

FACULTY OF COMPUTER SCIENCE & IT

SYLLABUS

of

**Bachelor of Computer Applications (Honours)
(offered under 4-Year UG Degree Programme)**

(Semester I-IV)

(Under Credit Based Continuous Evaluation Grading System)

Under NEP 2020

Session: 2025-26



The Heritage Institution

**KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)**

PROGRAMME SPECIFIC OUTCOMES
Bachelor of Computer Applications (Honours)
(Session 2025-26)

Program Specific Outcomes

PSO1: Apply skills for development of software and websites for providing efficient solution to IT based problems

PSO2: Comprehend development process in IT industry through ethical, defined and innovative techniques.

PSO3: Achieve leadership role and team player role to be able to work in multidisciplinary areas at various job roles.

PSO4: Identify and demonstrate the implementation of various tools and technologies involved in the field of Information Technology.

PSO5: Demonstrate proficiency in the field of Programming, Web development and IT enabled services.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE/FOUR YEAR DEGREE PROGRAMME

Bachelor of Computer Applications ((Three Year Degree Programme)

Bachelor of Computer Applications (Honours) (Four Year Degree Programme)

Credit Based Continuous Evaluation Grading System (CBCEGS)

(Session 2025-26)

Bachelor of Computer Applications /Bachelor of Computer Applications (Honours) Semester - I										
Course Code	Course Title	Course Type	Hours per week	Credit		Marks				Examination Time (in Hours)
			L-T-P	L-T-P	Total	Total	Ext.		CA	
							L	P		
BCAL-1421 / BCAL-1031/ BCAL-1431	Punjabi (Compulsory) / ¹ Basic Punjabi/ ² Punjab History and Culture	C	4-0-0	4-0-0	4	100	70	-	30	3
BCAM-1102	Communication Skills in English - I	AEC	3-0-2	3-0-1	4	100	50	20	30	3+3
BCAL-1113	Digital Electronics	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-1114	Introduction to Programming – C	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-1115	Introduction to Computers and Information Technology	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAP-1116	Lab on Programming – C	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAP-1117	Lab on Office Package	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAM-1110	Introduction to the Internet	SEC	2-0-2	2-0-1	3	100	40	30	30	3+3
VACF-1491	*Foundation Course	VAC	2-0-0	2-0-0	2	50	35	-	15	1
	Total				29	750				

Note:

C – Compulsory, DSC – Discipline Specific Course, SEC – Skill Enhancement Course

AEC – Ability Enhancement Course, VAC – Value Added Course

¹ Special course in lieu of Punjabi (Compulsory)

² Special course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.

*Credits/Grades Points of these courses will not be added in total, only grades will be provided.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE/FOUR YEAR DEGREE PROGRAMME

Bachelor of Computer Applications ((Three Year Degree Programme)

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(Session 2025-26)

Bachelor of Computer Applications (Honours) Semester - II

Bachelor of Computer Applications (Honours) Semester - II										
Course Code	Course Title	Course Type	Hours per week	Credit		Marks				Examination Time (in Hours)
			L-T-P	L-T-P	Total	Total	Ext.		CA	
							L	P		
BCAL-2421/ BCAL-2031/ BCAL-2431	Punjabi (Compulsory) ¹ Basic Punjabi ² Punjab History and Culture	C	4-0-0	4-0-0	4	100	70	-	30	3
BCAM-2102	Communication Skills in English - II	MDC	3-0-2	3-0-1	4	100	50	20	30	3+3
BCAL-2113	Computer Architecture	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-2114	Database Management System	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-2115	Introduction to Object Oriented Programming-I	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAP-2116	Lab on Database Management System	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAP-2117	Lab on Object Oriented Programming - I	DSC	0-0-4	0-0-2	2	50	-	35	15	3
VACD-2161	*Drug Abuse: Problem, Management and Prevention (Compulsory)	VAC	2-0-0	2-0-0	2	50	35	-	15	3
	Total				26	650				

Note:

C – Compulsory, DSC – Discipline Specific Course, SEC – Skill Enhancement Course

MDC – Multi Disciplinary Course, VAC – Value Added Course

¹ Special course in lieu of Punjabi (Compulsory)

² Special course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.

* Credits/Grades Points of these courses will not be added in total, only grades will be provided.

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SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE/FOUR YEAR DEGREE PROGRAMME

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(Session 2025-26)

Bachelor of Computer Applications /Bachelor of Computer Applications (Honours) Semester - III										
Course Code	Course Title	Course Type	Hours per week	Credit		Marks				Examination Time (in Hours)
			L-T-P	L-T-P	Total	Total	Ext.		CA	
							L	P		
BCAL-3111	Advanced Database Management System	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-3112	Computational Problem Solving	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-3113	Numerical Methods and Statistical Techniques	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-3114	Management Information System	MDC	4-0-0	4-0-0	4	100	70	-	30	3
BCAP-3115	Lab on Computational Problem Solving	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAP-3116	Lab on Advanced Database Management System	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAI-3117	Internship	C	0-0-4	0-0-2	2	50	-	50	-	-
BCAM-3110	Data Analysis using Spreadsheets and Tableau	SEC	2-0-2	2-0-1	3	100	40	30	30	3+3
VACG-3531	Gender Sensitization	VAC	2-0-0	2-0-0	2	50	35	-	15	1
	Total				29	750				

Note:

C – Compulsory, DSC – Discipline Specific Course, SEC – Skill Enhancement Course

MDC – Multi-Disciplinary Course, VAC – Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE/FOUR YEAR DEGREE PROGRAMME

Bachelor of Computer Applications ((Three Year Degree Programme)

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(Session 2025-26)

Bachelor of Computer Applications /Bachelor of Computer Applications (Honours) Semester - IV										
Course Code	Course Title	Course Type	Hours per week	Credit		Marks				Examination Time (in Hours)
			L-T-P	L-T-P	Total	Total	Ext.		CA	
							L	P		
BCAL-4111	Data Structures	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-4112	Computer Networks	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-4113	Web Designing and Development	DSC	4-0-0	4-0-0	4	100	70	-	30	3
BCAL-4114	Applied and Discrete Mathematics	DSC	4-0-0	4-0-0	4	100	70	-	30	3
	Effective Soft Skills	AEC	0-0-4	0-0-2	2	50	-	35	15	3
BCAP-4115	Lab on Data Structures	DSC	0-0-4	0-0-2	2	50	-	35	15	3
BCAP-4116	Lab on Web Designing and Development	DSC	0-0-4	0-0-2	2	50	-	35	15	3
AECE-4221	Environmental Studies (Compulsory)	VAC	1-0-2	1-0-1	2	50	20	15	15	3+3
	Total				24	650				

Note:

C – Compulsory, DSC – Discipline Specific Course, SEC – Skill Enhancement Course

AEC – Ability Enhancement Course, VAC – Value Added Course

Bachelor of Computer Applications (Honours) Semester – I
Session 2025-26
COURSE CODE: BCAL–1113
DIGITAL ELECTRONICS

Course Outcomes:

After the completion of this course, the student will be able to:

CO1: Comprehend and apply the number systems.

CO2: Apply K-map for simplification of Boolean expressions and implement them with Logic Gates.

CO3: Design advanced and complex combinational and sequential circuits.

CO4: Demonstrate the internal structure of semiconductor memory.

Bachelor of Computer Applications (Honours) Semester – I
Session 2025-26
COURSE CODE: BCAL–1113
DIGITAL ELECTRONICS

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 marks each) are to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Number System: Introduction to number system (Binary, Octal, Decimal, Hexadecimal and Arbitrary), number conversion system, binary arithmetic. 1's and 2's complement.

Representation of signed binary numbers, Non-weighted Codes: BCD Code, Excess-3 Code, Grey Code, ASCII, Integer and floating point representation.

UNIT- II

Logic Gates and Boolean algebra: Logic gates, Universal Gates, Boolean Algebra Laws of Boolean Algebra, canonical forms of Boolean expressions, K-Map.

UNIT-III

Combinational Circuits: Half, Full, BCD and Parallel Adder, Half and full Subtractor, Multiplexers, Demultiplexers, Multiplexer Tree, Demultiplexer Tree, Decoder, Encoder: Priority and 7-segment Display, Parity Generator and Checker.

RAM and ROM Chips, Read and Write timing diagrams, Address Selection Logic, Design of Large memory using smaller chips.

UNIT-IV

Sequential Circuits: Introduction, RS-latch, Flip-flops (Truth Table, Internal Circuit, Excitation Table), clock and Triggering, Registers: SISO, SIPO, PISO, PIPO, Counters: Up, Down, Up/Down, Ring, Twisted Ring.

References / Textbooks:

1. M. Morris Mao, Digital Design, Pearson Publication (2018), 6th Edition.
2. Ronald J. Tocci, Digital Systems, Pearson (2009), 10th Edition.
3. Morris Mano, Digital Logic and Computer Design, Pearson Education (2004), 1st Edition.

4. V.K. Jain, Arti Agarwal, Digital Electronics, Genius Publications Pvt. Ltd. (2018), 1st Edition
5. K. Meena, Principles of Digital Electronics, Prentice Hall India Learning Private Limited (2009), 1st Edition
6. William H. Gothmann, Digital Electronics: An introduction to Theory and Practice, Prentice Hall India Learning Private Limited (1982), 2nd Edition

Note: The latest editions of the books should be followed.

**Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)**

**COURSE CODE: BCAL–1114
INTRODUCTION TO PROGRAMMING – C**

Course Outcome:

After passing course the student will be able to:

CO1: Comprehend the working of various programming constructs involved in C Programming.

CO2: Design C program and control its sequence using various control statements.

CO3: Apply programming concepts such as arrays, functions and strings to provide solution in different problem domains.

CO4: Work with pointers, structures and union.

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)

COURSE CODE: BCAL–1114

INTRODUCTION TO PROGRAMMING – C

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Fundamentals: Character set, Identifiers and Key Words, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants.

Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions. Data Input and Output statements

UNIT-II

Control Statements: Preliminaries, While, Do-while and for statements, Nested loops, If-else, Switch, Break – Continue statements.

Program Structure Storage Class: Storage Classes- Auto, extern, register and static about library functions.

UNIT-III

Functions: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion.

Arrays: Defining, processing an array, passing arrays to a function, multi-dimensional arrays.

Strings: String declaration, string functions and string manipulation

UNIT-IV

Structures & Unions: Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, Unions.

Pointers: Fundamentals, pointer declaration, passing pointer to a function, pointer and one dimensional arrays, operation on pointers, pointers & multi-dimensional arrays of pointers, passing functions, other functions, more about pointer declarations.

References/Textbooks:

1. E Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2002.
2. Byron Gottfried, Schaum's Outline Programming with C, McGraw Hill, 1996.
3. Brian W. Kernighan, Dennis M. Ritchie, The C Programming language, Prentice Hall, 1988.
4. Stephen G. Kochan, Programming in C, Pearson Education, 2015.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)
COURSE CODE: BCAL–1115
INTRODUCTION TO COMPUTERS AND INFORMATION TECHNOLOGY

Course Outcome:

After passing course the student will be able to:

CO1: comprehend about computer hardware, operating system concepts and various system software.

CO2: Identify various input, output and memory devices.

CO3: Apply word processing software to create professional and academic documents.

CO4: Create effective and well-formatted presentation.

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)
COURSE CODE: BCAL–1115
INTRODUCTION TO COMPUTERS AND INFORMATION TECHNOLOGY

L-T-P: 4-0-0
Credits: 4
Examination Time: 3 Hours

Max. Marks: 100
Theory: 70
CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Fundamentals of Computer: Introduction to computer, Applications of computer, Components of computers (Input unit, Output Unit, Memory Unit & CPU).

Software: Application Software, Service software, System software, booting a System.

Memories: Primary Memory -RAM (Working and Its types), ROM (Types of ROM). Secondary Memory - Hard Disk (Structure of a hard disk, working, concept of tracks, sectors, clusters, cylinders).

UNIT-II

Input Devices: Keyboards, Mouse, Joystick, Light Pen and Data Scanning devices (scanner, OCR, OMR, MICR, Bar Code Reader, Card Reader)

Output Devices: Monitor, Printers (laser printer, dot matrix printer, ink jet printer)

Word Processing: Introduction to Office, word processing & its features, Parts of window of word (Title bar, menu bar, status bar, and ruler), understanding the Ribbon, Use of Office Button and Quick Access Toolbar, Creation of new documents, opening document, insert a document into another document.

UNIT-III

Word Processing: Page setup, margins, gutters, font properties, Alignment, page breaks, header & footer, deleting, moving, replace, editing text in document, saving a document, spell checker, printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height, width of row/column. Editing, deleting Rows, columns in table. Adding picture, page colors and Watermarks, Borders, shading, Templates, wizards, drawing objects.

Presentation: Introduction to PowerPoint, Exploring menus, starting a new slide, saving presentation, moving/rearranging slides, printing slides. Applying theme to presentation, Views (slide View, slide sorter, notes view, outline view), Formatting & enhancing text formatting. Displaying slide show, adding multimedia. Slide transitions, applying Animation, Timing slide display, adding movies & sounds.

UNIT-IV

Spreadsheet: Introduction to Worksheet/Spreadsheets, creating a simple Worksheet, Computations in a Worksheet, Printing the Worksheet, Graphs, Data Sorting, Filling, Filtering data. **Functions and Formulas:** Applying Formulas. Inserting and Editing a Function, Auto Calculate and Manual Calculation, Defining Names, Using and Managing Defined Names, Displaying and Tracing Formulas, Understanding Formula Errors, Using Logical Functions (IF), Using Financial Functions (PMT), Using Database Functions (DSUM), Using Lookup Functions (VLOOKUP), User Defined and Compatibility Functions, Date & Time Functions, Math & Trig Functions, Statistical Functions, Text Functions, Logical Functions. **Working with Pivot Tables:** Creating a PivotTable, Specifying PivotTable Data, changing a PivotTable's Calculation, Filtering and Sorting a PivotTable, working with PivotTable Layout, Grouping PivotTable Items, updating a PivotTable, formatting a PivotTable, creating a PivotChart.

References/Textbooks:

1. Joyce Cox, Joan Lambert and Curtis Frye, Microsoft office Professional 2010 Step by Step, Microsoft Press, 2010.
2. V. Rajaraman, Neeharika Adabala, Fundamentals of Computers, PHI Learning, 2015.
3. P.K. Sinha, Computer Fundamentals, BPB Publications, 2004.
4. Anshuman Sharma, A book of Fundamentals of Information Technology, Lakhanpal Publishers, 5th Edition.
5. Peter Norton, Peter Norton's Computing Fundamentals, McGraw-Hill Technology Education, 2006.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications (Honours) Semester – I

(Session 2025-26)

COURSE CODE: BCAP–1116
LAB ON PROGRAMMING – C

L-T-P: 0-0-2

Credits: 2

Examination Time: 3 Hours

Max. Marks: 50

Practical:35

CA: 15

Lab based on course code BCAL-1114

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)

COURSE CODE: BCAP-1117

LAB ON OFFICE PACKAGE

L-T-P: 0-0-2

Credits: 2

Examination Time: 3 Hours

Max. Marks: 50

Practical:35

CA: 15

Lab based on course code BCAL-1115

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)
COURSE CODE: BCAM-1110
INTRODUCTION TO THE INTERNET

Course Outcome:

After passing course the student will be able to:

CO1: Understand Internet basics and its working.

CO2: Gain knowledge of email service on different mail servers.

CO3: Understand different Internet protocols and search engines.

CO4: To give hands-on experience and provide a comprehensive, non-technical, hands-on overview of the Internet based services.

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)

COURSE CODE: BCAM-1110
INTRODUCTION TO THE INTERNET
(Theory)

L-T-P: 2-0-1

Credits: 3

Examination Time: 3+3 Hours

Max. Marks: 100

Theory: 40

Practical: 30

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (8 Marks each) are to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT I

Origin, growth and evolution of the Internet; the impact of the Internet; terminology: web pages, website, web browser, web server, bandwidth; Connect to the Internet: hardware and software, types of Internet connections, Internet Service Providers; Navigating different types of websites and online resources.

Student should explore the local market to understand the internet service providers, rates, bandwidth etc.

UNIT II

Email Communication: Email Etiquette and Best Practices, Managing and Organizing Emails
Email Tools and Features, identifying spam and phishing emails

Searching on the Internet: Overview of internet resources and search engines, Basics of Using Search Engines -How search engines work, Basic search techniques and tips, Understanding search engine results pages (SERPs), Using search operators (e.g., AND, OR, NOT), Utilizing advanced search features (e.g., Google Advanced Search)

UNIT III

Online Tools for Productivity: Introduction to productivity tools (e.g., Google Workspace, Microsoft Office 365), Cloud storage and file management (e.g., Google Drive, Dropbox), Collaboration and Communication Tools: Online communication etiquette and best practices, using collaboration tools (e.g., Google Docs, Slack, Microsoft Teams), Effective virtual meeting strategies (e.g., Zoom, Google Meet)

UNIT IV

Building Online Presence: Creating and maintaining a professional online profile (e.g., LinkedIn), Personal branding and digital portfolios, Networking strategies for academic and career growth, Understanding digital footprints and online reputation.

Digital citizenship and respectful online behaviour, balancing screen time and managing digital distractions

References / Textbooks:

1. Douglas E Comer, The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, CRC Press
2. Faithe Wempen, Digital Literacy For Dummies 1st Edition

Bachelor of Computer Applications (Honours) Semester – I
(Session 2025-26)

COURSE CODE: BCAM–1110
INTRODUCTION TO THE INTERNET
(Practical)

L-T-P: 2-0-1

Credits: 3

Examination Time: 3+3 Hours

Max. Marks: 100

Theory: 40

Practical: 30

CA: 30

Instructions for the examiners: -

Two questions of equal marks strictly as per the syllabus and based on the practical exercises covered in the semester. Questions may be subdivided into parts (not exceeding four). Candidates will attempt ONE question, explain their answer by writing on the answer sheet, and then implement the same on the computer. Examiner will evaluate both the answers (theory as well as practical). The viva should also be conducted alongside, and the student is asked viva questions related to the question and the solution he/she is working on during the exam.

Lab exercises based on:

- Identifying internet connections and Configuring internet connection on PC/Laptop
- Email Tools and features
- Using the Google search engine and explore Bing
- Using Google Docs, Google Drive for document preparation and storage
- Collaboration using Slack
- Analyzing LinkedIn profiles
- Creating your own LinkedIn profile
- Virtual meeting platforms: Microsoft Teams, Zoom, Google Meet

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAL–2113
COMPUTER ARCHITECTURE

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend various registers and its micro-operations, computer instructions and basic design of computer.

CO2: Comprehend various instruction formats and addressing modes.

CO3: Identify the hierarchy of computer memory and their organization.

CO4: Comprehend I/O organization, Pipeline and vector processing.

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAL–2113
COMPUTER ARCHITECTURE

L-T-P: 4-0-0
Credits: 4
Examination Time: 3 Hours

Max. Marks: 100
Theory: 70
CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Information Representation: Register Transfer, Various Registers, Implementing Common Bus Using Multiplexers: Logical; Arithmetic & Shift Micro-operations.

Basic Computer Design Instruction Codes, Interfacing various Registers, Computer Instructions, Timing Signals, Instruction Cycle, Design of a Basic Computer.

UNIT-II

CPU Design Stack Organized CPU, Instruction Formats, Addressing Modes, Program Control, Hardwired & Micro programmed (Wile's Design) Control Unit.

UNIT-III

Memory Organization Memory Hierarchy, Designs & Concepts of Main Memory, Auxiliary Memory, Associative Memory, Cache and Virtual Memory.

UNIT-IV

I/O Organization I/O Interface, Modes of Transfer, Program Interrupt, DMA & I/O Processor.

Pipeline & Vector Processing Parallel Processing Pipelining, Parallel & Distributed Computers, SISD, SIMD& MISD, MIMD Machines, Vector Processing.

References/Textbooks:

1. Morris M. Mano, Computer System Architecture, Prentice Hall, 1992.
2. J.P. Hayes, Computer Architecture and Organization, McGraw Hill, 1998.
3. J.L. Hennessy D.A Patterson, and D. Goldberg, Computer Architecture A Quantitative Approach, Pearson Education Asia, 2006.

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAL–2114
DATABASE MANAGEMENT SYSTEM

Course Outcomes:

After passing course the student will be able to:

CO1: Understand data, database and database models.

CO2: Apply relational algebra and relational calculus for performing queries of different types.

CO3: Gain knowledge of normalization and transaction control.

CO4: Create, manage and access database using SQL and PL/SQL.

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)

COURSE CODE: BCAL–2114

DATABASE MANAGEMENT SYSTEM

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Introduction: Introduction to Database, Database management system. Structure of database system, Advantages and Disadvantages, Schema, levels of database system, Relational model, Hierarchical model, Network model.

E-R diagram: Entity set, Relationship set, Attributes, Generalization, Participation, different keys used in a relational system.

UNIT-II

DBA, responsibilities of DBA, Codd's Rules, Relational Algebra: Selection, Projection, Rename, Union, Intersection, Set Difference, Cartesian Product.

Introduction to SQL, Data types, Constraints, DDL: Creating Table, Deleting Table, Alter Table (Renaming table, changing name of column, adding/dropping column, adding dropping constraint, changing type of column).

UNIT-III

DML: Insertion, Deletion and Update. Inserting multiple records, Deleting and update records having reference to another table (Cascade/Restrict/Set Null).

Querying Data: Operators, Where, Order By, Group By and having clause. Aliases, Handling NULL values, displaying distinct records, built in Functions, Aggregate Functions and Wildcards.

UNIT-IV

DCL: Creating and managing users/roles, Grant and Revoke commands.

Introduction to Normalization – need and advantages of normalization, Role of Candidate Key, 1NF, 2NF, 3NF, BCNF, 4NF.

Query Processing and Optimization: Steps and Components. Views in SQL.

References/Textbooks:

1. C.J. Date, An Introduction to Database Systems, Pearson Education 2000.
2. H. F. Korth&Silverschatz, A., Database System Concepts, Tata McGraw Hill, 2010.
3. Elmasri & Navathe, Fundamentals of Database Systems, Addison-Wesley, 2011.
4. Hoffer, Prescott, Mcfadden, Modern Database Management, Paperback International, 2012.
5. Martin Gruber, Understanding SQL, BPB Publication, 1994.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAL–2115
INTRODUCTION TO OBJECT ORIENTED PROGRAMMING-I

Course Outcomes:

After the completion of this course, the student will be able to:

CO1: Comprehend the concepts of Object-Oriented Programming Paradigm.

CO2: Identify the use of access specifiers and different types of constructors in class.

CO3: Apply function and operator overloading.

CO4: Comprehend different types of inheritance and polymorphism.

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAL–2115
INTRODUCTION TO OBJECT ORIENTED PROGRAMMING- I

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT -I

Programming Paradigms: Introduction to the object oriented approach towards programming by discussing Traditional, Structured Programming methodology.

Objects & Classes: Object Definition, Instance, Encapsulation, Data Hiding, Abstraction, Inheritance, Messages, Method, Polymorphism, Classes.

UNIT -II

Object Oriented Programming using C++: Characteristics of OOP, Overview of C++, I/O using cout and cin, Objects and Classes, Member functions and data, private & public, constructor & destructor, Constructor Overloading, Types of Constructors.

UNIT -III

Function Overloading: Function Overloading, Default Arguments, Ambiguity in Function Overloading.

Operator Overloading: Overloading unary and binary operators, Type Conversion using Operator Overloading

UNIT-IV

Inheritance: Concept of inheritance, Base & derived classes, Access Specifiers, Class Hierarchies, Types of Inheritance with examples.

Virtual Functions and Polymorphism: Virtual functions, friend functions, static function, this pointer, polymorphism, Types of Polymorphism with examples, templates, class templates.

References / Textbooks:

1. Herbert Schildt, C++: The Complete Reference, Tata McGraw-Hill Education India, 4th Edition.
2. Bjarne Stroustrup, The C++ Programming Language, Addison – Wesley Professional (2013), 4th Edition

3. Bjarne Stroustrup, A Tour of C++ (C++ In-Depth Series), Addison – Wesley Professional (2018), 2nd Edition
4. G.S. Baluja, C++ Program Design (w/CD), Khanna Book Publishing Company (2015), 2nd edition.
5. Stanley Lippman, Josee Lajoie, Barbara Moo, C++ Primer, Addison-Wesley Professional (2012), 5th edition.
6. Richard Johnsonbaugh and Martin Kalin, Object Oriented Programming in C++, Pearson Education (1999), 2nd Edition

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAP–2116
LAB ON DATABASE MANAGEMENT SYSTEM

L-T-P: 0-0-2
Credits: 2
Examination Time: 3 Hours

Max. Marks: 50
Practical:35
CA: 15

Lab based on course code BCAL-2114

Bachelor of Computer Applications (Honours) Semester – II
(Session 2025-26)
COURSE CODE: BCAP–2117
LAB ON OBJECT ORIENTED PROGRAMMING - I

L-T-P: 0-0-2

Credits: 2

Examination Time: 3 Hours

Max. Marks: 50

Practical:35

CA: 15

Lab based on course code BCAL-2115

Bachelor of Computer Applications (Honours) Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3111
ADVANCED DATABASE MANAGEMENT SYSTEM

Course Outcomes:

After passing course the student will be able to:

CO1: Gain knowledge of transaction management and Concurrency control.

CO2: Create, manage and access database using PL/SQL.

CO3: Create and manage database using NoSQL

CO4: Comprehend the implementation of queries using MongoDB

Bachelor of Computer Applications (Honours) Semester – III
(Session 2025-26)
COURSE CODE: BCAL-3111
ADVANCED DATABASE MANAGEMENT SYSTEM

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

SQL: Join methods & sub query, Union, Intersection, Minus, Indexes, Views.

Transaction Management-ACID Properties, Concurrency Control, Security amongst users.

UNIT-II

PL/SQL: Introduction, advantages and limitations, block structure, constant and variables, input and output, control statements, data-types. Triggers, functions and procedures, cursors, packages, exceptions.

Big Data: Meaning, Characteristics, Benefits, CAP Theorem

UNIT III

NoSQL: Overview, Need of NoSQL, Structured Data Vs. Unstructured Data, Types of Database in NoSQL, Features of NoSQL, Advantages of NoSQL, Eventual Consistency, ACID vs BASE Properties.

MongoDB: Overview, Install MongoDB server, Environment, Create Database, Data Model, Collection (Creation and Deletion), Data types in MongoDB, CRUD: Create, Update, Delete And Query Database.

UNIT IV

SQL to MongoDB Mapping, Projection. Sorting, Limiting and Counting records. Indexes in MongoDB: Creation of Index, Options, Dropping and fetching of Index. Analyze Query performance, Plan and Profiler. MongoDB Aggregation Query: Aggregate Framework (sum, avg, min, max, push, first, etc). Replication and Sharding, MapReduce Function. Creating database backup.

Reference/ Textbooks:

1. C.J. Date, An Introduction to Database Systems, Pearson Education 2000.
2. H. F. Korth&Silverschatz, A., Database System Concepts, Tata McGraw Hill, 2010.
3. Elmasri&Navathe, Fundamentals of Database Systems, Addison-Wesley, 2011.
4. Hoffer, Prescott, Mcfadden, Modern Database Management, Paperback International, 2012.
5. Adam Fowler, “NoSQL For Dummies”, Wiley, First Edition, 2015.
6. Gerardus Blokdyk, “NoSQL A Complete Guide”, 5STARCook, Second Edition, 2021.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3112
COMPUTATIONAL PROBLEM SOLVING

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend basics of Python programming like operators, data types, control structures, etc.

CO2: Apply list and dictionaries for handling and accessing data through iterations.

CO3: Implement various built-in and user defined function to solve mathematical problems.

CO4: Comprehend Object Oriented Programming and modules in Python.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3112
COMPUTATIONAL PROBLEM SOLVING

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Introduction to Python: Process of Computational Problem Solving, Python Programming Language

Data and Expressions: Literals, Variables and Identifiers, Operators, Expressions, Statements and Data Types

Control Structures: Boolean Expressions (Conditions), Logical Operators, Selection Control, Nested conditions, Debugging

UNIT-II

Lists: List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python

Dictionaries: Dictionaries and Files, Looping and dictionaries, advanced text parsing

Iteration: While statement, definite loops using For, Loop Patterns, Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion

UNIT-III

Functions: Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments

Files: Opening Files, Using Text Files, String Processing, Exception Handling

UNIT-IV

Objects and Their Use: Introduction to Object Oriented Programming

Modular Design: Modules, Top-Down Design, Python Modules

Using Databases and SQL: Database Concepts, SQLite Manager Firefox Add-on, SQL basics summary, basic Data Modeling, Programming with multiple tables.

References/Textbooks:

1. Charles Severance, Python for Informatics, Version 0.0.7.

2. Charles Dierbach, Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Wiley Publications, 2012.
3. Guttag John V, Introduction To Computation And Programming Using Python, PHI, 2014.
4. Jeeva Jose and Sojan P. Lal, Introduction to Computing & Problem Solving Through Python, Khanna Publishers, 2015.
5. Mark J. Guzdial, Introduction to Computing and Programming in Python, Pearson Education, 2015.
6. Kenneth Lambert, Fundamentals of Python, Course Technology, Cengage Learning, 2015
7. Mark Lutz, Learning Python, O'Reilly Media, 2013

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3113
NUMERICAL METHODS AND STATISTICAL TECHNIQUES

Course Outcomes:

After the completion of this course, the student will be able to:

CO1: Solve non-linear and linear equations using different methods.

CO2: Comprehend interpolation and numerical integration.

CO3: Calculate different means and deviations using statistical techniques.

CO4: Comprehend correlation, curve fitting and regression for finding solutions to various statistical problems

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3113
NUMERICAL METHODS AND STATISTICAL TECHNIQUES

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Students can use non-storage and non-programmable scientific calculator.

UNIT-I

Introduction: Numerical Methods, Numerical methods versus numerical analysis, Types of Error, Errors and Measures of Errors.

Non-linear Equations: Bisection Method and Newton Raphson's Method

Linear Equations: Gauss Elimination Method, Gauss Jordan Method.

UNIT-II

Interpolation: Newton's Methods: Forward Difference Method, Backward Difference Method, and Divided Difference Method.

Numerical Integration: Trapezoidal Rule, Simpson's 1/3 method and Simpson's 3/8 Method

UNIT-III

Statistical Techniques:

Measure of Central Tendency: Arithmetic mean, Median, Mode.

Measures of dispersion: Range, Quartile Deviation, Mean deviation, Standard deviation, Co-efficient of variation.

UNIT –IV

Correlation: Introduction, Karl Pearson's Coefficient of Correlation, Rank Correlation method

Regression: Regression line and regression equations, Regression Coefficient

Non Linear Curve Fitting: Fit a quadratic or polynomial equation, Fit an exponential curve,

References / Textbooks:

1. Amrinder Pal Singh, Jaspal Singh, Anshuman Sharma, Fundamentals Of Numerical Methods And Statistical Techniques, Lakhanpal Publishers, 4th edition.
2. Kandasamy P.& et Al., Numerical Methods, S. Chand & Company (2006), Reprint Edn. 2006 Edition.
3. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers (2013), 11th Edition.
4. E. Balagurusamy, Numerical Methods, Tata McGraw Hill Education (2017)
5. H.S.G. Rao, Numerical Methods, IK International Publishing House (2011)
6. S.S. Sastry, Introductory methods of Numerical Analysis, PHI (2012), 5th Edition

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3114
MANAGEMENT INFORMATION SYSTEM

Course Outcomes:

After passing course the student will be able to:

CO1: Identify the importance of Management Information System.

CO2: Comprehend development life cycle of information systems.

CO3: Identify the decision-making process and role of DSS and EIS.

CO4: Comprehend the role of Expert System and case studies of HR and ERP.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAL–3114
MANAGEMENT INFORMATION SYSTEM

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT - I

Basic Concepts: Data, Information, Knowledge, Meaning of Information System, Organization structure, Role of information systems, Components of Information System.

Management Information System - Need, Components and Functions of MIS. Planning of MIS, Implementation and Controlling.

UNIT - II

Planning Information systems: System Analysis and System Design, System Development Life Cycle - various phases including Planning, Analysis – Analysis Tools, Requirement determination, Methodologies and Best Practices, Design & development, Implementation and Maintenance. Rapid Application Development.

UNIT - III

Decision Making Process: Structured, Semi structured and unstructured decisions, Decision Support Systems - Characteristics, Types, Components and Approaches of DSS,. Executive Support Systems – Components of EIS, Benefits of using EIS, Difference between DSS and EIS.

UNIT - IV

Expert Systems: Meaning, Types of Expert Systems, Case Studies of Expert Systems using Artificial Intelligence for HR and ERP.

References / Textbooks:

1. Mohammad Azam, Management Information Systems, Tata McGraw Hill Education (2012).

2. James A. O'Brein, Management Information Systems, Tata McGraw-Hill.
3. Effy OZ, Management Information Systems, Thomson Learning/Vikas Publications
4. Nagpal D.P., Textbook on Management Information System, S.Chand& Company (2011).
5. R. Kelly, Rainer and Casey G. Cegielski, Introduction to Information Systems, Wiley (2015), 4th Edition
6. C. Laudon Kenneth and P. Laudon Jane, Management Information System, Pearson Education (2018), 15th Edition.
7. David Kroenke, Management Information System, Tata Mc Graw Hill Publication.
8. Brien, Marakas and Behl, Management Information Systems, McGraw Hill Education (2017), 10th Edition
9. W.S Jawadekar, Management Information System, Tata Mc Graw Hill Publication
10. Kenneth C. Landon, Jane P. Landon, MIS: Managing the digital firm, Pearson Education

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAP–3115
LAB ON COMPUTATIONAL PROBLEM SOLVING

L-T-P: 0-0-2
Credits: 2

Max. Marks: 50
Practical: 35
CA: 15

Lab based on Computational Problem Solving.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAP-3116
LAB ON ADVANCED DATABASE MANAGEMENT SYSTEM

L-T-P: 0-0-2
Credits: 2

Max. Marks: 50
Practical: 35
CA: 15

Lab based on Advanced Database Management System.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAI - 3117
INTERNSHIP

L-T-P: 0-0-2
Credits: 2

Max. Marks: 50

Internship with Local / Public / Private Industry / Business organization / MOOCs / Online Internship / Certifications from the recognized organization.

Important points to be considered:

- MOOCs tenure should not be less than 8 weeks.
- The tenure of the Online Certification must be more than 60 hours.
- Online / Offline Internship tenure not to be less than two months / 60 hours.
- The requisite certificate to be submitted to HOD in print form on or before November 15, 2025.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAM-3110
DATA ANALYSIS USING SPREADSHEET AND TABLEAU

Course Outcomes:

After the completion of this course, the student will be able to:

CO1: Understand the scope of data analysis with Spreadsheet

CO2: To enable students to create applications and tools to deal with complex.

CO3: To comprehend hands-on experience with Spreadsheet and Tableau

CO4: To enable the students to create a Tableau dashboard.

Bachelor of Computer Applications Semester – III
(Session 2025-26)
COURSE CODE: BCAM–3110
DATA ANALYSIS USING SPREADSHEET AND TABLEAU

L-T-P: 2-0-1

Credits: 3

Examination Time: 3+3 Hours

Max. Marks: 100

Theory: 40

Practical: 30

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (8 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Students can use non-storage and non-programmable scientific calculator.

UNIT - I

Spreadsheet: Font Formatting, changing the Color of a cell, Currency symbols in Spreadsheet, Merging cells, Using Auto fill, using paste special, adding comment to a cell.

Spreadsheet Charts: Sorting Data, Creating an Spreadsheets chart, Moving and Resizing your chart, Charts Styles and Layouts, Chart Titles and Series Titles, Chart Layout Panel in Spreadsheets, Format chart Panel, Create Pie chart, Add Labels to a Pie Chart, Format Pie chart segments, Create a 2D line Chart in Spreadsheets, Format your Axis titles, Predict the future with a Trendline chart.

UNIT - II

Introduction to Time series, Analysis of Time Series Data: Forecasting/Data Relationship Tools –Graphical Analysis.

Conditional Logic: IF Function, Conditional Formatting in Spreadsheets, CountIF, CountIFS, SUM, MULTIPLY, SUMIF, and SUMIFS. MS Spreadsheets Advance Feature: Pivot Tables, LOOKUP Function, VLOOKUP Function, Searching with MATCH and INDEX, Drop down Lists in Spreadsheets, Adding your Error Message box.

UNIT – III

Tableau: Introduction, Architecture, File Types & Extensions, Creating Data Extracts in Tableau.

Tableau Chart Types: Working with Combined Axis, Working with Combination Charts, Using Scatter Plots, Using Line Chart, Using Heat Maps, Using Histograms, Using Pie Charts.

UNIT - IV

Tableau Dashboard: Build Interactive Dashboards, Best practices for creating effective dashboards, creating a Dashboard and Importing Sheets, Use of Running Actions, Using Dashboard Actions.

References / Textbooks:

1. Joyce Cox, Joan Lambert and Curtis Frye, Microsoft office Professional 2010 Step by Step, Microsoft Press, 2010.
2. V. Rajaraman, Neeharika Adabala, Fundamentals of Computers, PHI Learning, 2015.
3. P.K. Sinha, Computer Fundamentals, BPB Publications, 2004
4. Jumpstart Tableau: A Step-By-Step Guide To Better Data Visualization, Apress Publication

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL-4111
DATA STRUCTURES

Course Outcomes:

After passing course the student will be able to:

CO1: Analyse complexity of algorithms to determine their efficiency.

CO2: Comprehend various hashing method, sorting and searching algorithms.

CO3: Comprehend various operations of stack and queue along with different scenarios.

CO4: Comprehend advanced data structures such as tree and graph.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL-4111
DATA STRUCTURES

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Data Structure: Introduction, Common Operations on Data Structures, Algorithm Complexity, Big O Notation, Time – Space tradeoff between Algorithms.

Arrays: Array Defined, Representing Arrays in Memory, Operations, Bubble Sort, Linear Search, Binary Search and Multidimensional Arrays.

UNIT-II

Hashing: Hash Functions: Division Method, Mid-Square Method & Folding Method and Collision Resolution methods.

Linked Lists: Types of Linked Lists, Representing Linked Lists in Memory, Advantages of using Linked Lists over Arrays, Various Operations on Linked Lists.

UNIT-III

Stacks: Description of STACK structure, Implementation of Stack in memory, Applications of Stacks – Converting Arithmetic expression from infix notation to reverse polish and their subsequent evaluation and Quicksort method.

Queues: Description of queue structure, Implementation of queue in memory, Description of priorities of queues, Dequeues.

UNIT-IV

Trees: Description of Tree Structure and its Terminology, Binary Trees and Binary Search Trees and their representation in Memory and Heapsort.

Graphs: Description of Graph Structure, Implement Graphs in Memory using Adjacency Matrix, Path Matrix and Graph traversal techniques - DFS, BFS.

References / Textbooks:

1. Seymour Lipschutz, Data Structures with C (Schaum's Outline Series), McGraw Hill Education (2017), 1st Edition
2. Reema Thareja, Data Structures Using C, Oxford Publication (2014), 2nd Edition
3. Sahni Horowitz, Fundamentals of Data Structures in C (2008), 2nd Edition
4. Narasimha Karumanchi, Data Structures and Algorithms made easy, Careermonk Publications (2016), 5th Edition
5. S.K. Srivastava and Deepali Srivastava, Data Structures through C, BPB Publications (2004)
6. YedidyahLangsam, Augestein and Tanenbaum, Data Structures using C and C++, Pearson Education India (2015), 2nd Edition

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL–4112
COMPUTER NETWORKS

Course Outcomes:

After passing course the student will be able to:

CO1: Describe the functions of each layer in OSI and TCP/IP model.

CO2: Identify various network devices and the layers on which it operates.

CO3: Describe the Data Link layer and Network layer design issues.

CO4: Comprehend the functioning of Transport layer and Application layer protocols.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL–4112
COMPUTER NETWORKS

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT – I

Introduction: Basic concepts of Computer Networks, Basic Components of a Network, Network types and topologies.

Models: OSI Reference Model, TCP/IP Model, Comparison between TCP/IP and OSI model

Transmission Media: Coaxial Cable, Twisted Pair Cable, Fiber Optics & Satellites.

UNIT – II

Network Devices: Hub, Switch, Repeaters, Bridges, Routers, Gateways.

Introduction to Analog and Digital Transmission: Introduction to Analog and Digital Signals, Modems, Types of modems, pulse code modulation. Multiplexing and its types, Circuit Switching, Packet Switching, Message Switching.

Data Link Layer Design Issues: Error Control, Flow Control, Error Detection & Correction

UNIT - III

Media Access Protocols: CSMA, CSMA/CD, CSMA/CA.

IEEE standards 802: Token Ring, FDDI.

Design Issues of Network Layer: Routing Algorithm- Distance Vector Routing, Link state Routing and The Dijkstra Algorithm, IPv4: Notation, Classful addressing, Header Format, IPv6 addressing.

UNIT – IV

Design issues of Transport Layer: Introduction to TCP, TCP Services, features, TCP segment format, Introduction to UDP, User Datagram Format, UDP Operation

Network Security and Privacy: Introduction to Cryptography, types of Key.

References/Textbooks:

1. Tanenbaum , A.S., Computer Networks, Prentice Hall, 2010.
2. Stallings, W., Local Networks: An Introduction: Macmillan Publishing Co, 1990.
3. Stallings W., Data and Computer Communications, Prentice Hall, 2011.
4. Forouzan B., Data Communications and networking, McGraw Hill, 2007.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL-4113
WEB DESIGNING AND DEVELOPMENT

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend basics of internet and email along with their effective use.

CO2: Apply HTML for development of static webpages.

CO3: Implement styling and behavior in webpages through the use of CSS.

CO4: Create and manage websites through the application of WordPress content management system.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL-4113
WEB DESIGNING AND DEVELOPMENT

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT - I

Introduction to Web Design and Development: Overview of web technologies and the web development process, Understanding the difference between web design and development, Introduction to HTML, CSS, and JavaScript

HTML: The structure of a Webpage, Creating a full webpage, Header tags, Paragraph tags, Formatting tags, List, Image tags, Forms in HTML, Tables, Links, HTML entities, iFrame

UNIT - II

CSS: What is CSS, Inline CSS, Internal CSS, Class and id, Div, Color, Floating, Positions, Margins, Padding, Borders, Font style, Styling text, Aligning text, Styling links, FlexBox in CSS

JavaScript: Inline JavaScript, internal JavaScript, Accessing elements, Onclick event, Changing Website content, Manipulating styles with JavaScript, Disappearing circles.

UNIT III

JavaScript: Variables, Array, If statement, Random number guessing game, for loop, While loop, External JavaScript.

DOM: DOM introduction, Naming conventions, String concat, Length property in strings, Slicing, Changing Case of string, Operators in js, Functions, Objects, How to add event listener in js

UNIT IV

WordPress: Installation, Configuration, Management - Managing Posts, pages, categories, Plugins, Widgets, Tags, images, users, Import and export content.

Useful Plugins – MailChimp, Creating Gallery, Google Maps, Google Analytics.

References / Textbooks:

1. Anshuman Sharma, Fundamentals of Internet Applications, Lakhanpal Publications, 2016.
2. Ikvinderpal Singh, Internet Applications, Khanna Book Publishing Company, 1st Edition, 2011
3. P. Rizwan Ahmed, Internet & its Applications, Margham Publications, 2013.
4. Douglas E. Comer, Computer Networks and Internet with Internet Applications, Pearson, 4th Edition, 2008.
5. Satish Jain/Vineeta Pillai, Wireless Communication & Networking made Simple, BPB Publishers, 2007.
6. Laura Lerney, Rafe Colburn, Jennifer Kyrnin, Mastering HTML, CSS & Javascript Web Publishing, BPB Publishers, 1st Edition, 2016.
7. Lisa Sabin-Wilson, WordPress for Dummies, Wiley, 8th Edition, 2021.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL-4114
APPLIED AND DISCRETE MATHEMATICS

Course Outcomes:

After passing course the student will be able to:

CO1: Have knowledge of matrices, sets, relations, propositional logic.

CO2: Have knowledge of Boolean algebra.

CO3: represents world knowledge in symbolic notation through propositional calculus.

CO4: Apply discrete mathematical concepts to obtain analytical and numerical solutions.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAL–4114
APPLIED AND DISCRETE MATHEMATICS

L-T-P: 4-0-0

Credits: 4

Examination Time: 3 Hours.

Max. Marks: 100

Theory: 70

CA: 30

Instructions for Paper Setter -

Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Logic and Propositional Calculus: Proposition and Compound Propositions, basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence, Laws of propositional logic, Algebra of propositions, Conditional and Bi conditional Statements, Arguments, Logical Implication, Propositional Functions, inference theory of proposition calculus, truth sets, Predicates and Quantifiers, Negation of Quantified Statements, Inference theory of the predicates calculus.

UNIT-II

Sets: Definition of sets, set representation, types of sets, operations on sets, Venn diagram, cardinality of sets (formulae), laws of set theory, Countable and uncountable sets, minset, maxset, normal forms, Partitions of sets, Cartesian products.

Relations: Basic definitions, domain and range of relations, representation of relations (arrow diagram). Types of relations, properties of relations, inverse of relation, closure of relation, equivalence classes, composition of relation.

UNIT-III

Functions: Basic definitions, domain, co-domain and range of functions, types of functions (Surjective, injective, bijective), inverse of a function, composition of function.

Matrices: Introduction, types of matrix, matrix addition, subtraction and scalar multiplication, multiplication of matrices, properties of matrix multiplication, transpose and its properties.

UNIT IV

Symmetric, skew-symmetric, nilpotent, unitary, orthogonal, Hermitian, skew-Hermitian, Identity matrix, involuntary matrix.

Determinant, minors and co-factors, adjoint of a matrix, Inverse of matrix, properties of determinant, rank of matrix, equation solving using Cramer's rule and matrix inversion method.

References/Textbooks:

1. Seymour Lipschutz, Marc Lars Lipson, Discrete Mathematics (Schaum's outlines Series), McGraw-Hill, 1997.
2. Bernard Kolman, Robert C. Busby, Discrete Mathematical structures for Computer Science, Prentice-Hall, 1984.
3. Alan Doerr, Kenneth Levasseur, Applied Discrete Structures for Computer Science, Galgotia Publications, 1989.
4. J.P.Tremblay. and R Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill, 1997.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAP-4115
LAB ON DATA STRUCTURES

L-T-P: 0-0-2
Credits: 2

Max. Marks: 50
Practical: 35
CA: 15

Lab Exercises based on Implementation of Data Structures using the C++ language:

1. Arrays and strings
2. Searching (binary search, linear search)
3. Linked list
5. Stacks (Using Arrays, linked lists)
6. Queues (Using Arrays, linked lists)
7. Trees – Traverse the BST, AVL Trees and B tree.
8. Sorting (selection sort, insertion sort, quick sort, merge sort, heap sort, bubble sort) ,
9. Graph-transversal, finding the shortest path

Bachelor of Computer Applications Semester – IV
(Session 2025-26)
COURSE CODE: BCAP-4116
LAB ON WEB DESIGNING AND DEVELOPMENT

L-T-P: 0-0-2
Credits: 2

Max. Marks: 50
Practical: 35
CA: 15

Lab Based on web designing and Development.