

COURSES OF STUDY

Subject - Computer Application Hons.

B.Sc. Part - I

Paper I A : Introduction to computer science & IT

[50 Marks]

Introduction, Number System, Conversion between number bases, Signed/Unsigned nos., concept of overflow, 2's Complement arithmetic.

Logic Gates, Truth table, Combinational Logic Circuits & Realisation with Logic Gates - Half & Full adders and code, Multiplexers, Demultiplexers, Encoders, Decoders, Codes Converters.

Sequential Circuits, JK, RS, T,D, Master-Slaves Flip - Flop, Shift register, Synchronous and Asynchronous Counters.

Architecture of a Simple Computer, Architecture of 8085 & 8086, Registers and ALU, Instruction set, Addressing Modes, Timing diagram, Fetch Decode and Execute Cycle, Interrupt Mechanism, DMA.

Memory hierarchy, RAM, types of RAM, ROM, types of ROM, introduction to virtual & cache memory of Computer programme developing - Algorithm flowchart, Pseudo code.

Paper 1 B : Practical on 1 A

[50 Marks]

Slide making & Presentation using MS-Power Point (MS-Office 2000)

Editing mail merging, macros using MS-Word (MS-Office 2000)

Spreadsheets, worksheets application using MS-Excel (MS-Office 2000)

Paper 2 A : Operating System

[50 Marks]

What is an Operating System ? Simple batch systems, multi programmed batch systems, time - sharing systems, parallel systems and distributed systems, real - time systems.

Computer System structure-Computer system operation, I/O structures, storage structure, storage hierarchy, and hardware protection. Operating-System Structure-System components system services, system calls, system programs, and system structure simple-structure.

Process concept, process state, process, control blocks, process scheduling, and schedulers, threading. CPU scheduling, CPU - I/O burst cycle, scheduling criteria scheduling algorithm (Non-pre-emptive-FCFS, SJF pre-emptive - SJF, RR).

Memory management (contiguous Allocation, Paging, Swapping, Segmentation), Virtual memory- Demand paging, page replacement, page replacement algorithms (FIFO, LRU), Thrashing.

File system structures, file allocation (contiguous, linked and indexed) and free space management (bit vector, linked list, grouping, counting).

I/O Hardware, polling, interrupts DMA, spooling, buffering.

Disk structure, disk scheduling (FCFS, SSTF, SCAN). Disk management - formatting boot block, bad block, swap space management.

Security - The problem, authentication and program - threats, encryption.

LINUX System - Process management, scheduling, memory management, file system, Input and output, file structure, inodes, commands, Shell programming.

Paper 2 B : Practical on 2A

[50 Marks]

UNIX Commands & shell programming

Paper 3A : C & Data Structure

[50 Marks]

C Language Fundamentals :

Character set, keywords, Identifiers, constants, variables, storage class, Data Types, Operators & expressions, Header files, Library files.

Preprocessor directives # Include and # define. Control flow Selection & Iteration

Functions User defined & Library functions

Resursion vs. iteration. Pointer : Near far and Universal pointers
Structure & Union File Handling

Data Structures

DS fundamentals

- Definition of Data structure & Storage Structure
- Classification of Data structures
- Selection of a Data Structure

Arrays (vectors and matrices)

- Vectors (1-D arrays)
- Row-major & Column-major storage of a matrix
- Addition of two matrices
- Character array vs. Strings.

Stacks

- Array implementation
- Linked-list implementation
- Postfix, Prefix and Infix Notation
- Evolution of postfix /prefix expression

Queues

- Array implementation
- Linked-list implementation

Linked Lists : Singly, Doubly & Circularly linked list

Graphs : Nomenclature, adjacency lists & adjacency matrix representation of graph Trees, Definition & Properties of Binary tree

Pre - order, in-order, post-order and level order

Traversal of binary tree, binary search tree.

Sorting : Bubble, insertion, Quick & Merge Sort

Searching : Sequential search & Binary Search

Paper 3 B : Practical on 3A

Problem solving using C. Implementation of Simple data structures using C.

[50 marks]

Paper 4 A : System Analysis & Design

[50 Marks]

System development life cycle (SDLC) System analysis-System planning & initial investigation information gathering, DFD, data dictionary Decision tree, Feasibility study, cost benefit analysis System design-process & stage, I/O form stages, File organisation & database design.

System implementation - system fasting & quality anurance implementation & maintenance software (sw) selection, Security, Disaster/Recovery & ethics are system development.

Paper 4 B : Practical Lab

[50 Marks]

Visual Basic Programming, Simple form design, NOI, Database connectivity with Ms- access

Subject - Computer Application Hons.

B.Sc. Part - II

Paper 5A : Database Management System

[50 Marks]

DATABASE SYSTEM CONCEPTS & ARCHITECTURE

Data independence, Schemas, Instances, Database Languages, Database System Environments, Data Models Basic Structure of Oracle System, Storage Organization in Oracle.

DATA MODELING :

Use of High-Level conceptual Data Models, ER Diagrams, Subclasses, Super classes and Inheritance,

Specialization & Generalization, Conceptual object Modeling Using UML, Class Diagrams Knowledge Representatin Concepts, Exercises.

RELATIONAL DATA MODEL :

Relational Constraints, Domain Constraints, Key Constraints, Referential Integrity Constraints, Relation Algebra Fundamental Operations of Relational Algebra & their Implementation, Interdependence of Operations, Example Queries.

ER AND EER TO RELATIONAL MAPPING :

Mapping EER Model Concepts to Relation Tuple, Relational Calculus Domain Relational Calculus queries.

DATABASE DESIGN :

Functional Dependencies, Irreducible Sets of Dependencies. Nonloss Decomposition 1 2 & 3 NF Dependency preservation Boyce code NF, Multivalued Dependency & 4th NF Join Dependency & 5 NF Domain Key normal Form, Restriction - Union Normal Form denormalization.

QUERY PROCESSING AND OPTIMIZATION : SQL -

Basic Queries in SQL, sub queries, retrieving a Query Plan - Table Space Span & I/O INDEX Scan Equal Unique Index Lookup Clustered vs. None clustered Indexing Index Only Scan Methods for Joining Tables - Nested Loop Join, Merge Join, Hybrid Join, Multiple table join Transforming Nested Queries to Join, Object Relational SQL Procedural SQL, Introduction to Embedded SQL

TRANSACTION -

Schedules Serializability precedence Graph Concurrency Contrl Techniques Implementatin of Transaction in Programs Cursors and Transaction Dynamic SQL Locking Levels of Isolation REcovers Checkpoints.

DATABASE SECURITY & AUTHORIZATION :

Specifying Privileges, Revoking Privileges, Propagation of Privileges, Statistical Database Security.

Paper 5 B : Practical Lab

[50 Marks]

Oracle Commands and PL/SQL Programming

Paper 6 A : NETWORKING, DATA COMMUNICATION

[50 Marks]

- Basic network concepts, Advantages and Disadvantages of computer network Types of networks - LAN, WAN, MAN, Networks Topologies, Hardware Requirement of a network, Network operating systems.
- A Communication model, Communication tasks, Three-layer approach to protocols, Brief introduction to TCP/IP and OSI (Brief function to different layers).
- Data transmission, Concept and Terminology, Analog and digital data transmission, Transmission impairments, Guided transmission media.
- Ddata encoding, Digital data, Digital signal, Digital data analog, Signal analog, Data digital signal and analog data, analog signal.
- Asynchronous & Synchronous Transmission interfacing.
- Data link control, flow control, Error detection (CRC), Error control, High level data control (HDLC), Multiplexing statistical, time division multiplexing
- Circuit switching, Switched network, Circuit switching networks, Switching Concepts, Routing in circuit, Switched networks.
- Packet switching, Packet switching principals, Routing, Congestion and control X 25 Digkistras algorithm, Bellman ford algorithm.
- LAN Technology, LAN architecture, Bus/Tree LAN, Ring & star LANs, Ethernet and fast Ethernet (CSMA/CD) Token ring and FDDI.
- Bridges, Bridge operation, Routing with bridges.
- Network Security, Requirements, Conventional encryption, Public key encryption & Digital signature (numerical related question are to be asked)

GROUP (B)

- XML - Introduction to XML, Document Type Definition (DTD), XML Schema - Declaring attributes,

Namespaces grouping elements & attributes, Rendering XML, Documents - CSS XSLT Displaying data with XSLT displaying data in tabular format, Using HTML, Tags within XSLT XML Document object model - objects & methods, using XML OOM objects in scripts.

Paper 6 B : Practical Lab

Creating XML document, XML schema, Declaring attributes & using component of one schema into another creating XSLT style sheet for formatting data validating an XML document against a DTD by DON.

[50 Marks]

Paper 7 A : Programming in C++

Concepts of OOPS and differences with procedural languages, characteristics of OOPS, Idea of objects class, data abstraction, inheritance polymorphism dynamic binding I/O stream, C count I/O manipulation. Objects & classes : classes & objects, constructor, destructor, overloading binary operators, data conversion. Inheritance Derived class and base class, protected access specifier, derived class, constructors class, hierarchies abstract base class, public and private inheritance, multiple inheritance, containership classes within classes. Pointers Address and pointers, pointer and arrays, memory management "New" & "Delete" Pointer is objects linked list, pointer to pointer. Virtual functions, Virtual functions friend functions, static functions "This" pointer. File and streams String, String I/O, object I/O, I/O with multiple objects file pointer error handling and redirection, Classes, Templates in C++

[50 Marks]

Paper 7 B : Practical Lab

C++ Programming

[50 Marks]

Paper 8 A : E-Commerce and Application

Information technology & Business, E-Commerce, EDI-electronic data interchange, UN/EDIFACT standard, Internet & Extranets, Identification & tracking tools, Business process, Re-engineering management of change, Concerns for e-commerce growth-Legal issues, cyber security, cyber crimes, Information Technology act 2000, Public key Infrastructure, Electronic payment system and Internet banking. E-commerce case studies, E-governance case studies

[50 Marks]

Paper 8 B : Practical on 8 (a)

Use of VB, Oracle Client Server architecture to implement a business model
Virus design, virus scanner/cleaner design.

[50 Marks]

Subject - Computer Application Hons.

B.Sc. Part - III

Paper 9 A : WEB TECHNOLOGY

Dynamic HTML :

Overview to DHTML, Features of DHTML. Document object model. Events inner text property Dynamically changing text Attributes (style sheet and its properties. Inline Embedded. External & imported style sheets) Displaying items in tree structure.

Java script :

Overview to JavaScript. Features of JavaScript. Variables, Operator. JavaScript object hierarchy (window objects & array). Various events. Methods and objects of JavaScript. Decision making and Loop forming statements. Functions. Creation of document at runtime.

Active server page :

Overview to ASP, Creation of virtual directory. Active data ADO connection with ms access, ADO command object and query. Creation of Record set execute method of command object open method of

[50 marks]

record set object. Execute method of connection object insertion deletion and modification of data in a database.

Paper 9 B : Practical on 9 A

[50 marks]

Paper 10 A : Java Programming

[50 marks]

Introduction to java history of java. Features of java types of java programs
JDK Tools javac compiler java interpreter applet viewer job tool. Javap disassembler. Javasc tool javab tool.
Java keywords. Data types in java variable naming conventions. Initialising variables literals operators. Type conversion. Decision construct looping construct. Arrays, Classes and objects declaring classes. Creating object. Declaring objects. Declaring methods passing arguments to methods. Constructors. Access specifier. Modifiers the main () method overloading relationship between classes, Applets & applications. Applet class. Applet & HTML. Life cycle of an applet. Graphic class font class passing parameters to applets creating an application. Converting applets to application, Introduction to threads. Threads. Single threaded and multithreaded applications life cycle of a threads, The current thread. The thread class. Problems in multithreading, Packages Java packages. Using a package. The Lang packages the collection class creating a package, Data base connectivity using JDBC (preferably oracle).

Paper 10 B : Practical on 10 A

Simple programming using java applet creation. Servlet creation

[50 marks]

Paper 11 A : On the job training I & II

[50 marks]

Paper 11 B : Project report

[50 marks]

Paper 12 : Entrepreneurship development

[100 marks]

Need scope and characteristics of entrepreneurship, special schemes for technical entrepreneurship STEP Identification of opportunity, Exposure to demand based, resource based, service based, import substitute and Export promotion industries, Market survey techniques, Need, scope and approaches for project formulation, Criteria for principles of product selection and development, Structure of project report, Choice of Technology, Plant and equipment, Institutions financing procedure and financial incentives, Financial ratio and their significance, Books of accounts. Financial statements and funds flow analysis, Energy requirement and utilization, Resource management men. Machine and materials, Critical path method [CPM] and Project Evaluation Review Techniques [PERT] as planning tools for establishing SSI, (a) Creative and innovation, (b) Strength weakness Opportunity and Threat [SWOT] Techniques, Plan layout and Process Planning of the Product, Quality control/quality assurance and testing of product, Elements of marketing and sales management, (a) Nature of product and market strategy (b) Packing and advertising (c) After Sales service, Costing and Pricing, Management of self and understanding human behavior, Success in small scale industries and their remedial measures, Coping with uncertainties stress management and positive reinforcement, Licensing registration, Municipal bye laws and insurance coverage, Income Tax, Sales Tax and Excise Rules

Practices 15 Hrs. Teaching Load

Conduct of mini market survey (one day exercise) Data collection through questionnaires and personal visits. Entrepreneurial Motivation Training : Through games, role playing discussions and exercises (a) Working capital and fixed capital : Practice assessment and management. (b) Exercise on working capital : Practice fixed capital calculation, Analysis of sample project report Discussion, Break even analysis : Practice. Communication written and oral : Practice

PAPER I

Full Marks : 100

Pass Marks : 45

Section - I (Compulsory) : One objective type question. - 10 Marks

Section - II : Answer ten questions selecting at least one from each group. Each question will contain two parts:

Short answer type : 2 Marks

Long answer type : 7 Marks

Group A : Differential Calculus

A. 1 : Successive Differentiation, Leibnitz theorem.

A. 2 : Expansion, Partial differentiation

A. 3 : Tangent and normal, Curvature.

A. 4 : Asymptote, Maxima and Minima of functions of two variables.

Group B : Integral Calculus

B.1 : Integration of rational and irrational functions.

B. 2 : Evaluation of definite integral, Reduction formula.

B. 3 : Curve tracing, Length and area.

B. 4 : Volume and Surface area of solids of revolution.

Group C : Vector

C. 1 : Point function, differentiation of a vector function of a scalar variable.

C. 2 : Gradient, Divergence and curl.

C.3 : Second order operators in Cartesian co-ordinate system.

Group D : Co-ordinate Geometry of two dimensions

D.1 : Change of rectangular axis. conditions for the general equation of second degree to represent parabola, Ellipse and hyperbola and reduction into standard forms. Lectures : 05, questions : 1½

D. 2 : Equations of tangents and normal (using calculus), Chord of contact, Polar and pair of tangents in reference to general equation of conic. Lectures : 05, questions : 1½

D. 3 : Polar equation. Lectures : 05, questions : 01

Group E : Real Analysis

E. 1 : Axioms for the real number system, bounds, closed, open and compact sets. Lectures : 04, questions : 01

E. 2 : Limit of a sequence, monotonic sequence and their convergence, $\lim \sup$ & $\lim \inf$, subsequence, algebraic operations and limit, Cauchy sequence, General Principle of convergence. Lectures : 07, questions : 01

E. 3 : Nature of Convergent and divergent series of real terms, Pringsheim's theorem. Comparison tests, Cauchy's root test, D'Alembert's ratio test. Alternating series and Leibnitz test. Absolutely convergent series. Lectures : 09, questions : 01

[4 Ques./ 25 lectures]

Lectures : 05, questions : 01

Lectures : 05, questions : 01

Lectures : 08, questions : 01

Lectures : 07, questions : 01

[4 Ques./24 lectures]

Lectures : 04, questions : 01

Lectures : 04, questions : 01

Lectures : 08, questions : 01

Lectures : 08, questions : 01

[3 Ques./10 lectures]

Lectures : 03, questions : 01

Lectures : 04, questions : 01

Lectures : 03, questions : 01

[4 Ques./15 lectures]

[3 Ques. / 20 lectures]

Subject : Mathematics

(General & Subsidiary)
B.Sc. Part - II

Section - I (Compulsory) : One objective type question. - 10 Marks

Section - II : Answer ten questions selecting at least one from each group. Each question will contain two parts:

Short answer type : 2 Marks

Long answer type : 7 Marks

Group A : Real Analysis

[3 Ques./25 lectures]

- A. 1 : [NB Course relates to real function of a real variable. Limit and Continuity Both sided limits, limit, Continuity, discontinuities (definition, Example, testing, algebra of limits). Partition of domain of a continuous function, continuity and boundedness. Lectures : 08, questions : 01
- A. 2 : Derivability, Relationship with continuity, Rolle's theorem, Langrange's Mean Value Theorem, Taylor's and Maclaurin's theorem with R_n . Lectures : 08, questions : 01
- A. 3 : Riemann Integration, definition, Oscillatory sum and integrability conditions. Integrability of monotonic and continuous functions. Fundamental theorems of integral calculus. Lectures : 09, questions : 01

Group B : Set Theory

[3 Ques./14 Lectures]

- B.1 : Indexed family of sets. Generalised set operations & Demorgan Laws, Set mapping. Lectures : 04, questions : 01
- B.2 : Bijection : Countable and uncountable sets. Equivalence relation and related fundamental theorem of partition. Lectures : 06, questions : 01
- B.3 : Partial order relation and related concepts of u.b., i. b., inf ..., sup, maximal element, minimal element and lattice (definition and examples only), Statement of Zorn's lemma. Lectures : 04, questions : 01

Group C : Complex Variable

[4 Ques./20 lectures]

- C.1 : Real functions of two variables : Simultaneous and iterated limits ; Continuity, partial derivatives, differentiability and related necessary and sufficient conditions. Lectures : 05, questions : 01
- C.2 : Functions of a Complex variables Limit, Continuity, derivative, Cauchy Riemann Equations, Analytic Function, Harmonic function. Lectures : 05, questions : 01
- C.3 : Import of some standard transformations e.g., $w = z+c$, $w=cz$, $w = 1/z$, $w=(az+b)/(cz+b)$ (bilinear). Conformal transformation as transformation effected by analytic function. Special conformal transformations $w = z^2$, $w = \sin z$, $w = e^z$ Lectures : 10, questions : 02.

Group D : Abstract Algebra

[5 Ques. /20 lectures]

- D.1 : Binary operations, Nation of group, Abelian group and non abelian group with examples. Uniqueness of identity element and inverse elements in a group, Different ways of defining a group, concept of sub group and cyclic group, Cosets, Lagrange's theorem. Lectures : 10, questions : 02
- D.2 : Matrices, operations on matrices, matrix algebra, kinds of matrices, Transpose, adjoint and inverse of a matrix, Product of determinants, Rank of matrix, Solution of system of linear equations. Lectures : 10, questions : 02

Group E : Differential Equations

[3 Ques./16 lectures]

- E.1 : First order higher degree, Clairaut's form, Singular Solution, Orthogonal trajectories. Lectures : 03, questions : 01
- E.2 : Linear Equations with constant co-efficients, homogeneous linear equations with variable co-efficients. Lectures : 08, questions : 01
- E.3 : Simultaneous equation $dx/p = dy/Q = dz/R$ and total d.e. $Pdx + Qdy + Rdz = 0$, together with their geometrical significance. Lectures : 05, questions : 01

Subject : Physics**(General/Subsidiary)
B.Sc. Part - I****Paper - I****Full Marks = 75**

The question in theory paper will have four groups:

Time - 3 hrs.

Group - A : Objective type questions:	10 x 1	=	10
Group - B : Short answer type questions (2 out of 4)	2 x 5	=	10
Group - C : Long answer type questions (4 out of 8)	4 x 10	=	40
Group - D : Numerical problems (3 out of 5)	3 x 5	=	15

Mathematical Physics

(10 lectures)

✓ Scalar and vector fields, differentiation of a vector, idea of line, surface and volume integrals. Gradient, Divergence and curl and their expression in rectangular Cartesian co-ordinate systems, Gauss' Stokes and Green's theorems.

General Properties of Matter

(20 Lectures)

✓ **Elasticity** : Elastic constants and their inter relations, calculation of torque on a cylinder, Torsional oscillations.
 ✓ **Surface tension** : Excess pressure on curved surface of a liquid from the principle of virtual work. Ripples and gravity waves. Surface tension and evaporation. Determination of surface tension by Quincke's method.
Viscosity : Viscosity of liquids by Poisseulle's method. Rotary viscometer.

ACOUSTICS

(10 lectures)

Theory of vibrations: Analytical treatment of free, damped, forced and resonant vibrations.
Intensity and loudness of sound : bel, phon, measurement of intensity by Rayleigh disc method. Reverberation time. Deduction of Sabine's law. Determination of absorption coefficient.

Thermal Physics

(30 lectures)

Measurements : Measurement of thermal conductivity of solids, Forbe and Lee's method.
 ✓ **Laws of thermodynamics** : Carnot's engine, Carnot's theorem. The second law of thermodynamics, Absolute scale of temperature, Entropy, Entropy changes in reversible and irreversible processes.
Kinetic theory of gases : Derivation of Maxwell's velocity distribution law and its verification by Stern's method, Mean free path and principle of equipartition of energy (deduction not required).
Real gases : Deviation from ideal gas equation, van der Waal's equation of state and its derivation, Critical constants, Joule Thomson effect, Liquefaction gases (air and hydrogen).
Radiation physics : Black body radiation, Kirchhoff's law, Stefan and Stefan-Boltzmann laws, their deduction and verification. Qualitative explanation of black body radiation by Wein's law, Rayleigh-Jean's law and Planck's law, Solar constant.

Optics

(30 lectures)

Coherence : Temporal and spatial coherence, Interference in thin films, Newton's rings, Michelson's interferometer
Diffraction : Fresnel and Fraunhofer diffraction, Half-period zones, Zone plate, Plane diffraction grating.
Polarisation of light : Double refraction, Nicol's prism, Construction of wave fronts in uniaxial crystals. Quarter wave plate, Production and detection of plane, circularly and elliptically polarized light. Rotary polarization and polarimeters.
Velocity of light : Group and phase velocity (concept to be brought by superposition of two waves) Kerr cell method for determining the velocity of light.

(20 lectures)

Electrostatics

Electric polarization and displacement vectors. $D = \epsilon_0 E + P$ relation (by simple method- slab placed in electric field between plates), Energy density (by simple spherical distribution of charge) Dielectric constant and measurement by Hopkinson's null method. Quadrant and attracted disc electrometer.

Text and Reference Books

1. Rajput, V.S. "Mathematical Physics",
2. Mathur, D.S. "General Properties of Matter"
3. Khanna and Bedi "Text Book of Sound"
4. Brij Lal and Subramanyam, "Heat and Thermodynamics"
5. Gratak A., "Optics"
6. Vasudeva, D.N. "Fundamentals of Magnetism and Electricity"

Practical & Lab Tutorial**Time - 3 hrs.****Full Marks = 25**

The students shall have to perform at least 8 of the following experiments. The Laboratory notebook shall carry 5 marks. Only one experiment will be allotted in the examination to each student. The pass marks in practical paper will be 10.

List of experiments

1. Bar pendulum,
2. Rigidity modulus by (a) Statical method, (b) dynamical method.
3. Study of oscillations of a mass under different combinations of springs.
4. Surface tension by capillary rise method (tube to be supplied).
5. Viscosity of water by capillary flow method,
6. Kundt's tube method of measuring the velocity of sound.
7. Melde's experiment,
8. Thermal conductivity of copper.
9. Spectrometer : refractive index by symmetry method.
10. High resistance measurement,
11. Low resistance measurement.

Subject : Physics**(General/Subsidiary)****B.Sc. Part - II****Paper - II****Full Marks = 75****Time = 3 hrs.**

The question in theory paper will have four groups:

Group - A : Objective type questions:	10 x 1	=	10
Group - B : Short answer type questions (2 out of 4)	2 x 5	=	10
Group - C : Long answer type questions (4 out of 8)	4 x 10	=	40
Group - D : Numerical problems (3 out of 5)	3 x 5	=	15

The pass marks in practical paper will be 10 and the examination will be of 3 hours duration.

Magnetism

(18 lectures)

Gauss' law, Ampere's circuital law, Magnetic induction, $B = \mu_0 (H + M)$ relation (by Rowland ring method), Energy density of magnetic field (by simple solenoid method), Hysteresis and hysteresis loss and measurements by magnetometer and ballistic galvanometer methods, Dia, para and ferro-magnetic substances. Magnetic circuits, Design of permanent magnets by the concept of magnetic circuits. Susceptibility and permeability and their measurements for dia-, para- and ferro-magnetics.

Current Electricity

(25 lectures)

Field due to a solenoid, Theory of moving coil ballistic galvanometer and its uses.

Transients : Growth and decay of currents in L-R, R-C and L-R-C circuits, Simple application of these circuits, Measurement of L by Rayleigh's method.

Alternating current circuit : Power and power factor of AC circuits, Wattmeter, Vector diagram method and j-operator method for ac circuits, Analytical treatment of series and parallel circuits including sharpness

of resonance. Transformer and its principle by vector diagram method, Polyphase current, Rotating magnetic fields, Induction motor.

Classical Mechanics

Generalised co-ordinates and momenta, Lagrange's and Hamilton's equations from D'Alembert's principle, Applications to simple pendulum, Compound pendulum and projectiles. Motion in a central field, Kepler's laws - their deductions from law of gravitation and vice-versa. (12 lectures)

Special Theory of Relativity

Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformation, Simultaneity and order of events, Lorentz contraction and time dilation, Addition of velocities, Velocity dependence of mass, Equivalence of mass and energy. (12 lectures)

Atomic Physics

Bohr's theory of hydrogen atom, Discrete levels in atoms, Critical potentials, Mosley's law, Compton effect, Bragg's law. (7lectures)

Quantum Physics

Wave-particle duality, de Broglie's relation and experimental verification of matter waves, Uncertainty principle. (7lectures)

Nuclear Physics

Basic properties and structure of nuclei, Elementary ideas about nuclear forces, Nuclear disintegration, Cosmic rays and elementary particles, Geiger-Muller counter. (10 lectures)

Solid-state Physics And Electronics

pn junction (calculation of conduction current by concept of Fermi level), Zener diode, Tunnel diode, Photo-diode, Diode as a rectifier, Half-wave and full-wave rectifier circuits, Calculation of ripple factor. Transistor and its characteristics and constants, Photo transistor, Transistor as an amplifier. (25 Lectures)

Qualitative idea about amplitude modulation and detection. Simple transmitter and receiver through block diagram, Propagation of radio waves through ionosphere. Electron microscope, Cathode rays oscilloscope, Elementary idea about TV.

Digital Circuits

Basic logic gates, Boolean algebra and its application to simple logic circuits (half adder), Realisation of basic logic gates from NAND gates. (10 lectures)

Text and Reference Books

1. Vasudeva, D.N., "Fundamentals of Magnetism and Electricity"
2. Gupta and Kumar "Classical Mechanics"
3. Miah W., "Electromagnetics"
4. Rajam J.B. "Atomic Physics"
6. Boylestad, R.L., "Electronic Devices and Circuit Theory"
7. Floyd, "Digital Electronics"

Practical & Lab Tutorial

Full Marks = 25

Time - 3 hrs.

The students shall have to perform at least 8 of the following experiments. The laboratory notebook shall carry 5 marks. Only one experiment will be allotted in the examination to each student. will be 10.

List of experiments

1. Young's modulus of a beam by bending method,
2. Newton's ring.
3. i-d graph by spectrometer,
4. Resistance of a galvanometer by half deflection method.
5. Figure of merit of a galvanometer,
6. Variation of resistance of a wire with temperature.
7. Calibration and use of a thermocouple,
8. Earth inductor.
9. De sauty bridge,
10. Characteristics of a transistor.