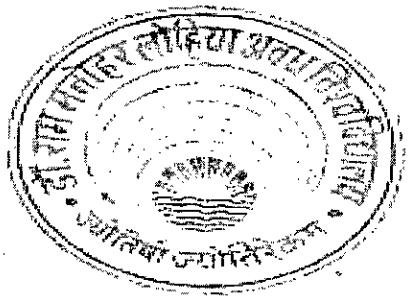
SYLLABUS FOR

BACHELOR OF SCIENCE

OPTION 1: PHYSICS, ELECTRONICS AND MATHEMATICS

OPTION 2: PHYSICS, COMPUTER SCIENCE AND MATHEMATICS

(SEMESTER SYSTEM)



DEPARTMENT OF PHYSICS & ELECTRONICS

DR. RAM MANOHAR LOHIA AVADH UNIVERSITY, FAIZABAD

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DR. RAM MANOHAR LOHIA AVADH UNIVERSITY, FAIZABAD

DEPARTMENT OF PHYSICS AND ELECTRONICS

OPTION 1: PHYSICS, ELECTRONICS AND MATHEMATICS

OPTION 2: PHYSICS, COMPUTER SCIENCE AND MATHEMATICS

SYLLABUS

SEMESTER I TO VI

B.Sc.- SEMESTER I			**Th + S***
	Option – 1:Physics ,Electronics ,Math	**Option – 2:Physics,Math, Computer Science**	
BSC101	Mechanics and Properties of Matter	Mechanics and Properties of Matter	40 + 10
BSC102	Oscillation , Waves and Optics	Oscillation , Waves and Optics	40 + 10
BSC103	Algebra & Trigonometry	Algebra & Trigonometry	40 + 10
BSC104	Basic of Electronics	Computer Architecture	40 + 10
Practical – I	General Physics and Electronics Lab	General Physics and Computer Lab	100
	TOTAL MARKS OF FIRST SEMESTER		300
B.Sc.- SEMESTER II			**Th + S***
BSC201	Heat and Thermodynamics	Heat and Thermodynamics	40 + 10
BSC202	Electricity and Magnetism	Electricity and Magnetism	40 + 10
BSC203	Digital Electronics	Programming in C	40 + 10
BSC204	Differential Equations	Differential Equations	40 + 10
Practical – II	Digital Electronics Lab	Programming Lab	100
	TOTAL MARKS OF SECOND SEMESTER		300
B.Sc.- SEMESTER III			**Th + S***
BSC301	Mathematical Physics	Mathematical Physics	40 + 10
BSC302	Analog Communication	Analog Communication	40 + 10
BSC303	Numerical Computing	Numerical Computing	40 + 10
BSC304	Network Analysis	Software Engineering	40 + 10
Practical – III	Numerical Computing and Communication Lab	Numerical Computing and Communication Lab	50
	TOTAL MARKS OF THIRD SEMESTER		300
B.Sc.- SEMESTER IV			**Th + S***
BSC401	Classical and Statistical Physics	Classical and Statistical Physics	40 + 10
BSC402	Digital Communication	Digital Communication	40 + 10
BSC403	Audio & Video Electronics	Visual Programming	40 + 10
BSC404	Differential Geometry and Tensor Analysis	Differential Geometry and Tensor Analysis	40 + 10
Practical – IV	Audio and Video Electronics Lab	Visual Programming Lab	50
	TOTAL MARKS OF FOURTH SEMESTER		300
B.Sc.- SEMESTER V			**Th + S***
BSC501	Quantum Mechanics	Quantum Mechanics	40 + 10
BSC502	Electromagnetic Theory	Electromagnetic Theory	40 + 10

BSC503	Calculus	Calculus	40 + 10
BSC504	Solid State Physics	Java Programming	40 + 10
Practical – V	Solid State Devices Lab	Java Programming Lab	100
	TOTAL MARKS OF FIFTH SEMESTER		300

VI Semester

B.Sc.- SEMESTER IV			**Th + S***
BSC601	Nuclear Physics	Nuclear Physics	40 + 10
BSC602	Atomic and Astrophysics	Atomic and Astrophysics	40 + 10
BSC603	Linear Programming	Linear Programming	40 + 10
BSC604	Microprocessor and Applications	Data Structure	40+10
Project			100
	TOTAL MARKS OF SIX SEMESTER		300
	GRAND TOTAL		1800

***Sessional Marks Distribution**
1. Test-1:10 Marks
Intake:50(Option-I)
50(Option-II)
Fee:30,000/per year

Semester – I

BSC101: Mechanics and Properties of Matter

Unit I: Rotational motion: Analogy of rotational motion with translational motion, Moment of inertia of a spherical shell, solid cylinder (only about axis of symmetry), Motion of spherical Shell and solid cylinder rolling down an inclined plane, Pendulum: Compound pendulum, Kater's pendulum, Bessel's formula.

Unit II: Motion under central force: Concept of gravitational field and gravitational potential, Gravitational field and potential due to spherical shell and Solid sphere. Elasticity: Bending of beam, Bending moment, Cantilever (without considering weight of cantilever),
Beam supported at both the ends (without considering weight of beam).

UNIT-III: Surface Tension : Surface tension (definition), Angle of contact and wettability, Relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Applications of surface tension.

UNIT-IV: Fluid Dynamics and Viscosity: General concepts of fluid flow, Viscous fluids, the equation of continuity, Flow of liquid through capillary tube, Poiseuille's equation, Experimental determination of coefficient of viscosity of liquid by Poiseuille's method, effect of temperature and pressure on viscosity of liquid.

Reference Books :

1. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
2. Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
3. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram .
4. J.C. Upadhyay: 'Mechanics'.
5. D.S, Mathur "Mechanics",
6. P.K. Srivastava: "Mechanics" (New Age International).

BSC102 Oscillation, Waves and Optics

UNIT-I: Oscillations: Damped oscillations, case i) Over damped ii) critically damped and iii) Damped, forced oscillations, amplitude resonance and Q factor (statement only).

UNIT-II: Waves :Types of waves, Differential equation of progressive wave, Speed of longitudinalwaves in a fluid, Group velocity and phase velocity.

2) Ultrasonic waves: Ultrasonics, Piezo-electric effect, Production- Piezo-electric method, Detection and applications.

UNIT-III: Geometrical optics: Aberration in images, Spherical aberration, methods to minimize it, Chromatic aberration, achromatic combination of two thin lenses separated by finite distance.

Optical instruments: Entrance and exit pupils, Common types of eyepieces, Huygen's eyepiece and Ramsden's eyepiece.

UNIT-IV: Interference: Interference in thin parallel films (reflected light only), Wedge shaped films,Newton's rings, it's application for determination of wavelength of light. Diffraction :

Elementary theory of plane diffraction grating (qualitative treatmentonly).Experimental determination of wavelength using plane diffraction grating

Reference Books:

1. Acoustics, Waves and Oscillations – S. N. Sen, Willey eastern Ltd, New Delhi.
2. Oscillations and Waves – D.P. Khandelwal.
3. Optics – B. K. Mathur.
4. Optics – Heeht, Zajac Addison, Wesley Publishing Company, London.
5. Sound by Khanna and Bedi. Atmaram and sons, New Delhi.
6. Optics by B. K. Mathur
7. Optics by A K Ghatak, - (Tata McGrew Hill).

BSC103 Algebra & Trigonometry

Unit -I: Sequence and its convergence (basic idea), Convergence of infinite series, Comparison test, ratio test, root test, Raabe's test, Logarithmic ratio test, Cauchy's condensation test, DeMorgan and Bertrand test and higher logarithmic ratio test. Alternating series, Leibnitz test, Absolute and conditional convergence, Congruence modulo m relation, Equivalence relations and partitions.

Unit -II: Definition of a group with examples and simple properties, Permutation groups, Subgroups, Centre and normalizer, Cyclic groups, Coset decomposition, Lagrange's theorem and its consequences.

Unit -III: Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group, Fundamental theorem of homomorphism, Conjugacy relation, Class equation, Direct product.

Unit -IV: Introduction to rings, subrings, integral domains and fields, Characteristic of a ring, Homomorphism of rings, Ideals, Quotient rings, Complex functions and separation into real and imaginary parts, Exponential, direct and inverse trigonometric and hyperbolic functions, logarithmic function, Gregory's series, Summation of series.

Reference Books :

1. Titu Andreescu and Dorin Andrica, Complex Numbers from A to .... Z, Birkhauser, 2006.

2. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory(3rd Edition), Pearson Education (Singapore) Pvt. Ltd., Indian Reprint, 2005.

3. David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Education Asia, Indian Reprint, 2007.

BSC104 Basic of Electronics

UNIT-I: Semiconductor Devices & Circuit: Classification of material; Energy band structure of conductors, insulators & semiconductor ;Classification of Semiconductor Mobility and conductivity, Intrinsic and extrinsic semiconductors and charge densities in semiconductors.

UNIT-II:PN junction Characteristics & Analysis ;diode rating ; Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LED's), Varactor diodes and tunnel diodes.

Unit –III: Rectifiers and filter circuit: Half wave, full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters,

UNIT-IV: Transistor Amplifier: Single stage common emitter transistor amplifier, D. C. and A. C. load lines, Frequency response curve of an amplifier, Positive and negative feedbacks, Effect of negative feedback on the gain response curve.Integrated Circuits: Classification of ICs; OP Amp: Characterstics of Ideal OPAmp& application

Reference Books :

1. Basic Electrical & Electronics Engineering –V Jegathesan , K Vinoth Kumar & R Saravanakumar, Wiley India

2. Basic Electrical & Electronics Engineering- B.L.Thereja

3. Electronics devices and circuit theory by Robert Boylestad.

4. Electronics Devices and circuits by Millman&Halkias, TMH.

5. Electronic Principles by Malvino (T.MH. Publication).

6. Basic Electronics and Linear Circuits – Bhargava, Kurshrestha and Gupta, (T.MH.
Publication).

7. Electronic Devices and Circuits – Allan Mottershed.

BSC104 Computer Architecture

UNIT I: Overview & Instructions: Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II :Arithmetic operations: ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III :Processor and control unit: Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV :Parallelism and Memory and i/o systems: Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

Reference Books :

1. M. Morris Mano, Computer System Architecture, Pearson
2. Andrew S. Tanenbaum and Todd Austin, Structured Computer Organization, Sixth Edition, PHI
3. M. Murdocca & V. Heuring, Computer Architecture & Organization, WILEY
4. John Hayes, Computer Architecture and Organization, McGrawHill

Semester- II

BSC201 Heat and Thermodynamics

UNIT-I: Ideal and Real gas: Interpretation of temperature, Andrew's curve, critical constants, Relation between critical constants and Vander Waal's constants, reduced equation of state. **Thermometry :** Principle of thermometry, Mercury thermometer, Platinum resistance thermometer.

UNIT-II: Transport Phenomena: Molecular collisions, Mean free path and collision cross-section, Estimation of molecular diameter and mean free path (Elementary method), Clausius and Maxwell's equation for mean free path (without derivation). Transport of momentum (viscosity), energy (thermal conduction), mass (diffusion).

UNIT-III: Thermodynamics-I: Thermodynamical state, Thermodynamic equilibrium, Reversible and irreversible changes, isothermal and adiabatic changes, Adiabatic relations, Work done during isothermal and adiabatic changes.

UNIT-IV: Thermodynamics-II: Carnot's reversible engine, Carnot cycle, Efficiency of Carnot's engine. Carnot's theorem, Second law of thermodynamics (different statements), Entropy, principle of increase of entropy in natural processes (conduction and free expansion of gas), Third law of thermodynamics.

Reference Books :

1. Treaties on Heat – Saha and Shrivastava.
2. Kinetic Theory of gases – V.N. Kelkar.
3. Heat and Thermodynamics – Brijlal and Subramanyam S. Chand and Co. Ltd, Delhi.
4. Thermal Physics (Heat and thermodynamics)- A. B. Gupta, H. P. Roy- Books and allied(P) Ltd., Kolkata

BSC202 Electricity and Magnetism

Electric Charges and Fields: Conservation and quantization of charge, Coulomb's Law, Energy of a system of charges, Flux and Gauss's law.

Electric Potential: Potential as line integral of field, potential difference, Gradient of a scalar function, Derivation of the field from the potential, potential of a charge distribution, Uniformly charged disc. Force on a surface charge, energy associated with an electric field, Gauss's theorem and differential form of Gauss's law.

Electric Fields Around Conductors: Conductors and insulators, General electrostatic problem. Boundary conditions, Uniqueness theorem, some simple system of conductors; capacitors and capacitance, Energy stored in a capacitor.

Electric Currents : Charge transport and current density, Stationary currents, Ohm's law, Electrical conduction model, Failure of Ohm's law, Circuits and circuit elements, Energy dissipation in current flow, variable currents in capacitors and resistors.

Reference Books :

1. Electricity and Magnetism (Berkley, Phys. Course 2) : E.M. Purcell (Tata McGraw Hill) (1981).
2. Elements of Electromagnetics : M.N.O.sadiku (Oxford University Press) (2001).
3. Electricity and Magnetism : A.S. Mahajan & A.A. Rangwala (Tata-McGraw Hill) (1988).
4. Electricity and Magnetism : A.N. Matveev (Mir) (1986).

BSC203 Digital Electronics

Unit -I: Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, conversion of one code to another, Complements (one's and two's), Signed and Unsigned numbers, Addition and Subtraction, Multiplication Gray and alpha numeric Codes.

Unit-II: Boolean Algebra: Boolean operation –Rules and laws of Boolean algebra, De-Morgan's Theorems, implication of expressions using Boolean algebra- K- map.

Unit –III: Basic Logic gates: AND, OR, NOT (symbol truth table circuit diagram and working), NAND, Nor, XOR, XNOR (symbol truth table).

Unit IV: Combinational Circuits: Adder (half and full) and subtractor (half and full), Binary adder, BCD adder Multiplexers and Demultiplexers
Encoder and Decoder and Flip-Flops (Types and working).

Reference Books :

1. R.L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994)
2. Donald P. Leach, Albert Paul Malvino, Digital Principles and Applications, Tata McGraw Hill (1995)
3. M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education Asia, (2007)
4. Thomas L. Floyd , Digital Fundamentals, Pearson Education Asia (1994)
5. S.P. Bali , Solved Problems in Digital Electronics, Sigma Series, Tata McGraw-Hill, (2005)
6. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India
(2000)
7. R.P. Jain , Modern Digital Electronics, Tata McGraw-Hill (2003).

BSC204 Differential Equations

Unit -I: First order ordinary differential equations: Basic concepts and ideas, Exact differential equations, Integrating factors, Bernoulli equations, Orthogonal trajectories of curves, Existence and uniqueness of solutions, Second order differential equations: Homogenous linear equations of second order.

Unit -II: Existence and uniqueness theory, Wronskian, Nonhomogenous ordinary differential equations, Solution by undetermined coefficients, Solution by variation of parameters, Higher order homogenous equations with constant coefficients, System of differential equations.

Unit III: Power series method: Theory of power series methods, Legendre's equation, Legendre polynomial, Partial differential equations: Basic Concepts and definitions, Mathematical problems, First order equations.

Unit IV: General solutions of first order partial differential equations, Canonical forms and method of separation of variables for first order partial differential equations, Classification of second order partial differential equations,

Reference Books :

1.Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 9/e, (2006).
2.TynMyint–U and LokenathDebnath; Linear Partial Differential Equations for Scientists and Engineers, Springer, Indian Reprint (2009).

BSC203 Programming in C

Unit -I: Structure of C program, keywords, identifiers, constants, variables, data types,type conversion, Types of operators and expressions, Input and output functions in C. Decision Statement – IF-ELSE statement, break, continue, goto, switch() case and nested IF statement.

Unit -II: Loop Control Statements – For loop, While loop , Do-while loop and nested loops. Arrays – Definition, Initialization, characteristics, One, Two, Three and Multidimensional Arrays, sscanf() and sprintf() functions, Working with Strings & Standard Functions.

Unit -III: Pointers – Introduction, features, Declaration, Arithmetic operations, pointers and Arrays, Array of pointers, pointers to pointers, pointers and strings, Void pointers.

Unit -IV: Functions – Declaration, Prototype, Types of functions, call by value and reference, Function with operators, function with decision statements, function with Loop statements, Function with Arrays and Pointers, Types of Storage Classes.

Reference Books :

1.E. Balaguruswamy, "Programming In C ", TMH Publications REFERENCES BOOKS
2. Ashok Kamthane – "Programming with ANSI & Turbo C - Pearson
3. Gottfried, Schaums Outline Series, " Programming With C ", TMH Publications
4. Mahapatra, " Thinking In C ", PHI Publications

Semester – III

BSC301 Mathematical Physics

Unit-I : Orthogonal transformations, transformation matrix, proper and improper rotations, Euler angles (notation of Goldstein)

Unit-II: Curvilinear coordinates: tangent basis vectors, scale factors, spherical, polar and cylindrical coordinate systems, gradient of a scalar, Divergence and curl of a vector, Laplace equation in spherical, polar and cylindrical coordinate systems and its solution.

Unit-III: Special Functions: Legendre, Hermite, Laguerre differential equations; their generating functions, recurrence relations, Rodrigue's formula and orthogonality properties. Associated Legendre polynomial.

Unit-IV: Function of complex variable, limit, continuity and differentiability of function of complex variables, Fourier series, Dirchlets conditions, Fourier series of periodic Function.

REFERENCE BOOKS:

1. Mathematical Methods for Physicists: G. Arfken and H. J. Weber, (Academic Press, San Diego).
2. Mathematical Physics: P. K. Chatopàdhyay (Wiley Eastern, New Delhi).
3. Introduction to Mathematical Physics: C. Harper (Prentice Hall of India, New Delhi).
4. Mathematical Methods in the Physical Sciences: M. L. Boas (Wiley, New York).
5. Applied Mathematics for Engineers and Physicists: L. Pipes & L. R. Horwell
6. Mathematics for Physicist: Mary L. Boas
7. Mathematical Physics: B. S. Rajput.
8. Mathematical Methods for Physicists: A. K. Ghatak, I. C. Goyal

BSC302 Analog Communication

Unit- I: Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation , DSB, SSB Modulation and VSB modulation.

Unit-II: Generation and detections circuits of AM , DSB, SSB and VSB Modulations , Block diagram of AM Radio transmitter and super heterodyne Receiver.

Unit -III: Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators –

Unit -IV: FM Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.

Reference Books :

1. Electronic Communication Systems - George Kennedy, McGraw Hill Book Company, 4/e, 2005.
2. Communication Engineering - T.G. Palanivelu, Anuradha Publicatons, 1/e, 2002.

BSC303 Numerical Computing

Unit – I: Errors and Iterative Methods Truncation and Round-off Errors. Floating Point Computation , Overflow and Underflow, Single and Double Precision Arithmetic. Iterative Methods,

Unit – II: Solution of Algebraic and Transcendental Equations (1) Fixed-Point Iteration Method, (2) Bisection Method, (3) Secant Method, Comparison and Error Estimation.

Unit –III: Matrices and Linear System of Equations Solution of Linear Equations: - (1) Gauss Elimination Method and (2) Gauss-Seidel Iterative Method.

Unit – IV: Eigenvalues and Eigenvectors: Computation of Eigenvalues and Eigenvectors of Matrices by using Iterative Methods. Newton's Interpolation Formulas , Trapezoidal Rule. Simpson's 1/3 and 3/8 Rules.

Reference Books :

1. Introductory Methods of Numerical Analysis 4th Ed. By S.S. Sastry (PHI Learning Pvt. Ltd., 2006)
2. Numerical Mathematical Analysis by James D. Scarborough (sisth Edition), Oxford & IBH Publishing
3. Elementary Numerical Analysis By Kendall E. Atkinson (Wiley, 1985)
4. Numerical Methods for Scientists and Engineers By Richard Wesley Hamming (Courier Dover Publications, 1986)

BSC304 Network Analysis

Unit -I: Basic Circuit Concepts: Voltage and current sources, Resistance, Capacitance, Inductance, Mutual Inductance, Series and Parallel elements, Duality, voltage division and current division.

Unit -II: Circuit Analysis: Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node analysis, Mesh analysis, Star-Delta conversion.

Unit -III: Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem.

Unit IV :Two Port Networks: Impedance (Z) parameters, Admittance (Y) parameters, Transmission (ABCD) parameters, Hybrid (h) parameters.

Reference Books :

1. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill (2005)
2. Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004)
3. M. Nahvi and J. Edminister, Electric circuits, Schaum's outline series, Tata McGraw Hill (2005)
4. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill (2004)

BSC304 Software Engineering

Unit-I: Introduction to Software Engineering: Definitions - Size Factors - Quality and Productivity Factors - Managerial Issues - Planning a software project : Defining the problem - Developing a Solution Strategy - Planning the Development Process - Planning an Organization structure - Other Planning Activities.

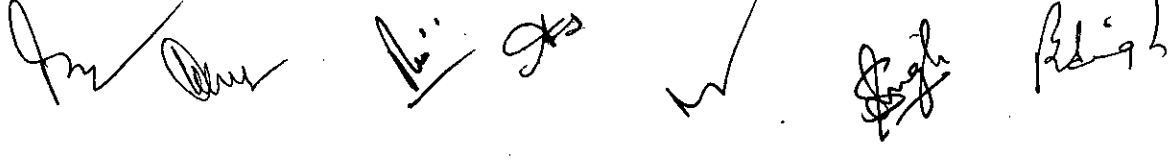
Unit-II: Software Cost Estimation: Software cost factors - Software Cost Estimation Techniques – Staffing level Estimation - Estimating Software Maintenance Costs - The Software Requirements, Specification - Formal Specification Techniques - Languages and Processors for Requirements Specification.

Unit-III: Software design: Fundamental Design Concepts - Modules and Modularization Criteria – Design Notations - Design Techniques - Detailed Design Considerations - Real-Time and Distributed System Design - Test Plans - Milestones, walkthroughs, and Inspections.

Unit-IV: Implementation issues: Structured Coding Techniques - Coding Style - Standards and Guidelines - documentation guidelines -Type Checking - Scoping Rules - Concurrency Mechanisms, Quality Assurance - Walkthroughs and Inspections.

Reference Books :

1. R.Fairley, Software Engineering Concepts, Tata McGraw-Hill, 1997.
2. R.S. Pressman, Software Engineering, Fourth Ed., McGraw Hill, 1997.
3. Software Engineering, H. Sommervill Ian , Addition Wesley Pub. Co.
4. Software Engineering: An object Oriented Perspective by Braude, E.J., Willey, 2001.



Semester- IV

BCS 401 Classical and Statistical Physics

UNIT –I: Langrangian Formulation: Constraints, degrees of freedom, generalized co-ordinates, principle of virtual work, D'Alembert's principle, Langrange's equation from D'Alembert's principle, Applications of Langrange's equation

UNIT -II: Techniques of Calculus of Variation: Hamilton's principle, deduction of Hamilton's principle from D'Alembert'sprinciple, deduction of Langrange's equation from Hamilton's principle and Applications

UNIT -III: Basic Concepts in Statistical Physics: Micro and macro states, micro canonical and canonical ensembles, phase space, accessible micro states, apriori probability, thermodynamic probability, probability distribution, entropy and probability.

UNIT- IV: Qualitative idea of M-B distribution law, BE distribution law, FD distribution law, derivation of Planck's radiation formula, deductions of Rayleigh-Jean's law, Wien's law, Wien's displacement law and Stefan's law from Planck's formula.

Reference Books :

1. Classical Mechanics – H. Goldstein.
2. Classical Mechanics – N. C. Rana and P. S. Joag
3. Classical Mechanics – Gupta, Kumar and Sharma.
4. Classical Mechanics – P. V. Panat.
5. Thermodynamics & Statistical physics – Sharma, Sarkar.
6. Statistical Mechanics – B. B. Laud.
7. Statistical & Thermal Physics – S. Loknathan.
8. Statistical Mechanics – Satya Prakash, J. P. Agarwal
9. Elementary statistical mechanics – Kumar, Gupta.

BSC402 Digital Communication

Unit- I: Advantages of digital Communication, Analog signal to digital signal conversion - quantizing, sampling, coding, decoding, quantization error, sampling theorem.

Unit-II: ASK, FSK, PSK , delta modulation and adaptive delta modulation.

Unit III: Pulse Modulation -- PAM, PWM, PPM, PCM, Multiplexing - FDM, TDM, CDMA.

Unit IV: Information Theory: Shannon's Theorem and Shannon's bound, Coding and decoding of Information Source coding, Entropy coding, Hamming code, Single Parity- Bit Code

Reference Books :

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2.Analog and Digital Communication, Schum Series, TMH
3.Digital & Analog Communication Systems, Leon W. Couch, Pearson
4.Analog & Digital Communication Systems, Singal, TMH
5. An Introduction To Analog & Digital Communications, Haykins, Wiley.
6.Electronic Communication Systems-, Kennedy Devis, TMH

BSC403 Visual Programming

Unit-I: Getting Started with VB The IDE , The Elements of user interface, Designing user interface, Programming an application Visual Development and Event Driven Programming.

Unit-II: Visual Basic- The language Variable, Constants, arrays, collections, Procedures, control flow & loop statements.

Unit-III: Working with forms Form types, Appearance of forms, Designing menu structure, Building dynamic forms at run time, The Multiple document Interface MDI Applications, Accessing child forms Implementing scrolling forms.

Unit-IV: Database Programming with VB Understanding Database and DBMS, Understanding relational concepts, Understanding Visual data manager 6. Introduction to Web Internet & web protocols, An HTML Primer, Activating the client with VBScript, Dynamic HTML, Study of Web browser control and Internet explorer object.

Reference Book :

1 Mastering Visual Basic 6 By Evangelos Perroutosos (BPB Publications)

BSC403 Audio & Video Electronics

Unit-I : Audio: Acoustical systems & its electrical equivalent circuits; Microphones, loud speakers, recording & reproduction of sound; high fidelity stereophonic systems; compact disc.

Unit-II : Video: TV fundamentals, scanning, synchronization & blanking, composite video, video bandwidth consideration, vestigial side brand transmission, channel bandwidth , standard channel, different TV systems, allocation of frequency bands, camera tube – image orthicon, vidicon & plumbicon.

Unit – III : Block diagram of TV: TV transmitter & receiver, short description of each block; characteristics of TV transmission & transmitting antenna; fundamentals of colour signal transmission & reception, frequency interleaving, distinction between NTSC & PAL systems.

Unit -IV: HDTV: Introduction, Principle, Standards, applications.

Reference Books :

1. D. P. Roychowdhury, " Advanced Acoustics", The New Book Stall
2. R.R. Gultari, " Monochronic & Colour Television",
3. M. Dhake," TV & Video Engineering", TNH
4. K. Blair Benson & Donald G. Fink, " HDTV", Advanced television for 1990's, MGH

BSC404 Differential Geometry and Tensor Analysis

Differential Geometry

Unit-I: Local theory of curves-Space curves, Examples, Plane curves, tangent and normal and binormal, Osculating plane, normal plane and rectifying plane. Helices, Serret-Frenet apparatus, contact between curve and surfaces, tangent surfaces, involutes and evolutes of curves, fundamental existence theorem for space curves.

Unit-II: Local theory of surfaces (Contd.), Direction coefficients, families of curves, intrinsic properties, geodesics, canonical geodesic equations, normal properties of geodesics, geodesics curvature, geodesics polars, Gauss-Bonnet theorem, Gaussian curvature, normal curvature, Meusneir's theorem, mean curvature, Gaussian curvature, umbilic points, lines of curvature, Rodrigue's formula, Euler's theorem.

Unit-III: The fundamental equation of surface theory- The equation of Gauss, the equation of Weingarten, the Mainardi-Codazzi equation.

Tensor Analysis

Unit-IV: Contravariant and covariant vectors and tensors, Mixed tensors, Symmetric and skewsymmetric tensors, Algebra of tensors, Contraction and inner product, Quotient theorem, Reciprocal tensors, Christoffel's symbols, Covariant differentiation, Gradient, divergence and curl in tensor notation.

Reference Books :

1. G. E. Hay, Vector and Tensor Analysis, (Dover Publications, Inc., 1979)
2. G. R. Fowles and G. L. Cassiday, Analytical Mechanics, (Thomson Brooks/Cole, 2005)
3. H. Goldstein, C. P. Poole and J. L. Safko, Classical Mechanics, (Addison-Wesley Publisihng Co., 2001)
4. M. R. Spiegel, Theoretical Mechanics, (McGraw Hill Book Company, 1980)
5. M. R. Spiegel, Vector Analysis, (McGraw Hill Book Company, 1981)
6. D. C. Kay, Tensor Calculus, (McGraw Hill Book Company, 1988)
7. E. C. Young, Vector and Tensor Analysis, (Marcel Dekker, Inc., 1993)

V Semester

BSC501 Quantum Mechanics

UNIT –I: Schrodinger's Equation: Physical interpretation of wave function, requirements of wave function time dependent and time independent Schrodinger's wave equations (one and three dimensional), probability current density, eigen values and eigen functions, expectation values.

UNIT- II: Applications of Schrodinger's Equation: Applications of Schrodinger's time independent wave equation to a particle in a rigid box (one and three dimensional), step potential-reflection and transmission coefficients, potential barrier penetration (qualitative treatment only).

UNIT- III: Hydrogen Atom : Schrodinger's equation for hydrogen atom, separation of radial and angular parts, solution of radial Schrodinger's equation to obtain energy values, significance of quantum numbers n, l, m_l and m_s.

UNIT -IV: Operators in Quantum Mechanics: Definition of operators, Linear momentum operator (p), kinetic energy operator (T), Hamiltonian operator (H), parity operator (π) and angular momentum operator(L) in Cartesian co-ordinates, commutators, commutator brackets involving position, linear momentum and angular momentum operators, raising and lowering operators L+ and L-, Eigen values of L^2 and L_z.

Reference Books :

1. Perspective of modern physics – Arthur Beiser.
2. Introduction to Quantum Mechanics – P. T. Mathew.
3. Quantum Mechanics – J. Powell and B. Crusemann.
4. Quantum Mechanics - Ghatak and Loknathan.
5. Quantum Mechanics – S. L. Gupta, K. Kumar, H. V. Sharma.
6. A text book of Quantum Mechanics – P. M. Mathew, K. Venkateshwaran.
7. Quantum Mechanics – Bagade and Singh.
8. Quantum Mechanics – Chand Kiran Singh.
9. Introduction to Quantum Mechanics – Rojansk.
10. Quantum Mechanics – Chatwal and Anand.

BSC502 Electromagnetic Theory

UNIT –I: Electrostatics and Charged Particle Dynamics: Statement and significance of Poisson's and Laplace's equations, motion of charged particles in (i) uniform electric field (E) (ii) uniform magnetic (B) fields (iii) crossed uniform electric (E) and magnetic (B) fields.

UNIT –II: Time Varying Fields: E. M. F., electromagnetic induction– Faraday's law (integral and differential forms), Lenz's law, mutual and self inductance, applications to transformer and solenoid, energy in magnetic field.

UNIT –III: Maxwell's Equations : Bio-Savart's law, Ampere's law, derivation of $\nabla.B=0$ and $\nabla \times B=J$, displacement current, Maxwell's correction to Ampere's law, Maxwell's equations for time dependent electric and magnetic fields in vacuum and dielectric medum.

UNIT –IV: Electromagnetic Waves: Wave equation for (E) and (B) fields in vacuum, plane wave solutions, orthogonality of E, B and propagation vector (k), plane electromagnetic waves in vacuum, attenuation of wave in metal (skin depth), Poynting's theorem, conservation of energy in electromagnetic fields. Boundary conditions for electromagnetic field vectors.

Reference Books :

1. Introduction to Electrodynamics (3rd edition) – David J. Griffith.
2. Classical Electrodynamics – S. P. Puri.
3. Classical Electrodynamics – J. D. Jackson.
4. Electrodynamics – B. B. Laud.

BSC503 Calculus

Unit-I: definition of the limit of a function, Continuous functions and classification of discontinuities, Differentiability, Chain rule of differentiability, Rolle's theorem, First and second mean value theorems, Taylor's theorems with Lagrange's and Cauchy's forms of remainder, Successive differentiation and Leibnitz's theorem.

Unit -II: Expansion of functions (in Taylor's and Maclaurin's series), Indeterminate forms, Partial differentiation and Euler's theorem, Jacobians.

Unit –III: Maxima and Minima (for functions of two variables), Tangents and normals (polar form only), Curvature, Envelopes and evolutes.

Unit –IV: Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple points, Tracing of curves in Cartesian and polar co-ordinates, Integral Calculus: Reduction formulae, Beta and Gamma functions , Qudrature, Rectification, Volumes and surfaces of solids of revolution, Double and triple integrals, Change of order of integration, Dirichlet's and Liouville's integral formulae.

Reference Books :

1. M.D. Intriligator, A Mathematical Optimization and Economic Theory (Prentice Hall, 1989)
2. B.S. Gottfried & W. Joel, Introduction to Optimization Theory, (Prentice Hall, 1973)
3. R.K. Sudaram, A First Course in Optimization Theory, (Cambridge University Press, 1996)
4. S. S. Rao, Optimization: Theory and Application, (John Wiley and Sons Ltd, 1978)
5. M. J. Fryer and J. V. Greenman, Optimization Theory: Applications in Operation Research and Economics, (Butterworth-Heinemann Ltd, 1987)

BSC504 Solid State Physics

UNIT –I: Crystal Structure: Difference between crystalline and non crystalline solids, space lattice, basis and crystal structure, unit cell, symmetry elements of a cube, Bravais lattices two dimensional, three dimensional (seven crystal systems), Miller indices, relation among lattice constant, Miller indices and interplaner spacing, simple crystal structures - cubic (simple, BCC, FCC) and HCP (with respect to co-ordination number, atomic radius, atoms per unit cell, packing fraction).

UNIT- II: X – Ray Diffraction by Crystals: Reciprocal lattice, Properties of reciprocal lattice (Reciprocal of the reciprocal lattice is direct lattice and volume of the unit cell of reciprocal lattice is inversely proportional to the volume unit cell of the direct lattice), Bragg's law in reciprocal lattice, powder method of X-ray diffraction in reciprocal lattice.

UNIT –III: Free ~~Energy~~ Electron Theory: Free electron model, Fermi-Dirac distribution, energy levels and energy density of orbital in one dimension. (Analytic only)

UNIT -IV: Band Theory of Solids: Origin of energy bands, one electron approximation, Bloch theorem (statement only), motion of electron in one dimensional periodic potential (Kronig-Penny model), effective mass of an electron, distinction between metals, semiconductors and insulators, Hall Effect (Expression for Hall voltage and Hall coefficient).

Reference Books :

1. Solid state Physics – S. O. Pillai (Wiley Eastern Ltd.).
2. Solid State Physics – A. J. Dekker.
3. Solid state Physics – C. M. Kachhava (TMH).
4. Solid state Physics – Charles Kittel.
5. Solid state Physics – R. L. Singhal.
6. Electronic devices and circuits – Millman and Halkias (TMH).
7. Principles of Electronics (7th edition) – V. K. Mehta (S. Chand).

BSC504 Java Programming

Unit-I: C++ Vs JAVA,JAVA and Internet and WWW, JAVA support systems, JAVA environment. JAVA program structure,Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting ,Operators.

Unit-II: Defining a Class,Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods. Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control.

Unit-III: Arrays: One Dimensional & two Dimensional, strings, Vectors, wrapper Classes, Defining Interface Extending Interface, Implementing Interface, Accessing Interface Variable, System Packages, Using System Package, Adding a Class to a Package, Hiding Classes.

Unit-IV: Creating Threads,Extending the Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface.

Reference Books :

1. E. Balaguruswamy, "Programming In Java", 2nd Edition, TMH Publications ISBN
2. Peter Norton, "Peter Norton Guide To Java Programming", Techmedia Publications 18 CS – 604 SO

VI Semester

BSC601 Nuclear Physics

UNIT –I: Accelerator & detectors : Need of accelerators, orbital accelerators, Nuclear detectors: Geiger-Muller counter, its construction and working, dead time, self quenching mechanism, bubble chamber, scintillation counter.

UNIT –II: Structure of nucleus and its properties : Composition of nucleus, nuclear size, nuclear radius, nuclear spin, magnetic moment, mass defect, packing fraction, binding energy, binding energy per nucleon and its variation with mass number, liquid drop model.

UNIT –III: Nuclear Energy Levels: Alpha decay: - α particle spectra, α disintegration energy, nuclear energy levels of α emitters, Beta decay:– experimental study of β ray spectra, continuous nature of spectrum, end point energy, conservation theorems, Gamma decay:–origin of γ rays (nuclear and internal conversion).

UNIT –IV: Nuclear Reactions: General scheme of nuclear reactions, Q value of reaction, exothermic and endothermic nuclear reactions, threshold energy, cross section of nuclear reactions (qualitative), deuteron induced reactions, stripping reaction.

Reference Books :

1. Nuclear Physics – Kaplan.
2. Nuclear physics – D. C. Tayal.
3. Electricity, magnetism and Atomic Physics – Yarwood.
4. Nuclear Physics – S. B. Patel.
5. Nuclear Physics – J. B. Rajam.
6. Nuclear Physics – Burcham.
7. Basic Concepts of Nuclear Physics – Cohen

BSC602 Atomic and Astrophysics

UNIT –I:Doublet Fine Structure: Optical spectral series, spectral notations, spectrum of sodium, doublet fine structure, selection rule for doublets, intensity rules for fine structure doublets, normal order of fine structure doublets, electron spin-orbit interaction, calculation of term value of fine structure level.

UNIT –II: Effects of Magnetic field on Atomic Spectra: Anomalous Zeeman effect and its explanation from vector atom model of one electron system in a weak magnetic field, Lande's g factor, the Paschen-Back effect, Paschen-Back effect in principal series doublets, selection rules for Paschen-Back effect, difference between Zeeman and Paschen Back effect.

UNIT –III: Molecular Spectra: Molecular bond, electron sharing, H_2^+ + molecular ion, the hydrogen molecule, rotational energy levels, rotational spectra, vibrational energy levels, vibrational spectra, Raman Effect: Raman effect, characteristic properties of Raman lines, difference between Raman spectra and infrared spectra, classical theory of Raman effect.

UNIT –IV: ~~Cosmology:~~ Astrophysics: The Big-Bang theory, the steady state theory, the oscillating theory, The Hubble law, cosmological tests, Milky Way Galaxy .

Reference Books :

1. Atomic and Nuclear Physics – H. Semat and T. E. Albright.
2. Introduction to Atomic Spectra – H. E. White.
3. Concept of Modern Physics – Arthur Beiser.
4. Perspective of Modern Physics – Arthur Beiser. .
5. Spectroscopy (Atomic and Molecular) – Gurdeep Chatwal, Sham Anand.
6. Astronomy – Fundamentals and Frontiers – Robert jastrow and M. H. Thompson
7. Astronomy – Frank Bash.

BSC603 Linear Programming

Unit-I: Linear programming problems, Statement and formation of general linear programming problems, Graphical method, Stack, and surplus variables, Standard and matrix forms of linear programming problem, Basic feasible solution.

Unit-II: Convex sets, Fundamental theorem of linear programming, Simplex method. Artificial variables, Big-M method, Two phase method.

Unit-III: Resolution of degeneracy, Revised simplex method, Sensitivity Analysis

Unit-IV: Duality in linear programming problems, Dual simplex method, Primal-dual method Integer programming, Transportation problems, Assignment problems.

Reference Books :

1. S. I. Gass, Linear programming, Mc Graw Hill Book Company, 1985.

2. K. V. Mittal and C. Mohan, Optimization methods in Operations Research and System Analysis, New Age International Publications,1996.

3. Kanti Swaroop, Man Mohan and P.K. Gupta, Operations Research, Sultan Chand and Sons, 2005.

4.Hamdy A. Taha, Operations Research: An Introduction, McMillan Publishing Company, 2007.

BSC604 Microprocessors and Applications

Unit-I: 8085 Microprocessor: Internal architecture, Real mode memory addressing, Introduction to protected mode memory addressing, Memory Paging. Addressing modes: Data-Addressing modes, Program Memory-Addressing modes, Stack Memory Addressing modes.

Unit-II: Data movement instructions: MOV, PUSH/POP, Load-Effective Address, String data transfers, miscellaneous data transfer instructions, Arithmetic and logic instructions: Addition, Subtraction and comparison, Multiplication and division,

Unit-III: Interrupt instructions, Operation of real mode and protected mode interrupt, interrupt flag bits, Hardware interrupts

Unit-IV: Peripheral Devices: 8255-Programmable Peripheral Interface, 8253-Programmable interval Timer.

Reference Books :

1. B. Brey, The Intel Microprocessors- Architecture, Programming and Interfacing, Pearson Education (2003)
2. D. V. Hall, Microprocessors and Interfacing – Programming and Hardware, Tata Mcgraw Hill (1999).

BSC604 Data Structure

Unit-I: The concept of data structure, Abstract data type, data structure operations, algorithms complexity, time-space tradeoff. Introduction to strings, storing strings, string operations, pattern matching algorithms.

Unit-II: Linked list: Introduction and basic operations, Header nodes, Doubly Linked List, Circular Linked List, Applications of Linked List. Stack: primitive operation on stack, Representation of Stack as Linked List and array, Stacks applications.

Unit-III: Introduction to queues, Primitive Operations on the Queues, Circular queue, Priority queue, Representation of Queues as Linked List and array, Applications of queue.

Unit-IV: Trees - Basic Terminology, Binary Trees, Tree Representations using Array & Linked List, Basic operation on Binary tree, Traversal of binary trees:- In order, Preorder & post order, Applications of Binary tree, Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs.

Reference Books :

1. Seymour Lipschutz, "Data Structures", Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines, New Delhi.
2. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structures Using C", Prentice Hall of India Pvt. Ltd., New Delhi.

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