

MATHEMATICS-I					
Course Code	FE 110		Credits	4	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	1	0	39 hrs/sem
Scheme of Examination TOTAL = 150 marks	IA	TW	TM	P	O
	25	25	100	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the concepts of an infinite series, Beta and Gamma Functions, ordinary differential equations and limit and continuity
CO2	Evaluate integrals using Beta and Gamma functions,
CO3	Demonstrate various operations on complex numbers & analytic properties of functions of complex variables
CO4	Apply Partial differentiation in engineering applications

UNIT -1	
Convergence of sequence and series-tests for convergence: Integral Test, Comparison test, D'Alembert's Ratio test, Cauchy root test, Raabe's Test, Leibnitz test for alternate series. Power series: Radius of convergence and Interval of convergence, Taylor's series, series for exponential, trigonometric and logarithm functions.	10hrs
UNIT -2	
Leibnitz's theorem, Taylor's and Maclaurin's theorems with remainders; Limits: Indeterminate forms and L'Hospital's rule; Maxima and minima. Beta and Gamma functions and their properties.	10hrs
UNIT -3	
First order and first degree Ordinary Differential Equations, Method of separation of variables, Homogeneous and Non- Homogeneous differential equations, Equations reducible to Homogeneous form, Linear Differential Equations, Bernoulli's Differential Equation, Exact and Non- Exact Differential Equations.	10hrs
UNIT -4	
Functions of two variables: Limit and continuity, Partial derivatives, Euler's Theorem, Maxima, Minima and saddle points; Method of Lagrange multipliers.	9 hrs

TEXTBOOKS

1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES

1	D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3	Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

PHYSICS					
Course Code	FE 120 / FE220		Credits	3	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	0	0	39 hrs/sem
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the behaviour of light, lasers, x-rays, semiconductors and ultrasonic devices.
CO2	Describe the influence of physical system parameters on propagation of light, lasers, x-rays and the properties of magnetic materials and semiconductors
CO3	Determine the influence of the physical parameters on behaviour of light, lasers, semiconductors, ultrasonic waves, magnetism and x-rays
CO4	Compute the dimensions of lenses, wavelength of ultrasonic waves, magnetic saturation, semiconductor characteristics, lasers passing through fibre optics and x-ray diffraction.

UNIT -1	
<p>INTERFERENCE OF LIGHT: Geometric and optical path, Phase change at reflection (only statement), Interference based on division of amplitude, Interference due to reflected and transmitted light in thin parallel film, Interference in wedge shaped film, Newton's rings for reflected and transmitted light, Determination of radius of curvature of plano-convex lens, wavelength of light used and refractive index of liquid using Newton's ring experiment, applications of interference.</p> <p>ULTRASONICS: Production of ultrasonic waves, Magnetostriction, Piezoelectric oscillator, detection of ultrasonic waves, Properties, Application of ultrasonics in various fields, Measurement of wavelength and velocity by acoustic diffraction grating.</p>	10hrs
UNIT -2	
<p>MAGNETISM: Introduction, Origin of magnetization, Classification of magnetic materials, Magnetic hysteresis, Soft and hard magnetic materials, Applications of magnetic materials. Electron Ballistics: Electrostatic and magnetic focusing, CRO and applications.</p> <p>SEMICONDUCTORS: Band theory of solids, Energy Gap, Energy band structure of semiconductors, Mobility, Drift velocity, Conductivity of charge carriers, Generation and recombination of charges, Diffusion, Hall effect,</p>	10hrs
UNIT -3	
<p>LASERS: Interaction of radiation with matter from quantum mechanical point of view: absorption, stimulated and spontaneous emission of radiation, Active medium, Metastable state, Einstein's theory of stimulated emission(no derivation), Condition for light amplification, Population inversion, Pumping, Pumping schemes, Optical resonator, Properties of laser, He-Ne laser, Ruby laser, Applications.</p> <p>FIBER OPTICS: Total internal reflection, Propagation of light in optical fiber, Structure of an optical fiber and fiber cable, Acceptance angle and cone,</p>	10hrs

Numerical aperture, Modes of propagation, Types of optical fibers: single and multimode fibers, Applications- fiber optic communication , endoscopy.	
UNIT -4	
X-RAYS: Origin of X-rays, characteristic and continuous X-ray spectra, Mosley's law, X-ray diffraction: Bragg's law and Bragg's spectrometer, properties and applications. WAVE-PARTICLE DUALITY: Compton effect, Expression for Compton shift, Wave nature of particle, de Broglie hypothesis, Davisson-Germer experiment.	9 hrs

TEXTBOOKS	
1	M. N. Avadhanulu & P. G. Kshirsagar; A text book of engineering Physics; S. Chand & company Pvt. Ltd. Revised edition 2015.
2	A. S. Vasudeva; Modern Engineering Physics; S. Chand & Company Pvt. Ltd. Revised Edition.
REFERENCES	
1	Uma Mukherji; Engineering Physics; Narosa Publications.
2	R. K. Gaur & S. L. Gupta; Engineering Physics; Dhanpat Rai Publications Pvt. Ltd. Reprint 2013.
3	K. Rajagopal; Engineering Physics; PHI Learning Pvt. Ltd. Third Printing 2009.

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING					
Course Code	FE 130		Credits	3	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
	3	0	0	39 hrs/sem	
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the use of DC Circuits, Ac Circuits, Diodes and Bipolar Junction Transistor
CO2	Demonstrate the use of DC Circuits, Ac Circuits, Diodes and Bipolar Junction Transistor in simple circuits and compare their performance
CO3	Design simple DC Circuits, AC circuits and Transistor circuits for real life applications.
CO4	Implement and analyse the basic DC circuits, AC Circuits and Transistors.

UNIT -1	
Introduction to Energy sources, DC Circuit Analysis: Kirchoff's laws, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power transfer theorem. Magnetism: Related terms, B-H curve, Faraday's Laws, Lenz's Law, Analogy between Electrical and magnetic circuits, Solenoid	10hrs
UNIT -2	
A.C Fundamentals: Analysis of R, L, C, R-L, R-C, RLC circuits, Concept of active power, reactive power, apparent power. Three phase systems. Star and Delta connection, current voltage and power relationship. Single phase transformer: Construction, principle of operation, efficiency, voltage regulation	10hrs
UNIT -3	
Diodes and Circuits: Semiconductors, p-n junction basics, pn junction diode, Zener diode, breakdown mechanism in diodes, light emitting diode. Diode Applications: Half-wave, Full-wave and Bridge Rectifiers, PIV; DC and r.m.s voltages, Ripple Factor. Voltage regulation using Zener diodes.	10hrs
UNIT -4	
Bipolar Junction Transistor (BJT): Transistor Construction; Transistor Operation, Transistor various configurations, Transistor Biasing. MOSFET and IGBT: Construction, V-I characteristics and comparison. SCR- construction, V-I characteristics and phasecontrol applications	9 hrs

TEXTBOOKS

1	Vincent Del Tero; Principles of Electrical Engineeringby; PHI Publication.
2	Joseph Administer; Electrical Circuits; Schaum Series Publication.
3	Hayt, Kemmerly, Durbin ;Engineering Circuit Analysis; Tata McGraw Hill Publication.

REFERENCES

1	Rajendra Prasad; Fundamentals of Electrical Engineering; PHI Publication.
2	Boylestad and L. Nashelsky; Electronic Devices and Circuits; PHI
3	A. Mottershead; Electronic Devices and Circuits; PHI.
4	N.N.Bhargava; Basic Electronics and Linear Circuits; Tata McGraw-Hill.
5	Vijay Baru, RajendraKaduskar, Sunil Gaikwad; Basic Electronics Engineering; Dreamtech Textbooks.

BASICS OF MECHANICAL ENGINEERING					
Course Code	FE 140		Credits	3	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
	3	0	0	39 hrs/sem	
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Find resultant and understand the concept of equilibrium of coplanar concurrent and non-concurrent force systems
CO2	Explain the concept of centroid, area moment of inertia and mass moment of Inertia,
CO3	Demonstrate the basic principles of Engineering Mechanics and applications to beams and trusses
CO4	Analyse the principle of virtual work, application of Work Energy principle, Impulse Momentum equation, and principle to rigid bodies.

UNIT -1	
<p>Basic Concepts and Equilibrium: Concept of a rigid body, Laws of motion, Force systems, Principle of Transmissibility of forces, concurrent and non-concurrent Forces, Composition and resolution of forces, moment of a force, Principle of moments, Resultant of a forces. Equilibrium of forces, Lami's theorem, Free body diagrams, Applications. Types of beams, Determinate and Indeterminate beams, Types of loads, Types of supports and support reactions of determinate beams.</p> <p>Friction: Theory of friction, Types of friction, Static and kinetic friction, angle of friction, Limiting Friction, Laws of friction, Coefficient of friction, Angle of repose, Applications involving rigid body on a horizontal or an inclined plane, ladder and wedge friction.</p>	10hrs
UNIT -2	
<p>Centroid and Moment of Inertia: First moment of an area and Centroid, Second moment of area, radius of gyration, Parallel Axes Theorem, Perpendicular axes Theorem, polar moment of inertia, Finding moment of inertia of built up sections.</p> <p>Kinetics of Rigid Body: Work Energy principle, Impulse Momentum equation, D'Alembert Principle and related applications.</p>	10hrs
UNIT -3	
<p>Introduction to Thermodynamics: Definition of thermodynamics. Thermodynamic systems—system, boundary and surroundings—closed system—open system—isolated system—adiabatic system—homogeneous system—heterogeneous system, Macroscopic and microscopic points of view. Thermodynamic equilibrium Properties of systems, State, Process, Cycle, Point function. Path function, Temperature, Zeroth law of thermodynamics.</p> <p>Heat Work and Energy Interaction: Work Transfer, displacement work, displacement work in various process, P-V representation, other types of work</p>	10hrs

transfer, net work done by system, Heat transfer- path function, Specific heat and latent heat concepts, Statements/ corollaries of First, Second and Third law of thermodynamics.	
UNIT -4	
<p>Introduction to manufacturing processes and Their Applications: Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes</p> <p>Machine Tools (Basic elements, Working principle and types of operations): Lathe Machine – Centre Lathe, Types of lathe, lathe specifications, Parts of lathe, Lathe operations, Plain turning, Step turning, Taper turning, Thread cutting, knurling, Drilling Machine, Grinding machine, Power saw, Milling Machine, Introduction to CNC machines.</p> <p>Working Principles of various Transmission Systems: Belts, Chains, Gears</p>	9 hrs

TEXTBOOKS	
1	S.S. Bhavikatti and K.G. Rajshekharappa; Engineering Mechanics, New Age International Publication.
2	P. K. Nag; Engineering Thermodynamics; Tata McGraw Hill Publications.
3	S. K. Hajra Choudhury, S. K. Bose, A. K. Hajra Choudhury, Nirjhar Roy, Elements of Workshop Technology, Media Promoters & Publishers Pvt. Ltd.
REFERENCES	
1	A. K. Tayal; Engineering mechanics; Umesh Publications
2	Y. a. Cengel, M. A. Boles; Thermodynamics – An Engineering Approach; Tata McGraw Hill Publications.
3	K.R.Gopalkrishna A Textbook of Elements of Mechanical Engineering, Subhash Publishers

PHYSICS LABORATORY					
Course Code	FE 150		Credits	1	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		0	0	2	26 hrs/sem
Scheme of Examination TOTAL = 25 marks	IA	TW	TM	P	O
	0	25	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the applications of concepts like Ultrasonics, X- rays, Superconductivity and Lasers in the different fields of daily life
CO2	Experiment using various apparatus like Cathode ray Oscilloscope and CRT tube.
CO3	Analyse the concept of physics like interference, semiconductors, ultrasonics and , Electron Ballistics.
CO4	Design and develop a simple applications of semiconductors and ultrasonics

SN	Experiment
1	Newton's Ring
2	Air Wedge
3	Hall Effect
4	e/m by Thomsons Method
5	Velocity of Ultrasonic Waves
6	He/Ne/Diode Lasers
7	Energy Gap of a Semiconductor
8	Planck's Constant by Photocell
9	Thin Film Transistors
10	B-H Curve
11	Thermistor Characteristics
12	Applications of Lasers
13	Voltage Regulatots
14	Rectifiers and Filters

TEXTBOOKS	
1	M. N. Avadhanulu & P. G. Kshirsagar; A text book of engineering Physics; S. Chand & company Pvt. Ltd. Revised edition 2015.
2	A. S. Vasudeva; Modern Engineering Physics; S. Chand & Company Pvt. Ltd. Revised Edition.

ELECTRICAL & ELECTRONICS LABORATORY					
Course Code	FE 160		Credits	1	
Scheme of Instruction	L	T	P	TOTAL	
Hours/ Week	0	0	2	26 hrs/sem	
Scheme of Examination	IA	TW	TM	P	O
TOTAL = 25 marks	0	25	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the need of Energy sources, DC Circuits and A.C Circuits.
CO2	Design and develop experimental setup for voltage regulators, rectifiers, Zener diode and Transformers.
CO3	Experiment the applications of various theorems using relevant apparatus
CO4	Analyse the transistors based circuits and rectifier circuits.

SN	Experimental List
1	Voltage Regulator
2	Half, Full and Bridge Rectifiers
3	Verification of Kirchoff's Law
4	Zener Diode Characteristics
5	Open and Short Circuit Tests & Load Test on Single Phase Transformer
6	Verification of Thevenin's theorem and Norton's theorem
7	Verification of Superposition theorem and Maximum power transfer theorem
8	Silicon-Controlled Rectifier (SCR) Characteristics
9	FET Characteristics
10	Transistor Common - Emitter Configuration Characteristics
11	Measurement of power in single phase circuit
12	Study of single phase domestic wiring system

TEXTBOOKS	
1	Vincent Del Tero; Principles of Electrical Engineeringby; PHI Publication.
2	Joseph Administer; Electrical Circuits; Schaum Series Publication.
3	Hayt, Kemmerly, Durbin ;Engineering Circuit Analysis; Tata McGraw Hill Publication.

WORKSHOP-I					
Course Code	FE 170		Credits	1	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		0	0	2	26 hrs/sem
Scheme of Examination TOTAL = 50 marks	IA	TW	TM	P	O
	0	50	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the basic workshop skills from raw material stage to finished product.
CO2	Identify the tools required for fitting, forging, welding and carpentry jobs
CO3	Demonstrate the use of tools, machines and effort required to complete the job
CO4	Demonstrate the skills required to complete fitting, forging, welding and carpentry jobs

SN	Experimental List
1	<p>Fitting</p> <p>a. Demonstration of various tools and equipments used in fitting shop.</p> <p>b. Practical Experiments: at least one job covering simple fitting practice.</p>
2	<p>Carpentry</p> <p>c. Demonstration of wood cutting machines, various tools and equipments used by a carpenter.</p> <p>d. Practical Experiments: at least one of the following jobs</p> <p>i. Wooden joint</p> <p>ii. Wood turning</p>
3	<p>Forging</p> <p>(a) Demonstration of various equipments used in Forging shop.</p> <p>(b) Practical Experiments: At least one job covering forging practice.</p>
4	<p>Welding</p> <p>a. Demonstration of various tools and equipments used by a welder.</p> <p>b. Practical Experiments: At least one job on electric arc welding.</p>

ENVIRONMENTAL SCIENCE					
Course Code	AC180		Credits	0	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		2	0	0	26 hrs/sem
Scheme of Examination TOTAL = 0 marks	IA	TW	TM	P	O
	0	0	0	0	0

Course Outcomes:

The student will be able to:

CO1	Describe the Present, past and future status of the Environment.
CO2	Demonstrate the knowledge of core concepts and components in Environmental Science.
CO3	Explain environment management by equitable handling of natural resources, pollution control technologies, biodiversity and ecosystem protection.
CO4	Identify environmental issues and problems arising due to human activities at local, national and global level.

UNIT -1	
The Environment: Definition, Objectives, Principles, Importance, ethics and Scope of Environmental education, Need for public awareness. Role of an individual in conservation of natural resources. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. Forest Resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.	06hrs
UNIT -2	
Water Resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.	06hrs
UNIT -3	
Food Resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy Resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. Environmental Pollution: Definition, Causes, effects and control measures of- Air Pollution, Water Pollution, Marine Pollution and Noise Pollution, Fire works - crackers effects and control measures.	06hrs
UNIT -4	
Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, Rain water harvesting, Watershed management.	06hrs

Disaster Management: Planning, Disaster Preparedness, Response and Recovery. Guidelines of national disaster management division. Rehabilitation policy: Objectives and guidelines.	
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TEXTBOOKS	
1	S. Deswal, A. Deswal; A Basic Course in Environmental Studies; Dhanpat Rai & Co Publication.
2	N.K. Uberoi; Environmental Studies, Excel Books Publications New Delhi, first edition; 2005.
REFERENCES	
1	D.K. Asthana and Meera Asthana; A Text Book Of Environmental Studies; S. Chand Publications New Delhi, 1st Edition; 2006..
2	Mrinalini Pandey; Disaster Management; Wiley Publication.
3	T. G. Miller; Environmental Science; Wadsworth Publication.

MATHEMATICS-II					
Course Code	FE 210		Credits	4	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	1	0	39 hrs/sem
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Evaluate double & triple integrals & learn its various Engineering applications.
CO2	Explain analytic properties of vector valued functions & the associated results used in engineering.
CO3	Solve first order differential equation & higher order linear differential equations
CO4	Explain the multiple integrals, vector calculus, solve ordinary differential equations.

UNIT -1	
Applications of definite integrals to evaluate length of curves, surface areas. Multiple Integration: Double integrals (Cartesian & Polar), change of order of integration in double integrals. Change of variables (Cartesian to Polar).	10hrs
UNIT -2	
Applications of double integrals: Areas , volumes of solid of revolutions, Center of Mass and Gravity (constant and variable densities); Triple integrals (Cartesian, Spherical, Cylindrical), Simple applications involving cubes, sphere and rectangular parallelepipeds	10hrs
UNIT -3	
Vector Differentiation: Vector differentiation, Scalar and Vector fields, Directional Derivatives, Divergence and Curl of Vector fields, Gradient of a Scalar field. Vector Integration: Vector integration, line integrals and work done by a force, surface integrals, Integral Theorems: Green's theorem with proof, Gauss Divergence theorem and Stokes theorem only application.	10hrs
UNIT -4	
Higher order linear Differential Equation with constant coefficients and with right hand side of the form e^{ax} , $\sin ax$, $\cos ax$, $e^{ax} f(x)$, $x^n f(x)$, $e^{ax}x^n f(x)$. Linear equations with variable coefficients such as Cauchy's Equation and Lagrange's Equation, D- operator and Inverse D- operators, method of Variation of Parameters.	9 hrs

TEXTBOOKS

1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,

	Reprint, 2002.
REFERENCES	
1	D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3	Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

CHEMISTRY					
Course Code	FE 220		Credits	4	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	0	0	39 hrs/sem
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the basic concept of electrochemical system involving different types of energy systems and components involved therein
CO2	Describe the classification and grading of Hydrocarbon fuels and non-conventional energy systems like solar and Biogas
CO3	Differentiate various types of corrosion and gain knowledge on control measures associated with corrosion
CO4	Identify polymeric materials, methods and properties associated with these materials.

UNIT -1	
Electrochemical Energy Systems: Single electrode potential: concept, sign convention, Determination of standard electrode potential, Nernst equation and related numerical. Electrochemical cells: Galvanic and Concentration cells- Construction, Representation and related numerical on EMF. Electrodes: Reference Electrodes –Calomel and Silver/Silver chloride electrodes; Ion Selective electrodes, glass electrode; Construction, representation, pH determination using the electrodes. Batteries: Basic concepts, Characteristics, classification. Construction, working and applications of Zn-Air Battery and Li-ion polymer battery.	10hrs
UNIT -2	
Corrosion: Definition and Mechanism of corrosion- Direct chemical corrosion & Electrochemical corrosion. Types of Corrosion: Galvanic corrosion, differential aeration corrosion(with reference to waterline and Pitting corrosion). Factors Influencing corrosion: Nature of metal and Environment; Corrosion Control Measures: Proper design, Purity and alloying, Cathodic protection, Modifying environment, Metal Coatings: Anodized coatings(Aluminium), Electroless (Copper) and Electroplating coatings (Chromium Plating)..	10hrs
UNIT -3	
Stereochemistry and Organic Reactions: chirality, optical activity, enantiomers and diastereomers, Projection formulae and geometrical isomerism, Organic Chemical Reactions: Beckmann Rearrangement and Reimer-Tiemann Reaction (mechanism and applications) Fuels: Definition, Classification with reference to combustible fuels; Crude oil-Mining and purification, grading of Gasoline and Diesel. Instrumental techniques and applications Principles, Instrumentation and Applications of : UV-Vis spectrometry, FTIR and Gas Chromatography	10hrs
UNIT -4	
Polymers: Definition, Classification-based on source of availability, structure, number of monomers and their arrangement, type of polymerization and response to heat, Basic concepts- monomers, Degree of polymerization, Functionality.	9 hrs

Methods of Polymerization- Bulk and Suspension. Structure-Property relationships in Polymers- chemical, Electrical(conducting polymer e.g. polyacetylene), optical, Mechanical and Crystallinity in Polymers (Tg and Tm).Degradation of Polymers- Oxidation, weathering, Environmental stress cracking and thermal.	
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TEXTBOOKS	
1	Shashi Chawla; A Text Book of Engineering Chemistry; Dhanpat Rai Publishing Co.; 2011.
2	S. S. Dara; Engineering Chemistry; Chand & Co.;2011.
REFERENCES	
1	Jain and Jain; Engineering Chemistry; Dhanpat Rai Publishing Co.;2013.
2	M.G. Fontana; Corrosion Engineering; McGraw HillPublication.
3	M.M. Uppal; Engineering Chemistry; KhannaPublication.

COMPUTER PROGRAMMING					
Course Code	FE 230		Credits	4	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	0	0	39 hrs/sem
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Demonstrate the use of algorithms and flowcharts to plan the solution of a computing problem
CO2	Explain the use of formatted and unformatted input and output statements in C programs
CO3	Analyse the syntax and semantics of any given data types, data structures and programs in C language.
CO4	Design and implement programs using standard C language infrastructure regardless of the hardware or software platform

UNIT -1	
Programming Basics: Notions of algorithms, flowcharts and programming, iteration and recursion. Features of block-structured languages, Functions and procedures, Parameter passing, Top-down style and stepwise-refinement with concrete examples Fundamental algorithms: Exchanging values of two variables, counting, summation of a set of numbers , generation of prime numbers , reversal ,series.	10hr s
UNIT -2	
Overview of Programming language C, constants variables and data types, operators and expressions, data input output, decision making and looping: If, If-else, while, do- while, for, switch. Function declarations and prototypes, pass by value, and pass by reference. Iterative function and recursive functions	10hr s
UNIT -3	
Arrays: One dimension array, array initialization, Searching, Insertion, deletion of an element from an array; finding the largest/smallest element in an array, two dimension array, addition/multiplication of two matrices, transpose of a square matrix; passing array to function , character array and string. Pointers: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, arrays and pointers, pointer arrays.	10hr s
UNIT -4	
Structure & Unions: Defining a structure, declaring structure variables, Accessing structure members, structure initialization, copying & comparing structure variables, operation on individual members, Array of structures, structure & functions, Unions, Size of Structure. Files management in C: Defining & opening a file, closing a file, I/O operations on files, Error handling during I/O files, Random Access to files. Introduction to Dynamic Memory Allocation	9 hrs

TEXTBOOKS

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|---|---|
| 1 | Herbert Schildt ; C: The Complete Reference, 4th Edition; Tata McGraw Hill;2000 |
| 2 | Stephen Prata ; C Primer Plus 5th Edition; SAMS Publishing;2005. |

REFERENCES

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|---|--|
| 1 | Brian W. Kernighan and Dennis M. Ritchi; C Programming Language 2nd Edition; Pearson Education;2006. |
| 2 | Samuel P. Harbison and Guy L. Steele; C: A Reference Manual , 5th Edition; Prentice Hall;2003. |
| 3 | King K.N; C Programming: A Modern Approach, 2nd Edition; W. W. Norton and Company;2008. |

INTRODUCTION TO CIVIL ENGINEERING					
Course Code	FE 240		Credits	4	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		3	0	0	39 hrs/sem
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the history and basic disciplines of Civil Engineering and building materials.
CO2	Identify various processes involved in building constructions and structures.
CO3	Apply the IoT and Computational methods in Civil Engineering.
CO4	Implement safety measures for buildings

UNIT -1		
<p>Basic Understanding: Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career and interdisciplinary career options.</p> <p>History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Works of Eminent civil engineers</p> <p>Fundamentals of Building Materials: Properties and uses of Stones, bricks, mortars, sand, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Cement and different types and properties/ Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.</p>	10hrs	s
UNIT -2		
<p>Basics of Building Construction: Plain cement concrete, Reinforced & Pre-stressed Concrete constructions, Components of building, load bearing and framed structures, types of foundations, bearing capacity of soil, Mortar, Brick masonry and stone Masonry works- types of masonry construction.</p> <p>Construction Equipments; different types of constructions equipments and uses. Automation & Robotics in Construction; Advent of Lean Construction.</p>	10hrs	s
UNIT -3		
<p>Types of Civil Engineering Structures: Buildings, Bridges, Tunnels, Railways, Port & Harbor, Airport, Dams, Water supply systems, Water tanks, typical uses and importance of each structure.</p> <p>Computational Methods: Typical software's used in Civil Engineering-Building Information Modeling; brief introduction and uses, guidelines suggested by NBC and IS codes for Civil engineering constructions.</p> <p>IoT in Civil Engineering: smart buildings, smart street, smart city concepts, Significance of IoT in Civil engineering & Construction Industry. Typical applications in monitoring and maintenance of civil infrastructures.</p>	10hrs	s

UNIT -4	
<p>Fundamental of Fire Safety Basic Chemistry and physics of fire, Recognition of possible fire sources and emergency, procedures in the event of a fire, types of detecting devices and extinguishing agents and systems, fire investigation, National Fire Protection Association and Occupational Safety and Health Administration standards. Fire fighting installations. Fire fighting Drills, Visit to Fires safety laboratories.</p> <p>Industrial Safety & Construction Safety Fundamentals of industrial safety, Different types of industries, Different types of safety systems and equipments, Safety policy and safety terminology. Emergency planning, safety survey, Duties of a safety officer, Accident prevention methods, Safety committee, Laws related to safety (Factories ACT 1948 Explosive ACT, Electricity ACT etc.).</p>	9 hrs

TEXTBOOKS	
1	Elements of Civil Engineering by S SBhavikatti, New Age International Private Limited.
2	Basic Civil Engineering BY By Satheesh Gopi, Pearson Education India
3	Building Construction and Construction Material, G.S.Birdie and T.D.Ahuja Publisher : Dhanpat Rai Publishing Company.
REFERENCES	
1	Principles of Fire Safety Engineering: Understanding Fire and Fire Protection by Akhil Kumar Das, Prentice Hall India Learning Private Limited (2014).
2	The National Building Code, BIS, (2017), RERA Act, (2017)
3	Building Construction and Construction Material, G.S.Birdie and T.D.Ahuja Publisher : Dhanpat Rai Publishing Company

CHEMISTRY LABORATORY					
Course Code	FE 250 / FE 150		Credits	1	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
	0	0	2	26 hrs/sem	
Scheme of Examination TOTAL = 25 marks	IA	TW	TM	P	O
	0	25	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the basic concept of electrochemical system involving different types of energy systems and components involved therein
CO2	Describe the classification and grading of Hydrocarbon fuels and non-conventional energy systems like solar and Biogas.
CO3	Differentiate various types of corrosion and gain knowledge on control measures associated with corrosion.
CO4	Identify polymeric materials, methods and properties associated with these materials.

SN	Experimental List
1	Determination of Standard Electrode potential and verification of Nernst Equation
2	Study of corrosion activity of Aluminum metal in Acid and Base Solution
3	Determination of Viscosity by using Ostwald Viscometer
4	Elemental analysis using Colorimeter
5	Determination of pH and Dissolved solid content of water
6	Titrimetric analysis involving use of Conductometer
7	Determination of Hardness and Alkalinity of a given water sample; Determination of Dissolved oxygen content in water; Determination of COD of a water sample
8	Determination of molecular weight of polymer using Ostwald viscometer
9	Analysis of an ore using titrimetric method of analysis
10	Separation of miscible liquids using Fractional distillation method
11	Synthesis of Polymer
12	Synthesis of a Drug
13	Electroless plating of nickel on copper

SUGGESTED READING BOOKS

1	Vogels Text Book of Quantitative Chemical Analysis; 6th edition
2	Sunita Rattan; Experiments in Applied Chemistry; S.K. Kataria & Sons

PROGRAMMING LABORATORY					
Course Code	FE 260		Credits	1	
Scheme of Instruction	L	T	P	TOTAL	
Hours/ Week	0	0	2	26 hrs/sem	
Scheme of Examination	IA	TW	TM	P	O
TOTAL = 25 marks	0	25	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the program development denvironment for editing, compiling, executing and debugging a C Program.
CO2	Demonstrate the concepts of C Programming Language using a program development environment.
CO3	Design and develop C programs to solve real life problems.
CO4	Evaluate and modify any given C program as per the requirement.

SN	Experimental List
1	Program to convert temperature from degree centigrade to Fahrenheit.
	Program to find area and circumference of circle.
	Program to find whether given no is even or odd.
2	Program to print Fibonacci series up to 100.
3	Program to find factorial of a number.
4	Program to show sum of 10 elements of array & show the average.
5	Program to find sum of two matrices.
6	Program to find multiplication of two matrices
7	Program to find transpose of a matrix.
8	Program to find transpose of a matrix
9	Program to find the maximum number in array using pointer.
10	Program to show input and output of a string
11	Program to show call by reference.
12	Program to find factorial of a number using recursion
13	Program to find factorial of a number using recursion.

SUGGESTED READING BOOKS

Dromey R.J ; How to Solve it by Computer, Prentice Hall India Series; 2000

King K.N; C Programming: A Modern Approach, 2nd Edition; W. W. Norton and Company; 2008.

Yashwant Kanetkar; Let Us C; BPB Publications, 9th Edition; 2008.

ENGINEERING GRAPHICS					
Course Code	FE 270		Credits	2	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
	1	0	2	39 hrs/sem	
Scheme of Examination TOTAL = 100 marks	IA	TW	TM	P	O
	0	100	0	0	0

Course Outcomes:

The student will be able to:

CO1	Demonstrate the imagination skills required in converting idea into drawing.
CO2	Explain projection systems in engineering drawing.
CO3	Analyze solids and their cut sections along with development of surfaces.
CO4	Explain Orthographic and Isometric projection of parts.

UNIT -1		
<p>Introduction to Engineering Graphics, different types of lines used in engineering graphics. Dimensioning techniques. Orthographic Projection: Introduction, principle planes of projection, four quadrants, first angle projection, third angle projection, symbols of projection. Projections of points: Points situated in all four quadrants.</p>		8hrs
UNIT -2		
<p>Projection of Straight lines(both the end points in first quadrant only) Line parallel to one or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to the other plane, line inclined to both the planes, line contained by a plane perpendicular to both the reference planes, true lengths and true inclinations Projections of Planes: Circle, square, triangle, rectangle, pentagon, hexagon</p>		12hrs
UNIT -3		
<p>Projections of Solids: Cube, cylinder, cone, pyramid, prism Orthographic Projection& Sections: Using 1st angle projection. Only simple machine parts and castings</p>		9hrs
UNIT -4		
<p>Isometric projection: simple machine parts. Free hand sketching: Sketching orthographic views given a three dimensional view or a simple machine part. Sketching isometric view given the orthographic views of a simple machine part.</p>		10 hrs

TEXTBOOKS	
1	N. D. Bhatt; Engineering Drawing; Charotar Publishing House Pvt. Ltd.;2015
2	K. R. Gopalkrishna; Engineering Drawing; Subash Publishing House;2012.
REFERENCES	

1	K. R. Mohan; Engineering Graphics; Dhanpat Rai Publishing Co.;2015.
2	P. J. Shah; Engineering Drawing; Vol. 1 & 2 – Praveen Shah Publishers;2003.
3	P. S. Gill; Engineering Drawing; S. K. Kataria& Sons; 2013.

WORKSHOP-II					
Course Code	FE 280		Credits	1	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
		0	0	2	26 hrs/sem
Scheme of Examination TOTAL = 50 marks	IA	TW	TM	P	O
	0	50	0	0	0

Course Outcomes:

The student will be able to:

CO1	Explain the basic workshop skills from raw material stage to finished product.
CO2	Demonstrate the skills required for turning, plumbing, pattern making and foundry jobs.
CO3	Identify the tools, machines and effort required to complete the job.
CO4	Explain the concepts of machining, joining and forming processes.

1	<p>Turning/ Machining</p> <p>Demonstration of lathes, drilling machines, grinding machines, milling machines and shapers tools and equipments</p> <p>Practical Experiments: at least one job on lathe covering operations such as facing, centre drilling, plain turning, step turning, taper turning and chamfering</p>
2	<p>Plumbing</p> <p>Demonstration of various tools and equipments used by a plumber</p> <p>Demonstrations of various plumbing fittings</p> <p>Practical Experiments: at least one job on G.I pipe or P.V.C pipe fitting by threading.</p>
3	<p>Foundry</p> <p>Demonstration of various tools and equipments and furnaces used in foundry shop</p> <p>Practical Experiments: preparation of at least four different types of sand moulds</p>
	<p>Practical Experiments mentioned above are to be conducted in the workshop and the jobs are to be submitted for assessment at the end of the course. Credits will be granted to a student if he/she submits the jobs in all the trades at the end of the semester.</p>