APPROVED STRUCTURE

Course structure for UG Engineering Degrees in Ceramic Technology, Information Technology and Computer Science & Engineering, Basic Science & Engineering (As per AICTE Guidelines)

SEMESTER-I

Sl. No.	Course Code	Course Title	L	T	P	Contact Hrs/wk	Credits
1.	HS-101	English for Communication	2	1	0	3	2
2.	BS-101	Mathematics-I	3	1	0	4	3
3.	BS-102	Engineering Physics-I	3	1	0	4	3
4.	BS-103	Engineering Chemistry	3	1	0	4	3
5.	ES-101	Mechanical Sciences-I	3	1	0	4	3
6.	ES-102	Basic Electrical Engg.	3	1	0	4	3
7.	BS-112	Physics Lab-I	0	0	3	3	2
8.	BS-113	Chemistry Lab-I	0	0	3	3	2
9.	ES-111	Engg. Workshop	0	0	4	4	3
10.	ES-112	Basic Electrical Engg. Lab	0	0	3	3	2
		TOTAL	**17**	**6**	**13**	**36**	**26**
11.	MC-101	NSS	0	0	3	3	2

SEMESTER-II

Sl. No.	Course Code	Course Title	L	T	P	Contact Hrs/wk	Credits
1.	BS-204	Mathematics-II	3	1	0	4	3
2.	BS-205	Engineering Physics-II	3	1	0	4	3
3.	ES-203	Mechanical Sciences-II	3	1	0	4	3
4.	ES-204	Basic Electronics Engg.	3	1	0	4	3
5.	ES-205	Introduction to Computing	3	1	0	4	3
6.	BS-215	Physics Lab-II	0	0	3	3	2
7.	ES-213	Engineering Drawing & Graphics	0	0	3	3	2
8.	ES-214	Basic Electronics Engg. Lab	0	0	3	3	2
9.	ES-215	Computer Programming Lab	0	0	3	3	2
10.	HS-212	Language Lab	0	0	3	3	2
		TOTAL	**15**	**5**	**15**	**35**	**25**
11.	MC-202	Environmental Sciences	3	0	0	3	3

The approved course structure for B.Tech. 1st Sem. Course has been approved in the B.O.S. meeting held on the 5ht April, 2013

SYLLABUS FOR 1ST YEAR, 1ST SEMESTER

Mathametics-1
Code-BS-101
Contacts: 3L + 1T =4
Credits: 4

MODULE-I

Matrix: Determination of a Square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, adjoint of a determinant Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties. Trace of a matrix. Rank of a matrix and its determination using elementary row and column operations. Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations, Eigen values and given vectors of a square matrix (of a order 2 or 3), Eigen values of AP^{TP}, kA, AP^{-1P}, Caley-Hamilton theorem and its applications.

MODULE –II

Successive Differentiation: Higher order derivatives of a function of single variable. Leibnitz's theorem (statement only and its application, problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n)_o$

Mean Value Theorems & Expansion of Functions: Rolle's theorem and its application. Mean Value theorems-Lagrange & Cauchy and their application. Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the Functions: sin x , cos x , e^x, log(1+x) , $(a+x)^n$, n being an integer or a fraction (assuming that the remainder $R_n \Rightarrow 0$ as $n \Rightarrow \infty$ in each case.) 5L

Reduction formula: Reduction formula both for indefinite and definite integrals of types

$\int \sin^n x$, $\int \cos^n x$, $\int \sin^n x \int \cos^m x$, $\int \cos^m x \sin nx$. $\frac{dx}{(x^2 + a^2)^n}$, m.n are positive. Integers.

2L

MODULE-III

Calculus of Functions of Several Variables: Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, homogeneous functions and Euler's theorem and problems up to three variables, Chain rules, Differentiation of implicit
Functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of time line integrals, Double and triple integrals.

MODULE-IV

Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence; Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statement and related problems on these tests), Alternating series, Leibnitz's test (statement, definition) illustrated by simple example, Absolute convergence and conditional convergence.

MODULE-V

Vector Algebra and Vector Calculus: Scalar and vector fields-definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere. Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, gradient of a scalar point function, divergence and curl of a vector point function. Directional derivatives. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications).

Engineering Physics 1: Code/BS-102

[Total lectures: 40]

Module 1: Vibrations ***[9 lectures]***

1.1 ***Simple Harmonic Motion*** - its expression, differential equation and solution, Superposition of SHMs in two mutually perpendicular direction, Lissajous' figures. [3L]
1.2 ***Damped vibration*** – differential equation and its solution, Critical damping, Logarithmic decrement, Analogy with electric circuits. [3L]
1.3 ***Forced vibration*** – differential equation, Amplitude and Velocity resonance, Sharpness of resonance and Quality factor. [3L]

Module 2: Optics I ***(13 lectures)***

2.1 ***Classification of different radiation*** - Visible, IR, Electromagnetic, UV, X-ray, Gamma ray and Microwaves. [1L]
2.2 ***Interference*** - Conditions for sustained interference, Double slit as an example, Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring (No deduction - Qualitative only). [3L]
2.3 ***Diffraction*** – Fresnel and Fraunhofer diffraction, Single slit, Grating and its use as a monochromator; Imaging, types of imaging, classification (Visible, IR, Electromagnetic, UV, X-ray, Gamma ray and Microwaves). [4L]
2.4 ***Polarization*** – general concept of polarization, Plane of vibration, plane of polarization, Polarization through reflection and Brewster's law, Double slit diffraction (Biprism – ordinary and extra-ordinary), Nicol prism, Polaroid, half wave plate and quarter wave plate. [5L]

Module 3: Optics II ***(13 lectures)***

3.1 ***X-ray*** – origin of characteristics and continuous X-rays, Bragg's law, determination of lattice constant and application. [4L]
3.2 ***Laser*** – spontaneous and stimulated emission of radiation, Einstein's coefficients, Optical resonator and principle of lasing action, Ruby and He-Ne lasers, applications of laser. [4L]
3.3 ***Optical Fibre*** – Core and cladding, Wave guide - total internal reflection, step index and graded index, Calculation of Numerical aperture and acceptance angle, energy losses in the optical fibre, applications of optical fibre. [5L]

Module 4: Crystallography ***(5 lectures)***

Elementary ideas of crystal structure - lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, f.c.c. and b.c.c. lattices, Miller indices and miller planes, Co-ordination number and Atomic packing factor. [5L]

Physics Lab-1: Code/BS-112

1. Determination of Young's modulus by flexure method and calculation of bending moment.
2. Determination of modulus of rigidity by static/dynamic method.
3. Use of Carry Foster bridge to determine unknown resistance.
4. Determination of wavelength of light by Newton's ring method.
5. Determination of numerical aperture and energy loss related to optical fibre experiment.
6. Determination of Band gap energy by 4-probe method.

~~Chemistry~~/ Engineering Chemistry :
Code: BS-103
Contacts: 4
Credits: 3

Module 1

Chemical Thermodynamics:

Concept of Thermodynamic parameters: System, Surroundings, Universe with example, diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form.
Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. **3L**

Heat Capacity: Definition, Classification of Heat Capacity (Cp and C_V): Definition and General expression of $Cp - C_V$, Expression of $Cp - C_V$ for ideal gas.

Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.
Application of first law of thermodynamics to chemical processes, exothermic, endothermic processes, **3L**

Second law of thermodynamics: Statement, Mathematical form of 2^{nd} law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. **2L**
Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity and equilibrium reaction. **2L**

Module 2

Chemical Bonding:
(i) Ionic Bond – Types of ionic solids, radius ratio effect and coordination number, limitations of radius ratio, lattice defects, lattice energy and Born, Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability, Fajan's rules. **3L**

(ii)Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals. Applications of MO theory to explain the stability of homo and hetero dinuclear diatomic molecules, multi centre bonding in electron, deficient molecules. **4L**

(iii) Coordination Compounds: Werner's theory, nomenclature, chelates, stereo, chemistry of coordination numbers 4, 5 and 6. Various types of isomerism in coordination complexes. Important applications of coordination compounds. Sidgwick effective atomic number concept, valence bond theory of coordination compounds. **3L**

(iv) Theories of Metal-Ligand bonding: Limitations of valence bond theory; Crystal field theory and crystal field splitting in octahedral and tetrahedral complexes; factors affecting the crystal field parameters. Different applications. J.T. distortion. Demerits. Ligand field theory.

Structure and reactivity of Organic molecule Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions. Polymerization Concepts, classifications and industrial applications. **3L**

Module 3

Electrochemical cell:
Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, Discussion, Application) Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discuss ion, Application). **3L**

Module 4

Surface and Colloids Chemistry:

Adsorption-Langmuir and Freundlich isotherms. Multi layer adsorption, BET equation (no derivation) and its application to surface area measurement. Sols (reversible and irreversible), emulsions and emulsifiers, association colloids (micelles), gels. Applications of colloids. Qualitative idea of electrokinetic phenomena. Zeta potential. **3L**

Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor. **2L**

Practical: Chemistry Lab. Code: BS-113

1. To Determine the alkalinity in a given water sample.
2. Red-ox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. To determine the total hardness of water
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)
6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution

Mechanical Science-I

Code: ES-101
Contacts: 3L + 1T = 4
Credits: 4

Mod-I
Introduction of statics of a particle: Concept of particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; vector and scalar quantities; force-a vector,

Parallelogram law of forces; addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i.j.k; cross product and Dot product and their applications. 4L + 1T

Two dimensional force system; Composition and resolution of forces; Moment; Varignon's theorem; Couple, Resolution of a coplanar force by it equivalent force-couple system; Resultant of forces. 4L + 1T

Mod-II
General conditions of equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. 3L +1T

Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of Friction, Kinetic friction. 3L + 1T

Mod-III

Parallel forces: Centroid and centre of Gravity, Centroids of a triangle, circular sector, quadrilateral, composite areas consisting of above figures and right circular cone. 4L + 1T

Moments of inertia: MI of plane areas with respect to an axis in its plane and with its respect to an axis perpendicular to the plane of the figure; Parallel and perpendicular axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. 3L + 1T

Simple stresses and strains : Normal stress, shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; stress –strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding Modulus of elasticity; Factor of safety; stress in composite bars, temperature stresses. 4L + 2T

Mod-IV
Dynamic Kinematics and kinetics; Newton's law of motion; Rectilinear motion of particles; determinations of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion. 3L + 1T

Plane curvilinear motion o0f particles: projectile motion. 2L + 1T

Mod-V
Kinetics of particles: Newton's second law; Equations of motion; D. Alembert's principle and free body diagram; Principle of work, power and energy. 4L + 1T

Basic Electrical Engineering
Code: [redacted] ES 102
Contacts: 3L + 1T = 4
Credits: 4

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, stardelta conversion. Maximum power transfer theorem with proof. 7L

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet. 5L

AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series , parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit. 9L

Electrostatics: Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor. 5L

DC Machines: Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control) 6L
Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation. 4L

3 Phase Induction Motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control) 5L

Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method. 3L

General structure of electrical power system: Power generation to distribution through overhead lines and under ground cables with single lone diagram. 1L

Text books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering(TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition

Basic Electrical Engineering Lab
Code: ~~EE191~~ ES 111
Contacts: 3
Credits: 2

List of Experiments:

Sl. No Name of the Experiments

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorem.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit
8. Calibration of ammeter and voltmeter.
9. Open circuit and Short circuit test of a single phase Transformer.
10. No load characteristics of D.C shunt Generators
11. Starting and reversing of speed of a D.C. shunt
12 Speed control of DC shunt motor.
13. Measurement of power in a three phase circuit by two wattmeter method.

Engg.Workshop

Code: ES111

Wood working – Study of different tools used in carpentry shop. Making of different joints such as Halving joint, Mortise and tenon joint, Bridle joint, Dovetail joint etc.

Bench work and fitting - Study of different tools used in bench work and fitting shop. Squaring of M.S. plate, making of V-groove and V- notch.

Lathe –Classifications and Specifications of lathe, functions of the principal parts and their applications, different operations, cutting tool materials and applications, nomenclature of a single point cutting tool, Influence of Tool angles, Cutting fluid etc., Execution of a job with multiple operations .

Drilling Machine – Types of drilling machine, different parts of a sensitive drilling machine, tool holding devices – sleeve, socket, chucks etc., types of drill commonly used, twist drill nomenclature.

Shaper - Types of Shapers, Principal parts of Shaper, reciprocating movement of Ram, quick return mechanism, different operations. Making of a flat surface alongwith channels on a M.S. block.

Grinding Machine – Classifications,study , operation and applications.

Welding – Principles of welding.Classifications and Principle of operations of different welding processes,e.g., Oxy-acetylene gas welding, Electric arc welding, Joining of two parts by Electric arc welding.

➢ Subject No : **HS13001** Subject Name : **ENGLISH FOR COMMUNICATION** L-T-P : **3-0-2** Credit : **4**

The aim of this foundational course is to help the second language learners acquire fluency in both spoken and written English to communicate messages with clarity, precision and confidence in the workplace. The course will have three components: Language, Speaking and Writing. The skills required in these areas will be imparted through Lectures and Sessionals. While lectures will introduce learners to the basic concepts in communication, sessionals will provide hands-on experience. It is hoped that after commanding the skills required in spoken and written English, learners will be able to communicate better. Section A (lecture topics) Introduction to communication, Language and grammar skills, speaking skills, Writing skills Section B (Sessionals) Building Vocabulary, Building sentences, Grammar, Pronunciation drills, Phonetics, vowels, Diphthongs, consonants, Stress, Rhythm and intonation, Conversational skills, Meta Language, the writing process, Writing with a thesis, Writing topic sentences, Writing a paragraph, linking paragraph.

Subject: Mathematics – II Code: BS204 Credit:3

Module I

Ordinary differential equations (ODE)- First order and first degree: Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation). 5L

Module II

ODE- Higher order and first degree: General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. 6L

Module III

Basics of Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. 10L

Module IV

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms. 6L

Module V

Improper Integral: Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. 3L

Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of LT of $t^n f(t)$, LT of derivatives of f(t), L.T. of . Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. 10L

Suggested Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, (Wiley Eastern)
2. Graph Theory: V. K. Balakrishnan, (Schaum's Outline, TMH)
3. A first course at Graph Theory: J. Clark and D. A. Holton (Allied Publishers LTD)
4. Introduction to Graph Theory: D. B. West (Prentice-Hall of India)
5. Graph Theory: N. Deo (Prentice-Hall of India)
6. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
7. Higher Engineering Mathematics: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
8. Calculus: Strauss, Bradley and Smith (3rd edition, Pearson Education)
9. Engineering Mathematics (Volume 2): S. S. Sastry (Prentice-Hall of India)
10. Advanced Engineering Mathematics, 3E: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition

Engineering Physics II

[Total lectures: 40]

Module 1: Electromagnetic Theory:-

Gradient of scalar field, Divergence and Curl of vector field and their physical significance, Concept of displacement current, equation of continuity, Maxwell's field equations, Maxwell's wave equation and its solution for free space, E.M. wave in a charge free conducting media, E.M. energy flow and Poynting Vector, skin effect. 8L

Module 2: Statistical Mechanics:-

2.1 Concept of energy levels and energy states, microstates, macrostates and thermodynamic probability, equilibrium of macrostate. 2L

2.2 MB, FD, BE statistics (No deductions necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, calculation of Fermi level in metals and application of FD statistics in material science. 5L

Module 3: Nuclear physics:-

Properties of nuclei: Nuclear BE, semi-empirical mass formula, Nuclear forces, Nuclear reaction and Q-values, Nuclear Fission and Fusion, Nuclear reactor, A-Bomb and H-Bomb, Nuclear power plant. 5L

Module 4: Quantum Mechanics:-

4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy-momentum relation: Inadequacy of Classical Physics in explaining (i) Black body radiation (derivation required) - Rayleigh Jeans' law, Wien's law and Stefan's law, Ultraviolet catastrophy, Planck's radiation law (Calculation of the average energy of the oscillator), (ii) Einstein's Photoelectric effect, (iii) Compton effect (calculation of Compton wavelength is required); Application of Planck's law in the case of colour glasses. 7L

4.2 Wave-particle duality and de Broglie's hypothesis, Concept of matter waves, Davisson-Germer experiment, Notion of wave packets and Heisenberg's uncertainty principle, notion of group velocity and phase velocity. 5L

4.3 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrodinger's equation, formulation of time independent Schrodinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrodinger equation – Particle in an infinite square well potential (1-D potential well), Discussion on degenerate levels. 8L

Physics Lab-II
Code: ~~PH 291~~ BS215

1. Determination of specific charge e/m of electron by Thomson's method.
2. Determination of Planck's constant using photocell.
3. Determination of Stefan's radiation constant
4. Determination of dielectric constant of a given dielectric material.
5. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
6. Determination of Rydberg constant by studying Hydrogen/Helium spectrum

Mechanical Science II

Code: ~~ES-201~~ ES-203
Contacts: 3L + 1T = 4
Credits: 4

Module 1 : 10L+3T

Basic Concepts of Thermodynamics : Microscopic and Macroscopic viewpoints, Definition of thermodynamic systems: closed, open and isolated systems

Concept of Thermodynamics state; Definition of properties: intensive, extensive & specific properties, Thermodynamic equilibrium, Thermodynamic processes; quasi-static, reversible &irreversible processes; Thermodynamic cycles.

Zeroth law of thermodynamics. Concept of Heat and Work, Definition & units of thermodynamic work. Examples of different forms of thermodynamic works. Work done during expansion and compression process, Definition of Heat; unit of Heat ,Similarities & Dissimilarities between Heat & Work, Ideal Equation of State, processes; Real Gas , Definition of Ideal Gas

Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.

Properties of Pure Substances, p-v & P-T diagrams of pure substance like H_2O ,Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
Definition of dryness fraction of steam, degree of superheat of steam.

Module 2 : 5L+3T

1st Law of Thermodynamics :Definition of Stored Energy & Internal Energy ,1st Law of Thermodynamics for cyclic processes, Non Flow Energy Equation ,Flow Energy & Definition of Enthalpy, Conditions for Steady State and Unsteady State, Steady State Steady Flow Energy Equation

Module 3 : 6L+3T

2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat etc.,Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & Co-efficient of Performance of Refrigerators Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics, Absolute or Thermodynamic scale of temperature, Clausius Integral ,Entropy: Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency ,PMM-2; definition & its impossibility

Module 4: 6L+3T

Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S planes; Thermal efficiency,Diesel cycle; plot on P-V, T-S planes; Thermal efficiency ,Rankine cycle of steam, h-s chart of steam (Mollier's Chart),Simple Rankine cycle plot on P-V, T-S, h-s planes ,Rankine cycle efficiency with & without pump work

Module 5 : 6L+3T

Principle of Refrigeration , Classifications and applications, Basic Principles of Air-cycle and Vapour compression refrigeration cycle with p-v & T-S diagram,Isentropic and Isenthalpic expansion, Calculation of C.O.P of cycles
(Problems are to solved for each module

Engineering Drawing
Code ~~ME-191~~ ES213

1. Lines, letterings, dimensioning-Drawing of two views of any object with the application of different lines, lettering and dimensioning.
2. Scale – Concept of R.F, Reducing and Enlarging scales, Plain scale, diagonal scale
3. Geometrical constructions and curves, e.g. Regular Polygon with given side and Inscribing etc., ellipse, parabola, hyperbola, Cycloid, Involute etc.
4. Orthographic projection of points
5. Orthographic projection of lines-Inclined to both the reference planes
6. Orthographic projection of planes like circle, rhombus, polygons
7. Orthographic projection of solids like cone, pyramids, prisms etc
8. Section of solids like cone, pyramids, prisms etc with true shape of section
9. Isometric projection with isometric scale & Isometric views of different planes and solids
10. *Development of surfaces of cones, cube, cylinder with or without truncation*
11. Conversion of pictorial views to orthographic projection.

Basic Electronics Engineering
Contacts: 3L + 1T = 4
Total= 40L
Credits: 4
Code: ES 204
Module 1: Semiconductors: 4L

Crystalline material: Mechanical properties, energy band theory, Femi levels, Conductors, Semiconductors and insulators: electrical properties, band diagrams: Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module 2: Diodes and Diode Circuits: 6L

Formation of P-N junction, energy band diagram, and built potential forwarded and reverse biased P-N Junction, formation of depletion zone, V-I characteristics, zener breakdown, Avalanche breakdown and reverse characteristics; junction capacitance and Varactor diode. Simple diode circuits: half wave circuits: full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module 3: Bipolar Junction Transistors: 10L

Formation of PNP/NPN junctions, energy band diagram; transistor mechanism and principle of transisto0rs, CE, CB, CC configuration, transistors characteristics: cut-off active and saturation mode, transistor action , injection efficiency, base transport factor and current, amplification factors for CB, CC and CE modes, biasing and bias stability: calculation of stability factor;
Different classes Amplifiers-(Class-A, B, AB and C-=basic concepts, power and efficiency)

Module 4: Field Effect Transistors: 7L

Concepts of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and Characteristics, MOSEFT Structure and characteristics, depletion and enhancement type: CS, CG, CD, Configuration; CMOS; Basic Principles.

Module 5: Feed Back Amplifier and Oscillators: 8L

Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feed back factors; topologies of feed back amplifier; effect to feed back on gain, out put impedance; input impedance, sensitivities (qualitative), bandwidth stability, effect to positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria.
Phase Shift, Wein Bridge, Colpitts oscillatorts.

Module 6: Operational Amplifiers : 5L

Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Basic Electronics Engg. Lab (ES-214)
Credit – 2

List of experiments:

1. Determination of input-Offset voltage, Input Bias current, Slew Rate of Op-Amps [1]

2. Determinations of Common –Mode-Rejection-Ration, Bandwidth offset null of Op-Amps

3. Study of Op-Amps Inverting Amplifiers, Non-Inverting Amplifiers, Adders, Integrators, differentiators etc. [2]

4. Study on logic-Gates, Realization of Boolean Functions using Logic Gates [1]

5. Study on the Characteristics curves for transistor in common base (CB), common emitter (CE) and common collector (CC) mode [2]

Introduction to Computing
Code: ES-205 Contacts: 3L, Credits: 3

Module I:Computer basics, data representation, input/output units, computer memory, processor, binary arithmetic, logic circuits, computer architecture, computer languages, operating systems, computer generation and classifications, voice & data communications.

Module II: Flowchart, definition of algorithm, criteria of algorithms, C preliminaries, numeric variables and constants, data types and expressions, precedence and associatively of operators; concepts of structural program development, control statements.

Module III: Implementing Loop in program, while, for, do-while, switch, break and continue, storage variables; Implementing Function in program - call by value, call by reference and their differences, recursions;.

Module IV: Definition of Array, one, two dimensional array, Passing arrays to function, concept of arrays of pointers and processing character string.

Module V: Concept of Pointers and their usages, memory allocation, passing pointers to a function, pointers and arrays, array of pointers, pointers to pointers; Declaration, definition and initialization of Structures, accessing structures, structures in functions, structure and pointers, self referential structures, Unions

Module VI: Files - basic concept of various types of file access methods: sequential, indexed sequential, random, various statements for file handling, bitwise operation, command line parameters, macros, preprocessor.

Reference books:

Fundamental of Computers: Rajaraman, P.H

Computer fundamentals: D.P.Nagpal,Wheeler Publishing

Introduction to Computing: E Balagurusamy, TMGH

C how to run Program P: Dietel & Dietel, P.H

Computer Programming in C: Rajaraman, P.H

The C Programming Language: Kernighan and Ritchie, P.H

Programming with C: Byron S Gottfried, TMGH

C Programming Lab

Code: ES-215

Concepts of Flow chart and decision table. Practice problem,

Introduction of Digital Computer and its component,

Introduction to DOS and Unix Operating System.

Development of C programs using Loops- while, for, do-while, switch, break and continue: Functions, Recursions;

Array- one, two dimensional array;

String;

Pointers; Structures- accessing structures, structures in functions, structure and pointers, self referential structures,

Unions.

Development of C programs using File handling,

Environmental Sciences

Code: MC202; Contacts: 3L = 3; Credits: 3

General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. 1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. 2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. 2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. 1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). 2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. 1L
Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). 1L

Water Pollution and Control
Hydrosphere, Hydrological cycle and Natural water.
Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L
River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. 2L
Lake: Eutrophication [Definition, source and effect]. 1L
Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L
Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. 2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic 1L

Land Pollution
Lithosphere; Internal structure of earth, rock and soil 1L
Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste). 2L

Noise Pollution
Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] 1L
Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, 10 L (18hr Index), Ldn. Noise pollution control. 1L

Environmental Management
Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

References/Books
1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

Language Lab

2nd ~~1st~~ Yr. 2nd Sem.

Code: HS-212, cr-2

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.

Detailed Course Outlines:

A. Technical Report Writing: 2L+6P
   1. Report Types (Organizational / Commercial / Business / Project)
   2. Report Format & Organization of Writing Materials
   3. Report Writing (Practice Sessions & Workshops)

B. Language Laboratory Practice

I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory Practice Sessions 2L

2. Conversation Practice Sessions: (To be done as real life interactions) 2L+4P

a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed

b) Introducing Role Play & honing over all Communicative Competence

3. Group Discussion Sessions: 2L+6P

a) Teaching Strategies of Group Discussion

b) Introducing Different Models & Topics of Group Discussion

c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure

Interview Sessions; 2L+6P

a) Training students to face Job Interviews confidently and successfully
b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication

4. Presentation: 2L+6P

a) Teaching Presentation as a skill

b) Strategies and Standard Practices of Individual /Group Presentation

c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids

5. Competitive Examination: 2L+2P

a) Making the students aware of Provincial /National/International Competitive Examinations

b) Strategies/Tactics for success in Competitive Examinations

c) SWOT Analysis and its Application in fixing Target