NATIONAL INSTITUTE OF TECHNOLOGY JAMSHED PUR
JAMSHEDPUR (JHARKHAND) - 831014

Group – I: CE, EEE, ECE and CSE – Physics Cycle
Group – II: ME, MFG and MME – Chemistry Cycle

FIRST SEMESTER

GROUP – I (CE, EE, ECE and CSE)

SL. NO.	COURSE CODE	COURSE NAME	CREDIT L–T-P	THEORY PRACTICAL
1	PH1101	ENGINEERING PHYSICS	3-1-0	THEORY
2	MA1101	MATHEMATICS- I	3-1-0	THEORY
3	EE1101	BASIS ELECTRICAL AND ELECTRONICS ENGINEERING	3-1-0	THEORY
4	MM110	MATERIAL SCINCE	3-0-0	THEORY
5	CE1101	ENVIRONMENT AND ECOLIGY	3-0-0	LABORATORY
6	ME1103	ENGINEERING GRAPHICS	2-0-2	THEORY+LAB
7	PH1102	ENGINEERING PHYSICS LAB.	0-0-3	LABORATORY
8	EE1102	BASIS ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	0-0-3	LABORATORY
		YOGA/NSS/NCC/LIFE SKILLS	17-3-5	
		TOTAL	25	

GROUP – II (ME, MFG, MME)

SL. NO.	COURSE CODE	COURSE NAME	CREDIT L–T-P	THEORY PRACTICAL
1	CH1101	ENGINEERING CHEMISTRY	3-1-0	THEORY
2	MA1101	MATHEMATICS- I	3-1-0	THEORY
3	ME1101	ENINEERING MECHANICS	3-1-0	THEORY
4	HS1101	ENGLISH FOR COMMUNICATION	3-1-0	THEORY
5	CS1101	COMPUTER PROGRAMMING	2-0-2	THEORY
6	ME1102	ENINEERING MECHANICS LAB.	0-0-3	LABORATORY
7	CH1102	ENGINEERING CHEMISTRY	0-0-3	LABORATORY
8	MF1101	WORKSHOP PRACTICE	0-0-3	LABORATORY
			14-4-7	
		TOTAL	25	

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SECOND SEMESTER

GROUP – I (CE, EEE, ECE, and CSE)

SL. NO.	COURSE CODE	COURSE NAME	CREDIT L–T-P	THEORY PRACTICAL
1	CH1201	ENGINEERING CHEMISTRY	3-1-0	THEORY
2	MA1201	MATHEMATICS- II	3-1-0	THEORY
3	ME1201	ENINEERING MECHANICS	3-1-0	THEORY
4	HS1201	ENGLISH FOR COMMUNICATION	3-1-0	THEORY
5	CS1201	COMPUTER PROGRAMMING	2-0-2	THEORY
6	ME1202	ENINEERING MECHANICS LAB.	0-0-3	LABORATORY
7	CH1202	ENGINEERING CHEMISTRY	0-0-3	LABORATORY
8	MF1201	WORKSHOP PRACTICE	0-0-3	LABORATORY
			14-4-7	
		TOTAL	25	

GROUP – II (ME, MFG, MME)

SL. NO.	COURSE CODE	COURSE NAME	CREDIT L–T-P	THEORY PRACTICAL
1	PH1201	ENGINEERING PHYSICS	3-1-0	THEORY
2	MA1201	MATHEMATICS- II	3-1-0	THEORY
3	EE1201	BASIS ELECTRICAL AND ELECTRONICS ENGINEERING	3-1-0	THEORY
4	MM1201	MATERIAL SCINCE	3-0-0	THEORY
5	CE1201	ENVIRONMENT AND ECOLIGY	3-0-0	LABORATORY
6	ME1203	ENGINEERING GRAPHICS	2-0-2	THEORY+LAB
7	PH1202	ENGINEERING PHYSICS LAB.	0-0-3	LABORATORY
8	EE1202	BASIS ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	0-0-3	LABORATORY
.			17-3-5	
		TOTAL	25	

National Institute of Technology, Jamshedpur

B.Tech. Course Syllabus

SEMESTER I

Engineering Physics

Electromagnetic Waves: Introduction to del operator, gradient of a scalar, divergence and curl of vectors, Gauss divergence theorem, Stake's theorem, equation of continuity, Introduction to displacement current, Maxwell's Equations, Wave Equation, Plane electromagnetic waves, Poynting's Theorem, Electromagnetic Boundary Conditions, Reflection and Refraction.

Polarization:Unpolarised light, Production of plane polarized light by grid polarizer, Polarization by reflection and Brewster's Law, Malus' Law, Double refraction, quarter wave plate, half wave plate, Production and analysis of various kinds of polarized lights.

Magnetic properties of matter: Dia, Para and Ferromagnetic materials, Magnetic domains, Magnetic Hysteresis, Calculation of Hysteresis loss, Three magnetic vectors, Magnetic circuit. Interaction of Radiation with Matter: Compton Effect and pair production (qualitative).

Laser: Coherent waves and interference, Temporal and Spatial coherence, Metastable states, Optical pumping, Population inversion, spontaneous and stimulated emission, Einstein's A and B coefficients, He-Ne laser.

Wave Mechanics: Failure of classical physics, Qualitative review of relevant experiments, de Brogile waves, Phase and Group velocities, Davisson and Germer experiment, Uncertainty principle, wave function and Schrodinger equation, probability interpretation, Application of time-independent Schrodinger equation -Particle in a box.

Engineering Mathematics-I

Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with remainders, Indeterminate forms, Concavity and Convexity of a curve, Points of inflexion, Asymptotes and Curvature.

Limit, Continuity and Differentiability of function of several variables, partial derivatives and their geometrical interpretation, Directional derivatives of composite and implicit functions.

Euler's theorem on homogeneous functions, Taylor's expansion of functions of several variables, maxima and minima of functions of several variables, Lagrange's method of multipliers

First order differential equations: Exact, Linear and Bernoulli's form, Second order differential equations with constant coefficients, Method of undetermined coefficients, variation of parameters, Euler's equations, system of differential equations. Review of limit, continuity, differentiability of functions of complex variables, Analyticity of functions, Cauchy- Riemann equations, Harmonic functions. Reduction formula for indefinite and definite integrals of type $\sin^n x$, $\cos^n x$,$\sin^m x \cos^n x$ and their evaluation

Basic Electrical and Electronics Engineering

Electrical circuit: D.C circuit: voltage and current sources, mesh current method, nodal voltage method. Delta star and Star-delta transformation, Thevenin's theorem, super position theorem, Norton's theorem, maximum power transfer theorem

A.C. Circuit: single phase and three phase A.C phasor representation. Electrical Circuit Element's R-L-C, their physical origin based on electromagnetic and electrostatics, R-L, R-C, R-L-C series circuits, sinusoidal study state: power factor, active and reactive power, parallel and series circuits. Delta and star connections, line and phase quantities, single and three phase power measurement A.C Fundamentals, Active, Reactive and Apparent power, Basics of transformers, D.C Machines and Induction motor.

Semiconductor devices: construction, working and V-I characteristics of diode, zener diode, LED, photodiodes, SCR, Diac, Triac and their applications.

Transistors: BJT, FET,MOSFET, Construction, working, type of configuration, V-I characteristics, biasing transistor circuits-fixed bias, emitter bias, feedback bias, voltage divider bias, transistor as an amplifier

Operational amplifier: introduction, parameters application-inverting, non-inverting amplifier unity follower, integrator, differentiator, summing circuit. Introduction of logic gates

Environment and Ecology

Eco-system: Concept of ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries.

Biodiversity and its conservation: Introduction-Definition: Genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of diversity: Consumptive use, productive us, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot space 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.

Environment pollution: Causes, effects and control measures of: (a) Air Pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution. (e) Noise pollution. (f) Thermal pollution, (g) nuclear pollution, Solid waste management: causes effects and control measures of urban and industrial wastes, role of individual in prevention of pollution, Pollution case studies, and Disaster management: floods, earthquake, cyclone and landslides.

Solid issues and the environment: From understandable 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 warning, 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, Wild life protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, public awareness.

Material Science

Introduction: Types of materials from structure to property, Crystal structure: Crystalline and non-crystalline materials, Miller indices, Bravias lattices, Lattice direction and planes. Crystal Imperfections: point, line and planer defect. Deformation of material: Recovery re-crystallization and grain growth, Mechanical properties of materials: Tensile, Impact, Fatigue and Creep of metals. Electron theory of Metals: Free electron theory, Zone theory , The dependence of the energies on the wave number, The density of state curves, Conductors and insulators, Semiconductors, Dielectric behavior, Ferro-electricity, Piezoelectricity, Magnetism, Principles of solidification: Nucleation and growth, Homogeneous and heterogeneous nucleation, Phase Diagrams: Phase rule,

isomorphous, eutectic, peritectic, eutectoid and peritectoid transformation, Fe-cementite diagram; Heat Treatment of Steel: TTT diagram, different heat treatment process: Annealing, normalizing and Hardening, Hardenability. Selection of Engineering Materials: Common engineering materials including metals and alloys, ceramics composites, polymers.

Text Book:

1. Materials Science by R.S Khurmi, S. Chand Publication.
2. Materials Science and Engineering by V Raghavan, Eastern Economy Edition PHI publication.

Reference book:

1. Materials Science and Engineering by William Callister, Wiley Publication

Engineering Graphics

Introduction to basic engineering drawing, instruments, sheet layouts, lines, lettering, dimensioning, Projection of points and lines, Projection of Solids, Section of solids, Development of surfaces of solids, Isometric projections, Orthographic projections, Use of CAD software to draw plan, elevation and other views of different objects.

SEMESTER II

Engineering Chemistry

Thermodynamics: Laws of thermodynamics, system, thermodynamic functions, state of a system, equilibrium, enthalpy, work done in different processes, C_p, C_v, adiabatic PVT relations, Carnot cycle, concept of entropy, Clausius-Clapeyron equation & its applications, Maxwell relations, concept of free energy, chemical potential, Maxwell relations.

Electrochemistry and corrosion: Electrochemical cells, origin of electrode potential, standard potential, Nernst equation, EMF series, rechargeable batteries, Types of corrosion, galvanic series, Cathodic and anodic reactions, differential aeration cells, corrosion prevention methods.

Kinetics & Solution Chemistry: Kinetics of chemical reaction, 1^{st}, 2^{nd} order reactions, reversible, consecutive and parallel reaction. Steady state approximations, Arrhenius equation, Chain reactions, photo chemical reactions, Solution chemistry and colligative properties, Real and ideal solutions, Diffusion, Osmosis, Osmotic pressure, Lowering of vapor pressure, Elevation in boiling point, Depression of freezing point, Abnormal molecular weight, Degree of association and dissociation.

Chemical Bonding & Co-ordination chemistry: Bonding models in inorganic chemistry, Molecular orbital theory (MOT), Valance bond theory (VBT), and crystal field theory (CFT), Co-ordination chemistry: Co-ordination number, Chelate effect, EAN rule, splitting of 'd' orbital in octahedral, tetrahedral and square planar complex, Example of Bio-inorganic & metals in biological systems

Industrial chemistry: Polymers: types of polymer, polymerization, applications, and important synthetic polymers. Refractory & ceramics material: Classification, manufacturing and Applications, Water treatment, Air pollution and Control techniques

Engineering Mathematics-II

Linear dependence and independence, rank and inverse of a matrix, solution of algebraic, equations- consistency conditions, Eigen values and Eigen vectors, Hermitian and skew Hermitian matrices,

Convergence of improper integrals, test of convergence, Beta and Gamma functions elementary properties, differentiation under the integral sign.

Series solution, Frobenius Method, Legendre's and Bessel's differential equation, Recurrence formula, Generating functions, orthogonality.

Rectification, double and triple integrals, computations of surfaces and volumes, change of variables in double integrals, Jacobians of transformations

Scalar and vector fields, level surfaces, directional derivative, Gradient, Divergence, Curl, Laplacian, line and surface integrals, theorems of Green, Gauss and Stokes.

Finite differences, Newton's forward and backward interpolation formulae, Central difference interpolation Lagrange's interpolation, Trapezoidal rule and Simpson's $1/3^{rd}$ rule of integration, Solution of polynomial and transcendental equations-bisection method, Newton-Raphson method and Regula-falsi method

Engineering Mechanics

Fundamental principles of mechanics: Idealization of mechanics, Laws of mechanics, Force vector in 2D & 3D, Directions cosines, Dot and vector product, Moment of a force, Component of moment an axis, Couple & Couple moment, Force system, Reduction of complex force system to simplest form, Equivalent force system, Wrench.

Equilibrium: Definition, Conditions & Criteria of equilibrium, Free body diagram, 2 D & 3D problems on engineering applications. Plane Truss: Simple truss, Idealization of plane truss, Methods of sections & Joints.

Friction: Coulomb's law of dry friction, Roller, wedge & belt friction, Screw jack.

Kinematics and kinetics of a particle: Types of motion, Rectilinear & curvilinear translation, Relative velocity and relative acceleration, Dependent motion, kinematics w.r.t. a moving frame of reference, Kinematics in normal & tangential component & polar coordinates, Kinetics of particle, D'Alembert's principle, Principle of work & energy, Principle of Impulse & momentum, Collision of two bodies, Central & oblique impact.

Kinematics and Kinetics of rigid body: Kinematics of rotation, Non-Centroidal rotation Plane motion, Instantaneous centre of rotation, D'Alembert's principle, Principle of work & energy & principle of impulse-momentum of rigid body.

Axial force, shear and bending moment: Concept of Internal forces, Relation between axial force, shear force and bending, Shear force and bending moment diagram, Summation method and Singularity function.

English for Communication

Art of communication: Basic grammatical concept, Elementary theories of phonetics, sound of English, Mechanics of sound production, Rules of phonetics with examples, reading, listening and advanced writing skills. Business Letters, effective speaking (interactive sessions).Essay, poems and stories; The world is too with us: William words worth, the scientific point of view: JBS Haldane, Strange Meeting: Wilfred Owen, If: Rudyard Kipling, The Necklace: G D Maupassant, Piano: D H Lawrence Basic concepts in Communications: Nature of communication, Types of communication, Process of communication, Barriers to communication, Characteristics of successful communication, Informal communication: Chat, the grapevine, Rumour. Merits and limitations

Computer Programming

Digital computer fundamentals: Historical perspective, Early computers, the von Neumann architecture. Pseudo code, and Flowchart. Memory, Variables, Values, Instructions, Programs, Assembly language, High level language, Compiler, Assembler, Operating Systems, Binary and other number system representations and conversion between them. The C language Phases of developing a running computer program in C.

Data Concepts in C: Constants, Variables, Expressions, Operators, and operator precedence in C. Managing input and output statements, Sequential control statements, Decision making statements (If-Else constructs), Loop control statements (While construct, Do While construct, For construct).

Different basic data types and their sizes, One-dimensional Arrays: Declaration and Initialization, Two-dimensional Arrays: Declaration and initialization, Multidimensional Arrays.

String variables, Reading and writing strings, Arithmetic operations on characters, Putting strings together, Comparison of two strings

Functions: The prototype declaration, Function definition.

Function call: Passing arguments to a function (by value, by reference), Scope of variables.

Recursive function calls, Tail recursion, Tree of recursion.

Sorting problems: Selection sort, Insertion sort, Sorting in multidimensional arrays. Sorting in arrays

Search problems: Linear search and binary search. Recursive and iterative formulations

Pointers: Declaring and dereferencing pointer variables, Pointer arithmetic. Accessing arrays through pointers, Pointer types, Pointer and strings.

Structures in C: Motivation, examples, declaration, and use. Operations on structures, Passing structures as function arguments, Type defining structures.Self-referential structures, Dynamic data structures, Linked lists with examples

File operations in C: Input, output, and error streams. Opening, closing, and reading from files. Searching through files using functions such as fseek (), ftell (), and rewind (). Programming for command line arguments