reading/ Supplementary Reading	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 Outcomes	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 to content 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 of results with theoretical calculations.

Subject Code	PH-1181	Total Contact Hour	
Semester	1st / 2nd	Total Credit	1.5
Subject Name	PHYSICS LAB.		
Pre-requisites	None		

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.

Subject Code	**CY-1101**	**Total Contact Hour**	**30**
Semester	**1st / 2nd**	**Total Credit**	**3**
Subject Name	**CHEMISTRY**		
Pre-requisites	**None**		
SYLLABUS			
Module I	**Periodic Properties:** 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.		**6 Hours**
Module II	**Free Energy in Chemical Equilibria**: 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.		**6 Hours**
Module III	**Spectroscopic Techniques and Applications**: Basic Terms and Principles of Spectroscopy Molecular Rotational (Microwave) Spectroscopy: Basic Principle and Application to Diatomic Molecules, Selection Rules. Molecular Vibrational (IR) Spectroscopy: Basic Principle, Types of Vibrations, Vibrational Frequency, Selection Rules. Electronic (UV-Visible) Spectroscopy: Laws of Absorption, Basis Principle, Types of Electronic Transitions, Chromophores and Auxochrome.		**6 Hours**
Module IV	**Stereochemistry**: 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).		**6 Hours**
Module V	**Organic Reactions and Synthesis**: Introduction to Reaction Intermediates {Carbocation, Carbanion, Free Radial (Formation, structure and stability), Reactions involving Substitution, Addition, Elimination (Examples and Mechanisms).		**6 Hours**
Essential Reading	1. Engineering Chemistry: fundamental to Applications by Shikha Agarwal, Cambridge University Press, Second Edition, 2019. 2. Engineering Chemistry by B. Rama Devi, P. Aparna, and Prasanta Rath, Cengage Learning, 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, Pragati Prakashan,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 realize 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.

Subject Code	**CY-1181**	**Total Contact Hour**	
Semester	**1st / 2nd**	**Total Credit**	**1.5**
Subject Name	**Chemistry Lab**		
Pre-requisites	**None**		
	LIST OF EXPERIMENTS		

Any Ten Experiments:

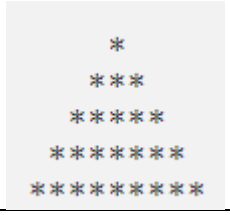
1. Determination of the alkalinity in the given water sample.
2. Determination of the temporary and permanent hardness in the given water sample by complexometric titration using EDTA as standard solution.
3. Determination of amount of available chlorine in bleaching powder.
4. Standardization of potassium 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 solution using pH 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. 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 analyze 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.

Subject Code	**CS-1101**	**Total Contact Hour**	**30**
Semester	**1st/2nd**	**Total Credit**	**3**
Subject Name	**C and Data Structures**		
Pre-requisites	**Fundamentals of Computers**		
Course Objective	1. Learn fundamentals of C programming 2. Learn various steps of program development and implementation 3. Learn different Data Structures for structured programming approach 4. Learn relation of memory and memory referencing with the program execution 5. Learn to implant small projects		
SYLLABUS			
Module I	**Fundamentals of C:** 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)		**8 Hours**
Module II	**Function, Array, Structure and Union:** Functions (Built-in, user-defined), Recursive function. Array: 1 – D, 2 – D, Matrix operations, String, Passing Array to Function, Structure, Union.		**7 Hours**
Module III	**Pointer & Dynamic Memory Allocation:** 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 ()].		**6 Hours**
Module IV	**Data Structures:** Introduction to Data Structure, Linear Linked List: Creation, Insertion, Deletion. Stack, Stack applications (Infix to postfix, postfix evaluation), Queue (linear & circular).		**5 Hours**
Module V	**Tree, Introduction to Sorting & Searching:** Binary Tree, Binary Search Tree, Sorting (Bubble Sort, Quick Sort), Searching (Linear Search, Binary Search).		**4 Hours**
Essential Reading	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 Reading	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 **CO1.** Remember, understand and implement simple algorithms to C programs. **CO2.** Test and execute programs using function, array, structure and union. **CO3.** Analyze the relation of memory and memory referencing with the program execution. **CO4.** Apply different Data Structures for problem solving. **CO5.** Implement different sorting and searching algorithms.		

Subject Code	CS-1181	Total Contact Hour	
Semester	1st/2nd	Total Credit	1.5
Subject Name	PROGRAMMING LAB.		
Pre-requisites	None		

LIST OF EXPERIMENTS

1	a) Write a program to print your Bio-data. b) Write a program in C to test the arithmetic operators. c) Write a program to find out the simple interest and compound interest with the given input data.
2	a) Write a program to test the logical, bitwise, unary and ternary operators with the given input data. b) Write a program to check an inputted year is leap year or not. c) 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	a) 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. b) Write a program to enter a number from 1-7 and display the corresponding day of the week using switch case statement. c) 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	a) Write a program to check a given number is palindrome or not. b) Write a program to generate prime numbers present between two given numbers. c) Write a program to print the following pyramid star pattern. 
5	a) 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. b) Write program that will accept an array and sort the array in ascending order. Display both the unsorted and unsorted arrays. c) 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	a) Write a program to swap the value of two inputted variable using function. Show the initial value and value after swapping. b) Write a program to print the Fibonacci series using function. c) Write a program that will accept two matrices using function and multiply them using function and show the result using function.
7	a) Write a program to find the GCD among two given number using recursion. b) Write a program to accept student data in a structure and display the structure elements. c) Check a inputted string is palindrome or not using pointer.
8	a) 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. b) Write a program to implement realloc() and free(). c) 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	a) Write a program to implement Quick Sort algorithm using C. b) Write a program to search an element using Linear Search algorithm. c) Write a program to search an element using Binary Search algorithm.

Subject Code	**ME-1101**	**Total Contact Hour**	**30**
Semester	**1st / 2nd**	**Total Credit**	**3**
Subject Name	**ENGINEERING MECHANICS**		
Pre-requisites	**None**		
SYLLABUS			
Module I	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.		**8 Hours**
Module II	Friction: Fundamentals and Problems involving friction, Ladder, Wedges. Principle of virtual work.		**4 Hours**
Module III	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.		**6 Hours**
Module IV	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.		**6 Hours**
Module V	Curvilinear translation: Kinematics, Equation of motion, Projectile, D Alembert‟s principle of curvilinear motion. Kinematics of rotation of rigid body.		**6 Hours**
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 Shankara Subramanium, 3rd Edition, 2017, S. Chand. 3. Engineering mechanics: K. L. Kumar and Veenu Kumar, 4th Edition,2017, Tata MC Graw Hill.		
Course Outcomes	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**. Enrich fundamental concept of friction and demonstrate the analytical skills to solve the problems involving friction. **CO3**. Assimilating the knowledge for determination of centroid and second moment of area of sections and 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.		

.

Subject Code	ME-1181	Total Contact Hour	
Semester	1st/2nd	Total Credit	1.5
Subject Name	WORKSHOP AND DIGITAL MANUFACTURING LABORATORY		
Pre-requisites	None		

LIST OF EXPERIMENTS

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.

I. 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.

II. 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.

III. Black Smith Section: Study of different Hand tools, equipment's 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.

IV. 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.

V. Robotics Lab:

A. Study of Robot.

B. Pick and place operation, demonstration and explanation of code.

C. Palletizing operation, demonstration and explanation of code.

VI. 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.

Subject Code	**EE-1101**	**Total Contact Hour**	**30**
Semester	1st / 2nd	**Total Credit**	**2**
Subject Name	**BASIC ELECTRICAL ENGINEERING**		
Pre-requisites	**None**		
SYLLABUS			
Module I	**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.		**6 Hours**
Module II	**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.		**6 Hours**
Module III	**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.		**6 Hours**
Module IV	**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.		**6 Hours**
Module V	**Introduction to Power System:** General structure of electrical power systems, Concepts of Generation, Transmission and Distribution, Sources of Electrical Power.		**6 Hours**
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		

Subject Code	EE-1181	Total Contact Hour	
Semester	1st / 2nd	Total Credit	1.5
Subject Name	ELECTRICAL ENGINEERING LAB.		
Pre-requisites	None		

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's 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.

Subject Code	**EC-1101**	**Total Contact Hour**	**30**
Semester	**1st/2nd**	**Total Credit**	**2**
Subject Name	**BASIC ELECTRONICS**		
Pre-requisites	**NONE**		
Course Objective	1. To impart the fundamentals of semiconductor devices and their applications to various circuits. 2. To impart the knowledge of fundamentals of digital electronics and Integrated Circuits (IC). 3. To impart the knowledge of electronic measuring instruments and fundamentals of communication systems.		
SYLLABUS			
Module I	Semiconductor Physics: Properties of semiconductor, current flow in semiconductors, voltage-current characteristic of a p-n junction, Rectifiers. Bipolar junction Transistor (BJT): Device structure, types and modes of operation, static characteristic, BJT as a switch, BJT as an amplifier, concept of biasing of BJT.		**7 Hours**
Module II	JFET: Physical structure, operation and static characteristics. MOSFET: Physical structure, operation and characteristics of D- and E-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 Hours**
Module III	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 Hours**
Module IV	Digital Electronics Fundamentals-Number system (Decimal, Binary, Octal and Hexadecimal), conversion among number systems, signed-binary numbers, binary addition, subtraction, multiplication and division, logic gates, laws of Boolean Algebra, simplification of expressions.		**5 Hours**
Module V	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 Hours**
Essential Reading	1. Electronics Fundamentals and Applications, D. Chattopadhyay and P.C. Rakshit, New Age International Publications. (Selected portions from chapters) 2. Electronic Devices & Circuit Theory, R.L. Boylestad and L. Nashelsky, Pearson Education.		
Supplementary Reading	1. Integrated Electronics, Millman and Halkias, TMH Publications. 2. Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford University Press.		

	3. VLSI Design, Debaprasad Das, Oxford University Press. 4. Electrical & Electronics Measurement and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co (Pvt.) Ltd.
Course Outcomes	After completion of the course, students should be able to **CO1.** Understand the operation and application of semiconductor devices. **CO2.** Analyze characteristics of FETs. **CO3.** Apply the Feedback Amplifiers and Operational Amplifiers. **CO4.** Remember the fundamentals of different Digital arithmetic operations and Integrated circuits. **CO5.** Evaluate some important Electronic Instruments and Communication systems.

Subject Code	**EC-1181**	**Total Contact Hour**	
Semester	**1st / 2nd**	**Total Credit**	**1.5**
Subject Name	**ELECTRONICS LAB.**		
Pre-requisites	**None**		
Course 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.		

LIST OF EXPERIMENTS

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 READING	1. Integrated Electronics, Millman and Halkias, TMH Publications. 2. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education.
Course Outcomes	After completion of the sessional student should be able to **CO1.** Acquire basic knowledge on electronic devices and components **CO2.** Design different electronics circuits using semiconductor diodes. **CO3.** Analyze and develop the characteristics of BJT and FET Circuits **CO4.** Implement Operational amplifier circuits. **CO5.** Acquire knowledge on basic digital logic gates.

Subject Code	PE-1101	Total Contact Hour	30
Semester	1st / 2nd	Total Credit	2
Subject Name	BASIC MANUFACTURING PROCESS		
Pre-requisites	NONE		
SYLLABUS			
Module I	Foundry Process/ Casting, Patterns, Pattern Materials, Pattern Allowances, Moulding Materials, Composition of Moulding Sand, Properties of Moulding Sand, Sand Testing.		6 Hours
Module II	Solidification of Casting, Types of Solidification, Special Casting Technique, Advantages of special casting over Sand Casting, Special Casting Processes: Die Casting and Centrifugal Casting, Casting Defects.		6 Hours
Module III	Welding: Introduction, Classification of Welding Processes, Gas Welding, Arc Welding: SMAW, TIG, MIG, Resistance Welding: Resistance Spot Welding, Resistance Seam Welding and Resistance Projection Welding. Friction Welding and Ultrasonic Welding.		6 Hours
Module IV	Metal Forming Process: Cold & hot working of metals, Extrusion: Classification, Advantages, Limitations and applications, Rolling: Terminology used in Rolling, Types of rolling Mills & rolling defects.		6 Hours
Module V	Digital manufacturing: Numerical control- The NC procedure, Elements of NC systems, Classification of NC systems, Functions of CNC, Features of CNC, CNC programming in APT (PTP drilling, milling), Additive manufacturing- The generic additive manufacturing process, Classification of AM processes, Fused deposition modeling, Material jetting, Binder jetting, Sheet lamination process. Applications of robots in manufacturing.		6 Hours
Essential Reading	1. Manufacturing Technology (Foundry Forming & Welding)- P.N. Rao, Tata McGraw Hill. 2. CAD/CAM by Groover and Zimmers, TMH.		
Supplementary Reading	1. Additive Manufacturing Technologies by Gibson, Rosen and Stucker, Springer. 2. Manufacturing Science- AmitabhaGhosh and A K Mallik, East-West Press Pvt. Ltd.		
Course Outcomes	At the end of this course, students will demonstrate the ability to **CO1.** Understand the basic foundry process. **CO2.** Acquire the brief overview of casting processes. **CO3.** Recognize various welding processes. **CO4.** Comprehend metal forming processes. **CO5.** Understand basics of digital manufacturing.		

Subject Code	CE-1101	Total Contact Hour	30
Semester	1st/2nd	Total Credit	2
Subject Name	**BASIC CIVIL ENGINEERING**		
Pre-requisites	NONE		
SYLLABUS			
Module I	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).		**6 Hours**
Module II	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).		**6 Hours**
Module III	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).		**6 Hours**
Module IV	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).		**6 Hours**
Module V	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.		**6 Hours**
Essential Reading	1. Basic Civil engineering, Gopi, S., Pearson Publication 2. zBasic Civil Engineering, Bhavikatti, S. S., New Age.		
Course Outcomes	**CO1.** Able to understand the basics of civil engineering and fundamental aspects of building. **CO2.** Able to get the brief overview of general aspect of building material. **CO3.** Able to get brief idea about transportation modes and planning. **CO4.** Able to get brief idea about drinking water standards and water treatment plant. **CO5.** Able to get brief idea about irrigation network system.		

Subject Code	**CE-1181**	**Total Contact Hour**	
Semester	**1st / 2nd**	**Total Credit**	**1.5**
Subject Name	**ENGINEERING GRAPHICS AND DESIGN LAB (WITH AUTOCAD)**		
Pre-requisites	**None**		

LIST OF EXPERIMENTS

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	**HS-1101**	**Total Contact Hour**	**25**
Semester	**1st/2nd**	**Total Credit**	**2**
Subject Name	**ENGLISH FOR TECHNICAL WRITING**		
Pre-requisites	**None**		
Course Objective	1. To develop awareness about the complexity of the communication process. 2. To provide learning environment to practice listening, speaking, reading and writingskills. 3. To assist the students to carry on the tasks and activities through guided instructionsand materials. 4. To develop effective writing skills so as enable students to write in a clear, concise, persuasivemanner 5. 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:** Process of communication, types of communication (Verbal & Non-Verbal). Channels of business communication. Barriers to communication. Bias free language. Cross-cultural communication.		**5 Hours**
Module II	**Communicative Grammar:** Time and Tense. Passive and active voice. English Conditionals.		**5 Hours**
Module III	**Sounds of English:** Consonant sounds of English. Vowel sounds of English. Stress pattern: Syllable, Stress and Intonation. Problem sounds for Indian speakers		**5 Hours**
Module IV	**Professional Communication for Workplace:** Paragraph writing (The Seven Cs of Good Professional Writing). Formal Letter Writing. Memo and Notice writing. Agenda and Minute writing. Report Writing.		**5 Hours**
Module V	**Professional Communication for Employment:** CV writing. Interview skills.		**5 Hours**
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 Outcomes	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. **CO4:** Write flawless business correspondence like formal letters, memos, notices, reports etc. **CO5:** Draft job application with Resume and e-mails in a convincing manner.

Subject Code	**HS-1181**	**Total Contact Hour**	
Semester	**1st / 2nd**	**Total Credit**	**1.5**
Subject Name	**COMMUNICATIVE ENGLISH AND 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 ofthe 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 1. To provide a platform to the students to develop their language skills. 2. To strengthen their professional skills and to improve fluency in spoken English, to practice correct pronunciation and neutralize their mother tongue influence. 3. To provide hands-on training in Speaking, Listening, reading and writing skills. 4. To improve the fluency of students in spoken English and neutralize their mother tongue influence.		

LIST OF EXPERIMENTS

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

Assignment VII: Listening practice

Assignment VIII: Group discussion

Assignment IX: Mock interview

Assignment X: Reading practice

Course outcomes	At the end of this course students will demonstrate the ability to **CO1.** To acquire strategic competence to use both spoken and written language in a wide range of communication strategies. **CO2.** To maintain good linguistic competence- through accuracy in grammar, pronunciation and vocabulary. **CO3.** Speak English with proper pronunciation and intonation. **CO4.** Make effective oral presentations by interpreting and analyzing data, pictures and videos and participate in Group Discussion on general topics. **CO5.** Speak with clarity and confidence which in turn enhances their employability skills

Subject Code	**EA-1101**	**Total Contact Hour**	
Semester	**1st/2nd**	**Total Credit**	**2**
Subject Name	**UNIVERSAL HUMAN VALUES-I: UNDERSTANDING HARMONY**		
Pre-requisites	**None**		
Course Objective	The objective of the course is fourfold: 1. Development of a holistic perspective based on self-exploration about themselves (human beings), family, society and nature/existence. 2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence 3. Strengthening of self-reflection. 4. Development of commitment and courage to act towards full human potential.		
SYLLABUS			
Module I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Know each other (Introduction of the faculty and the students), Get to know batch mates. Exploring basic Human Aspirations and concerns. Basic Human Aspirations and their fulfillment Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and experiential Validation- as the process for self-exploration and the basis of right understanding. Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for the fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking. In addition, the video of "The Story of Stuff" can be shown and discussed.		**7 Hours**
Module II	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Resolution of some of the concerns Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease		**5 Hours**
Module III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding values in human-human relationship; program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and		**5 Hours**

	competence. The videos (two parts) of "Right Now Right Here" can be shown and discussed as practice session. Understanding the meaning of Respect, and the other salient values in relationship. Understanding the harmony in the society (society being an extension of the family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives	
Module IV	**Understanding Harmony in the Nature and Existence - Whole Existence as Coexistence** Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self -regulation in nature.The video of "How to grow a forest in your backyard" can be shown and discussed. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space Self-evaluation Include practice sessions to discuss human being as the cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc	**7 Hours**
Module V	**Understanding the harmony in the Nature.** Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. The video of "How to grow a forest in your backyard" can be shown and discussed. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Self-evaluation include practice sessions to discuss human being as the cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc	**6 Hours**
Essential Reading	Human Values and Professional Ethics (2nd revised edition) by R R Gaur, R Asthana, G P Bagaria, Excel Books, New Delhi, 2019	
Supplementary Reading	1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.	
Course Outcomes	On completion of the course, a student will be able to: **CO1.** Have more awareness of themselves and their surroundings (family, society, nature). **CO2.** Be more responsible in life in handling problems with sustainable solutions **CO3.** Have better clarity about human relationships and human nature and also become sensitive to their commitment towards what they have understood (human values, human relationships, and human society). **CO4.** Keep human relationships and human nature in mind. **CO5.** Apply what they have learned to their real life.	

Subject Code	**MA-1102**	**Total Contact Hour**	**30**
Semester	**1st / 2nd**	**Total Credit**	**3**
Subject Name	**MATHEMATICS-II**		
Pre-requisites	**None**		
Course Objective	To deal with fundamentals of Mathematics that is required to solve and analyze engineering problems.		
SYLLABUS			
Module I	First order ODE Exact ODEs. Integrating factors. Linear first order ODEs. Nonlinear first order ODE and Bernoulli's equations, Applications to Population growth, Newtons law of cooling, RL circuit.		**6 Hours**
Module II	Second order ODE Second order linear differential equations with constant coefficients, Euler-Cauchy equations, method of undetermined coefficients, solution by variation of parameters. Power series solutions of ODE. Legendre's equations (explicit solution only).		**6 Hours**
Module III	Vector Calculus Vector and Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane (Statement and applications).		**6 Hours**
Module IV	Complex Analysis Limit, Continuity, Derivative, Analytic Function, Cauchy-Riemann Equations, Laplace's Equation, Exponential Function, Trigonometric and logarithm functions.		**6 Hours**
Module V	Complex Analysis Line Integral in the Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Functions, Laurent series, Residue theorem with simple problems.		**6 Hours**
Essential Reading	1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2006.		
Supplementary Reading	1. E.M. Stein, Fourier Analysis: An Introduction (Princeton Lectures in Analysis) 2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 3. S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984. 4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995. 5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.		

Course Outcomes	The objective of this course is to familiarize the prospective engineers with techniques in ODE, PDE and Fourier analysis. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. **CO1:** The effective mathematical tools for the solutions of differential equations that model physical processes. **CO2:** Apply differential equation in real life engineering problems. **CO3:** Application of modeling in differential equation **CO4:** To know about complex functions **CO5:** To familiar with application of complex integration