

“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 Syllabus with effect from June, 2022

B. Sc. (Computer Science Entire) – II C B C S PATTERN (2022-23)

Sr. No	Course Name	Paper name	Credits	Marks
Semester III				
1	GEC-1300C1	Linear Algebra	04	70+30=100
2	GEC-1300C2	Numerical Methods		
3	GEC-1301C1	Instrumentation	04	70+30=100
4	GEC-1301C2	Computer organization		
5	CC-CS-1303C1	Introduction to RDBMS using MySQL	04	70+30=100
6	CC-CS-1303C2	OOP Using C++		



	Course Name	Paper name	Credits	Marks
Semester IV				
1	Sr. No	Computational Geometry	04	70+30=100
2		Operation Research		
3	GEC-1301D1	8051 programming,interfacing	04	70+30=100
4	GEC-1301D2	Raspberry Pi		
5	CC-CS-1303D1	Data structure using C++	04	70+30=100
8	CC-CS-1303D2	Cyber security essentials		
9	SEC-BCSD	Python Programming And Sqlite3	04	100
10	AECC-B	EVS	04	70+30=100
11	GEC-1300P2	Mathematics Lab course	04	100
12	GEC-1301P2	Electronics Lab course	04	100
13	CC-CS1303P2	Computer Science Lab Course	04	100
			44	1100

Nature of Question Paper for all (Theory) papers U.G. Courses under Faculty of Science.
Nature of Question Paper ----- Total 80 Marks

Paper-I 40 marks

Q.No.1 Multiple Choice based objective type question 08 Marks

(Four options for each question be given)

Q.No. 2 Attempt any two of the following –long Answers (out of three) 16 Marks

Q.No. 3 Attempt any four of the following -Short Answers - (out of six) 16 Marks

Paper-II

Q.No.1 Multiple Choice based objective type question 08 Marks

(Four options for each question be given)

Q.No.2 Attempt any two of the following –long Answers (out of three) 16 Marks

Q.No. 3 Attempt any four of the following -Short Answers - (out of six) 16 Marks



Semester-III:
Mathematics Paper-III
Linear Algebra & Numerical Methods
Theory: 60 Hours (75 Lectures)

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, use numerical methods for solving integration and ordinary differential equations

Section-I: Linear Algebra

Unit 1: Linear Equations and Matrices

[10]

- 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]

- 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]

- 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]

- 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 Rorres, 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

[9]

- 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

[9]

- 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]

- 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]

- 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.

Mathematics Lab-III
Linear Algebra & Numerical Methods
60 Hours (75 Lectures)

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



Reference Books

1. K.R.Venugopal, RajkumarBuyya, Mastering C++, Tata McGraw Hill.2010
2. PooranchandraSarang, Object Oriented Programming with C++ ,Prentice Hall .2004
3. JunaidKhateeb, Dr.G.T.Tampi,Computer Programming in C++, Dreamtech.2010
4. RajendraAkerkar,SudhakarBhoite,Glimpses of C++ Object Oriented Programming, Mahalaxmi publication.2002
5. D. Ravichandran , Programming with C++, McGraw Hill.2001
6. PoonamPonde, Object Oriented Programming with C++, Vision publication.2013

Electronics Paper- III Electronics GEC-1301 C

Instrumentation and Computer Organization

Theory: 60 Hours (75 Lectures) credits -4

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

(10)

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).



(07)

Unit-3: Data Converters

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).

(08)

Unit-4: Data Acquisition System and Digital Instruments

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).

(09)

Unit-6: Input and Output Organization

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.

(09)

Unit-7: CPU Organization

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

(08)

Unit-8: Introduction to 8086 microprocessor

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.



Computer Science 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:

CO1: 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.

CO2: To implement programs in C++ using control structures, inline function, default argument, function overloading and explain Object Oriented Programming Concepts. , explain class, access modifiers and define member functions of a class, static data members and member function, develop the programs using array of object.

CO3: To explain 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.

CO4: 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

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

Section II

Object Oriented Programming Using C++

Unit I. Introduction to C++ and Basics of Object Oriented programming Concepts 08

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 07

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

07

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

08

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, RajkumarBuyya, Mastering C++, Tata McGraw Hill.2010
2. PooranchandraSarang, Object Oriented Programming with C++ ,Prentice Hall .2004
3. JunaidKhateeb, Dr.G.T.Tampi,Computer Programming in C++, Dreamtech.2010
4. RajendraAkerkar,SudhakarBhoite,Glimpses of C++ Object Oriented Programming, Mahalaxmi publication.2002



5. D. Ravichandran , Programming with C++, McGraw Hill.2001
6. PoonamPonde, Object Oriented Programming with C++, Vision publication.2013

**Semester: III Skill Enhancement course-I
SEC-I**

Introduction to SQLite

Theory: 30 Hours (38 Lectures) credits -2

Course Outcomes:

CO1: Understand the basics of SQLite , able to create, open, drop database files.

CO2: Able to create tables, add and edit data using different constraints, operators, understand data selection and retrieval using clauses etc.

CO3: Able to process data using different SQLite functions

CO4: Able to retrieve data using joins and has overview of Index, Trigger and views.

UNIT 1. Introduction to SQLite

- Downloading and installing SQLite
- Features of SQLite
- Appropriate uses of SQLite: When to use, why to use.
- Limitations of SQLite

UNIT 2. Creating Database, tables with SQLite

- Create, open, drop database files
- SQLite DataTypes
- Create, Alter, drop table with example.

UNIT 3. Introduction to SQLite Queries

- Primary Key and Foreign Key
- Insert, Update, Delete Queries
- Select, Where, LIMIT, OFFSET, Count, Group By
- SQLite operators, functions

UNIT 4. SQLite Joins, triggers, string functions

- Join - Natural Left Outer, Inner, Cross with Table Examples
- Index, trigger and View
- String Functions - REPLACE, SUBSTR, TRIM, ROUND (Examples)

lab course on SEC-I Introduction to SQLite

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.



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

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, 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 [4]

- 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]

- 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]

- 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 [9]

- 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



- 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

ElectronicsPaper- IV
Electronics GEC-1301 D
8051 Programming, Interfacing and Raspberry Pi

Theory: 60 Hours (75 Lectures) credits -4

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 **(8)**

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 **(10)**

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 **(11)**

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

(9)

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 AndhePallavi, 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

(9)

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

(9)

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

(9)

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

(10)

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

Paper I

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-n 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)

Paper II

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



10/1/20

Semester: IV :
Computer science 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:

CO1: 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.

CO2: To implement programs in C++ using control structures, inline function, default argument, function overloading and explain Object Oriented Programming Concepts. , explain class, access modifiers and define member functions of a class, static data members and member function, develop the programs using array of object.

CO3: To explain 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

CO4: 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 Data Structure Using C++

Unit I: Introduction to Data structure and Linear Data Structure (Array) [07]

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 [7]

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

Unit III: Stack and Queue [8]

Stack: Definition of Stack, Operations on Stack and 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 and Trees

08

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:



Unit IV: Linked List and Trees

(08)

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++ -RajeshShukla
2. Data Structure using C and C++ -Tanenbaum
3. Data Structure using C++ - EBalagurusamy
4. Data Structure using C++ - YashwantKanetkar
5. Data Structure using C++ -D.S.Malik

Section -II

Cyber Security Essentials

(09)

Unit I: Introduction to Computer Network

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

(09)

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), SecurityAudit.

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

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.



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_noint(5), dept_name varchar2(20), location varchar2(20)).

ii) create a table emp_dtls(emp_noint(5), emp_name varchar2(20), job varchar2(20), mgr_noint(5), dept_noint(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

Semester: IV Skill Enhancement course-II
Python Programming
Theory: 30 Hours (38 Lectures) credits -2

Course Outcome:

- CO1: To learn how to install Python, start the Python shell and to define the structure and components of a Python program.
CO2: To learn to perform basic calculations, print text on the screen and perform simple control flow operations using if statements and for loops.
CO3: To learn how to use lists, tuples, and dictionaries in Python programs.
CO4: To learn how to reuse code with functions

Unit I: Introduction to Python and Basic Concepts in python

Introduction to python: What is python? , Applications of Python, Why Python? Installation of python, First program in Python, Comments and Docstrings in Python

Variable and data types, Operators in python

File Handling : working with open, read, write, append modes of file

Conditional Statements: Indentation in python, if, if-else, nested if-else statements

Unit II: Looping Statements, Control statements, String Manipulations

Looping Statements: for loop, while loop , Nested loops

Control Statements: break, continue and pass

String Manipulations: Accessing strings, Basic operations, String slices, Functions and methods

Unit III: Python collection

Python collections : list, Tuple, set and dictionary

List: Introduction, Accessing lists, change item value in list, loop through list, methods

Tuple: Introduction, Accessing tuples, change item value in tuple , loop through tuple and methods of tuple

Set: introduction and methods of set

Dictionary: Introduction, Accessing values in dictionaries, properties, Change value in dictionary, loop through dictionary and methods of dictionary.

Unit IV: Functions, Data visualization in python

Functions: Defining a function, Calling a function, Function arguments, Default parameter value, Anonymous function : Lambda function(why use lambda, syntax and examples of lambda).

Data visualization in python: Pandas packages (NumPy and matplotlib libraries)



References:

1. Mark Lutz, Learning Python, 5th Edition, O'reilly .2013
2. Charles Dierbach, Introduction to computer science using python, Wiley.2015
3. Harsh Bhasin, Python for Beginners, New age international publishers.
4. Dr.R.Negeswara Rao, Core python programming, Dreamtech.2018
5. Ajay Ohri, Python for R users, Wiley.2018
6. Laura Cassell and Alan Gauld, Python Projects, Wrox.2018

Lab course:

1. Hello world program in python
2. Python Program to Check Whether a Given Year is a Leap Year
3. Python Program to Check Whether a Number is Positive or Negative
4. Python Program to Take in the Marks of 5 Subjects and Display the Grade
5. Print "1" if a is equal to b, print "2" if a is greater than b, otherwise print "3". Print "Hello" if a is equal to b, and c is equal to d.
6. Python Program to Read a Number n And Print the Series "1+2+.....+n="
7. Python Program to Check if a Number is a Palindrome
8. Python Program to Count the Number of Digits in a Number
9. Python Program to Find the Sum of Digits in a Number
10. Python Program to Print Odd Numbers Within a Given Range
11. Python Program to Find the Factorial of a Number
12. Python Program to check the number is prime or not
13. Python program to print hello world message using function
14. Python Program to Make a Simple Calculator using function
15. Python program to demonstrate lambda function
16. Write a Python programming to display a bar chart of the popularity of programming Languages.
Sample data: Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7
17. Write a Python program to draw a scatter plot comparing two subject marks of Mathematics and Science. Use marks of 10 students.
Test Data: math_marks = [88, 92, 80, 89, 100, 80, 60, 100, 80, 34] science_marks = [35, 79, 79, 48, 100, 88, 32, 45, 20, 30] marks_range = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100]
18. Write a Python programming to create a pie chart with a title of the popularity of programming Languages. Sample data: Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity : 22.2, 17.6, 8.8, 8, 7.7, 6.7



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