FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
OBJECT ORIENTED PROGRAMMING USING C++
CODE- BSCC(Y- 201A)

UNIT I

Principles of OOPS, procedure oriented programming vs. object oriented programming, basic concepts, advantages, application of OOPS, object oriented languages. Beginning with C++: What is C++, structure of C++ program, creating, compiling, linking & executing a C++ program, Tokens, expressions & control structures, keywords, identifiers, basic data types, user-defined data types, derived data types, symbolic constants, type compatibility, variable declaration, dynamic initialization of variables, reference variables.

UNIT II

Operators in C++: scope resolution operator, mepory management operators, manipulators, type cast operators, operators, operator precedence, control structures. Functions in C++:_Main function, function prototyping, call by reference vs. call by value, inline functions, default arguments, const arguments, function overloading, friend functions. Classes and objects: specifyingo a class, defining member functions, making an outside functions inline, private member function; array within a class, memory allocation for object; static data members, static member functions, array of objects, objects as function arguments, returning objects.

UNIT III

Constructors and Destructors: Constructors, Parametric Constructors, Multiple Constructors in a class, constructors with default arguments. Dynamic initialization of objects, copy constructors, dynamic constructors, destructors. Operator Overloading & Type Conversions: Definition of Overloading, & Operator Overloading, rules for Overloading Operators, Overloading Unary Operators; Binary Operators, Binary Operators using Friends.

UNIT IV

Inheritance: defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base class, abstract classes, constructors in derived classes, member class, nesting of class.

UNIT V

Pointers, virtual functions and polymorphism, pointers to objects, this pointer, pointers to derived class, pure virtual functions, exception handling in C++, managing console I/O operations, working with files :open, close, basic read-write operations on tiles.

BOOKS:

1. Object Oriented Programming with C++ by E Balagurusamy.
2. Programming in C++ by Robert Lafore
3. C++ - The complete Reference - by Herbert Schildt (TMH)

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
OBJECT ORIENTED PROGRAMMING USING C++
PRACTICAL

1. **Write a program to convert decimal (integer) number into equivalent binary number.**
2. **Write a program to print Fibonacci series.**
3. **Write a program to find factorial of a given number using recursion.**
4. **Write a program to swap the contents of two variables with functions value parameters, address parameters and pointer parameters.**
5. **Write a program to check given string is palindrome or not.**
6. **Write a max function which accepts two numbers and find the maximum of two numbers. The two given numbers can be integer, float, or double so that the functions may call the overloaded functions.**
7. **Write a program to perform multiplications of two matrices.**
8. **Write a program to design a class distance with feet and inches as data members. Use a data function to set and show the distance.**
9. **Write a program to design a class with length and height as data member. Use a data function to get value of length and height from the keyboard and display area of right angle triangle.**
10. **Write a program to overload the binary operator to add two complex numbers.**
11. **Write a program to find the area and volume of a rectangular box using constructor.**
12. **Write a program to design a class time with hours, minutes and seconds as data members. Use a data function to perform the addition of two times objects in hours, minutes and seconds.**
13. **Write a program to implement single inheritance.**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
DATA STRUCTURE AND ALGORITHMS

CODE- BSCC(Y- 201B)

UNIT-I

Basic concepts and notations: Types of data structures, Data structure operations, Algorithmic complexity, Big 'O' notation. Arrays: Linear array, representation of single dimensional & multi dimensional array in memory, address calculation of single dimensional & multi dimensional array in memory, traversing l linear array, insertion and deletion in an array, Two-dimensional array, applications of Array.

UNIT-II

Stacks: Representation of stacks in memory (linked and sequential), operations on stacks, Applications of Stacks infix& Postfix expression, postfix expression evaluation. Queues: Representation of queues in memory (linked and sequential) circular queue, DE queue, priority queue, operations on queues: insertion, deletion from queue, application of Queue.

UNIT-III

Linked list: single and doubly linked list, description and operations on single and doubly linked list, Linked representation of stake and queue.

UNIT-IV

Trees: Definition and basic concepts, binary tree, Binary search tree, Operation on binary tree: insertion & deletion, binary tree traversal: in order, preorder & post order, Binary search tree, searching, insertion and deletion in binary search tree.

UNIT-V

Searching and sorting algorithms: Linear and binary search, bubble sort, insertion sort, selection sort, quick sort, merge sort. Graphs: Related concepts and its representations, Graph traversal Schemes: Depth First Search (DFS), Breadth First Search(BFS).

Suggested Reference Books:

1. Data Structure by Schaum Series
2. Data Structure by Tanenbaum
3. Data Structure using C++ by YashvantKani

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
DATA STRUCTURE AND ALGORITHMS
PRACTICAL

1. **Write a program to traverse an array.**
2. **Write a program to insert item at k^{th} position in an array.**
3. **Write a program to delete k^{th} position item from array.**
4. **Write a program to push and pop operations on a stack using array.**
5. **Write a program to insert and delete operation on a queue using array.**
6. **Write a program for selection sort.**
7. **Write a program for bubble sort.**
8. **Write a program for linear (sequential) Search.**
9. **Write a program for binary search.**
10. **Write a program to implement linked list.**

\

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- PHYSICS
PAPER-I (OPTICS)
CODE- BSCC(Y- 202A)

UNIT I

Geometrical optics:

Reflection and refraction, Fermat's principle, Refraction at a spherical surface, aplanatic points and its applications. Lens formula. Combination of thin lenses and equivalent focal length. Dispersion and dispersive power, chromatic aberration and achromatic combination, different types of aberration (Qualitative) and their remedy, Need for multiple lenses in eyepieces, Ramsden and Huygens eye-piece.

UNIT II

Interference of light:

The principle of superposition two slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refractometer and other applications, localized fringes, thin films, Interference by a film with two non0 parallel reflecting surfaces. Newton's rings, Haidinger fringes (Fringes of equal inclination), Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Intensity distribution in multiple beam interference, fabry – perot interferometer and Etalon.

UNIT III

Diffraction:

Fresnel's theory of half period zone. Diffraction at straight edge. Rectilinear propagation. Diffraction at a slit, phasor diagram and integral calculus methods. Diffraction at a circular aperture and a circular disc, Rayleigh criterion of resolution of images. Resolving power of telescope and and microscope. Outline of phase contrast microscopy. Diffraction at N-parallel slits, Intensity distribution, plane diffraction grating, Resolving power of a grating and comparison with resolving power of prism and of a fabry parot etalon.

UNIT IV

Polarizations:

Transverse nature of light waves, Polarization of electromagnetic waves, Plane polarized light – production and analysis, Description of linear, circular and elliptical polarization Propagation of electromagnetic waves in anisotropic media, uniaxial and biaxial crystals, and symmetric nature of dielectric tensor, Double refraction, and Hagen's principle. Ordinary and extraordinary refractive indices. Fresnel's formula, light propagation in uniaxial crystal, Nicole prism, Production of circularly and elliptically polarized light, Babinet compensator and applications, optical rotation, optical rotation in liquids and its measurement through polarimeter.

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR

UNIT V

Laser and photo sensors:

A brief history of laser. Characteristics of laser light. Einstein prediction, Relationship between Einstein's coefficients (Qualitative discussion). Pumping schemes. Resonators, Ruby laser. He-Ne laser. Applications of laser. Principle of holography. Photodiodes, Phototransistors and photomultipliers.

SUGGESTED READIING;

- **FUNDAMENTAL OF OPTICS: F.A. JENKINS AND H.E. WHITE, 1976 MC GRAW HILL**
- **PRINCIPLES OD OPTICS: B. K. MATHUR 1995 GOPAL PRINTING**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- PHYSICS
PAPER-II (Electro-Statics, Magneto Statics And Electrodynamics)
CODE- BSCC(Y- 202B)

UNIT I

Electrostatics: Coulombs law in vacuum expressed in vector forms. Calculations of electric field E for simple distributions of charge at rest, dipole and quadruple fields. Work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Relation between electric field and electric potential ($E = -\nabla V$), torque on a diploe in a uniform electric field and its energy. Flux of the electric field. Gauss's law and its application for finding E for symmetric charge distributions. Capacitors. Conducting sphere in a uniform electric field. Point charge in front of a grounded infinite conductor. Dielectric parallel plate capacitor with a dielectric. Dielectric constant. Polarization and polarization vector P. Relation between displacement vector D. E and P molecular interpretation of claussius – mossotti equation.

UNIT II

Magneto statics: Force on a moving charge. Lorentz foree equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field. Torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio. Biot and savart's law, calculation of H for simple geometrical situations such as solenoid, Anchor ring, Ampere's law, $\nabla \times V = \mu_o J$, $\nabla . B = 0$. Field due to magnetic dipole, free and bound currents. Magnetization vector (M), relationship between B, H and M. derivation of the relation $\nabla \times M = J$ for non-uniform magnetization.

UNIT III

Current Electricity and Bio electricity: Steady current, current density J, non-stedy currents and continuity equation, Kirchhoff's laws and analysis of multiloop circuits growth and decay of current in LR and CR circuits. Decay constants, LCR circuits, AC circuits, complex numbers and their applications in solving AC circuits problems, complex impedance and reactance, series and parallel resonance, Q-factor, power consumed by an AC circuit, power factor, Y and Δ networks and transmission of electric power, Electricity observed in living systems, origin of bioelectricity.

UNIT IV

Motion of charged particles in Electric and magnetic fields: (Note: The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned which are indicated as applications of principles involved.)

E as an accelerating field, electron gun, discharge tube, linear accelerator, E as deflecting velocity selector, Curvatures of tracks for energy determination for nuclear, Mass spectrograph and principle and working of cyclotron. Mutually perpendicular and parallel E & B fields positive ray parabolas, discovery of isotopes. Elements of Mass spectrographs. Principle of magnetic focusing (lenses).

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR

UNIT V

Electrodynamics: Electromagnetic induction, Faraday's Laws, Electromotive force, Integral and differential forms of Faraday's laws. Self and mutual inductance. Transformers. Energy in a static magnetic field. Maxwell's displacement current, Derivations of Maxwell's equations. Electromagnetic field energy density. Pointing vcctor, electromagnetic wave equation. Plane electromagnetic waves in vacuum and dielectric media. Reflection at a plane boundary of dielectrics, Fresnel's Laws, Polarization by reflection and total internal reflection. Waves in a conducting medium, Reflection and refraction by the ionosphere.

SUGGESTED READINGS :

- **PHYSICS VOLUME 2: D. HALLIDAY AND R. RESNICK**
- **INTRODUCTION TO ELECTRODYNAMICS : D. J. GRIFFITHS, 4TH EDITION PRINTICE HALL**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- PHYSICS
PRACTICAL

1. Study of interference using biprism.
2. Study of diffraction at straight edge.
3. Use of plane diffraction grating to determine D_1, D_2 lines of sodium lamp.
4. Resolving power of telescope.
5. Polarization by reflection and verification of Brewster's law,
6. Study of optical rotation in sugar solution.
7. Refractive index and dispersive power of prism using spectrometer.
8. Absorption spectrum of material using constant deviation spectrograph.
9. Beam divergence of He-Ne laser.
10. Determination of wavelength of laser by diffraction.
11. Determination of radius of curvature of Plano-convex lense by newton's rings.
12. Characteristics of Ballistic galvanometer.
13. Setting up and using an electroscope or electrometer.
14. Measurement of low resistance by carey-foster bridge or otherwise.
15. Measurement of inductance using impedance at different frequencies.
16. Measurement of capacitance using, impedance at different frequencies.
17. Response curve for LCR circuits and response frequencies.
18. Sensitivity of cathode-ray oscilloscope.
19. Use of a vibration magnetometer to study a field.
20. Study of magnetic field due to current using tangent galvanometer.
21. Study of decay of currents in LR and RC circuits.
22. Study of lissajous figures using CRO.
23. Verification of network theorems.

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- MATHEMATICS
PAPER-I (ABSTRACT ALGEBRA)
CODE- BSCC(Y- 203A)

UNIT – I

Definition and basic properties of groups. Subgroups. Subgroups generated by a subset, Cyclic groups and simple properties.

UNIT-II

Coset decomposition. Lagrange's theorem and its corollaries including Fermat's theorem. Normal subgroups. Quotient groups.

UNIT –III

Homomorphism and Isomorphism of groups. Fundamental theorem of homomorphism. Transformation and Permutation group. Sn (various subgroups of Sn,n<5 to be studied). Cayley's theorem

UNIT – IV

Group Automorphism. Inner Automorphism. Group of Automorphisms. Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian groups and non- abelian groups.

UNIT -V

definition and basic properties of rings. Ring homomorphism subrings. Ideals and Quotient rings. Polynomial rings & its properties. Integral domain and Field.

Suggested Reading:

1. **I.N. Herstein- Topics in Algebra Wiley Eastern Ltd. New Delhi. 1977.**
2. **PB Bhattacharya. S.K. Jain and S R Nagpaul – Basic Abstract Algebra. Wiley Eastern. New Delhi.1977**

Reference Books:

1. **Shantinarayan- A text Book of Modern Abstract Algebra. S. Chand and Company. New Delhi.**
2. **Surjeet Singh – A Text Book of Modern Algebra.**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- MATHEMATICS
PAPER-II (ADVANCED CALCULUS)
CODE- BSCC(Y- 203B)

UNIT- I

Definition of a sequence. Theorem on limits of sequence. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison test. Cauchy's integral test. Cauchy's root test. Ratio tests, Raabe's tests. Logarithmic test. Alternating series. Leibnitz's test. Absolute and conditional convergence.

UNIT-II

Continuity of function of single variable, Sequential continuity, Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.

UNIT –III

Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians.

UNIT-IV

Envelopes, Evolutes. Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.

UNIT – V

Double and triple integrals. Volumes and surfaces of solids of revolution Dirichlet's integrals. Change of order of integration in double integrals.

Suggested Reading:

1. **R.R. Goldbeg- Real Analysis. Oxford & I.B.H. Publishing co. New Delhi**
2. **Gorakh Prasad- Differential Calculus. Pothishala Pvt. Ltd Allahabad.**
3. **Gorakh Prasad- Integral Calculus. Pothishala Pvt. Ltd. Allahabad.**

Reference Books:

1. **Gabreil Klaumber – Mathematical Analysis. Marcel Dekkar. Inc.New York.1975**
2. **T.M. Apostol- Mathematical Analysis. Narosa Publishing House. New Delhi. 1985**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
SUBJECT- MATHEMATICS
PAPER-III (DIFFERENTIAL EQUATION)
CODE- BSCC(Y- 203C)

UNIT- I

Series solutions of differential equations. Power series method. Bessel and Legendre equations. Bessel's and Legendre's functions and their properties- recurrence and generating function. Orthogonality of functions.

UNIT- II

Laplace Transformation. Linearly of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.

UNIT-III

Inverse Laplace transforms. Convolution theorem. Application of Laplace transformation in Solving linear differential equations with constant coefficients.

UNIT-IV

Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method.

UNIT- V

Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant constant coefficients. Partial differential equations reducible to equations with constant coefficients.

Text Books:

1. **Sharma and Gupta- Integral Transform. Pragati. Prakashan Meerut.**
2. **Sharma and Gupta- Differential Equation. Pragati. Prakashan Meerut.**
3. **Raysinghania-Differential Equation. Pragati. Prakashan Meerut.**

Reference Book:

1. **D.A. Murray- Introductory course in differential equation. Orient Longman. India 1967**
2. **G.F. Simnons – Differential Equations.Tata Megraw Hill. 1972.**
3. **E.A.Codington – An introduction to Ordinary differential equations. Prentice Hall of India. 1961**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR
FOUNDATION COURSE (MORAL VALUE AND LANGUAGE-II)
Code: FC(Y--204A)

UNIT-I

हिन् दी भाषा:

1. वह तोड़ती पत थर)कविता - (सूर्यकांत त्रिपाठी निराला
2. दिमागी गुलामी)निबंध - (राहुल सांक्रत् यायन
3. वर्ण -विचार) स् वर -व् यंजन, वर्गीकरण, उच् चारण स् थान

UNIT-II

हिन् दी भाषा

1. नारीत व का अभिशाप)निबंध - (म हादेवी वर्मा
2. चीफ की दावत)कहानी - (भीष् म साहनी
3. विराम चिन् ह) -संकलित(

UNIT-III

हिन् दी भाषा: नैतिक मूल् य

1. शिकागो व याख् यान)व् याख् यान - (स् वामी विवेकानंद
2. धर्म और राष् ट्रवाद) -लेख (महर्षि अरविन् द
3. सादगी)आत् मकथा -(महात् मा गांधी
4. चित त जहां भय शून् य)कविता -(रवीन् द्रनाथ टैगोर

UNIT IV

English:

1. Tree: Tina Morris
2. Night of the Scorpion : Nissim Ezekiel
3. Idgah : Premchand (translated by Khushwant singh
4. Letter to God : G.L. Swanteh (translated by Donald a Yates
5. My Bank Account : Stephen Leacock
6. God sees the Truth but waits : Leo Tolstoy

UNIT V

English:

1. Short Essay on given topics
2. Correspondence skills (format & Informal letters and Application)
3. Translation of sentences/passage English to Hindi and Hindi to English.

Suggested Readings: Madhya Pradesh Hindi grant academy, Bhopal published book.

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (COMPUTER SCIENCE) SECOND YEAR

FOUNDATION COURSE (ENVIRONMENTAL STUDIES)
Code: FC(Y—204B)

UNIT I

Study of Environment and ecology: Definition and Importance of Environment and Ecology, Public participation and Public awareness.

UNIT II

Environmental Pollution : Air Pollution, water Pollution, noise Pollution, heat and nuclear pollution- Definition, Causes, effect and prevention of pollution, Disaster management – Flood, Earthquake, cyclones and landslides.

UNIT III

Environment and social problems: Sustainable development- Introduction, Energy problems of cities, solar energy, biogas and wind energy, Water conservation – rain-water harvesting.

UNIT IV

Role of mankind in conserving natural resources: Food resources – World food problem , Energy resources – increasing demand for energy.

UNIT V

Environment conservation laws: Conservation laws for air and water pollution, Wildlife conservation laws, Role of information technology in protecting environment & health.

Suggested Readings:

- **Madhya Pradesh Hindi grant academy, Bhopal published book.**