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	
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. **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.	10hrs
UNIT -2	
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. **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,	10hrs
UNIT -3	
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. **FIBER OPTICS**: Total internal reflection, Propagation of light in optical fiber, Structure of an optical fiber and fiber cable, Acceptance angle and cone, Numerical aperture, Modes of propagation, Types of optical fibers: single and multimode fibers, Applications- fiber optic communication , endoscopy.	10hrs
UNIT -4	
X-RAYS: Origin of X-rays, characteristic and continuous X-ray spectra,	9 hrs

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.	

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. 2015
REFERENCES	
1	Uma Mukherji; Engineering Physics; Narosa Publications. 2012
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	understand circuit laws, magnetic circuit quantities, single phase and three phase circuits, diode applications, principles of single phase transformer, Bipolar junction transistor, MOSFET and IGBT.
CO2	Describe the concept of Power generation, magnetic circuits, voltage-current phasor relationships in three phase circuits, working of single phase transformer, Bipolar junction transistor, MOSFET and IGBT
CO3	Use circuit laws to compute electrical quantities in DC, single phase and three phase circuits, rectifier circuits, voltage regulator circuits and transistor biasing circuits.
CO4	Develop phasor diagrams of single phase, three phase ac circuits and single phase transformer and analyse the performance of voltage regulator circuits using Zener diode and phase angle control circuits using SCR.

UNIT -1	
Introduction to Energy sources, DC Circuit Analysis: Kirchoff's laws, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power transfer theorem.Batteries, series and parallel connection of Batteries, Battery specifications.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	9 hrs
UNIT -3	
Diodes and Circuits: PN junction diode, V-I characteristics, 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. SCR: construction, V-I characteristics, operation and phase control applications	10hrs
UNIT -4	
Bipolar Junction Transistor (BJT): Construction; Operation, Transistor Amplifying Action; Common-Emitter Configuration; Common-Collector Configuration; Limits of Operation. **DC Biasing:** Operating Point, Fixed-Bias Circuit; Emitter-Stabilized Bias Circuit; Voltage-Divider Biasing. **Field Effect Transistors:** Construction and Characteristics of JFETs; Transfer Characteristics; Depletion-Type MOSFET; Enhancement- Type MOSFET,	10hrs

CMOS. IGBT-Construction and characteristics.	

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	understand circuit laws, magnetic circuit quantities, single phase and three phase circuits, diode applications, principles of single phase transformer, Bipolar junction transistor, MOSFET and IGBT.
CO2	Describe the concept of Power generation, magnetic circuits, voltage-current phasor relationships in three phase circuits, working of single phase transformer, Bipolar junction transistor, MOSFET and IGBT
CO3	Use circuit laws to compute electrical quantities in DC, single phase and three phase circuits, rectifier circuits, voltage regulator circuits and transistor biasing circuits.
CO4	Develop phasor diagrams of single phase, three phase ac circuits and single phase transformer and analyse the performance of voltage regulator circuits using Zener diode and phase angle control circuits using SCR.

UNIT -1	
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. 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.	10hrs
UNIT -2	
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. **Kinetics of Rigid Body:** Work Energy principle, Impulse Momentum equation, D'Alembert Principle and related applications.	10hrs
UNIT -3	
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.	10hrs

Heat Work and Energy Interaction: Work Transfer, displacement work, displacement work in various process, P-V representation, other types of work 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	
Introduction to manufacturing processes and Their Applications: Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes **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. **Working Principles of various Transmission Systems:** Belts, Chains, Gears	9 hrs

TEXTBOOKS	
1	S.S. Bhavikatti and K.G. Rajshekharappa; Engineering Mechanics, New Age International Publication. 2010
2	P. K. Nag; Engineering Thermodynamics; Tata McGraw Hill Publications. 2012
3	S. K. Hajra Choudhury, S. K. Bose, A. K. Hajra Choudhury, Nirjhar Roy, Elements of Workshop Technology, Media Promotors& Publishers Pvt. Ltd. 2012
REFERENCES	
1	A. K. Tayal; Engineering mechanics; Umesh Publications 2010
2	Y. a. Cengel, M. A. Boles; Thermodynamics – An Engineering Approach; Tata McGraw Hill Publications. 2012
3	K.R.Gopalkrishna A Textbook of Elements of Mechanical Engineering, Subhash Publishers 2010

PHYSICS LABORATORY					
Course Code	**FE 150/FE250**		**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

Minimum 12 Experiments to be performed from the following list.

SN	Experiment
1	Newton's Ring
2	Air Wedge
3	Hall Effect
4	Velocity of Ultrasonic Waves
5	He/Ne/Diode Lasers – Determination of wavelength & particle size
6	Energy Gap of a Semiconductor
7	Planck's Constant by Photocell
8	B-H Curve
9	Thermistor Characteristics
10	Dispersive power of the material of a prism
11	Determination of Optical Absorption Co-efficient of materials using lasers
12	Helmholtz Resonator
13	Determination of dielectric constant of a parallel plate capacitor
14	Photodiode characteristics and power response
15	Frequency of AC mains using Electric Vibrator
16	Estimation of Fermi Energy of Copper
17	Determine the acceptance angle and numerical aperture of an optical fiber
18	Determination of magnetic field constant along the axis of current carrying coil
19	Series and Parallel L-C-R circuit – Inductance, Bandwidth and Quality Factor

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. 2015

ELECTRICAL & ELECTRONICS LABORATORY					
Course Code	**FE 160**		**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	Understand working of regulators, rectifiers, characteristics of various electronics devices
CO2	Assemble and test different circuit theorems and characteristics
CO3	Analyse and verify power in electric circuit, testing of single phase transformer
CO4	Apply circuit concept in electrical wiring

Minimum 12 Experiments to be performed from the following list.

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 on Single Phase Transformer
6	Load Test on Single phase Transformer
7	Verification of Thevenin's theorem and Norton's theorem
8	Verification of Superposition theorem and Maximum power transfer theorem
9	Silicon-Controlled Rectifier (SCR) Characteristics
10	FET Characteristics
11	Transistor Common - Emitter Configuration Characteristics
12	Measurement of power in single phase circuit
13	Study of single phase domestic wiring system

SUGGESTED READING BOOKS	
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.

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

ENVIRONMENTAL SCIENCE					
Course Code	**AC180**		**Credits**	**0**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**2**	**0**	**0**	**26 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 0 marks	**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.	07hrs
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.	07hrs
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. Disaster Management: Planning, Disaster Preparedness, Response and Recovery.	06hrs

Guidelines of national disaster management division. Rehabilitation policy: Objectives and guidelines.	

TEXTBOOKS	
1	S. Deswal, A. Deswal; A Basic Course in Environmental Studies; Dhanpat Rai & Co Publication. 2015
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., 2008
3	T. G. Miller; Environmental Science; Wadsworth Publication. 2005

MATHEMATICS-II					
Course Code	**FE 210**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**39 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 150 marks	**25**	**25**	**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	**FE120/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. Methods of Polymerization- Bulk and Suspension. Structure-Property	9 hrs

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.	

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. 2010
3	M.M. Uppal; Engineering Chemistry; KhannaPublication. 2009

COMPUTER PROGRAMMING					
Course Code	**FE 230**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**0**	**0**	**39 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**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.	10hrs
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	10hrs
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.	10hrs
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	
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	
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	
Basic Understanding: Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career and interdisciplinary career options. **History of Civil engineering**: Early constructions and developments over time; Ancient monuments & Modern marvels; Works of Eminent civil engineers **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; Recycling of Construction & Demolition wastes.	10 Hrs
UNIT -2	
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, Brick masonry and Stone masonry works- types of masonry constructions.3D printing **Construction Equipment**; Different types of constructions equipment's-earthmoving, excavating and lifting equipment's and uses. Automation & Robotics in Construction; Advent of Lean Construction.	10 Hrs
UNIT -3	
Types of Civil Engineering Structures: Buildings, Bridges, Tunnels, Railways, Port &Harbor, Airport, Dams, Water supply systems, Water tanks,typicaluses and importance of each structure. **Computational Methods:**Typical software's used in Civil Engineering- Building Information Modeling; brief introduction and uses, guidelines suggested by NBCon Development control rules and general building requirements. Names of IS codes for Civil engineering constructions. **Basic of building drawings**: drawing typical plan, section and elevation of simple buildings. Different symbols used in building drawing.	10 Hrs
UNIT -4	
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, Firefightinginstallations, Visit to Fires safety laboratories.Fundamentals of industrial safety, Different types of safety systems and equipments, Laws related to safety (Factories ACT 1948	12 Hrs

Explosive ACT, Electricity ACT **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.	

TEXTBOOKS	
1	Elements of Civil Engineering by S S Bhavikatti, New Age International Private Limited, 2010.
2	Basic Civil Engineering BY By Satheesh Gopi,Pearson Education India, 2012
3	Building Construction and Construction Material, G.S.Birdie and T.D.Ahuja Publisher : Dhanpat Rai Publishing Company, 2010
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, 2012

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.

Minimum 12 Experiments to be performed from the following list.

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 BaseSolution
3	Determination of Viscosity by using OstwaldViscometer
4	Elemental analysis usingColorimeter
5	Determination of pH and Dissolved solid content ofwater
6	Titrimetric analysis involving use ofConductometer
7	Determination of Hardness and Alkalinity of a given watersample; Determination of Dissolved oxygen content inwater; Determination of COD of a watersample
8	Determination of molecular weight of polymer using Ostwaldviscometer
9	Analysis of an ore using titrimetric method ofanalysis
10	Separation of miscible liquids using Fractional distillationmethod
11	Synthesis ofPolymer
12	Synthesis of a Drug
13	Electroless plating of nickel on copper

SUGGESTED READING BOOKS	
1	Vogels Text Book of Quantitative Chemical Analysis; 6thedition, 2015
2	Sunita Rattan; Experiments in Applied Chemistry; S.K. Kataria&Sons, 2015

PROGRAMMING LABORATORY					
Course Code	**FE 260**		**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 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.

Minimum 12 Experiments to be performed from the following list.

SN	Experimental List
1	Program to convert temperature from degree centigrade toFahrenheit.
	Program to find area and circumference ofcircle.
	Program to find whether given no is even orodd.
2	Program to print Fibonacci series up to100.
3	Program to find factorial of anumber.
4	Program to show sum of 10 elements of array & show theaverage.
5	Program to find sum of twomatrices.
6	Program to find multiplication of twomatrices
7	Program to find transpose of amatrix.
8	Program to find transpose of amatrix
9	Program to find the maximum number in array usingpointer.
10	Program to show input and output of a string
11	Program to show call byreference.
12	Program to find factorial of a number usingrecursion
13	Program to find factorial of a number usingrecursion.

SUGGESTED READING BOOKS
DromeyR.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	
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. .	8hrs
UNIT -2	
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	12hrs
UNIT -3	
Projections of Solids: Cube, cylinder, cone, pyramid, prism **Orthographic Projection& Sections:** Using1stangle projection. Only simple machine parts and castings	9hrs
UNIT -4	
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.	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	**Turning/ Machining** Demonstration of lathes, drilling machines, grinding machines, milling machines and shapers tools and equipments Practical Experiments: at least one job on lathe covering operations such as facing, centre drilling, plain turning, step turning, taper turning and chamfering
2	**Plumbing** Demonstration of various tools and equipments used by a plumber Demonstrations of various plumbing fittings Practical Experiments: at least one job on G.I pipe or P.V.C pipe fitting by threading.
3	**Foundry** Demonstration of various tools and equipments and furnaces used in foundry shop Practical Experiments: preparation of at least four different types of sand moulds
	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.