SYLLABI OF FIRST YEAR B.TECH. COURSES

ACS1110
APPLIED CHEMISTRY

Course Title	Applied Chemistry
Course Number	ACS1110
Credits	4
Course Category	BS
Pre-Requisite if any	Nil
Contact Hours	3-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To impart the knowledge of applications of chemical sciences in Engineering and Technology
Course Outcome	After completion of the course the student shall be able to Understand: 1. Water treatment technology for municipal and industrial use. 2. About solid, liquid and gaseous fuels. Types of lubrications their testing and applications. 3. About corrosion and techniques to control corrosion. 4. About polymers and their applications.
Syllabus	**UNIT-I: Treatment of water for municipal and industrial use (12 L)** Sources of water, impurities, in water, Requirement water for municipal use, Municipal water treatment methods: Plain sedimentation, Sedimentation with coagulation (Role of alum, sodium aluminate and coppers) filtration (operation of sand filter), Disinfection, Requirements of a good disinfectant, Types of disinfesting agents (Bleaching powder, Liquid chlorine, Ozone, UV radiations and Chloramine and their disinfection action), Break point chlorination, Super chlorination and de- chlorination. Requirements of water for industrial use, hardness of water, units of hardness, calculations on hardness, determination of hardness by soap and EDTA methods. Boiler defects: Sludge and scale formation, priming and foaming, Boiler corrosion and caustic and embrittlement, Boiler water treatment: External treatment (water softening methods) Lime-soda process, Zeolite process and Ion-exchange process, Internal treatment methods, Calculation based on lime-soda and zeolite process. **UNIT-II: Fuels and Lubricants (12 L)** Definition of fuels, Classification of fuels, Calorific value, Gross and net calorific value, Units of calorific value, Determination of calorific value by bomb calorimeter, Dulong's formula, Numerical problems, Coal, Classification of coal , Coal analysis (Proximate and ultimate analysis), Significance, Classification of petroleum, Fractions of petroleum and their uses, Cracking, Thermal and catalytic cracking (fixed bed only), Synthetic petrol, Synthesis of petrol by Fisher Tropsch process and Bergius process, Gaseous fuels (CNG, LPG), Advantages and disadvantages of Definition and classification of lubricants, Functions, of lubricants, Mechanism of lubrication, liquid lubricants: petroleum oils, purification of crude petroleum blended oils, additives in the blended oils, Semi-solid lubricants or Greases: preparation and their types, Solid lubricants, Selection of lubricants. **UNIT-III: Corrosion and its prevention (12 L)** Definition, Significance of corrosion, classification of corrosion, DRY corrosion, Mechanism of dry corrosion, Types of oxide films, pilling Bedworth rule, Electrochemical corrosion, Electrode potential and its measurements, Electrode reactions, Electrochemical cell, Nernst equation, Calculations based on EMF of an electrochemical cell, Electrochemical and Galvanic series and their importance, Mechanism of electrochemical corrosion (Corrosion of Fe in HCI and rusting

	of Fe)Factors influencing corrosion rate, Corrosion control methods, Proper design (designing principles), Material selection, catholic protection (sacrificial and impressed current), Metallic coatings (methods of applications, hot dipping, galvanizing, timing). Organic Coatings: Paints, Requirements of good paints, Constituents of paints and their functions, drying mechanism of oil, Varnishes (types, constituents), Characteristic of a good varnishes. **UNIT_IV: High polymers (12 L)** Introduction, Homo-polymers and Copolymers, Tacticity, Functionality, classification of polymers (based on origin, sources, thermal behaviour, structure, synthesis method, polymer chain growth), Types of polymerization, Mechanism of Polymerization (Free radical, anionic and cationic), Plastics, Advantages and disadvantages, thermoplastic resins: Preparation properties and uses of cellulose acetate, PVC PS, PTFE, Nylons thermosetting resins: Preparation properties and uses Bakelite, Polyesters, and epoxy resins, Different between thermoplastics and thermosetting plastics, Molecular mass of a polymer, Types of molecular mass, Elastomers: natural rubber, Structure of natural rubber, Extraction and processing of natural rubber from rubber plant, Limitations of natural raw rubber, Vulcanization advantages, synthetic rubbers: Preparation properties and uses of Buna-S, Buna-N, Neoprene and Thiocol rubbers, Compounding of rubbers.
Suggestion Readings/ Text/References	1.A Text Book of Engineering Chemistry by SS. Dara, S. Chand & Co., New Delhi (India). 2.Engineering Chemistry by B.K Sharma, Krishna Prakashan Media (P) Ltd., Meerut. 3.Engineering Chemistry by P.C. Jain, Dhanpat Rai Publishing Company, New Delhi.

ACS1910
APPLIED CHEMISTRY LAB

Course Title	Applied Chemistry Lab
Course Number	ACS1910
Credits	1.5
Course Category	BS
Pre-Requisite if any	Nil
Contact Hours	0-0-3 (Lecture-Tutorial-Practical)
Type of Course	Practical
Course Assessment	Course Work (Reports/Viva-Voce) (60%) End Semester Examination (2 hour) (40%)
Course Objectives	To train the students for the application of the chemical sciences in the field of Engineering and Technology
Course Outcome	After completion of the course the student shall be able to Understand: 1. To estimate the hardness of water. 2. To carry out analysis of coal and grade the coal for industrial purposes. 3. To determined dissolved oxygen in water. 4. To carry out testing of lubricants like flash point, aniline point, relative viscosity and drop point of grease and its applications. 5. To study and explore the nature of the electrochemical corrosion. 6. About the determination of available chlorine in bleaching powder.
Syllabus	LIST OF EXPERIMENTS: 1. Determine total. Permanent and temporary hardness of water in ppm by versenate method. 2. To determine the amount of dissolved oxygen in water in ppm units. 3. To determine the cloud point, pour point and setting point of an oil.

	4. To determine the percentage of available chlorine in the given sample of bleaching powder. 5. To carry out proximate analysis of the given sample of coal. 6. To determine the saponification value and percentage of fatty oil in the given sample of compounded oil. 7. To determine the aniline point of a given sample of an oil. 8. To determine the relative viscosity of an oil by redwood viscometer and to study the variation of viscosity with change it temperature. 9. To demonstrate and explore the electrochemical nature of aqueous corrosion. 10. To determine the flash point of an oil by Abel's and Pensky Marten's apparatus.
Suggestion Readings/ Text/References	Lab Manual's Provided by the Department.

AMS1110
APPLIED MATHEMATICS-I

Course Title	Applied Mathematics-I
Course Number	AMS1110
Credits	4
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	3-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To learn the fundamental concepts of matrices, differential and integral calculus, theory of ordinary differential equations and applications.
Course Outcome	After completing this course the students would be able to: 1. apply tools of the theory of matrices to relevant fields of engineering. 2. understand curve tracing, regions between different curves and expansion of functions. 3. apply tools of integration to find length, area and volume. 4. apply differential equation methods to physical problems.
Syllabus	**Unit 1 Linear Algebra-Matrices**: Rank of a matrix, Consistency of a system of linear equations, Linear dependence and independence of vectors, Eigen-values and Eigen vectors of a matrix, Cayley-Hamilton theorem, Diagonalization of a matrix, Introduction of vector spaces, subspaces, finite dimensional vectorspaces and examples. **Unit 2 Curve Tracing and Successive Differentiation**: Asymptotes, Tracing of curves in cartesian, polar and parametric forms, Successive differentiation, Leibnitz theorem, Taylor and Maclaurin theorems with remainder terms, Infinite series, Ratio, Comparison and Root tests of convergence. **Unit 3 Integration and its Applications**: Improper integrals, Beta and Gamma functions, Application of integration to length of curves including intrinsic equation, surface area and volume of solids of revolution. **Unit 4 Ordinary Differential Equation**: Exact differential equations, Integrating factors, Linear differential equations of second and higher order with constant coefficients, Homogeneous differential equations, Simultaneous linear differential equations, Applications to physical problems, Method of variation of parameters.

Suggestion Readings/ Text/References	1. R.K. Jain and S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa. 2. Thomas and Finney; Calculus and Analytical Geometry, Narosa Publishing House. **Reference Books:** 1. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons, INC 2. Chandrika Prasad; Mathematics for Engineers, Pothishala Pvt. Ltd., Allahabad

AMS1120
APPLIED MATHEMATICS-II

Course Title	Applied Mathematics-II
Course Number	AMS1120
Credits	4
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	3-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To learn partial differentiation, multiple integration and their applications, Laplace transform and its applications to differential equations, Fourier series and Fourier transforms.
Course Outcome	After completing this course the students would be able to: 1. apply the theory of functions of saveral variables in engineering problems. 2. use double and triple integrals to find area and volume. 3. apply Laplace transform method to solve differential equations. 4. apply Fourier series and Fourier transform methods in relavent areas.
Syllabus	**Unit 1** **Partial Differentiation and Applications**: Functions of several variables, Partial differentiation, Euler's theorem for homogeneous functions, Total differential, Change of variables, Jacobian, Taylor series for a function of two variables, Maxima and minima of functions of two variables. **Unit 2** **Multiple Integration**: Double and triple integrals, Change of variables, Change of order of integration, Applications to area and volume. **Unit 3** **Laplace Transform**: Laplace transform of elementary functions, Shifting and other theorems with important properties, Inverse Laplace transforms, Applications to single and system of linear differential equations **Unit 4** **Fourier Series and Fourier Transform**: Fourier series, Fourier coefficients, Half range series, Fourier series of odd and even functions, Fourier series of T-periodic function, Introduction to Fourier transforms.
Suggestion Readings/ Text/References	1. R.K. Jain and S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa. 2. Thomas and Finney; Calculus and Analytical Geometry, Narosa Publishing House. **Reference Books:** 1. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons, INC 2. Chandrika Prasad; Mathematics for Engineers, Pothishala Pvt. Ltd., Allahabad

APS1110
APPLIED PHYSICS

Course Title	Applied Physics
Course Number	APS1110
Credits	4
Course Category	BS
Pre-Requisite if any	None
Contact Hours	3-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To equip the student with a strong understanding of the fundamentals of Physics so as to enable him/her to apply it to his/her field of study. This Course should enable the student to- 1. Explain the behaviour of the physical world around him/her 2. Relate the various laws of physics to the advancement of technology. 3. Approach problems, predict their results in advance, and solve them in quantitative and qualitative manner. 4. Enhance broader understanding of other sciences.
Course Outcome	Upon completion of the course, the student will be able to: 1. Recognize and present real life examples of the aforementioned concept and interrelate some of them. 2. Describe the correlation between physics and the technology. 3. Identify technological applications of some of the aforementioned concepts. 4. Describe how he/she can harness the benefits of some of the aforementioned concepts to his /her area of specialization.
Syllabus	**Unit I. Semiconductors** Elemental and compound semiconductors, Energy bands, Direct and indirect semiconductors, Electrons and holes, Effective mass, Intrinsic materials, Extrinsic materials, Fermi level, Electron and hole concentrations at equilibrium, Temperature dependence of carrier concentrations, Compensation and space charge neutrality, Conductivity and mobility and Hall effect in semiconductors. **Unit II. Lasers & its Applications** Basic principle, Induced absorption, Spontaneous emission and induced emission, Ruby and He-Ne lasers, Semiconductor laser, Characteristics of laser light and its applications based on these characteristics, (e.g., in industry, science, medicine, communication, surveying, holography, fusion reactors, isotope separation, etc.) **Fibre Optics** Basic principle, Fibre construction and dimensions, Light propagation in fibres, Numerical aperture of fibres, Step index and graded index fibres, Signal distortion in optical fibres, Transmission losses, Light wave communication in optical fibres and Advantages of optical fibres over conventional system of communication. **Unit III. Particles and Waves and Quantum Mechanics** Mechanism of x- ray production (continuous and characteristic x- rays, Duane- Hunt limit), Compton effect, Pair production, Phase and group velocities, Uncertainty principle and its applications. Introduction to quantum mechanics, Wave function, Conditions necessary for physically acceptable wave-function, Probability density and probability, Schrödinger equations: Time dependent and steady state (time independent) forms, Eigen values and Eigen functions, Expectation values, Particle in a box (infinite potential well) and Tunnel effect (qualitative discussion only).

	Unit IV. Statistical Mechanics: Statistical distributions, Maxwell–Boltzmann statistics, Molecular energies in an ideal gas, Quantum statistics, Specific heats of solids, Free electrons in a metal and Electron- energy distribution.
Suggestion Readings/ Text/References	1. Ben G. Streetman, "Solid State Electronic Devices" 5th edition (2000), Prentice-Hall of India, Private Limited, New Delhi. 2. Arthur Beiser, "Concepts of Modern Physics" 6th edition (2003), Mc. Graw Hills Inc. International Edition. 3. M.R. Wehr, J.A. Richards Jr. and T.W. Adair III, "Physics of the Atom" 4th edition (1984), Addison Wesley / Narosa. 4. M.R. Srinivasan, "Physics for Engineers" 1st Edition (1996), New Age International (P)Limited, Publishers.

APS1910
APPLIED PHYSICS LAB

Course Title	Applied Physics Lab
Course Number	APS1910
Credits	1.5
Course Category	BS
Pre-Requisite if any	None
Contact Hours	0-0-3 (Lecture-Tutorial-Practical)
Type of Course	Practical
Course Assessment	Course Work (Reports/Viva-Voce) (60%) End Semester Examination (2 hour) (40%)
Course Objectives	This course should enable the student to 1. Build an understanding of the fundamental concepts with the help of experiments 2. Familiarize the student with the various experiments of the physical world around him/her. 3. Developing experimental approach of Physics in his/her field of study. 4. Co-relate the concepts of physics to the advancement of technology. 5. Allow the student to gain expertise in design and maintenance of experimental setup.
Course Outcome	Upon completion of the course, the student will be able to: 1. Recognize and present real life examples of various experiment performed. 2. Understand and explain data analysis and identify technological applications of the experiments. 3. Describe how he/she can harness the benefits of some of the experiments to his /her area of specialization. 4. Understand the professional and ethical responsibilities of the subject. 5. Communicate effectively while speaking, employing graphics and writing.
Syllabus	1. To determine the moment of inertia, I of a flywheel about its axis of rotation. 2. To determine resistance per unit length, σ of a Carey Foster's Bridge wire and hence to find the difference between the two nearly equal unknown resistances. 3. To determine the modulus of rigidity o f th e material o f a wire, η by statical (vertical) method. 4. To determine the refractive index, μ of the material of a prism for parrot green line in the mercury spectrum. 5. To study the variation of semiconductor resistance with temperature and hence to find the energy- gap, Eg of the semiconductor. (a) To study the V-I and power characteristics of a solar cell and also to determine its fill factor. (b) To study the current versus voltage characteristics of two light emitting diodes (LED) and hence to determine their cut in voltages. 6. To determine the diameters of three thin wires with the help of a He-Ne Laser. 7. To determine the coefficient of thermal conductivity, K of rubber in the form of a tube. 8. To convert a Weston type galvanometer into an ammeter (ranges 5, 10 and 15 A) and a voltmeter

	(ranges 5, 10 and 15 V). 9. To determine the wavelength, λ of yellow line of shorter wavelength in the mercury spectrum with plane transmission grating. 10. To determine the specific rotation, αt of cane sugar solution in water using a biquartz polarimeter. 11. To calibrate a given thermo-couple with the help of a potentiometer. 12. To find the operating voltage of a G.M. counter and to determine the absorption coefficient, μ of copper for gamma rays from 137 Cs source. 13. (a). To draw the graph between various values of capacitance and the corresponding frequencies of a given oscillator and to determine the value of unknown capacitance by using Lissajous Figures. 14. To draw the graph between various values of inductance and the corresponding frequencies of a given oscillator and to determine the value of unknown inductance by using Lissajous Figures. 15. To determine Hall coefficient, RH and majority carrier concentration of a given semiconductor sample.
Suggestion Readings/ Text/References	1. Prof. D.S. Srivastava & Dr. Ameer Azam, Laboratory Manual of Applied 2. Physics Experiments, AMU, Aligarh 3. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, Kitab Mahal, New Delhi. 4. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication House, New Delhi. 5. K. K. Dey, B. N. Dutta, Practical Physics, Kalyani Publishers, 1981, New Delhi.

CEA1110
ENVIRONMENTAL STUDIES

Course Title	Environmental Studies
Course Number	CEA1110
Credits	3
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	1. To make the students conversant with the basic concept of ecology, environment and chemistry involved. 2. To make the students conversant about the air quality and its standards and how to control air pollution. 3. To make the students gain basic knowledge of Water Quality: Physical, Chemical and Biological parameters. 4. To educationally train the students about the water, wastewater characteristics, purification processes, both natural and advance techniques. 5. To give basic knowledge about importance of the solid waste and its management.
Course Outcome	Upon successful completion of this course, it is expected that students will be able to: 1. Understand fundamental physical and biological principles that govern natural processes. 2. Demonstrate an in-depth understanding of the sub disciplines within environmental studies (i.e. Biology. Chemistry, Physics etc). 3. Communicate environmental scientific information to both professional and lay audiences. 4. Demonstrate an understanding of current environmental challenges. 5. Develop a basic fundamental background for the higher environmental engineering courses offered in civil engineering department.

Syllabus	**Unit 1:** Multidisciplinary nature of environmental studies- Definition, Scope and Importance, Need for public awareness, Natural Resources- Renewable and non-renewable resources, Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, 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. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. **Unit 2:** Ecosystems, Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in an ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Environmental Pollution- Definition, Cause, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards **Unit 3:** Biodiversity and its conservation- Introduction, Definition : genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides. **Unit 4:** Social Issues and the Environment- Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Case Studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness. **Unit 5:** Human Population and the Environment- Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies, Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes, etc.
Suggestion Readings/ Text/References	1. Venugopala Rao, P., 2006, *Principles of Environmental Science and Engineering*, Prentice-Hall of India Private Limited, New Delhi. 2. Masters, G.M., 1991, *Introduction to Environmental Engineering and Science*, Prentice-

	Hall International, Inc., Englewood Cliffs, NJ. 3. Peavy, H.S., D.R. Rowe and G. Tchobanoglous, 1985, *Environmental Engineering*, McGraw-Hill Book Company, New York. 4. Erach Bharucha, 2nd Edition, *Text Book of Environmental Studies for Undergraduate Students*, UGC. **Additional Learning Source:** 1. Sawyer, C.N. and P.L. McCarty, 1978, *Chemistry for Environmental Engineering*, 3rd Edition, McGraw-Hill Book Company, New York. 2. Tchobanoglous, G., H. Theisen and S. Vigil, 1993, *Integrated Solid Waste Management*, McGraw-Hill Inc. Singapore.

CEA1120
STRENGTH OF MATERIALS

Course Title	Strength of Materials
Course Number	CEA1120
Credits	3
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	1. To develop an appreciation of forces, stresses and strains on normal and inclined planes, principal stress and principal strains 2. To develop basic understanding of various types of stress conditions viz. shear, bending and torsion in structural members. 3. To develop understanding of basic principles and methods of structural analysis and its application to the determinate structures.
Course Outcome	Upon successful completion of this course, it is expected that students will be able to: 1. Develop basic concepts of forces acting on simple structural elements and also the concept of combined stresses (2D stress state) in materials used in Civil Engineering. 2. Understand the behavior of simple structural elements under shear, bending and torsion 3. Understand the fundamental principles used for the analysis of the determinate structures. 4. Analyse determinate arches and trusses.
Syllabus	**Unit 1** Analysis of stress and strain: Mechanical properties, analysis of simple state of stress and strains, elastic constants, example of state of tension, compression and shear. Analysis of two dimensional stresses and strains, Principal stress and Principal strain, Mohr's circle. **Unit 2** Analysis of determinate structures: Concept of bending and shear forces in simple beams, Relationship between load, bending moment and shear force. Bending moment and shear force diagram for simple beams and cantilevers. **Unit 3** Bending shear and torsion: Bending and shear stresses in simple beams, concepts of torsion in circular shafts. **Unit 4** Analysis of statically determinate trusses and arches.
Suggestion Readings/ Text/References	1. Kazmi, S. M. A., 'Solid Mechanics" TMH, Delhi, India. 2. Norris, C.H. and Wilber, J. B. and Utku, S. "Elementary Structural Analysis" McGraw Hill, Tokyo, Japan. 3. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA **Additional Learning Source:** Web links to e-learning:*nptel*

COA1910
COMPUTER PROGRAMMING LABORATORY

Course Title	Computer Programming Laboratory
Course Number	COA1910
Credits	1.5
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	0-0-3 (Lecture-Tutorial-Practical)
Type of Course	Practical
Course Assessment	Course Work (Reports/Viva-Voce) (60%) End Semester Examination (2 hour) (40%)
Course Objectives	To make students of all branches of B.Tech familiar with the programming concepts and to implement the algorithmic approach of problem solving in C language to gain working knowledge of C programming.
Course Outcome	**1.** Understand programming concepts and C language constructs such as operators and data types, control statements, functions etc. **2.** Gain algorithm development skills 3. Implement programming problems in C Language
Syllabus	Introduction to Programming Environment, experiments to be conducted in the laboratory consist of, but not limited to, the following: **1.** Practice of program editing and compilation process. **2.** Simple introductory algorithms and programs for getting input, printing formatted output etc **3.** Programs introducing elementary C concepts and data types **4.** Programs using operators **5.** Programs using control structures **6.** Programs for repetitive tasks and iterations **7.** Programs on arrays and strings **8.** Programs introducing the use of function calls **9.** Programs introducing basic concept of file handling and storage classes
Suggestion Readings/ Text/References	1. *Kemighan, Brian W., and Dennis M. Ritchie. "The C programming language." Prentice-Hall, Englewood Cliffs, New Jersey (1978).* 2. *Gottfried "Theory and Problem of Programming with C" Schaum's Outline Series, TMC (Text book)* 3. *E. Balagurusamy "Programming in ANSI C", McGraw Hill Education India Private Limited (2016) (Text Book)*

EEA1110
PRINCIPLES OF ELECTRICAL ENGINEERING

Course Title	Principles of Electrical Engineering
Course Number	EEA1110
Credits	3
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)

Course Objectives	The objective of this course is to build a firm foundation of the basics of electrical sciences in Engineering and applications that pertain to it.
Course Outcome	After successful completion of this course, the students will be able to: 1. Analyse and solve engineering problems related to electrical circuits by applying fundamental laws and theorems. 2. Analyse magnetic circuits and understand the basics of construction and principle of operation of transformer. 3. Understand the fundamentals of electrical machines, power systems and generation of electrical energy.
Syllabus	**UNIT I: ELECTRIC CIRCUITS** Single phase ac circuits; concept of phasor, RLC series and parallel circuits, Network theorems for ac & dc circuits, Transients in electric circuits, Three phase ac circuit; star and delta connections, Three phase power. **UNIT II: MAGNETIC CIRCUITS & TRANSFORMERS** Magnetic circuits: Magnetic circuits, Magnetization curve & Magnetic losses, Equivalence of magnetic & electric circuits. Series & parallel magnetic circuits. Transformers: Construction & principle of operation; equivalent circuit, calculation of losses, efficiency and voltage regulation. **UNIT III: INTRODUCTION TO ELECTRIC MACHINES & POWER SYSTEM** Electrical Machines: Rotating magnetic field, Alternator construction, principle of operation & emf equation. Construction & principle of operation of Induction motor. Basics of Power System: Elements of power system; Typical voltage levels in a power system, Electric power generation, Concept of Green energy.
Suggestion Readings/ Text/References	1. Ashfaq Husain*: Fundamentals of Electrical Engineering, Third Edition, Dhanpat Rai & Sons. 2. Vincent Del Toro, "Electrical Engineering Fundamentals", Second Edition, Prentice-Hall of India. 3. D P Kothari & I J Nagrath, "Basic Electrical Engineering", Third Edition, Mc Graw Hill. 4. Jimmie J. Cathey, Syed A. Nasar, "Basic Electrical Engineering", Schaum's Outlines, Tata McGraw Hill, 1997.

ELA1110
PRINCIPLES OF ELECTRONICS ENGINEERING

Course Title	PRINCIPLES OF ELECTRONICS ENGINEERING
Course Number	ELA1110
Credits	3
Course Category	ESA
Pre-Requisite if any	None
Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To familiarize the students with electronics devices, its applications and digital logic systems.

Course Outcome	After successful completion of this course, the students will be able to: 1. Understanding the working principle and applications of electronic devices in circuits. 2. Introduction to operational amplifier and to develop ability to design opamp circuits. 3. Familiarization to mathematical operations on number system and digital logic.
Syllabus	**UNIT-I DIODE** Terminal characteristics of diodes; Diode models: ideal, constant voltage and piecewise linear; Diode applications: Rectifiers, Half Wave, Full Wave, and Bridge Rectifier with Filter. Clippers and Clampers. Zener diode: Operation, Characteristics, Voltage Regulation. **UNIT-II: BIPOLAR AND FIELD EFFECT TRANSISTOR** Bipolar Junction Transistor: operation, Current equation, Configurations, characteristics of common emitter configuration, DC load line analysis and biasing, applications as amplifier and switch. Enhancement MOSFET, construction, operation and characteristics, Current equation. **UNIT-III: OPERATIONAL AMPLIFIER** OPAMP: characteristics, equivalent circuit, ideal behavior, open loop and closed loop concept, concept of virtual short; OPAMP applications: Unity gain, inverting and non-inverting amplifiers, Difference and Summing amplifier, integrator, and differentiator. **UNIT-IV: INTRODUCTION TO DIGITAL LOGIC:** Introduction to Number Systems: Binary, Octal, Hexadecimal systems; Addition and Subtraction; Boolean algebra: Basic Theorems and Identities, DeMorgans theorem. Logic Gates: Symbols and Truth Tables; Decoder, Encoder and Multiplexer.
Suggestion Readings/ Text/References	1. R. Boylestad& L. Nashelsky*: Electronic Devices and Circuits, Prentice Hall, 1995. 2. A. S. sedra and K. C. Smith "Microelectronic Circuits: Theory and Applications", 6th Edition, Oxford University Press, New Delhi, 2013. **3.** Ronald J. Tocci,* "Digital Systems: Principles and Applications", 10th Edition, Pearson Education, New Delhi, 2007.

EZH1110
ENGLISH

Course Title	English
Course Number	EZH1110
Credits	3
Course Category	HM
Pre-Requisite if any	Nil
Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Syllabus	**Unit I:** Text: Comprehension Questions, Summary type as well as Short answer type and questions on Vocabulary for 10 passages of the Basic Scientific English by Ewer and Latorre (Longman). Units are 1,3,4,5,8&11 from main book and passages 4,11,13,17, from the supplement. **Unit II:** Comprehension questions, summary or short answer types from the following supplementary readers: 1. Animal Farm by George Orwell. 2. The time machine by HG Wells retold by Margery Gree (Macmillan). **Unit III:** Note taking, note making exercises, report and process writings. **Unit IV:** Precis writing **Unit V:** Composition and spoken English.

MEA1110
ENGINEERING THERMODYNAMICS

Course Title	Engineering Thermodynamics
Course Number	MEA1110
Credits	4
Course Category	ESA
Pre-Requisite if any	None
Contact Hours	3-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	1. Impart knowledge of basic concepts and laws of thermodynamics. 2. Develop capability to evaluate the performance of thermal engineering systems.
Course Outcome	After taking this course the students shall be able to 1. Understand the basic thermodynamic concepts, processes and parameters. 2. Learn the concepts of heat, work, First Law of Thermodynamics and apply it to engineering systems. 3. Use and practice property tables and diagrams of pure substances. 4. Understand the concept of Second law and its applications to thermal systems.
Syllabus	**Unit 1 : Introduction:** Basic Concepts and Definitions (Thermodynamic Systems, Properties, States, Processes, Cycles, Thermodynamic Equilibrium, Quasi-Static Process), Pressure and its Measurement, Zeroth Law of Thermodynamics, Temperature and its Measurement. **Unit 2: First Law of Thermodynamics and its Applications:** Thermodynamic Concepts of Heat and Work; Types of Work Interactions, Indicator Diagram, First Law for Closed System, Energy as a Property, Internal Energy, Enthalpy, Specific heats, First Law for an Open System, Steady Flow Energy Equation (SFEE) and its Applications. **Unit 3 : Pure Substance:** Different Phases of Pure Substance, Two-Property Rule, Property Diagrams, Tables and Charts, T~ s, T~ P, P~ v, P~ h and Mollier (h~s) diagrams, Phase Boundaries, S-L-V region, CP and TP, Dryness Fraction and its Measurement, Separating and Throttling Calorimeters. **Unit 4 : Second Law of Thermodynamics and its Applications:** Limitations of First Law, Statements and Corollaries of Second Law, Direct and Reversed Heat Engines (Efficiency and COP), Reversible and Irreversible Processes, Carnot Cycle, Thermodynamic Temperature Scale, Clausius Inequality, Entropy, Introduction to Air-Standard Cycles (Otto, Diesel and Brayton), Vapor Power Cycle (Rankine).
Suggestion Readings/ Text/References	1. Thermodynamics, An Engineering Approach by Yunus A. Cengel and Michael A Boles, McGraw-Hill Education. 2. Engineering Thermodynamics by D.B. Spalding and E. H. Cole, English Language Book Society, London. 3. Engineering Thermodynamics by P. K. Nag, Tata McGraw-Hill Education.

MEA1120
ENGINEERING MECHANICS

Course Title	Engineering Mechanics
Course Number	MEA1120
Credits	**3**
Course Category	ESA
Pre-Requisite if any	None

Contact Hours	2-1-0 (Lecture-Tutorial-Practical)
Type of Course	Theory
Course Assessment	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)
Course Objectives	To give students practice in applying their knowledge of mathematics, science, and engineering and to expand this knowledge into the vast area of Applied Mechanics. To enhance students' ability to design by requiring the solution of open ended problems. To prepare the students for higher level courses such as courses in Mechanics of Solids, Mechanical Design and Structural Analysis.
Course Outcome	After taking this course students should be able to 1. Classify basic engineering mechanics concepts required for predicting the behaviour of static structures. 2. Identify and choose various types of loading and support conditions that act on structural systems and model it using free-body diagrams. 3. Apply pertinent mathematical and physical principles to predict the behaviour of an engineering system. 4. Develop concepts of rigid body kinematics and dynamics with an emphasis on the modelling and analysis of motion of rigid body systems.
Syllabus	**Unit – I:** Fundamental Concepts and principles of Mechanics. Reduction of a system of forces to a force couple system, free body diagrams, equilibrium of rigid bodies in 3 dimensions, reactions, loading indeterminacy and solvability. Friction forces and laws of dry friction. Principle and application of virtual work. **Unit – II:** Analysis of Multiple particle system: Application of Newton's laws, linear and angular momentum, kinetic energy and work energy principle, principle of impulse and momentum to a system of particles. **Unit – III:** Translation and rotation about a fixed axis, general plane motion, absolute and relative velocity in plane motion, angular momentum of rigid body in plane motion. Problems of motion of rigid bodies and system of rigid bodies **Unit – IV:** Principle of work and energy, conservation of energy for rigid body and a system of rigid bodies, conservation of momentum and angular momentum of rigid body in a general 3D motion.
Suggestion Readings/ Text/References	**Text Book:** Beer Ferdinand P. and Johnston Jr. E Russel, Vector Mechanics of Engineering: Statics and Dynamics, Metric edition, Mc.Graw Hill, New Delhi. **Reference Book:** Merium, JL, Engineering Mechanics (Volume I and II), 3rd edition, (SI version) John Wiley and sons, Inc, NT.

MEA1910
ENGINEERING GRAPHICS LAB

Course Title	Engineering Graphics Lab
Course Number	MEA1910
Credits	1.5
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	0-0-3 (Lecture-Tutorial-Practical)

Type of Course	Practical
Course Assessment	Course Work (Reports/Viva-Voce) (60%) End Semester Examination (2 hour) (40%)
Course Objectives	1. To understand and appreciate the importance of Engineering Graphics. 2. To understand the basic principles of Teaching/ Engineering Drawing. 3. To understand the different steps in producing drawings according to BIS. 4. To learn basic engineering drawing formats.
Course Outcome	After completion of the course the student shall be able to Understand: 1. Classify the theory of plain geometric projection. 2. Narrate Plain/Diagonal/isometric scales in engineering graphics. 3. Apply various concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient. 4. Read and interpret drawings of simple machine parts/ sectional views in first and third angle of projections systems. 5. Explain the conventions and the methods of orthographic projection and isometric projection. 6. Improve their visualization skills so that they can propose these skills in developing new products. 7. Sketch simple machine parts in isometric projections. 8. Communicate ideas and information through engineering drawing.
Syllabus	**Unit-I:** Introduction to graphic language, instruments and their use, Conventional Lines and their uses. Printing of letters and numerals, Methods of dimensioning and use of scales, Construction of cycloidal curves and involutes. **Unit-2:** Necessity for orthographic projections 1st & 3rd angel methods of projection. Projection of points & lines on three coordinate planes, projections of plain surfaces. **Unit-3:** Orthographic projections of simple machine parts on different planes. Choice of view, Hidden lines, Preparation of multi view drawings. Necessity of sectional views and their drawings. **Unit-4:** Axonometric Projections. Drawing of isometric projection of simple solids; Development of surfaces of simple solids. Use and methods of drawing.
Suggestion Readings/ Text/References	1. P.S. Gill," A Text Book of Geometrical Drg., Katson Pub. Housing, Ludhiana. 2. Warren J. Lucadder," Fundamentals of Engg. Drg., Pren. Hall, N. Delhi. 3. N.D. Bhatt, Elementary Engg. Drg.,Charotar Pub. House, Anand, India. 4. Web Links :http://nptel.iitm.ac.in/courses.php, www.cognifront.com/engdrawing.html

MEA1920
MANUFACTURING PROCESS LAB

Course Title	Manufacturing Process Laboratory
Course Number	MEA1920
Credits	1.5
Course Category	ESA
Pre-Requisite if any	Nil
Contact Hours	0-0-3 (Lecture-Tutorial-Practical)
Type of Course	Practical
Course Assessment	Course Work (Reports/Viva-Voce) (60%) End Semester Examination (2 hour) (40%)
Course Objectives	1. To understand and appreciate the importance of Engineering Graphics. 2. To understand the basic principles of Teaching/ Engineering Drawing.

	3. To understand the different steps in producing drawings according to BIS. 4. To learn basic engineering drawing formats.
Course Outcome	After taking this course students should be able to: 1. List various types of ferrous and non-ferrous materials used for manufacturing processes. 2. Selection of processes, based upon jobs drawings used for manufacturing. 3. Describe and distinguish hot and cold working processes. 4. List various tools applied for cold and hot working process. 5. Classify and name machine tools required in various manufacturing processes. 6. Relate the job manufactured from practical relevance point of view.
Syllabus	1. To prepare through tennon and mortise joint. 2. To prepare of funnel of GI Sheet. 3. To perform filling, drilling and tapping operations. 4. To perform electroplating. 5. Preparation of green sand mould and to perform casting process. 6. To prepare a square headed bolt. 7. To carry out gear cutting by simple indexing. 8. To prepare a single V-butt joint by are welding and study of gas welding process. 9. To perform facing, simple turning, taper turning, threading and knurling operations on a lathe machine. 10. To perform plaining and slot cutting operations on shaper and slotter machines.