

PANJAB UNIVERSITY, CHANDIGARH-160014(INDIA)

(Estd. Under the Panjab University Act VII of 1947—enacted by the Govt.of India)

FACULTY OF SCIENCE

SYLLABI

FOR

BACHELOR OF COMPUTER APPLICATIONS (B.C.A.)

(Under NEP)

(Multi-disciplinary/ Inter-Disciplinary)

(SEMESTER SYSTEM)

(First to Fourth Semester)

FOR

2025 - 2026 Session

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Sem	Level of Course	Course Code	Course Title	Credits			Total Credits
				Th	Pr	Total	
I	L-100	BCA-DSC-1 (Maj)-101	Introduction to Web Technologies	2	--	4	24
		BCA-DSC-1 (Maj)-101P	Practical Based on BCA-DSC-1 (Maj)-101	--	2		
		BCA-DSC-1 (Maj)-102	Fundamentals of Mathematical Statistics	4	--	4	
		BCA-DSC-1 (Min)-103	Problem Solving Through C	2	--	4	
		BCA-DSC-1 (Min)-103P	Practical Based on BCA-DSC-1 (Min)-103	--	2		
		CSA-MDC-101/201/301	E-Commerce	3	--	3	
		AEC-1-101	English-1	2	--	2	
		CSA-SEC-101/201/301	Computer Fundamentals and Personal Computing Software	--	3	3	
		PUN-COMPL-1-101/HCP-COMPL-1-101	Punjabi-1 / HCP-1	2	--	2	
		CSA-VAC-101/201/301/401	Introduction to Blockchain Technology	2	--	2	
		CSA-VAC-102/202/302/402	Introduction to Computer Hardware	2	--		
		CSA-VAC-103/203/303/403	Digital Empowerment	2	--		
		CSA-VAC-104/204/304/404	Ethics of Artificial Intelligence	2	--		

* One credit of theory lecture is of 1 hour duration and one credit of practical is of 2 hours duration.

A student can opt one MDC, SEC and VAC out of given options respectively, unless specified.

A student can opt for a MDC course subject to following conditions:

- a) The student must not have studied that course in 10+2 level.
- b) The student must not have taken that course as a core subject.

Sem	Level of Course	Course Code	Course Title	Credits			Total Credits
				Th	Pr	Total	
II	L-100	BCA-DSC-2 (Maj)-201	Computer Organization	4	--	4	24
		BCA-DSC-2 (Maj)-202	Introduction to Artificial Intelligence and Data Science	2	--	4	
		BCA-DSC-2 (Maj)-202P	Practical Based on BCA-DSC-2 (Maj)-202	--	2		
		BCA-DSC-2 (Min)-203	Object Oriented Programming using C++	2	--	4	
		BCA-DSC-2 (Min)-203P	Practical Based on BCA-DSC-2 (Min)-203	--	2		
		CSA-MDC-102/202/302	Management Information System	3	--	3	
		AEC-2-201	English-2	2	--	2	
		CSA-SEC-102/202/302	Desktop Publishing using GIMP	--	3	3	
		PUN-COMPL-2-201/HCP-COMPL-2-201	Punjabi-2 / HCP-2	2	--	2	
		CSA-VAC-101/201/301/401	Introduction to Blockchain Technology	2	--	2	
		CSA-VAC-102/202/302/402	Introduction to Computer Hardware	2	--		
		CSA-VAC-103/203/303/403	Digital Empowerment	2	--		
		CSA-VAC-104/204/304/404	Ethics of Artificial Intelligence	2	--		

* One credit of theory lecture is of 1 hour duration and one credit of practical is of 2 hours duration.

A student can opt one MDC, SEC and VAC out of given options respectively, unless specified.

A student can opt for a MDC course subject to following conditions:

- a) The student must not have studied that course in 10+2 level.
- b) The student must not have taken that course as a core subject.

Sem	Level of Course	Course Code	Course Title	Credits			Total Credits
				Th	Pr	Total	
III	L-200	BCA-DSC-3 (Maj)-301	Computer Architecture	4	--	4	24
		BCA-DSC-3 (Min)-302	Data Structures	2	--	4	
		BCA-DSC-3 (Min)-302P	Practical Based on BCA-DSC-3 (Min)-302	--	2		
		BCA-DSC-3 (Min)-303	Computer Oriented Numerical Methods	2	--	4	
		BCA-DSC-3 (Min)-303P	Practical Based on BCA-DSC-3 (Min)-303	--	2		
		BCA-DSC-3 (Maj)-304	Introduction to Machine Learning	4	--	4	
		AEC-3-301	English-3	2	--	2	
	L-100	CSA-MDC-103/203/303	Web Development/ Designing	--	3	3	
		CSA-MDC-104/204/304	Introduction to Information Technology	--	3		
		CSA-SEC-103/203/303	Backend Web Development	--	3	3	

*** One credit of theory lecture is of 1 hour duration and one credit of practical is of 2 hours duration.**

A student can opt one MDC, SEC and VAC out of given options, respectively, unless specified.

A student can opt for a MDC course subject to following conditions:

- a) The student must not have studied that course in 10+2 level.**
- b) The student must not have taken that course as a core subject.**

Sem	Level of Course	Course Code	Course Title	Credits			Total Credits
				Th	Pr	Total	
IV	L-200	BCA-DSC-4 (Maj)-401	Operating System Concepts	4	--	4	24
		BCA-DSC-4 (Maj)-402	Data Base Management System	2	--	4	
		BCA-DSC-4 (Maj)-402P	Practical Based on BCA-DSC-4 (Maj)-402	--	2		
		BCA-DSC-4 (Maj)-403	Information System Design and Implementation	4	--	4	
		BCA-DSC-4 (Maj)-404	Cyber Security	4	--	4	
		BCA-DSC-4 (Min)-405	Python Programming	2	--	4	
		BCA-DSC-4 (Min)-405P	Practical based on BCA-DSC-4 (Min)-405	--	2		
		AEC-4-401	English-4	2	--	2	
	L-100	CSA-VAC-101/201/301/401	Introduction to Blockchain Technology	2	--	2	
		CSA-VAC-102/202/302/402	Introduction to Computer Hardware	2	--		
		CSA-VAC-103/203/303/403	Digital Empowerment	2	--		
		CSA-VAC-104/204/304/404	Ethics of Artificial Intelligence	2	--		

* One credit of theory lecture is of 1 hour duration and one credit of practical is of 2 hours duration.

A student can opt one MDC, SEC and VAC out of given options respectively, unless specified.

A student can opt for a MDC course subject to following conditions:

- a) The student must not have studied that course in 10+2 level.
- b) The student must not have taken that course as a core subject.

FIRST SEMESTER

Title: Introduction to Web Technologies

Paper Code: BCA-DSC-1(Maj)-101

Th	Pr	Cr	Theory External Marks: 45
2	2	4	Theory Internal Marks: 05
Level: L-100			Number of Theory Hours : 30 Practical Ext. Marks : 50

Time Duration: 3 Hrs.

Objective: This course enables students to create webpages using HTML, CSS, Javascript and dreamweaver.

Learning Outcomes:

After completing this course students will be able to:

- i. Get familiar with the terms related to World Wide Web.
- ii. Use the front end web site developing technologies like HTML and CSS
- iii. Know about the basics of Java Script.
- iv. Use Dreamweaver for creating Web Pages

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of NINE questions comprising TWO questions from each Unit and ONE compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt ONE question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT-I

Web Terminology: WebServer; Web Client/ Browser, Understanding how a Browser communicate s with a WebServer, Internet, Intranet, Extranet, WWW, URL

Introduction to HTML: Structure of an HTML program, Paragraph Breaks, Line Breaks; Emphasizing Material in a Web Page (Heading Styles, Drawing Lines); Text Styles (Bold, Italics, Underline); Other Text Effects (Centering (Text, Images etc.)); **Lists:** Unordered List, Ordered Lists, Definition lists; **Adding Images:** Img element using Border, Width, Height, Align, ALT Attributes; **Tables:** Caption Tag, Width, Border, Cell padding, Cell spacing, BGCOLOR, COLSPAN and ROWSPAN Attribute

UNIT-II

Linking Documents: Anchor tag, External Document References, Internal Document References and Image Maps

Frames: understanding frames, creating frames, Targeting Named Frames

Cascading style sheets (CSS): Style tag, Link tag, Types of CSS: In-Line, Internal, External Forms: Attributes of Form element, Input element: Text Element, Password, Button, Submit Button, Reset Button, The Checkbox, Radio, TextArea, Select and Option.

UNIT-III

Java Script: Features, tokens, data types, variables, operations, control constructs, strings arrays, functions, core language objects, client side objects, event handling. Applications related to clientsideformvalidation

Other Built-In Objects in JavaScript: The String Object, The Math Object, and The Date Object; User Defined Objects: Creating a User Defined Object, Instances, Objects within Objects

UNIT-IV

Creating Web Pages using Dreamweaver: Introduction to Dreamweaver, Understanding Workspace Layout, Managing Websites, Creating a Website , Using Dreamweaver Templates, Adding New WebPages, Text and Page Format, Inserting Tables, Lists, Images, Adding Links.

Suggested Reading:

Essential :

1. Wanger & Wyke : JavaScript Unleashed, Pearson, Latest reprint NewDelhi.
2. Bayross, Ivan : HTML, DHTML, JAVASCRIPT by BPB, Latest reprint

Further Reading :

3. Joseph Lowery : Adobe Dreamweaver CS6 Bible by Wiley India
4. Kogent Learning Solutions Inc Dreamweaver CS5 in Simple Steps by Wiley India

Practical Based on Paper- BCA-DSC-1(Maj)-101)

Paper Code: BCA-DSC-1(Maj)-101P

Time Duration: 3 Hrs.

Number of Practical Hours: 60

Note : Paper will be set at the time of examination. Due weight-age may be given to the Practical note-book and Assignments in evaluation.

Title : Fundamentals of Mathematical Statistics

Paper Code : BCA –DSC-1(Maj)-102

Th Pr Cr
4 - 4
Level: L-100

Theory External Marks: 90
Theory Internal Marks: 10

Number of Theory Hours :

60

Time Duration: 3 Hrs.

Objective: To teach the students the basic techniques Statistical Methods. After completing this course students will be able to solve various Financial, Scientific and Engineering fields' problems.

Learning Outcomes :

After completing the Course students will be able to

- i. Understand the Basic of Data Collection and Statistical Techniques
- ii. Use and Calculate various measure of central tendency, mean, median, mode, range, deviation.
- iii. Understand the Basic of correlation, measuring techniques and its type.
- iv. Gain an insight into regression analysis, its type and methods of calculation.

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.
- v. The student can use only Basic (Non-programmable) type of Calculator.
- vi. Log tables are allowed. Students may be provided the same for computation.

UNIT - I

Basic Statistics: Types of Statistics, Different Statistical Techniques, Steps in Statistical Investigation, Uses and Limitations of statistics, Collection of Data: Sources of collecting primary and Secondary Data, Limitations of Secondary Data, Criteria of evaluating secondary data, Organization of data, Graphs of Grouped Frequency Distribution, Tabulation of Data, Parts of Table

Measures of Central Tendency: Kinds of measures of central tendency (statistical averages or averages):

Arithmetic Mean: Simple Arithmetic Mean, Methods of calculating Simple Arithmetic Mean, Arithmetic Mean in case of Individual Series, Discrete series and continuous series, Weighted Arithmetic Mean, Combined Arithmetic Mean.

Geometric Mean: Simple Geometric Mean , Methods of calculating Simple Geometric Mean, Geometric Mean in case of Individual Series, Discrete series and continuous series, Weighted Geometric Mean, Combined Geometric Mean.

Harmonic Mean: Simple Harmonic Mean ,Methods of calculating Simple Harmonic Mean, Harmonic Mean in case of Individual, Discrete series and continuous series, Weighted Harmonic Mean, Combined Harmonic Mean.

UNIT - II

Median: Methods of Calculating Median in case of Individual, Discrete series and continuous series

Partition Value: Quartile, Quintiles, Hexiles, Septiles, Octiles, Deciles, Percentiles **Mode:** Methods of Calculating Mode in case of Individual Series, Discrete series and continuous series

Range: Computation of Range, Inter Quartile Range, Computation of Inter Quartile Range, Percentile Range and Computation of Percentile Range.

Mean Deviation, Computation of Mean Deviation, Standard Deviation, Calculation of Standard Deviation, Variance, Calculation of Standard Deviation for individual Series, Discrete Series and Continuous Series, Coefficient of Standard Deviation and coefficient of variation, Combined Standard Deviation, Correcting incorrect Standard Deviation

UNIT - III

Correlation Analysis : Correlation Analysis: Definition, Types of Correlation: Positive, Negative, Simple, Multiple, Partial, Total, Linear and Non-Linear. Need of Correlation Analysis, Correlation and Causation, Techniques for Measuring Correlation: Scatter Diagram Method, Graphic Method, Karl Pearson's Coefficient of Correlation: Correcting incorrect coefficient of correlation, calculating Karl Pearson's coefficient of correlation in case of grouped series, Probable Error, Coefficient of Determination, Spearman's coefficient of Correlation (Rank correlation): Calculation of Correct Coefficient of rank correlation, Difference between Rank Coefficient and Karl Pearson's coefficient of coefficient, Coefficient of concurrent deviation.

UNIT - IV

Regression Analysis (Linear Regression): Definition, Difference between Correlation and Regression, Types of Regression Analysis: Simple, Multiple, Partial, Total, Linear and Non-Linear, Objectives of Regression Analysis, Methods of obtaining regression analysis: Regression Lines, Regression Equations. Methods of obtaining regression equations: Normal Equations and Regression Coefficient, Properties of Regression Coefficient, Standard Error of Estimate, Regression Coefficient in case of Grouped Data, Uses of Regression Analysis and Limitations of Regression Analysis.

Suggested Readings:

1. Gupta S.C, Kapoor V.K. : Fundamentals of mathematical Statistics, Sultan Chand & Sons.
2. Gupta, S.P., 2003 : Statistical Methods, S. Chand.
3. Affi, A.A, 1979 : Statistical Analysis: A Computer Oriented Approach, Academic Press, Inc.

Title: Problem Solving Through C
Paper Code: BCA-DSC-1(Min)-103

Th	Pr	Cr	Theory External Marks: 45
2	2	4	Theory Internal Marks: 05
Level: L-100			Number of Theory Hours : 30
			Practical Ext. Marks : 50

Time Duration: 3 Hrs.

Objective: The objective of this course is to make the student understand programming language concepts, mainly control structures, reading a set of data, stepwise refinement, function and arrays. After completion of this course, the student is expected to analyze the real-life problem and write programs in 'C' language to solve problems. The main emphasis of the course is on problem solving aspect.

Learning Outcomes

On successful completion of the course, students will be able to:

- i. Understand the programming concepts.
- ii. Learn the C programming in practical usage.
- iii. Solve programming problems using C programming language.
- iv. Gain the in depth knowledge of strings, arrays, functions and file handling etc.
- v. Develop applications based on programming concepts.

Note:

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of NINE questions comprising TWO questions from each Unit and ONE compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt ONE question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Programming Process: Steps in developing of a program, Data Flow Diagram, Algorithm development, Flowchart, Testing and Debugging.

Fundamentals of C Languages: History of C, Character Set, Identifiers and Keywords, Constants, Types of C Constants, Rules for Constructing Integer, Real and character Constants, Variables, Data Types, rules for constructing variables.

Operators and Expressions: C Instructions, Arithmetic operators, Relational operators, Logical operators, Assignment Operators, Type Conversion in Assignments, Hierarchy of Operations, Standard and Formatted Statements, Structure of a C program, Compilation and Execution.

UNIT - II

Decision Control Structure: Decision making with IF-statement, IF-Else and Nested IF-Else, The

else if Clause.

Loop Control Structure: While and do-while, for loop and Nested for loop, Case Control Structure: Decision using switch, The goto statement.

Functions: Library functions and user defined functions, Global and Local variables, Function Declaration, Calling and definition of function, Methods of parameter passing to functions, recursion, Storage Classes in C.

UNIT - III

Arrays: Introduction, Array declaration, accessing values in an array, initializing values in an array, Single- and Two-Dimensional Arrays, initializing a 2-Dimensional Array, Memory Map of a 2-Dimensional Array, Passing array elements to a function: Call by value and call by reference, Arrays of characters, Insertion and deletion operations, Searching the elements in an array, Using matrices in arrays, Passing an Entire Array to a Function.

Pointers: Pointer declaration, Address operator “&”, Indirection operator “*”, Pointer and arrays, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, Array of Pointers.

UNIT - IV

String Manipulation in C: Declaring and Initializing string variables, Reading and writing strings, String Handling functions (strlen(), strcpy(), strcmp(), strcat()).

Structures and Unions: Declaration of structures, Structure Initialization, Accessing structure members, Arrays of structure, Nested structures, Structure with pointers, Union.

Files in C: Introduction, Opening and Closing files, Basic I/O operation on files.

Suggested Readings:

1. Yashavant P. Kanetkar : Let us C, BPB Publications, New Delhi.
2. Salaria, R.S. : Test Your Skills in C, Salaria Publications, New Delhi.
3. C. Balaguruswami : Programming with C Language, Tata McGraw Hill, New Delhi.
4. Byron S. Gottfried : Programming in C, McGraw Hills Publishers, New York.
5. M.T. Somashekara : Programming in C, Prentice Hall of India.

Title : Practical Based on Paper – BCA-DSC-1(Min)-103

Paper Code: BCA-DSC-1(Min)-103P

Time Duration: 3 Hrs.

Number of Practical Hours : 60

Note : Paper will be set at the time of examination. Due weight-age may be given to the Practical note-book and Assignments in evaluation.

SECOND SEMESTER

Title : Computer Organization
Paper Code : BCA-DSC-2(Maj)-201

Th **Pr** **Cr**
4 **-** **4**

Theory External Marks: 90
Theory Internal Marks: 10

Level: L-100

Time Duration: 3 Hrs.

Number of Theory Hours: 60

Objective: This course will enable the student to understand the working of logic gates, boolean laws and the basics of digital logic circuits in computer hardware organization. The course will familiarize the student with design and implementation of electronic circuits used in internal computer hardware architecture for various arithmetic, logic and shift micro-operations of the microprocessor.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i Understand concept of number systems, binary arithmetic and computer codes with its application in digital design.
- ii Learn characteristic and working of different logic gates.
- iii Design and simplify logic circuits using boolean algebra and K Maps.
- iv Demonstrate the working of various combinational and sequential circuits used as basic building blocks in internal hardware architecture.

Note

- i The Question Paper will consist of Four Units.
- ii Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv All questions carry equal marks unless specified.

UNIT I

Number System and its conversion: Binary, Octal, Decimal, Hexadecimal; Binary Arithmetic: addition, subtraction, multiplication, division; 8 Bit Signed Arithmetic: signed magnitude, 1's and 2's complement method; Information Representation: fixed and floating point representation; Computer codes: types of codes, BCD, Excess-3, Gray Code, alphanumeric codes – ASCII, EBCDIC, Error detecting and correcting codes- parity, block parity, checksum, CRC and hamming codes.

UNIT II

Logic gates and their characteristics: fan in/ fan out, propagation delay, power dissipation, noise margin, IC logic families; Basic Boolean Algebra: Boolean laws, duality principle, Demorgan theorem, minterm and maxterms, standard form, conversion to canonical form, simplification of circuit design by solving boolean expressions and Karnaugh map ; Universal Gates: conversion of circuits in terms of NAND or NOR only.

UNIT III

Combinational Circuit Design – Adders: Half adder, Full adder, Serial & n bit Parallel Adder, FA using two HAs; Subtractors: Half and Full Subtractor (n bit FS by 1's and 2's Complement) ; Code Convertors : Decoder and Encoder ; Chip Cascading : 4x16, 5x32 decoder using 2x4 and 3x8 decoders ; Multiplexer, Demultiplexer and their applications.

UNIT IV

Sequential Circuit Design – Flip Flops : Bistable circuit, SR FF, edge triggered with preset & clear, D Type FF, propagation delay, setup & hold time, JK FF, avoidance of race around condition in JK M/S FF, Toggle FF ; Working of Register and Shift Registers : SISO, SIPO, PISO, PIPO ; Counters : Asynchronous n bit counter, Up Down counter, Synchronous counter, applications and comparison.

Suggested Readings:

Essential :

1. M. Morris Mano, 2016. : Digital Logic and Computer Design, Pearson India Education Services Pvt. Ltd.

Further Reading :

2. F. J. Hill, G.R. Peterson, 2009 : Introduction to Switching Theory & Logic Design, John Wiley & Sons Inc.

3. Thomas L. Floyd, 2013 : Digital Fundamentals – A Systems Approach, Pearson International.

Title : Introduction to Artificial Intelligence and Data Science

Paper Code: BCA-DSC-2(Maj)-202

Th	Pr	Cr	Theory External Marks: 45
2	2	4	Theory Internal Marks: 05
			Number of Theory Hours : 30
L-100			Practical Ext. Marks: 50

Time Duration: 3 Hrs.

Objective: The course will help students to learn the basics of Artificial Intelligence and Data Science. It further aims to make them analyze data using spreadsheets.

Learning Outcomes

On successful completion of this course, a student will be able to

- i. understand basics of Artificial Intelligence and Data Science.
- ii. analyze data using spreadsheet software.
- iii. visualize, search and summarize the data using spreadsheet.

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Introduction to Artificial Intelligence (AI): Definition, Types of AI, History of AI, Applications of AI in healthcare, education and agriculture, Introduction to key technologies of AI: Machine Learning, Deep Learning, Natural Language Processing (NLP), Computer Vision, Robotics; Ethical issues and Future of AI. Problem Solving: AI problems, Agents and Environments, Structure of Agents.

UNIT - II

Data Science: Introduction to Data Science, evolution and need for Data Science, Types of Data, Data Science Applications in Various Fields, Data Science Life Cycle or Project Stages, Data collection, Data Pre-Processing Overview – Data Cleaning, Data Integration and Transformation, Data Reduction – Data Discretization, Data Storage and management, careers in Data Science

UNIT - III

Managing Data with Spreadsheet Software: Creating a database, sorting & filtering data, custom sorting and advanced filtering, defining and grouping database ranges, applying data tools like data validation, removing duplicates, text to columns, Flash fill; Managing data using Math, statistical, Trigonometric, String/Text, Date and Time, logical and Database functions, Nested functions.

UNIT - IV

Data Visualization, Searching and Summarizing using Spreadsheet Software: Understanding Chart types, Creating Embedded Charts, formatting Charts: Changing Chart types, adding Titles, Legends and Gridlines, Printing Charts, searching data using HLOOKUP and VLOOKUP, summarizing data using pivot table, analyzing data using What-if Analysis: goal seek, scenario manager and data Table.

Suggested Readings:

1. D.Venu Gopal, Data Science and Artificial Intelligence for Beginners Paperback
2. Sudhir Reddy Navar, Introduction to AI/ML and Data Science Paperback
3. C. Raju, Data Science: A Beginner's Guide Paperback
4. Sharma, A, Essentials of AI and Soft Computing, PHI Learning, 2024
5. Kevin Knight, Elaine Rich, B. Nair - Artificial Intelligence, TMH
6. Manish Nigam, Data Analysis with Excel Paperback, BPB Publications
7. Mali, L. ., Libre Office 5.1 Writer, Calc: Math Formula Book- Vol 1. Notion Press.
8. L. Winston Wayne, Microsoft Excel: Data Analysis & Business Model Paperback

Title: Practical Based on Paper – BCA-DSC-2(Maj)-202

Paper Code: BCA-DSC-2(Maj)-202P

Time Duration: 3 Hrs.

Number of Practical Hours: 60

Note : Paper will be set at the time of examination. Due weight-age may be given to the Practical note-book and Assignments in evaluation.

Title: Object Oriented Programming using C++

Paper Code : BCA-DSC-2(Min)-203

Th	Pr	Cr	Theory External Marks: 45
2	2	4	Theory Internal Marks: 05
			Number of Theory Hours : 30
Level: L-100			Practical Ext. Marks : 50

Time Duration: 3 Hrs.

Objectives: By the end of the course, students will be able to write C++ programs using the more esoteric language features, utilize Object Oriented techniques to design C++ programs, use the standard C++ library, and explore advanced C++ techniques.

Learning Outcomes :

On successful completion of the course, students will be able to:

- i. Understand the features and importance of object oriented programming concepts.
- ii. Use the concepts like inheritance, polymorphism, and dynamic binding to develop codes.
- iii. Gets better understanding of developing reusable components using C++ programming.
- iv. Develop of large software that needs bottom up and better modular approach.

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of NINE questions comprising TWO questions from each Unit and ONE compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt ONE question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Principles of Object-Oriented Programming (OOP): Introduction to OOP, Difference between OOP and Procedure Oriented Programming; Concepts: Object, Class, Encapsulation, Abstraction, Polymorphism and Inheritance, Applications of OOP. Special operators: scope resolution operator, Member Dereferencing operators, Memory management operators, Manipulators and Type cast operator.

Structure of a C++ Program and Classes and Objects: Class Declaration: Data Members, Member Functions, Private and Public members, Creating Objects, accessing class data members, Accessing member functions; Class Function Definition: Member Function definition inside the class declaration and outside the class declaration.

UNIT - II

Friend function, inline function, Static data members, Function Overloading, Arrays within a class.

Arrays of Objects; Objects as function arguments: Pass by value, Pass by reference, Pointers to Objects.

Constructors: Declaration and Definition, Types of Constructors, (Default, Parameterized, Copy Constructors). Destructors: Definition and use.

Operator Overloading: Concept of Operator Overloading, Overloading unary and binary operators.

UNIT - III

Inheritance: Extending Classes Concept of inheritance, Base class, defining derived classes, Visibility modes: Public, Private, Protected; Types of Inheritance: Single inheritance:

Privately derived, publicly derived; Making a protected member inheritable, multilevel inheritance, multiple Inheritance and ambiguity of multiple inheritance, Hierarchical Inheritance, Hybrid, Nesting of classes.

Polymorphism: Definition, Application and demonstration of Data Abstraction, Encapsulation and Polymorphism, Static and Dynamic Polymorphism, Virtual Functions, pure virtual functions.

UNIT - IV

Exception Handling: Definition, Exception Handling Mechanism: Throwing mechanism and Catching Mechanism, Rethrowing an Exception

File Processing: Opening and closing of file, Binary file operations, structures and file operations, classes and file operations, Random file processing.

Suggested Readings :

1. E. Balaguruswamy, 2008 : Object Oriented Programming with C++, TMH.
2. Bjarne Stroustrup, 2009 : The C++ Programming Language, Addison-Wesley Publishing Company.
3. Robert Lafore, 2003 : Object Oriented Programming in Turbo C++, Galgotia Pub.
4. Salaria, R. S. : Object Oriented Programming Using C++, Khanna Book Publishing Co. (P.) Ltd., New Delhi.

Title: Practical Based on Paper – BCA-DSC-2(Min)-203

Paper Code: BCA-DSC-2(Min)-203P

Time Duration: 3 Hrs.

Number of Practical Hours: 60

Note: Paper will be set at the time of examination. Due weight-age may be given to the Practical note-book and Assignments in evaluation.

SEMESTER III

Paper Title : Computer Architecture
Paper Code: BCA-DSC-3(Maj)-301

Th	Pr	Cr	Theory External Marks: 90
4	-	4	Theory Internal Marks: 10
Level: L-200			Number of Theory Hours: 60

Time Duration : 3 Hrs

Objectives: This course will enable the student to understand the basic computer organization and its internal hardware architecture design.

Learning Outcomes :

On successful completion of the course, students will be able to:

- i. Understand basic computer organization and its architecture.
- ii. Learn how micro-operations, interrupt and instruction cycles are executed in logic circuits.
- iii. Learn basic features, memory, input output organization of a simple microprocessor.

Note :

The Question Paper will consist of Four Units.

- i. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- ii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iii. All questions carry equal marks unless specified.

UNIT I

Definition of computer organization, design and computer architecture ; Digital Systems : basic block diagram of computer ; ALU design : Register Transfer Language, bus and memory transfer; Microoperations and their hardware implementation: Arithmetic microoperations - binary adder subtractor, binary incremter, arithmetic circuit; Logic microoperations – logic circuit; Shift microoperations – 4 bit combinational shifter; Arithmetic Logic Shift Unit.

UNIT II

Basic Computer Organization : stored program organization, Von Neumann architecture ; microoperations and macrooperations ; instruction code format, direct and indirect addressing ; basic computer registers ; Types of instructions - memory reference, register reference , input output instructions ; Common bus system; instruction cycle ; interrupt cycle ; types of interrupts ; Introduction to assembly language , assembly language vs machine language.

UNIT III

Memory organization : memory hierarchy ; RAM and ROM chips, memory connection of four 128x8 RAM and one 512x8 ROM chip to CPU ; Associative memory; Cache memory -

associative, set associative and direct mapping; Virtual memory - paging and segmentation; Microprocessor architecture: 8086/8088 - features, block diagram, memory and register organization, flag register, addressing modes.

UNIT IV

Input Output organization : input output interface ; IOP design, isolated I/O , memory mapped I/O ; Asynchronous data transfer: source initiated - destination initiated strobe control and handshaking modes of transfer ; programmed I/O data transfer, interrupt initiated data transfer ; Direct Memory Access : DMA controller, cycle stealing and burst mode DMA transfer.

Suggested Readings:

1. Mano, M. Morris: Computer System Architecture, Third Edition, Pearson Education India, 2007.
2. Mano, M. Morris, Contributor Mall, Rajib : Computer System Architecture, Revised Third Edition, Pearson Education India, 2017.
3. Stallings, William : Computer Organization and Architecture : Designing for Performance, 11th Ed. Pearson Education India, 2022.
4. Hayes , John P. : Computer Architecture and Organization, 3rd Ed, McGraw Hill Education, 2017.
5. Chaudhuri, P.Pal : Computer Organization and Design, 3rd Ed, Prentice Hall of India Learning Pvt. Ltd., 2008.

Paper Title: Data Structure
Paper Code: BCA-DSC-3(Min)-302

Th	Pr	Cr	Theory External Marks : 45
2	2	4	Theory Internal Marks : 05
Level: L-200			Number of Theory Hours : 30

Time Duration: 3 Hrs.

Objective: To teach the students various data structures and the basic operations performed using them. At the end of course the student will have complete knowledge of data structures, thus will be able to use them for solving real world problems.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i. Choose appropriate data structure as applied to specified problem definition.
- ii. Handle various operations on different data structures.
- iii. Analyze the time and space complexity of different data structures and their associated algorithms, using Big O notation.
- iv. Identify and discuss the application of various data structures in real-world software development and systems.

NOTE:

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Basic Concepts: Introduction to Complexity, Data Structure and Data Structure operations. Applications of Data Structure, Basic data Structures.

Arrays: Introduction, Types of Arrays, Memory representation, Applications and operations.

Stacks: Introduction, memory representation, Applications and operations, Recursion.

UNIT - II

Linked List: Definition, Types of Linked List: Singly, Doubly, Header, Circular linked List, Operations -traversing, searching, inserting, deleting, operations on singly linked list and doubly linked list, memory representation, Applications, polynomial manipulation.

Queue: Introduction, Types, Memory Representation and Applications.

UNIT - III

Trees – Definition and Basic concepts, Representation in Contiguous Storage, Binary Tree, Binary Tree Traversal, Searching, Insertion and deletion in Binary trees, Binary Search tree. **Graphs:**

Introduction, Memory Representation, Graph Traversal (DFS and BFS)

UNIT IV

Searching: Binary and Linear Search;

Sorting: Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick sort. Comparison of various Searching and Sorting algorithms.

Suggested Readings:

1. Schaum Lipschutz, “Data Structures with C”, Schaums’ Outlines Series, Indian Edition, 2nd Edition, 2017, Tata McGraw Hill.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd Edition, 2018, W.H. Freeman and Company.
3. “Data Structures Through C” by Yashavant Kanetkar, 4th Edition, 2022, BPB publication.
4. “Data Structures and Algorithms using C” by R. S. Salaria, 2nd Edition, 2022, Khanna Publishing.
5. “Data Structures Using C” by E Balagurusamy, 1st Edition, 2017, Tata McGraw Hill.
6. Gilberg and Forouzan: “Data Structure-A pseudocode approach with C”, 2nd Edition, 2005, Cengage Learning.
7. “Data Structures Using C” by Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, 1st Edition, 2019, Pearson Publication.

Paper Code: BCA-DSC-3(Min)-302P
(Practical Based on paper BCA-DSC-3(Min)-302)

Practical External Marks: 50
Number of Practical Hours : 60

Time Duration: 3 Hrs.

List of Practicals : Implementation of Programs in C for Data Structures

- Implementation of Program to perform the following operations on an Array
 - Traversal
 - Insertion
 - Deletion

- Implementation of Program to sort the given list using:
 - Bubble Sort
 - Insertion Sort
 - Selection Sort
 - Merge sort
 - Quick sort

- Implementation of Program to search an element using:
 - Linear search
 - Binary Search

- Program to Implement Stack using an array
- Program to implement Linear Queue using an array
- Program to Implement Circular Queue using an array
- Program to implement Linear Linked List
- Program to implement Doubly Linked List
- Program to perform Insertion in a Binary tree
- Program to perform Deletion in a Binary tree
- Program to perform Searching in a Binary tree
- Program to perform Traversal in Graph

Title: Computer Oriented Numerical Methods
Paper Code: BCA-DSC-3(Min)-303

Th	Pr	Cr	Theory External Marks : 45
2	2	4	Theory Internal Marks : 05
Level: L-200			Number of Theory Hours : 30

Time Duration : 3 Hrs

Objective: To teach students essential techniques of numerical methods in order to solve complex mathematical problems with computer programs useful in various scientific and engineering applications.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i. Understand the importance of error analysis and how errors propagate in numerical computing of mathematical problems.
- ii. Learn how to solve linear, non-linear equations, differential equations using numerical methods.
- iii. Learn how to integrate and interpolate for given set of data.
- iv. Learn algorithms to implement numerical methods when it's not possible to solve a problem analytically.

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.
- v. The student can use only **Basic Scientific (Non-programmable and Non-storage) Calculator**.
- vi. Log tables are allowed. Students may be provided the same for computation

UNIT I

Numerical and Error Analysis : Introduction, need of numerical methods, numerical analysis vs numerical methods ; Concept of exact and approximate numbers, accuracy and precision, significant digits ; Measures of Error: absolute error, relative error and percentage error; Types of error : blunder, modeling, inherent, numerical (round off, chopping and truncation) errors; Error Propagation in addition, subtraction, multiplication and division operations; Arithmetic of normalized floating point numbers and its error consequences.

UNIT II

Types of Equations : Linear, quadratic, higher degree polynomial equations, transcendental equations.

Non-Linear Equations:Methods to find solution of a non-linear equation : direct vs indirect method,bracketing vs open end iterative method ; Choosing initial approximation: largest possible root, search bracket, search interval; Termination criteria; Intermediate value theorem; Algorithm and methods to find roots of a non-linear equation : Bisection Method, False position method, Newton Raphson Method, BirgeVieta Method.

UNIT III

Simultaneous Linear Equations:Algorithm and methods to find solution of simultaneous linear equations :Direct Methods – Gauss Elimination Method, Concept of Pivoting , Gauss-Jordan Method ; Iterative Method – Gauss Seidal Method.

Interpolation:Need of interpolation, interpolation vs extrapolation ; Finite Differences – forward, backward, divided difference tables ; Methods to interpolate for given value using Newton’s Forward Difference Method, Newton’s Backward Difference Method, Newton’s Divided Difference Method and Lagrange’s Method. Concept of Inverse Interpolation.

UNIT IV

Numerical Integration:Methods and algorithm of Newton-Cotes Integration Formulae: Trapezoidal Rule, Simpson’s 1/3rd Rule, Simpson’s 3/8th Rule.

Ordinary Differential Equations:Methods and algorithm to find solution of ODEs using Euler’s Method, Runge–Kutta Methods - 2nd order & 4th order, Predictor Corrector Method - Modified Euler’s Method.

Suggested Readings:

1. Salaria, R.S. : Computer Oriented Numerical Methods : Theory, Problems, Algorithms & Implementation Using C, C++ & Python Languages, Sixth Edition, Khanna Publishers, New Delhi, 2023.
2. Rajaraman, V. : Computer Oriented Numerical Methods, 4th Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2019.

Paper Code: BCA-DSC-3(Min)-303P
(Practical Based on BCA-DSC-3(Min)-303)

Practical External Marks: 50
Number of Practical Hours : 60

Time Duration: 3 Hrs.

Programs in C/C++ for Numerical Methods :

1. Implementation of Program to find root of given non linear equation using :
 - Bisection Method
 - False Position Method
 - Newton Raphson Method
 - BirgeVieta method
2. Implementation of Program to find solution of simultaneous linear equations :
 - Gauss Elimination Method
 - Gauss Jordan Method
 - Gauss Seidal Method
3. Implementation of Program to interpolate for given value :
 - Equal Intervals : Newton's Forward Difference / Newton's Backward Difference Method
 - Unequal Intervals : Newton's Divided Difference Method / Lagrange's Method
4. Implementation of Program for Numerical Integration :
 - Trapezoidal Rule
 - Simpson's 1/3rd Rule / Simpson's 3/8th Rule
5. Implementation of Program to find solution of ODEs :
 - Runge-Kutta Method
 - Euler's Method

Title: Introduction to Machine Learning
Paper Code: BCA-DSC-3(Maj)-304

Th	Pr	Cr	Theory External Marks: 90
4	-	4	Theory Internal Marks: 10
Level: L-200			Number of Theory Hours: 60

Time Duration: 3 Hrs.

Objective: The course aims at introducing basic concepts of machine learning and implementation of machine learning algorithms.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i. Learning the basics of Machine Learning and its applications.
- ii. Understanding of data preprocessing, regression use in machine learning and data reduction.
- iii. Understanding of supervised learning algorithms and its implementation.
- iv. Understanding of unsupervised learning algorithms and its implementation. Basic understanding of deep learning.

Note :

The Question Paper will consist of Four Units.

- i. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- ii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iii. All questions carry equal marks unless specified.

UNIT-I

Introduction: Concept of Machine Learning, Supervised and Unsupervised learning, Training vs Test Data, Reinforcement learning, Designing a Learning System, Issues in Machine Learning, Applications of Machine Learning.

UNIT-II

Data Preprocessing: Understanding of data and its preprocessing, normalizing data, feature scaling and feature selection techniques, Overfitting, Data reduction using Principal Component Analysis.

UNIT-III

Supervised Learning: Concept of Classification, Decision tree, k-nearest neighbor, Naïve Bayes Classifier, Support Vector Machine, Neural Networks and backpropagation algorithm, Classification evaluation metrics.

UNIT-IV

Unsupervised Learning and Deep Learning: K-means Clustering, Limits of K-Means, DBSCAN, Concept of Deep Learning, Architecture of Convolutional Neural Networks and Recurrent Neural Networks.

Suggested Readings:

1. Andreas . C. Müller and S. Guido, "Introduction to Machine Learning with Python," O'Reilly, 2017
2. Amanda . Casari and Alice . Zheng, "Feature Engineering for Machine Learning," O'Reilly Media, Inc., 2018,

3. Sharma, A., Essentials of AI and Soft Computing, PHI Learning, 2024
4. Mitchell, T.M., Machine Learning, McGraw Hill Education, 2017.
5. Ian Goodfellow, Yoshua. Bengio, and Aaron. Courville, "Deep Learning," MIT Press, 2016
6. Alpaydin, E., Introduction to Machine Learning, MIT press, Fourth edition, 2020.

Paper Title: Operating System Concepts

Paper Code: BCA-DSC-4(Maj)-401

Th	Pr	Cr	Theory External Marks: 90
4	-	4	Theory Internal Marks: 10
Level: L-200			Number of Theory Hours: 60

Time Duration: 3 Hours.

Objective: The objective of the module is to make the student understand the basic concepts of an operating system mainly the functions of an operating system, various types of operating systems and how the operating system plays a significant role in various aspects of computing including hardware, memory and other computer resources. The module introduces Linux operating system structure, concepts and commands.

Learning Outcomes:

On successful completion of the course, students will be able to understand:

- i. Operating system features, types and functions
- ii. Process Management and Scheduling algorithms
- iii. Deadlocks and Banker's algorithm
- iv. Memory management techniques
- v. Basic Linux programming

Note:

The Question Paper will consist of Four Units.

- i. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- ii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iii. All questions carry equal marks unless specified.

UNIT - I

Operating Systems (OS): Introduction, its needs and services, Types of OS: Multi-user, Multitasking, Multiprocessing and Real time Operating Systems, Parallel systems, Distributed systems.

Process Management: Introduction to Process, PCB, Process States, CPU Scheduling: Scheduling Criteria and Algorithms: FCFS, SJF, Priority, Round Robin, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling.

UNIT - II

Deadlocks: Necessary and sufficient conditions for Deadlocks, Introduction to methods for handling deadlocks, deadlock detection and recovery.

Memory Management: Logical vs Physical address space, Swapping, Fragmentation: External and Internal, Compaction, Introduction to Paging, Segmentation, and Virtual Memory-Demand paging, Introduction to Page Replacement algorithms: FIFO, Optimal Page replacement and LRU.

UNIT - III

Introduction to Linux: Linux's shell, Kernel, Features of Linux, History, Minimum system requirements, Boot and Root disks, Starting and stopping Linux system, logging in and out.

General-Purpose Utilities: cal, date, echo, printf, bc-The calculator, script, passwd, pager (more and less), Terminal Handling commands: who, uname, tty.

Using file system: Introduction to common types of files, Filenames, Introduction to different types of directories: Parent, Subdirectory, Home directory; rules to name a directory,

Important directories in Linux File System, Absolute and relative filenames.

File and Directory handling commands: creating files and directories (cat, mkdir), change directory (cd), listing files (ls), pwd, moving and copying files (mv, cp), moving directories, removing files and directories (rm, rmdir), File handling commands: word count (wc), comparing two files (cmp), common between file (comm), converting one file to other (diff), using wildcards with files and directories. File and directory permissions, change/set file permissions using relative and absolute methods, Changing group ownership, umask settings, Understanding wildcards, Environment variables.

Understanding I/O Redirection and Piping, tee; Simple filters: pr, head, tail, cut, paste, sort, uniq; Introduction to Regular Expressions and grep.

UNIT - IV

Process Management: Types of processes, ps, bg, fg, nice, kill.

vi editor: starting vi, vi modes, inserting text, quitting vi, deleting text, copying and moving text, searching and replacing text.

Basic Shell Programming: Shell script, read, if statement, numeric and string comparison operators, case statement, expr command, loops (while and for).

System Administration activities: Superuser (su) command, Taking backups using tar, Managing disk space, Mounting and Un-mounting file system, Managing users, Managing printers with lpd, mknod, lpc, lpq, lprm.

Suggested Readings:

1. Peterson, J.L.& Silberschatz, A., Operating System Concept, Addison Wesley, reading.
2. John Goerzen: Linux Programming Bible, IDG Books, New Delhi, 2000.
3. A.S. Tenenbaum: Operating System: Design and Implementation PHI, 1989.
4. Petersen Richard :Linux: The Complete Reference, McGraw Hill ,2017
5. Brinch, Hansen, Operating System Principles, Prentice Hall of India
6. Haberman, A.N., Introducing to Operating System Design Galgotia Publication, New Delhi.
7. Sumitabha Das: Your Unix - The Ultimate Guide, TMH, 2000.

Title: Database Management System
Paper Code: BCA-DSC-4(Maj)-402

Th	Pr	Cr	Theory External Marks : 45
2	2	4	Theory Internal Marks : 05
Level: L-200			Number of Theory Hours : 30

Time Duration: 3 Hrs

Objective: This course aims at giving the students the insight of the underlying concepts of database management system and implement them using Database software.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i. Gain a solid grasp of fundamental database concepts.
- ii. Understand the basic elements of a relational database management system
- iii. Master the basics of SQL and construct queries using SQL
- iv. Understand the programming concepts using PL/SQL

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Basic Concepts: A Historical perspective, File Systems vs. DBMS, Characteristics of the Data Base Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of DBMS, Data Base Systems Concepts and Architecture: Schemas and Instances, DBMS architecture and Data Independence, Data base languages & Interfaces, DBMS functions and component modules, Entity Relationship Model: Entity Types, Entity Sets, Attributes & Keys, Relationships, Relationship Types, Roles and Structural Constraints, Design issues, weak entity types, E-R Diagrams. Design of an E-R Database Schema

UNIT - II

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra - Basic Operations.

Conventional Data Model: An overview of Network and Hierarchical Data Models.

Relational Data Base Design : Functional Dependencies, Decomposition, Desirable properties of decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF and BC NF).

RDBMS: Terminology, The 12 Rules (Codd's Rule) for an RDBMS.

UNIT - III

Understanding SQL-1: Data Types, Creating Tables, Creating a Table with data from Another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, Dropping a Column, Querying database tables, Conditional retrieval of rows, Working with Null Values, Matching a pattern from a table, ordering the result of Query Aggregate Functions, Grouping the Result of a Query, creation and deletion of Views, Managing privileges with Grant and Revoke Command, COMMIT and ROLLBACK, Functions: Character Functions, Date Functions, Group Functions

UNIT - IV

Understanding SQL-II: Querying Multiple Tables using Equi-Joins, Cartesian Joins, Outer Joins, Self-Joins, SET Operators: Union, Intersect, Minus; Introduction to Nested Queries

PL/SQL: Introduction to PL/SQL, The Advantage of PL/SQL, PL/SQL Block Structure, PL/SQL Architecture, Fundamentals of PL/SQL, PL/SQL Data Types, Variables and Constants, Scope and Visibility of a Variable, Assignments and Expressions, Operator Precedence, Conditional and Iterative Control, Cursor Management in PL/SQL, Implicit/explicit Cursor Attributes, Exception Handling in PL/SQL; Predefined Exceptions, User Defined Exceptions, Database Trigger, types of triggers, dropping triggers.

Suggested Readings:

1. Elmasri & Navathe: Fundamentals of Database systems, 2017, 7th Edition, Addison Wesley, New Delhi.
2. Ivan Bayross: SQL, PL/SQL, 2020, Fourth Edition, BPB Publication, New Delhi.
3. C.J.Date : An Introduction to Data bases Systems 8th Edition, 2003, Addison Wesley, New Delhi.
4. Korth & Silberschatz: Database System Concept, 2010, 6th Edition, McGraw Hill International Edition
5. Bipin C. Desai : An Introduction to Database System, 2015, Galgotia Publication, New Delhi
6. Raghuram Krishnan & Johannes Gehrke: Database Management Systems, 2002, 3rd edition, McGraw Hill International Edition.

Paper Code: BCA-DSC-4(Maj)-402P
(Practical Based on paper BCA-DSC-4(Maj)-402)

Total Practical Marks: 50
Number of Practical

Hours: 60

Time Duration: 3 hours

List of Practicals :

Implementation of SQL concepts

DDL, DML, DCL, TCL, Data Retrieval, Functions, Aggregate Functions, Views, Joins, Set Operators

Implementation of Programs in PL/SQL

1. Write PL/SQL blocks to show the declaration of variables.
2. Write a PL/SQL program to check whether a number is even or odd
3. Write a PL/SQL program to find greatest of three numbers
4. Write a PL/SQL program to display the grade of a student using else-if ladder.
5. Write a PL/SQL program to display the description against a grade using CASE statement
6. Write a program in PL/SQL to print 1st n numbers.
7. Write a program in PL/SQL to find factorial of a number.
8. Write a program in PL/SQL to print table of a given number.
9. Write a program in PL/SQL to print average of 1st n numbers.
10. Write a program in PL/SQL to reverse a given number.
11. Write a program in PL/SQL to show the uses of nested loop to print a particular pattern.
12. Write a program in PL/SQL to show use of %type and %rowtype.
13. Write a program in PL/SQL to show implicit/explicit cursor.
14. Write a program in PL/SQL to include implicit/explicit exception.
15. Write a program in PL/SQL to show execution of trigger.

Information System Design and Implementation
BCA-DSC-4(Maj)-403

Th	Pr	Cr	Theory External Marks: 90
4	-	4	Theory Internal Marks: 10
Level: L-200			Number of Theory Hours: 60

Time Duration: 3 Hrs.

Objectives: To teach the students about the various aspects of Information Systems to be developed their analysis and design. The motive is to aware the learners about pre requisite of software development and associated paradigms. After completing this course student will be able to be analyse and design information systems.

Learning Outcomes:

On successful completion of the course, students will be able to:

- i. To understand System Development Life Cycle and System Analyst role.
- ii. Understanding of SRS, Flow diagrams and other necessary tools.
- iii. Understand feasibility study, testing and quality assurance of projects.
- iv. To know system implementation, maintenance and installation of projects.

Note :

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of NINE questions comprising TWO questions from each Unit and ONE compulsory question of short answer type covering whole syllabi.
- iii. The students are required to attempt ONE question from each Unit and the Compulsory question.
- iv. All questions carry equal marks unless specified.

UNIT - I

Systems Concepts and Information Systems Environment: Definition and characteristics of a system. Elements of a system Environment: Boundaries and interface. Types of systems: Physical or Abstract Systems, Open and Closed System, Man - made information systems.

Types of System Models.

System Development Life Cycle: Introduction to various phases-Recognition of Need, Feasibility Study, Analysis, Design, Implementation, Post- Implementation and Maintenance.

The Role of System Analyst: Skills of a System Analyst, Duties of the System Analyst.

UNIT - II

System Planning and the Initial Investigation: Bases for planning in system analysis, Initial investigation, determining the user's information requirements, Problem definition and Project Initiation, Background Analysis, Fact Finding, Fact Analysis, Determination of Feasibility.

Information Gathering: Introduction, Information Gathering tools: Review of Literature, Procedures and forms. On -site observation. Interviews and questionnaires.

Tools of Structured Analysis: SRS features and structure, Various tools of structured analysis: Data flow diagram (DFD), Data Dictionary, Decision tree and structured English, Decision table, Pros and cons of each tools, ER-Diagrams

UNIT - III

Feasibility Study: System Performance-statement of Constraints, Identification of Specific System Objectives, description of Outputs. Feasibility Study – Feasibility considerations, Steps in feasibility analysis. Feasibility Report.

System Design: The Process of Design-Logical and Physical Design, Design methodologies: Structured design, Functional Decomposition

System Testing: Testing, System testing, test phases, types of System Testing, WBT and BBT techniques, OO testing.

Quality Assurance: Quality assurance and its goals in its system life cycle, Levels of quality assurance, Trends in testing.

UNIT - IV

Implementation and Software Maintenance: Introduction, Conversion- Activity network for Conversion, File Conversion, User Training: Elements of user Training Post implementation review.

Software Maintenance - Primary activities of a Maintenance Procedure, Reducing Maintenance Costs. Types of Software Maintenance.

Hardware and Software Selection: Types of Software, Procedure for Hardware/Software selection: Major phases in selection, Evaluation and Validation, Vendor Selection, Post – Installation Review. Software selection- Criteria for Software Selection, the evaluation process.

Suggested Readings:

1. WS Jawadekar and SS Dubey, Management Information System, McGraw Hill; Sixth edition 2020
2. Alan Dennis, Barbara Haley Wixom, Roberta M. Roth., Systems Analysis and Design, Edition 2018, John Wiley & Sons Inc.
3. Hardgrave Bill C., Siau Keng, Chiang Roger H.L., Systems Analysis and Design: Techniques, Methodologies, Approaches and Architectures, Edition 2017, M.E. Sharpe Publications.
4. E.M. Awad: Systems Analysis and Design, Edition 2015, Galgotia Publications

Paper Title: Cyber Security
Paper Code: BCA-DSC-4(Maj)-404

Th	Pr	Cr	Theory External Marks: 90
4	-	4	Theory Internal Marks: 10
Level: L-200			Number of Theory Hours: 60

Time Duration: 3 Hrs.

Objective: The objective of this course is to understand the Cyber Security and its implications.

Learning Outcome: On successful completion of the course, students will be able to:

- i. Understand the architecture and regulatory aspects of cyberspace and the key terminologies in cyber security.
- ii. Identify and assess web-based attacks, network vulnerabilities, and exploit tools.
- iii. Recognize and classify different types of cybercrimes and understand legal frameworks.
- iv. Grasp data privacy principles, including compliance with regulations.

Note:

The Question Paper will consist of Four Units.

- i. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
- ii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iii. All questions carry equal marks unless specified.

UNIT-I

Introduction to Cyber security:

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Defining Cyber Security, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker, Controls, Authentication, Access Control and Cryptography.

UNIT-II

Web attack: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

Network Vulnerabilities: Overview of vulnerability scanning, Open, Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, Open VAS, Meta exploit. Networks Vulnerability Scanning (Netcat, Socat), Network Sniffers and Injection tools.

UNIT-III

Cyber-crime and Cyber law: Classification of cyber-crimes, Common cyber-crimes- cyber-crime targeting computers and mobiles, cyber-crime against women and children, financial

frauds, social engineering attacks, malware and ransom-ware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organizations dealing with Cybercrime and Cyber security in India.

UNIT-IV

Data Privacy and Data Security: Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR), 2016 Personal Information Protection and Electronic Documents Act (PIPEDA), Social media- data privacy and security issues.

Firewalls and Packet Filters, password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.

Suggested Readings:

1. Cyber security and Cyber war: What Everyone Needs to Know" by P.W. Singer and Allan Friedman (2014)
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.(2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform (2015).
4. Cybercrime and Digital Forensics: An Introduction" by Marjie T. Britz (3rd Edition, 2019)
5. Security and Privacy in Communication Networks" by Nosseir, Ekici, and Cavallaro (2021)
6. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.(2009)
7. Auditing IT Infrastructures for Compliance by Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning.(2015)

Paper Title: Python Programming
Paper Code: BCA-DSC-4(Min)-405

Th	Pr	Cr	Theory External Marks : 45
2	2	4	Theory Internal Marks : 05
Level: L-200			Number of Theory Hours : 30

Time Duration: 3 Hrs.

Objective: The objective of the module is to make the student understand the basic concepts of python programming language, lists, tuples, classes and dictionary. The module will enable students to do programming using the python library.

Learning Outcome: After the completion of the module, student will gain knowledge of:

- i. The fundamental concepts of python programming, syntax and semantics.
- ii. Using Lists, tuples, Dictionaries, functions in python.
- iii. Creating and using Files in python.
- iv. Using python modules and functions.

Note:

- i. The Question Paper will consist of Four Units.
- ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
- iii. All questions carry equal marks unless specified.

UNIT - I

Introduction to Python Programming, Data Types, Operators, Expressions, Variables, Scope of a variable, Type Conversion in Python, if statement: simple if, if-else, if-elif-else chain, if statement with lists; Loops: Selection, Indentation, Repetition, Break and Continue statement, Nested Loops, while loop with lists and dictionaries, Strings: Introduction to String, String Operations, Transversal of string, Methods and Inbuilt Functions.

UNIT – II

Lists: Definition, Operations, Traversal, Methods and Inbuilt Functions, Nested Lists, Copying Lists, List as an argument, Mutable and Immutable Data types. Tuples: Introduction, Operations, Traversal, Methods and Inbuilt Functions, Nested Tuples

Dictionaries: Introduction, Traversal, Methods and Inbuilt Functions, Manipulating Dictionary.

UNIT - III

Function: definition, advantages, User defined functions: defining a function, passing arguments, return values, passing a list, Python standard Libraries.

Classes: creating and using a class, working with classes and instances, importing classes, Python standard library.

UNIT – IV

Exception Handling: exceptions and errors, try-except block, the else block, handling the ZeroDivisionError and FileNotFoundError exception.

File Handling: Introduction, Types of Files, Opening and Closing File, Writing to a file, Reading from a file, Setting offset in a file, Creating and Traversing a file.

Suggested Readings:

1. Learning Python, Mark Lutz 5th Edition, O'Reilly Media, Inc., 2015
2. Python Programming: A Complete Guide for Beginners to Master, Python Programming Language: A Complete Guide For Beginners To Master And Become An Expert In Python Programming Language, Brian Draper, Createspace Independent Pub; 1st edition, 2016
3. Python: Python Programming For Beginners - The Comprehensive Guide To Python Programming: Computer Programming, Computer Language, Computer Science , Adam Stark, CreateSpace Independent Publishing Platform, 2016
4. Python Essential Reference, David M Beazley, 4th edition, Pearson Education Inc., 2009.
5. Python Programming: An Introduction to Computer Science, John M Zelle, 2nd Edition ,2003
6. Python Crash Course, A Hands-On, Project-Based Introduction to Programming, Eric Matthes, 2nd Edition, No Starch Press, 2019

Paper Code: BCA-DSC-4(Min)-405P
(Practical based on paper BCA-DSC-4(Min)-405)

Total Practical Marks: 50

Time Duration: 3 Hrs.

Number of Practical Hours: 60

List of Practicals:

1. Program to find the largest out of two numbers.
2. Program to find out whether a given number is even or odd.
3. Program to print the first ten natural numbers.
4. Program to find the factorial of a number.
5. Program to find out whether a given number is prime or not.
6. Program to find whether a given string is palindrome or not.
7. Program to implement string functions: len(), count(), join(),split()
8. Program to print all the elements of the list.
9. Program to reverse the elements of the list.
10. Program to find whether an element exists in the list or not.
11. Program to clear a list.
12. Program to copy a list
13. Program to find the largest and smallest element from a list.
14. Program to find the length of a tuple
15. Program to remove tuples from list
16. Program to sort tuples.
17. Program to create a dictionary, access dictionary items, add items to a dictionary, remove items from a dictionary, change items from a dictionary, find dictionary length.
18. Program to swap two numbers
19. Program to implement recursion
20. Simple Programs to implement classes and objects in python.
21. Program to handle exception ZeroDivsisonError and FileNotFoundError
22. Program to read and write to file.