

“Education for knowledge, science and culture”
-Shikshanmaharshi Dr. Bapuji Salunkhe
Shri Swami Vivekanand Shikshan Sanstha’s
VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR
B. Sc. Part-II Computer Science (Entire)
CBCS Pattern 2022-23
Mathematics
Semester-III: Paper-III
Linear Algebra & Numerical Methods
Theory: 60 Hours (75 Lectures) credits-04

Course Outcomes:

CO1: To learn about matrices and solutions of system of linear equations

CO2: To learn different concepts related to vector spaces and linear transformations

CO3: To use appropriate numerical methods for solving algebraic and transcendental equations

CO4: To study different interpolation methods for given tabulated data

CO5: To use numerical methods for solving integration and ordinary differential equations

Section-I: Linear Algebra

Unit 1: Linear Equations and Matrices **10 lectures**

1.1 Matrices

1.2 Submatrices, Minors of matrix, Rank of matrix

1.3 Linear systems

1.4 Results on system of linear equations and invertible matrices
(Statements only)

1.5 Solutions of Systems of Linear Equations

1.5.1 Gaussian Elimination method

1.5.2 Gauss-Jordan method

1.6 LU Factorization method

Unit 2: Eigen values, Eigen vectors and Diagonalization **8 lectures**

2.1 Eigen values and Eigen vectors

2.2 Diagonalization

2.3 Cayley Hamilton theorem (Statement only) and examples

Unit 3: Real Vector spaces **12 lectures**

3.1 Ring, Integral Domain, Field (only definitions)

3.2 Vector Spaces

3.3 Subspaces

3.4 Linear Dependence and Independence (definition & examples)

3.5 Basis and Dimension

3.6 Rank and Nullity of a matrix

3.7 Inner product space

3.7.1 Definition and examples

3.7.2 Properties of inner product

3.7.3 Orthonormal Basis in \mathbb{R}^n

3.7.4 Gram-Schmidt process

Unit 4: Linear Transformations and Matrices **8 lectures**

- 4.1 Definitions and examples
- 4.2 The Kernel and Range of a linear transformation
- 4.3 The Matrix of a linear transformation

Recommended Books:

- 1. Linear Algebra, Schaum Series.

Reference Books:

- 1. Elementary Linear Algebra with Applications, Howard Anton, Chris Torres, John Wiley and sons., 7th Edition (1994).
- 2. A textbook of Matrices, Shanti Narayan, P. K. Mittal, S. Chand.

Section-II: Numerical Methods

Unit1: Solution of Non-linear Equations **09 lectures**

- 1.1 Introduction
- 1.2 Bisection method: Algorithm and examples
- 1.3 Regula-Falsi method: Algorithm, graphical representation and examples
- 1.4 Newton-Raphson method: Algorithm, graphical representation and examples
- 1.5 Secant method: Algorithm and examples

Unit 2: Numerical Interpolation **09 lectures**

- 2.1 Interpolation, Equally and Unequally spaced data
- 2.2 Definitions of forward difference (Δ), Backward difference (∇) and Shift operator (E)
- 2.3 Elementary results on Δ, ∇, E
- 2.4 Newton-Gregory Forward interpolation formula (with proof) and examples
- 2.5 Newton-Gregory Backward interpolation formula (with proof) and examples
- 2.6 Lagrange's interpolation formula (with proof) and examples
- 2.7 Newton's divided difference formula (with proof) and examples

Unit3: Numerical Integration **10 lectures**

- 3.1 Introduction of numerical integration
- 3.2 General Quadrature formula (with proof)
- 3.3 Trapezoidal rule (with proof) and examples
- 3.4 Simpson's $\frac{1}{3}$ rd rule (with proof) and examples
- 3.5 Simpson's $\frac{3}{8}$ th rule (with proof) and examples

Unit4: Solution of first order ordinary differential equation **09 lectures**

- 4.1 Introduction of first order ordinary differential equation
- 4.2 Euler's method and examples
- 4.3 Euler's modified method and examples
- 4.4 Runge-Kutta method (second and fourth order) and examples

Recommended Books:

- 1. Introductory Methods of Numerical Analysis, S.S. Sastry, 3rd edition, Prentice Hall of India, 1999.

Reference Books:

- 1. Numerical Methods and Operations Research, S.R. Patil and D. M. Pandhare,

Nirali Publication.

2. Finite differences and Numerical Analysis, H.C. Saxena, S. Chand and Company.
3. Applied Numerical Methods, S.S.Patil, Electrotech Publication, Engineering series, 3rd edition.

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B. Sc. Part-II Computer Science (Entire)
CBCS Pattern 2022-23
Mathematics
Semester-IV: Paper-IV
Computational Geometry & Operation Research
Theory: 60 Hours (75 Lectures) credits-4

Course Outcomes:

CO1: To study different types of two and three dimensional transformations

CO2: To learn different generation techniques of curves

CO3: To formulate and apply suitable methods to solve linear programming problems

CO4: To use different methods for solving transportation and assignment problems

CO5: To study different techniques for solving games

Section-I: Computational Geometry

Unit 1: Two dimensional transformations

13 Lectures

1.1 Introduction.

1.2 Representation of points.

1.3 Transformations and matrices.

1.4 Transformation of points.

1.5 Transformation of straight lines.

1.6 Midpoint transformation.

1.7 Transformation of parallel lines.

1.8 Transformation of intersecting lines.

1.9 Transformation: rotations, reflections, scaling, shearing.

1.10 Combined transformations.

1.11 Transformation of a unit square.

1.12 Solid body transformations.

1.13 Transformation and homogeneous coordinates. Translation.

1.14 Rotation about an arbitrary point.

1.15 Reflection through an arbitrary line.

1.16 Projection – a geometric interpretation of homogeneous co-ordinates.

1.17 Overall Scaling.

1.18 Point at infinity.

Unit 2: Three dimensional transformations

12 Lectures

2.1 Introduction.

2.2 Three dimensional – Scaling, shearing, rotation, reflection, translation.

2.3 Multiple transformations.

2.4 Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space.

2.5 Reflection through – coordinate planes, planes parallel to coordinate

planes, arbitrary planes.

- 2.6 Affine and perspective transformations.
- 2.7 Orthographic projections.
- 2.8 Axonometric projections.
- 2.9 Oblique projections.
- 2.10 Single point perspective transformations.
- 2.11 Vanishing points.

Unit 3: Plane Curves

9 Lectures

- 3.1 Introduction.
- 3.2 Curve representation.
- 3.3 Non-parametric curves.
- 3.4 Parametric curves.
- 3.5 Parametric representation of a circle and generation of circle.
- 3.6 Parametric representation of an ellipse and generation of ellipse.
- 3.8 Parametric representation of a parabola and generation of parabolic segment.
- 3.9 Parametric representation of a hyperbola and generation of hyperbolic segment.

Unit 4: Space curves

6 Lectures

- 4.1 Bezier Curves – Introduction, Definition, Properties (without proof)
- 4.2 Curve fitting (upto $n = 3$)
- 4.3 Equation of the curve in matrix form (upto $n = 3$)

Recommended Books:

- 1.Linear Algebra and Computational Geometry,S.R.Patil and D. M. Pandhare, Nirali Publication.

Reference Books:

- 1. Mathematical elements for computer graphics, F. David and J. Alan Adams, McGraw Hill International Edition.
- 2. Computer graphics, Schaum series.
- 3. Computer Graphics handbook, Geometry and Mathematics, M.E.Mortenson, Industrial Press Inc.

Section-II: Operations Research

Unit1: Introduction to Operations Research 04 lectures

- 1.1 Basics of operations research
- 1.2 Different definitions of operations research
- 1.3 Characteristics, scope, limitations of operations research

Unit2: Linear Programming Problem 12 lectures

- 2.1 Basics definitions
- 2.2 Solution of L.P.P by Simplex method and examples
- 2.3 Solution of L.P.P by Big – M method and examples
- 2.4 Definition of Dual Problem
- 2.5 Relationship between solutions of primal and dual problems

Unit3: Transportation and Assignment problem 10 lectures

- 3.1 Basics of Transportation problem
- 3.2 Basic Definitions
- 3.3 Initial Solution
 - 3.3.1 North – West corner method and examples
 - 3.3.2 Matrix minima method and examples
 - 3.3.3 Vogel's approximation method and examples
- 3.4 MODI method and examples
- 3.5 Maximization in transportation problem and examples
- 3.6 Unbalanced transportation problem and examples
- 3.7 Introduction to Assignment problem
- 3.8 Hungarian method and examples
- 3.9 Maximization in Assignment problems and examples
- 3.10 Unbalanced Assignment problem and examples
- 3.11 Assignment problems with restrictions and examples

Unit4: Theory of Games 09 lectures

- 4.1 Basics definitions
- 4.2 Saddle point and examples
- 4.3 Algebraic method for 2×2 size game and examples
- 4.4 Arithmetic method for 2×2 size game and examples
- 4.5 Principal of dominance, Dominance method and examples
- 4.6 Sub-game method for $2 \times n$ & $m \times 2$ size game and examples
- 4.7 Graphical method for $2 \times n$ & $m \times 2$ size game and examples

Recommended Books:

- 1. Numerical Methods and Operations Research, S.R.Patil and D. M. Pandhare, Nirali Publication

Reference Books:

- 1. Operations Research, S. D. Sharma
- 2. Operations Research, Gupta and Hira
- 3. Operations Research, J K Sharma, 2nd edition

MathematicsGEC-1300C Lab-III

Linear Algebra & Numerical Methods

Practical number	Title of practical
1	Gauss Elimination method
2	Gauss Jordan method
3	LU Factorization method
4	Gram Schmidt process
5	Eigen values and Eigen vectors
6	Diagonalizable Matrix
7	Verification of Cayley Hamilton theorem
8	Inverse of a matrix using Cayley Hamilton Theorem
9	Bisection method
10	Regula-Falsi method and Newton-Raphson method
11	Newton Forward and Backward interpolation
12	Lagrange's interpolation
13	Newton's divided difference formula
14	Trapezoidal, Simpson $\frac{1}{3}$ rd, and Simpson $\frac{3}{8}$ th rule
15	Computer program for 1) Euler's method 2) Euler's modified method 3) Runge-Kutta method (second and fourth order)
16	Computer Program for 1) Trapezoidal rule 2) Simpson $\frac{1}{3}$ rd rule 3) Simpson $\frac{3}{8}$ th rule

Mathematics GEC-1300D Lab-IV

Computational Geometry and Operations Research

Practical number	Title of practical
1	Plane Linear transformation 1 Scaling, Shearing, Reflection and Rotation about origin
2	Plane Linear transformation 2 Rotation about arbitrary point, Reflection through arbitrary line Combined transformation matrix
3	Space linear transformation 1 Scaling, Shearing and Rotation about Co-ordinate axis Reflection through Co-ordinate planes, Translation Multiple transformations, Rotation about a line parallel to Co-ordinate axis, Rotation through planes which are parallel to Co-ordinate planes, Reflection through arbitrary planes (algorithm only)
4	Plane Curves 1 Generation of points on circle and ellipse (Algorithm and Examples)
5	Plane Curves 2 Generation of points on parabola and hyperbola (Algorithm and Examples)
6	Bezier Curve: Generation of curve with $n = 2, 3$
7	Linear programming Problem 1 Simplex method (maximization and minimization problems)
8	Linear programming Problem 2 Big – M method (maximization and minimization problems)
9	Initial solution of transportation problem North-West Corner method, Matrix minima method Vogel's approximation method
10	MODI method
11	Transportation problem-minimization
12	Maximization in transportation problem, Unbalanced transportation problem
13	Hungarian method
14	Maximization in assignment problem, Unbalanced assignment problem
15	Game Theory 1 Two-person zero sum game with saddle point Arithmetic method, Algebraic method
16	Game Theory 2 Dominance method, Sub game method, Graphical method

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B. Sc. Computer science Entire Part - II CBCS Syllabus with effect from June, 2022
Semester: III Electronics Paper- III
Electronics GEC-1301 C

INSTRUMENTATION AND COMPUTER ORGANIZATION

Theory: 60 Hours (75 Lectures) credits -04

Course Outcomes:

After completion of this course, students will be able to –

CO1: Describe the working principle, selection criteria and applications of various transducers used in instrumentation systems.

CO2: Gain knowledge about different type of signal conditioning circuits, data converters and Understand construction, working principle of different types of digital instruments.

CO3: To explain the function of each element of a memory hierarchy and Learn about various data transfer techniques in digital computer and the I/O interfaces.

CO4: Understand the basics of hardwired and micro-programmed control of the CPU, pipelined architectures and architecture of 8086 microprocessor.

Section – I

Unit-1: Sensors and Transducers **(12)**

Definition of sensors and transducers, Classification of sensors: Active and passive sensors. Specifications of sensor: (Accuracy, range, linearity, sensitivity, resolution, reproducibility). Temperature transducers: Resistance temperature detector (RTD), Thermistors, Thermocouple (LM-35 and AD590), Pressure transducers: Piezoelectric transducer, capacitive transducer, displacement transducer(LVDT), Optical transducers: (LDR), Passive Infrared sensor (PIR), touch sensor, ultrasonic sensor, Hall effect transducer.

Unit-2: Signal Conditioning **(09)**

Introduction to signal conditioning, Signal conditioning of passive sensors using bridge circuit: Wheatstone’s bridge, Amplifiers: Introduction to Op-Amp Inverting and Non inverting amplifiers Three Op-Amp instrumentation amplifier, Introduction to Op-Amp Attenuators, I to V converter, Sample and Hold circuit, Filters: Concept of Order of filters, active and passive

filters:(Op-Amp based first order filters: Low Pass Filter, High Pass Filter, Band Pass Filter, Band reject filter).

Unit-3: Data Converters (09)

Digital to Analog Converter (DAC): Weighted Resistor, R-2R ladder, Parameters: (Linearity, resolution, accuracy), Analog to Digital Converter (ADC):Types of ADC: Parallel/Flash, Counter type, Successive approximation, Parameters of ADC (Linearity, resolution, conversion time, accuracy).

Unit-4:Data Acquisition System and Digital Instruments (07)

Introduction to Generalized Data Acquisition System (Single channel and multi-channel), Data Logger, Digital Instruments: Digital Multimeter, Digital Frequency Meter, Digital Tachometer, Digital pH Meter, Digital Phase Meter.

Recommended Books:

1. Sensors & Transducers: Dr. A. D. Shaligram: CTC publications.
2. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad PHI: 4th Ed.
3. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Edition.
4. Modern Electronic Instrumentation and Measurement Techniques: Albert D. Helfrick, William D. Cooper: PHI publications.

Section - II

Unit-5:Memory Organization (12)

Memory organization- Basic structure of computer system, Associative Memory, Cache memory, Cache mapping techniques: Direct, Associative, Set associative. Virtual memory, Virtual memory mapping (paging and segmentation).

Unit-6:Input and Output Organization (10)

Need of interface, Block diagram of general I/O interface, Working concepts like Polling, Daisy chain, Interrupt-initiated data transfer. Concept of DMA, DMA transfer, DMA Controller, Serial communication: UART, USB.

Unit-7:CPU Organization (09)

Register based CPU organization, stack organization: concept of PUSH, POP, Top of Stack and Stack pointer, Ascending and Descending stack, Register stack, Memory stack.

Unit-8:Introduction to 8086 microprocessor**(07)**

Evolution of Microprocessor (8086 to Pentium 4), Concept of RISC & CISC, Von-Neumann & Harvard Architecture, 8086 Architecture, Concept of pipeline.

Recommended Books:

1. Computer system Architecture: Morris Mano, Pearson Publication.
2. Computer Organization and Architecture: Designing for Performance, W. Stallings, Eighth Edition, Pearson
3. Microprocessors and Interfacing: Douglas V. Hall, Mcgraw Hill Higher Education.

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B. Sc. Computer science Entire Part - II CBCS Syllabus with effect from June, 2022
Semester: IV Electronics Paper- IV
Electronics GEC-1301 D
8051 Interfacing, Programming and Raspberry Pi
Theory: 60 Hours (75 Lectures) credits -04

Course Outcomes:

After completion of this course, students will be able to –

CO1: Understand the architecture of 8051 microcontroller and knowledge about assembly language programs of 8051.

CO2: Build systems using microcontroller for real time applications.

CO3: Understand the working of Raspberry Pi, its features and how various components can be used with Pi.

CO4: Understand Raspbian OS, Python programming and apply creative thinking skills in the design of practical solutions to specific case studies and projects.

Section - I

Unit-1: Introduction to Microcontroller 8051 (12)

Comparison of Microcontroller & Microprocessor, Architecture of 8051, Internal RAM Structure, SFRS, Pin diagram of 8051, I/O ports structure, Reset and Clock, Registers, Introduction to different types of 8-bit microcontroller like PIC, AVR. Comparison between 8051, AVR, PIC. Applications of microcontroller.

Unit-2: 8051 Instruction Set (09)

Study of 8051 Instruction Set and Addressing Modes, Data transfer, Arithmetic, Logical, Branch and Bit manipulation Instructions, Assemble language programming: Arithmetic and logical.

Unit-3: Facilities in 8051 (09)

Timer and Counter: Timer and Counters, Timer modes, Programming the timers in different modes using assembly / C for time delay generation.

Serial Port: Serial port of 8051, RS-232 standard and IC MAX-232, Baud rate in 8051, Programming for transmitting/receiving character through serial port using assembly / C.

Introduction to Interrupt: Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register (IE, IP).

Unit-4: Real World Interfacing (07)

Programming through embedded C: Interfacing with LED, Liquid Crystal Display (LCD), Analog to Digital Converter (ADC), Digital to Analog Converter (DAC), Stepper Motor and DC motor.

Reference Books:

1. 8051 microcontroller and Embedded system using Assembly and C - Mazidi, Mazidi and McKinley, Pearson Education, 2nd Edition.
2. The 8051 microcontroller - Architecture, programming and applications: K. Uma Rao and Andhe Pallavi, Pearson publications, First Edition.
3. Programming and Customizing the 8051 Microcontroller – MykePredko, Tata McGraw-Hill Publishing Company Ltd, Tata McGraw-Hill Edition.

Section - II

Unit-5: Introduction to Single board computer (12)

Basics of Single board computer, Introduction to ARM Cortex Processor, Raspberry Pi Series and Model, Comparison of various models of Raspberry Pi, Detailed specifications of Raspberry Pi 3B+: CPU, Storage devices, GPIO, Ethernet, Wi-Fi, Bluetooth, Power supply, Ports: USB, Display, Camera etc.

Unit-6: Architecture of Raspberry Pi-3B+, 4 (10)

Block diagram of Raspberry Pi-3B+, 4, Functions of each block, features of Broadcom processor, Pin Description, CPU Architecture: Pipeline stages, Cache Organization, Concept of branch Prediction & Folding, GPU Overview.

Unit-7: Programming of Raspberry Pi using Python (09)

Benefits of Operating system, different types of OS, Overview of Raspbian OS, OS Installation, Configuration of Raspberry Pi, Installation of libraries, Basic Python Programming (Script programming), Functions: I/O function (GPIO, Digital), Time functions (Delays), Library functions Basic Arithmetic Programs.

Unit-8: Interfacing & Python Programming

(07)

Basic: LED and Switch, LCD, Relay and Buzzer Advanced: Internal: Bluetooth, Wi-Fi, Ethernet, I2C, SPI External: Camera interfacing, Serial Communication, GSM, Ultrasonic Sensor, PIR, Fingerprint reader.

Recommended Books:

1. Raspberry Pi Cookbook: Software & Hardware problems and Solutions by Simon Monk, O'Reilly Media, 3rd Edition.
2. Python Crash Course: A Hands on Project-Based Introduction to Programming Raspberry
3. Pi Robotic Projects - Third Edition Machine Learning For Absolute Beginner
4. Raspberry Pi by Eben Upton and Gareth Halfacree - 3rd Edition.
5. Learn Raspberry Pi programming with Python by Wolfram Donat.

Practical Experiments

Group - A

1. Study of temperature sensor LM 35/AD 590
2. Instrumentation Amplifier using OP-AMP
3. 3-bit Flash ADC
4. R-2R ladder DAC
5. Filters (low pass and high pass)
6. Study of pre-amplifier (Inverting and Non-inverting Amplifiers).
7. Study of LVDT
8. Study of PIR sensor
9. Automatic porch light control using LDR
10. Study of Motherboard
11. Wired communication using RS-232 by Terminal software
12. Study of Read write action of RAM
13. Study of Diode matrix ROM
14. Study of Arithmetic and Logic Unit (ALU)

Group - B

15. Interfacing of light emitting diodes (LEDs) with Raspberry Pi
16. Interfacing of Switch and relay with Raspberry Pi

17. Interfacing of Temperature sensor with Raspberry Pi
18. Programming Raspberry Pi for Motion detection
19. Interfacing camera with Raspberry Pi to capture the image
20. Arithmetic and logical operations using 8051 microcontroller (Use 8051 Simulator)
21. Time delay generation using timers of 8051 microcontroller (Use 8051 Simulator)
22. Study the interfacing of Relay and LED using microcontroller 8051
23. Study the interfacing Stepper motor with 8051
24. Study waveform generator (square, triangular and saw tooth using DAC) with microcontroller.
25. Study of interfacing of 16 x 2 LCD.
26. Study the interfacing of ADC IC0804
27. Study the interfacing of DC motor.

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B. Sc. Computer science Entire Part – II CBCS Syllabus with effect from June, 2022

Semester: III Paper-III

CC-CS-1304C

Introduction to RDBMS using MySQL and Object Oriented Programming Using C++

Theory: 60 Hours (75 Lectures) credits -04

Course Outcomes:

The student will be able:

- 1) To draw DFD, ERD, create relational database using normalization and to understand MySQL basics, classify DDL, DML, DCL commands and data constraints, implement SQL operators and functions, build C++ program structure, memory management operators, this pointer and reference variable, implement programs in C++ using control structures, inline function, default argument, function overloading and explain Object Oriented Programming Concepts.
- 2) To explain class, access modifiers and define member functions of a class, static data members and member function, develop the programs using array of object, friend function and friend class, define a constructor, destructor and explain features of constructor, destructor and types of constructor, explain rules for operator overloading and implement programs using unary and binary operator overloading.
- 3) To explain inheritance and define Base class and derived class and implement programs using types of inheritance, define polymorphism and explain types of polymorphism and implement programs using virtual function and explain concept of pure virtual function and abstract class.

Section –I

Introduction to RDBMS using MySQL

UNIT 1. Introduction to RDBMS (07)

- Data, Database, Database Management System, Concept of RDBMS, RDBMS Terminologies : relation, attribute, domain, tuple, entities, DBA & Responsibilities of DBA
- Relational Model: Structure of Relational Databases, Relational Algebra
- Data Flow Diagram: concept of DFD, Symbols, Levels of DFDs, example.

UNIT 2. Introduction to Data Models and Normalization (09)

- Entity Relationship Diagram : Concept of Entity, Attributes, Symbols, Types of relations, examples.
- Normalization: Forms of Normalization – 1NF, 2NF, 3NF, BCNF.

UNIT 3. Introduction to MySQL

(12)

- What is MySQL, features of MySQL,
- Basic Data types in MySQL,
- Classification of Commands : DDL- Create, Alter, Drop, Truncate,
- DML- Insert, Update, Delete, Select.
- DCL- Grant, Revoke.
- TCL- Commit, Rollback, Savepoint.
- Data Constraints : Primary Key, Foreign Key, Unique, NOT Null, Check, Default.
- Select statement with - where, group by, order by clause.
- SQL Operators : Logical, Relational/Comparison, Special - In, Between, Like.
- SQL functions : Arithmetic, Date and time, Aggregate Functions.

UNIT 4. MySQL Sub-queries and Joins

(09)

- Introduction to Sub Queries: Sub queries, Nested Sub query.
- Introduction to Joins: Simple/Inner Two table Join, Left, Right, Outer join, Self join.
- Views, Indexes, Sequence.
- Introduction to Cursors and Trigger.

Reference Book

- MySQL The Complete Reference By Vikram Vaswani
- Learning MySQL by O'reilly
- MySQL in Nut Shell by Dyer 2nd Edition
- MySQL - Joel Murach 2012 edition

Section II Object Oriented Programming Using C++

Unit I. Introduction to C++ and Basics of Object Oriented programming Concepts **12**

Introduction to C++: Structure of C++ program, Input and output Streams, Memory management operators: new and delete, this pointer, Reference variables, Control Structures (looping and branching statements), Functions: inline function, default argument, function overloading. **OOP Concepts:** Data abstraction, Data Encapsulation, Inheritance, Polymorphism, Message Passing

Unit II. Class and Object, constructor and destructor **09**

Class declaration, Access modifiers: public, private, protected, defining member functions (Inside the class and outside the class), array of object, **Constructor and Destructor:** Definition and features of constructor, Types of constructor, Definition, syntax and use of Destructor

Unit III. Static data member and member function, Friend Function, Operator Overloading **08**

Static data members and member function, friend function and friend class, **Operator Overloading: Concept**, Rules for operator overloading, Unary and Binary Operator overloading

Unit IV. Inheritance and Polymorphism **09**

Inheritance: Concept, Definitions of base class and derived class, Types of inheritance (Single, Multiple, Multilevel, Hierarchical and Hybrid inheritance) **Polymorphism:** Definition of polymorphism, Types of polymorphism, virtual function, pure virtual function, Abstract class.

Reference Books

1. K.R.Venugopal, Rajkumar Buyya, Mastering C++, Tata McGraw Hill.2010
2. Pooranchandra Sarang, Object Oriented Programming with C++ ,Prentice Hall .2004
3. Junaid Khateeb, Dr.G.T.Tampi,Computer Programming in C++, Dreamtech.2010
4. Rajendra Akerkar,Sudhakar Bhoite,Glimpses of C++ Object Oriented Programming, Mahalaxmi publication.2002
5. D. Ravichandran , Programming with C++, McGraw Hill.2001
6. Poonam Ponde, Object Oriented Programming with C++, Vision publication.2013

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Semester: IV Paper- IV
CC-CS-1304D
Introduction to Data Structure Using C++ and Cyber Security Essentials
Theory: 60 Hours (75 Lectures) credits -04

Course Outcome:

The student will be able:

1. To define Data Type, Data structure, Data object and explain Abstract Data Type, Linear and nonlinear data structures, explain Algorithm efficiency, array, types of array and sparse matrices, define Stack and demonstrate operations and static implementation of stack, explain applications of stack.
2. To define queue and demonstrate operations and static implementation of queue and explain types of queues, explain Linked list and types of linked list, implement Stack and Queue using Linked list, define Tree and explain tree terminologies and tree traversal.
3. To implement programs using searching and sorting techniques, explain working of computer network and importance of cyber security, understand different security threats and information security management, explain access controls methods and wireless network security, understand cyber security laws and importance of security audit.

SECTION-I

Introduction to Data Structure Using C++

Unit I: Introduction to Data structure and Linear Data Structures (Array) 09

Introduction to Data Structure : Definitions: Data types, Data Object, Data structure, Abstract Data Type (concept), Data Structure classification, Algorithm Efficiency: Complexity, Big O notation, Array: Definition, Types of array (one dimensional and multidimensional), sparse matrices.

Unit II: Searching and Sorting 07

Searching: Linear search and binary search **Sorting:** Bubble Sort, Selection Sort, Insertion sort, Merge Sort

Unit III: Stack and Queue 12

Stack: Definition of Stack, Operations on Stack, Static Implementation of stack Applications of stack: Recursion, inter conversions between infix, prefix and postfix expressions. **Queue:** Definition of Queue, Operations on Queue, Static Implementation of Queue. Types of Queue: Linear, Circular and Priority queue, Applications of Queue.

Unit IV: Linked List, Trees, Searching and Sorting algorithms

09

Linked List: Concept of Linked List, Operations on Linked List, Implementation of Linear Linked List, Types of Linked List, Implementation of stack and queue using linked list Trees: Definition of tree, Tree terminologies, Types of Tree, Tree Traversal(inorder, preorder, postorder).

Reference Books

1. Data Structure using C and C++ -Rajesh Shukla
2. Data Structure using C and C++ - Tanenbaum
3. Data Structure using C++ - E Balagurusamy
4. Data Structure using C++ - Yashwant Kanetkar
5. Data Structure using C++ - D.S.Malik

Section –II

Cyber Security Essentials

- Unit I: Introduction to Computer Network** **9**
Computer Network: Definition, Types of Network, Topologies, Network devices, Internet, Search Engines, Web Browsers, OSI Model, TCP IP Model, IP address scheme, switching techniques.
- Unit II: Introduction to Cyber security** **9**
Introduction to Cyber Security: Definition, Importance, Computer ethics, Hacker, Hacking phases, Hacker classes, Mobile Device Security, File Security, Password Security, Browser Security, Email Security, Encryption, Decryption, Digital Signature, spoofing.
- Unit III: Introduction to information security and threats** **10**
Security Threats: Definition, Types of Threats - Virus, Worms, Trojan Horse, Malware, Ransom ware, Identity theft, Web application threats. Torrent and infected websites, Firewall, types of firewall Antivirus-Definition, Types, features, advantages, limitations, difference between Firewall and Antivirus. Definition of attack, Types of Attacks, DoS attack, phishing, What is cyber crime? and types of crime.
- Unit IV: Access Control and cyber security laws** **10**
Computer Forensics, Steganography, elements of information security and Introduction to Kali linux **Access Controls:** Overview of Authentication and Authorization, Overview of Intrusion Detection Systems and Intrusion Prevention Systems. **Wireless Network Security**-Concept and its security. **Cyber Security Laws:** Security Laws(IT Act India), Intellectual Property Rights(Copyright, Plagarism), Security Audit.

References:

1. Computer Networks - Forozoun (TMH)
2. Computer Networks – Olifer (Wiley-india)
3. Computer Network -AS Tannenbum
4. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyberwar, Hacking) by Harry Colvin (Author)
5. How NOT To Use Your Smartphone by Rodney D Cambridge
6. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book 1) AM. Perry
7. Cyber Security Essentials: James Graham, Richard Howard, Ryon Olson(E-book)
8. Network Security Secrets and Solutions – Stuart McClure, Joe Scambray, George Kurtz.
9. Information Assurance Handbook: Effective Computer Security and Risk Management Strategies – Corey Schou, Steven Hernandez.
10. Applied Network Security Monitoring: Collection, Detection, and Analysis –Chris Sanders, Jason Smith
11. E-Commerce and Security- Kjell Orsborn (E-book)

Lab Course- III

Paper Title: Laboratory Course in Computer Science – III

- **OOP using C++**

1. Write a C++ program to perform arithmetic operations using inline function
2. Write a C++ program to calculate area of circle ,rectangle and triangle using function Overloading
3. Write an object oriented program to display details of n number of students.
4. Write an object oriented program to display salary statement of n number of employees using array of object
5. Write an object oriented program to perform time addition using friend function
6. Write an object oriented program to handle saving account system using constructor and Destructor
7. Write an object oriented program to reverse a string using unary operator overloading
8. Write an object oriented program to perform addition of two complex numbers using binary operator overloading
9. Make a class named Fruit with a data member to calculate the number of fruits in a basket. Create two other class named Apples and Mangoes to calculate the number of apples and mangoes in the basket. Print the number of fruits of each type and the total number of fruits in the basket.
10. Write an object oriented program to display the result of student using hybrid inheritance.
11. Create class Shape, derive the two classes Rectangle and Circle from Shape class and calculate area of rectangle and circle using virtual function.

- **MySQL**

1) Write a MySQL command/Statement to Create a database Student_details and create a table Student inside it with fields – stud_rollno,stud_name, stud_address, stud_course, stud_ph_no and perform following commands:

- i) Display table structure.
- ii) Alter table to add new column marks.
- iii) insert 10 appropriate records.
- iv) display all records in descending order of stud_rollno.
- v) update record of stud_rollno=2 change name from „Supriya“ to „Priya“.
- vi) Display students with lowest and highest marks and count of records using appropriate aggregate functions.
- vii) Display names of students having letter “s” anywhere in their name.
- viii) Delete record of stud_name=08.
- ix) drop table Student.

2) Create following tables and perform following Queries:

- i) table Salesperson with columns s_no, s_name, city, commission.
- ii) table Customers with columns c_no, s_no, c_name, city.
- iii) table Orders with columns order_no, c_no, amount, order_dt.
- iv) Apply following Constraints:
 - a) Add primary key constraint on s_no in salesperson table, c_no on customers table and order_no in orders table.
 - b) Add foreign key constraint on c_no, s_no column in order table.
 - c) Add constraint on customer table to check city which should be from the following list (satara, sangli, Kolhapur, pune).
 - d) add default value „0“ to commissions column of salesperson table.
 - v) Select records from salesperson where city is “Sangli”.
 - vi) Select distinct city from salesperson.
 - vii) Display records whose amount is between 4000 to 5000.
 - viii) Display records of customer whose city is not “sangli” and “Kolhapur”.
- 3) Write a MySQL program to perform following Join Operations:
 - i) Create a table dept_dtls with following fields (dept_no int(5), dept_name varchar2(20), location varchar2(20)).
 - ii) create a table emp_dtls(emp_no int(5), emp_name varchar2(20), job varchar2(20), mgr_no int(5), dept_no int(5));
 - iii) insert 5 relevant records in each table.
 - iv) Perform following queries:
 - a) Use simple join and display dept_name, location, emp_no, emp_name, job.
 - b) Use outer left and outer right join to display information of dept_no, dept_name, location, emp_no, emp_name, job.
 - c) Use self join to display emp_no, emp_name, job, dept_no.
- 4) Write a procedure to accept two numbers from users and perform arithmetic operations on it.
- 5) Write a stored procedure to check whether given number is odd or even.
- 6) Write a stored procedure to check whether given number is prime or not.
- 7) Stored Procedure on table: (cust_id, cust_nm, contact, address, city, code, country).
 - i) Write a stored procedure named "SelectAllCustomers" that selects all records from the "Customers".
 - ii) create a stored procedure that selects Customers from a particular City from the "Customers" table.
 - iii) creates a stored procedure that selects Customers from a particular City with a particular PostalCode from the "Customers".
- 8) Procedures on table: Job1 (job_id, job_title, min_salary, maximum salary)
 - i) Write a procedure using parameter to accept a number to display number of records from a table. (for e.g. number of records=3, will display first 3 records from table Job1).
 - ii) Write a procedure using parameter to display the maximum salary from Job1 table.
- 9) consider tables product(prod_id, prod_nm, sup_nm, unit_price) and table

product_price_history(prod_id, prod_nm,sup_nm,unit_price) write a trigger to store old or previous records in product_price_history which are updated on product table.

10) write a procedure to select data from table using cursor.

Lab Course- IV

Paper Title: Laboratory Course in Computer Science – IV

Data Structure through C++

1. Write a program to perform various operations on array –matrix operations using array, string array program etc
2. Write a program to implement stack using static method.
3. Programs to implement applications of stack
4. Write a program to implement Queue using static method.
5. Programs to implement applications of queue
6. Write a program to create linked list, add node to linked list and Remove node from linked list.
7. Write a program to implement types of linked list
8. Write a program to implement stack and queue dynamically
9. Write a program to sort given elements using insertion sort, bubble sort, selection sort etc.
10. Write a program to search given element using Linear and Binary Search

Nature of Question Paper for all (Theory) papers U.G. Courses under Faculty of Science.

Nature of Question Paper ----- Total 70 Marks

Section-I

Q.1 A) Select Correct alternative and rewrites the sentence (5)

- i)
- ii)
- iii)
- iv)
- v)

Q.1 B) Fill in the Blanks (2)

- i)
- ii)

Q.2) Attempt any Two (16)

- i)
- ii)
- iii)

Q.3) Attempt any Three (12)

- i)
- ii)
- iii)
- iv)
- v)

Section-II

Q.1 A) Select Correct alternative and rewrites the sentence (5)

- i)
- ii)
- iii)
- iv)
- v)

Q.1 B) Fill in the Blanks (2)

- i)
- ii)

Q.2) Attempt any Two (16)

- i)
- ii)
- iii)

Q.3) Attempt any Three (12)

- i)
- ii)
- iii)
- iv)
- v)

