

Draft Syllabus
Department of Information Technology
Indian Institute of Information Technology (IIIT), Kalyani
West Bengal, India

1st Semester

SL. No.	Code No	Subject	Class L T P	Marks
Theoretical Papers				
1.	MA-101	Mathematics-I	3 1 0	100
2.	PH-101	Physics	3 1 0	100
3.	HU-101	Communicative English	2 0 0	50
4.	CE-101	Environmental Science	2 0 0	50
5.	IT-101	Introduction to Computing	3 1 0	100
6.	EE-101	Basic Electrical Engineering	3 1 0	100
Sessional Papers				
1.	PH-102	Physics Lab.	0 0 3	50
2.	IT-102	Computing Lab.	0 0 3	100
3.	WS-101	Workshop Practice	0 0 3	50
4.	EE-102	Basic Electrical Engineering Lab.	0 0 3	100
		Total Contact Periods:- 35	16 4 15	800

Second Semester

SL.No.	Code No.	Subject	Class L T P	Marks
Theoretical Papers				
1.	MA-201	Mathematics-II	3 1 0	100
2.	CH-201	Chemistry	3 1 0	100
3.	AM-201	Engineering Mechanics	3 1 0	100
4.	IT-201	Advanced Programming Language (C, C++)	3 0 0	100
5.	ET-201	Basic Electronics Engineering	3 1 0	100
Sessional Papers				
1.	CH-202	Chemistry Lab.	0 0 3	50
2.	IT-202	Computing Lab-II	0 0 3	100
3.	DR-201	Engineering Drawing	0 0 6	100
4.	ET-202	Electronics Engineering Lab.	0 0 3	50
		Total Contact Periods:- 35	16 4 15	800

MA 101 Mathematics-I

Contract Periods: (3 L + I T) TIME – 3Hrs Full Marks -70+ Internal Assessment Full Marks =30

Function of Single Variable: Successive Differentiation, Rolle's Theorem (statement only). Geometrical Interpretation, MVT, Geometrical Interpretation, Taylor's Theorem, Cauchy & Lagrange's form of remainders, Taylor's and Maclaurin's series, expansion of function, Indeterminate forms.

Application of Calculus: Intrinsic and Pedal equation of curves, Curvature, Asymptote.

Test of Convergence of Infinite Series: Comparison test, D Alembert's Ratiotest, Gauss test and Cauchy's Root test, Power series.

Functions of Several variables: Limit, Continuity, Differentiability (definition and sample examples only), Partial derivatives, Differentials & small errors, Euler's theorem, Taylor's theorem & series, Expansion of functions, Maxima & minima.

Complex Algebra: De Moivre's theorem, Extraction of roots of complex numbers, complex functions, e.g., az and $\sin z$, $\cos z$, $\log z$, $\sin^{-1}z$, $\cos^{-1}z$, $\tan^{-1}z$ etc.

PH-101 Physics

Contract Periods: (3 L + I T) TIME – 3Hrs Full Marks: 70+ Internal Assessment Full Marks 30

Fluid Mechanics: Surface tension & surface energy, pressure difference across a liquid surface rise of liquid in capillary tube. Streamline and turbulent motion, Reynold's number. Equation of Continuity, Bernoulli's theorem, Toricelli's theorem. Viscosity, Poiseuille's equation, Capillaries in series and parallel, Terminal velocity and Stokes' Law.

Elastic Properties of Materials: Relation between elastic constants, internal bending moment, bending of beams cantilever. Torsion of a cylinder, torsional rigidity.

Thermal Physics: Kinetic theory of gases – Maxwell's velocity distribution law, r.m.s. and most probable velocity. Transmission of heat – thermal conductivity, conduction of heat through thick pipes, radial flow of heat through spherical shell. Radiation-emissive and absorptive power, Kirchoff's law, Stefan's law and Wien's law.

Optics: Interference- Superposition of waves, conditions for interference, coherence, fringe width, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction in single slit and double slit, theory of grating, **Lasers and Fibre Optics:** Einstein's A & B coefficient, population inversion, He-Ne Laser. Optical fibre – step and graded index, numerical aperture and acceptance angle.

Electromagnetism: Gauss' law in electrostatics and its application. Polarisation and Electric displacement. Capacitance of conductors-spherical and cylindrical condensers. Lorentz force, Biot-savart's law, torque on current carrying loops, Ampere's circuital law. Electromagnetic induction – Faraday's law, Lenz's law. Concept of displacement current, Maxwell's equations. Plane electromagnetic wave equation in one dimension.

Solid State Physics: Lattice and symmetry, crystal classes. Miller indices. Band theory of solids, Brillouin Zone. Semiconductor, conductivity and mobility, Hall effect. Fermi level, band structure for p-n junction.

Modern Physics: Relativity- Michelson – Morley experiment. Einstein's principle of relativity. Consequences of special theory of relativity – length contraction, time dilation and concept of

mass-energy equivalence. Quantum mechanic – De Broglie's hypothesis, uncertainty principle and its application. Idea of operators in quantum mechanics. Time – dependent and time – independent Schrodinger's equation – application to free particle and particle in a one dimensional box.

Nuclear Physics: Q value of nuclear reaction, exoergic and endoergic reactions, binding energy and packing fraction. Semiempirical mass formula. Nuclear fission & fusion basic ideas.

HU-101 Communicative English

Contact Periods: (2 L + 1T)

Full Marks -35+ Internal Assessment Full Marks =15

Group A Note making; Paragraph writing, Commercial Correspondence, Precis, Preparing Instruction Manuals, Preparing Proposals, Report Writing, Writing of Dissertation / Thesis, Elements of Grammar and Vocabulary

Group B Group Discussion; Extempore Speaking; Presentation Strategies; Interview Preparation; This course seeks to develop a sense of language through texts drawn from contemporary writings in newspapers, newsmagazines, reports etc.

List of Text and Reference Books

1. Oxford Book of writing & Speaking - Peter Seeley
2. Technical Communication Principles and Practice Meenakshi Raman & Sangeeta Sharma

CE- 101 Environmental Science

Contact Periods: (2 L + 0T)

Full Marks -35 + Internal Assessment Full Marks -15

Ecology: Structure and function of an ecosystem; material cycle; energy flow; food chain; food web; ecological pyramid; bio-magnification; ecological succession; major ecosystems of the earth; ecological balance and consequences of change; biodiversity and its conservation.

Water Pollution: Surface water and ground water; water pollutants- sources and effects; agricultural pollution; eutrophication; case studies; water quality standards; control of pollution.

Air Pollution: Atmospheric composition; energy balance; air pollutants- sources and effects; weather and dispersion; vehicular pollution; case studies; air quality standards; control measures; global atmospheric issues – global warming, ozone layer depletion, acid rain, indoor air pollution.

Land Pollution: Municipal, Industrial, Commercial, agriculture, hazardous solid wastes; collection and disposal; recovery and conversion; case studies.

Noise Pollution: Classification of noise; the decibel; frequency characterization; noise criteria (Leq LN); standards; control measures.

Other Environmental issues: Form unsustainable to sustainable development; environmental impact assessment, environmental impacts of urbanization; environmental impacts of selected industrial activities; clean technologies; waste minimization; water conservation; rain water harvesting; watershed management; environment protection Act; Water (Prevention and control of pollution) Act; Air (Prevention and Control of pollution) Act, relevant international protocols and conventions; ISO 14000.

IT- 101 Introduction to Computing

Contact Periods: (3 L + 1 T)

Full Marks= 70+ Internal Assessment Full Marks =30

NUMBERSYSTEM & CODES Positional & non positional number systems, Binary, Octal, Hexadecimal number system & Conversion, Representation of negative numbers & real numbers, Fixed and floating point numbers. Characteristics codes (ASCII, EBCDIC etc.) & others like Grey, Excess3 etc. ARITHMETIC & LOGIC Logic operations & gates, Half adder. & full adder subtraction using add. Repetitive addition & subtraction to accomplish multiplication & division etc.

Computer Organization CPU, Memory & I/O devices – Commonly used peripherals. Role of the CPU, Memory and I/O devices in the context of solving a problem.

Problem Solving Steps & Program Development Cycle Systematic decomposition, Flowchart, Algorithm, the three constructs (sequential, conditional and iterative). Edit, compilation, Debugging & execution.

Introduction to Programming in C: Idea of High level, Assembly level & M/c level language Interpretation and compilation.

Assignment, decision, loops, scope: Global & local, control structure (if, if else, switch, for, while, do while, break and continue).

EE 101: Basic Electrical Engineering

Contract Period: (3 L + I T) Full Marks 70+Internal Assessment Full Marks 30

Storage Cell: Rating, charging, capacity & efficiency, maintenance; Maintenance free batteries, eco friendly batteries.

D.C. Circuits: Node, branch, active & passive elements, linear & nonlinear circuits, bilateral network, Kirchhoff's laws, Maxwell's loop current method, star delta transformation. Network theorems – Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

Magnetic Circuits: Magnetic quantities, BH curve, calculation on magnetic circuits, analogy with electric circuit.

Fundamentals : Sinusoidal quantities, phase & phase difference, average & rms values, form factor & peak factor, concept of phasor diagram, impedance & admittance, power & power factor.

Circuits: Single Phase series & parallel combinations of R, L & C, phasor diagram, apparent, active & reactive power, series & parallel resonance; applicability of network theorems to A.C. circuits. Three Phase Balanced system, star and delta connections, phase & line quantities & their relationships, phasor diagram, concept of rotating magnetic field.

Transformers: Constructional parts, types, emf equation, phasor diagrams, equivalent circuit, no load & short circuit tests, losses and efficiency, voltage regulation; Balanced three phase transformer connections; Autotransformer.

D.C. Machines: Construction and types, emf equation; d.c. motors back emf, torque equation, characteristic curves of different types of motors, starting & speed control methods, fields of application.

Induction Motor: Three phase Induction Motors – operating principle, types, slip & slip frequency, rotor emf & current, power & torque; Torque slip characteristic curve, losses & efficiency, starting & speed control methods, fields of application; Classification of single phase Induction Motors and their applications.

Measuring Instruments: Classification, torques in indicating instruments; PMMC, Moving Iron & Distribution of Electricity: Conductors & insulators properties and types of conducting and insulating materials, temperature effect on conductors, insulation resistance of cable, use of Megger. Fuse materials, fusing factor & characteristics, selection of rating, types of fuses.

Electric wiring in small premises, Earthing, Electrical safety, General awareness in electricity conservation.

PH-102 Physics Lab

Full Marks – 50. Contact Periods : (3S)

Laboratory experiments are recommended based on the course Physics (PH 101)

WS 101 Workshop Practice

Full Marks – 50 Contact Periods: (3S)

Carpentry Shop: Specification of wood and wood products, Introduction to Tools and Equipment, Practice Jobs and different wood-joineries and joints.

Fitting Shop: Introduction to different tools, equipment and measuring devices, Sawing, Filing and Drilling.

Smithy Shop, Forging Shop and Welding Shop: Different equipment and tools used, different simple jobs.

IT-102 Computing Lab

Full Marks – 100 Contact Periods: (3S)

Program Development in UNIX Environment: Simple file handling and editing commands in suitable O.S (UNIX/LINUX) environment & file structure. Batch files etc. servers/Clients and terminals in a Network environment. Edit, compile, link, debug and execute.
Programming in Higher Level Language C: Preliminary Program Development and Compilation in Unix Environment.

EE 102 Basic Electrical Engineering Lab.

Full Marks – 50, Contact Periods: (3S)
Laboratory experiments based on the course Basic Electrical Engineering (EE 101)

MA 201 Mathematics II

CONTRACT PERIODS: (3 L + I T), Full Marks 70, Internal Assessment Full Marks- 30

Calculus: Fundamental an MVT of Integral Calculus, (statement only), Improper Integrals, Beta and Gamma Functions, Multiple Integrals and Applications.

Vector Analysis: Sum and product of vectors, Vector equations of lines and planes, Derivative of a vector, Differential Geometry upto Serret – Frenet’s formula, Directional Derivations, Gradient, divergence, Curl, Line integral and surface integral, Green, Gauss and Stokes’ems, Application of vector to Geometry and Mechanics.

Maxtrix and Determinant: Definition and simple properties regarding sum and product of two matrices, Transpose, Symmetric, Skew Symmetric and orthogonal matrices, Determinant of square matrices & their simple properties, co-factors & minors, Left and right inverse, Rank of matrices, Eigen values and Eigen vectors, similar matrices, Diagonalisation of matrices, Solution of simultaneous linear equations: Consistency & Inconsistency.

Differential Equations: Higher order linear ODE with constant coefficients, method of variation of parameters, Cauchy or Euler’s equations, Frobenious method of solution in series of ODE, Singular points, Bassel and Legendre equations, Rodrigue’s Formula, Recurrence relations and Orthogonality relations

CH 201: Chemistry

Contract Periods: (3 L + I T), Full Marks 70, Internal Assessment Full Marks-30

Unit 1: Structure and Reactivity of Organic Molecules: Inductive effect; resonance; hyper conjugation; electromeric effect; carbocation, carbanion and free radicals. Brief study of some addition, elimination and substitution reaction. Conformational analysis (acyclic and cyclic molecules); geometrical and optical isomerisation; E, Z and R, S nomenclature

Unit 2: Spectroscopic Techniques: Experimental methods of structure determination using spectroscopic such as UVVIS, IR

Unit 3: Atomic Structure: Schrodinger equation; well behaved function; particle in a box, Hatom: radial and angular distribution function

Unit 4: Reaction Dynamics: Rate laws, mechanism and theories of reaction rates (Collision and Transition state theory)

Unit 6: Polymerization Basic concepts, classification and industrial applications

Unit 7: Solid State Chemistry Idea of spatial periodicity of lattces, elements of band theory, conductors, semi conductors and insulators

Engineering Mechanics (CE 201)

Contact Period: Time: 3 hours 3L + 1T per week, Full Marks: 70, Internal Assessment Full Marks : 30

Force System: Moment of a Force about a point and an axis; Reduction of a force system to a force and a couple.
Equilibrium: Laws Coulomb Friction, Problem Application to wedges, square threaded Screws, Belt friction; Rolling Resistance.

Properties of Areas and Solids: Centroid, Centre of Gravity; Moment of Inertia, Polar moment of Inertia and Principal Axes, Moment of Inertia of rigid Bodies.

Kinetics and Kinematics of Particles: Particle Dynamics in Rectangular Coordinates, Cylindrical Coordinates and in terms of Path Variables; Central Force Motion; Work and Energy; Impulse and Momentum; Conservation of Energy; Impact; Mechanical Vibration.

Kinetics and Kinematics of Rotation of Rigid Bodies, Resultant Inertia Force in Rotation, Centre of Percussion Simple Machines

IT-201 Advanced Programming Language (C, C++)

Overview to C programming.

Advanced topics in C programming: Arrays, Pointer, Functions, Memory management and structures, Files and streams, Pre-processor and complex declarations

Introduction to network programming: Berkeley socket interface, socket related system calls like socket(), bind(), listen(), connect(), accept(), etc.

Implementing TCP iterative and concurrent servers; implementing UDP servers. Case studies: file transfer server and client, chat server and client, railway reservation system server and client, etc.

C++ Programming: Principal of Object-Oriented Programming, C++ Programming Basics, Loops, Decisions, Structures, Functions, Classes & Objects, Constructors & Destructors, Operator Overloading, Inheritance, Extending Classes, Pointers, Virtual Functions & Polymorphism, Files & Streams, and Templates & Exception Handling.

ET 101 Basic Electronics Engineering

Contract Periods: (3 L + 1 T) TIME – 3Hrs. Full Marks -70 Internal Assessment Full Marks -30

Review of passive components-Types, characteristic and application Energy Bands in conductor, insulator and semiconductor.

Semiconductor properties, pn junction avalanche diode, zener diode-their applications as rectifier, voltage doublers and wave shaping power supply Bipolar junction transistors- biasing, characteristic, different mode of operation.

Use of BJT as amplifier, signal stage amplifier, power amplifier, feedback amplifier. Oscillator –RC.LC, Crystal type, Multivibrators Field effect transistor- types, configuration, characteristic and use as amplifier Elements of opto electronics devices-LED, LCD, LDR, Photo detectors

Principles of fiber optic communication

Elements of power electronics devices

Boolean function and logic gates. Introduction to analog and digital ICS. Cathode ray oscilloscope, use of analog and digital multimeter.

CH 202 Chemistry Lab

Full Marks – 50 Contact Periods : (3S)

Laboratory experiments are recommended based on the course CHEMISTRY (CH 1201)

IT-202 Computing Lab-II

Full Marks – 100, Contact Periods: (3S)

Laboratory experiments are recommended based on the course Advanced Programming Language (IT-201).

DR 201: Engineering Drawing

Full Marks: 100 Time – 6 hrs (S) per week.

Concept:

Practical Plane Geometry, use of Drawing Instruments, Printing of alphabets in Block Capital, Italics and Mechanical types, Types of lines, dimensioning, use of protractor and scales. Construction of plain, vernier, diagonal and comparative scales. Method of drawing Geometrical curves as used in engineering practices such as parabola, ellipse, hyperbola, rectangular hyperbola, involute, cycloid, epicycloid, hypo-cycloid, spirals, helix etc.

Practical Solid Geometry, Introduction to orthographic projection, Projection of points, lines, surfaces in 1st and 3rd angle.

Projection of solids and projection of combination of solids in 1st and 3rd angle. Section of solids and their projections.

Development of Solids. Isometric projections. Temporary and Permanent Fasteners, Bolts, Nuts, Rivets and Riveted joints. Interpenetration of solids. Machine Drawing, Drawing of Simple Machine parts from pictorial views. Machine Drawing Conventions, Dimensioning and Conventional Sectioning. Civil Engineering Drawing. Introduction to Computer Aided Drawing.

Drawing Practice:

Lettering and Dimensions, Scales, Curves. Projection of points, lines and surfaces. Projection of solids and combination of solids. Projection of section of solids and section of combination of solids.

Developments and Isometric Projections, Projection of Nuts, Bolts and Rivets and Riveted Joints. Interpretation of Solids, Machine Drawing from pictorial view, Projection of simple machine, Single storied buildings.

CAD: Introduction to AUTO CAD: (1) Basic 2D and 3D commands, (2) Drawing Aids and Text writing, (3) Introduction to Solid Modeling.

ET 102 BASIC ELECTRONICS ENGINEERING LAB

Full Marks – 50 Contact Periods : (3S)

Following experiments based on the course Basic Electronic Engineering (ET 1201):

1. Familiarization with electronic component and measurement using multimeter
2. Familiarization with function generator and use of CRO for various waveform measurement.
3. Experiment with DC power supply
4. Experiment with (a) Characteristics of transistors and (b) Characteristics amplifiers
5. use of 741 as (a) amplifier, (b) adder, (c) integrator
6. Realization of logic functions using 7400 and 7402.