

Chaudhary Bansi Lal University, Bhiwani, Haryana

Scheme of Examination for Under-Graduate Programmes

Bachelor of Computer Applications (BCA)



according to
Curriculum Framework for Under-Graduate Programmes

As per NEP-2020

(Multiple Entry-Exit, Internships and Choice Based Credit System)

Ch. Bansi Lal University, Bhiwani, Haryana

Ch. Bansi Lal University, Bhiwani

Scheme of Examination for the Computer Science Subject in Under Graduate Programmes
as per NEP2020 Curriculum and Credit Framework for Undergraduate Programmes

(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF) with effect from the session 2024-25 (in a phased manner)

Semester-I

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A1	24UN-BCA-101	Problem Solving through C	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B1	24UN-BCA-102	Foundations of Computer Science	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C1	24UN-BCA-103	Logical Organization of Computer	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M1	24UN-BCA-104	Mathematical Foundations for Computer Science-I	2	1	1	1	2	3	10	5	20	15	50	3	3
MDC1	To be taken from other department														
AEC-1	To be taken from AEC Pool														
SEC-1	To be taken from SEC Pool														
VAC-1	To be taken from VAC Pool														

Semester-2

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A2	24UN-BCA-201	Object Oriented Programming using C++	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B2	24UN-BCA-202	Introduction to Web Technologies	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C2	24UN-BCA-203	Concepts of Operating Systems	4	3	1	3	2	4	20	10	50	20	100	3	3
CC-M2	24UN-BCA-204	Mathematical Foundations for Computer Science-II	2	1	1	1	2	3	10	5	20	15	50	3	3
MDC-2	To be taken from other department														
SEC-2	To be taken from SEC Pool														
VAC-2	To be taken from VAC Pool														
AEC-2	To be taken from AEC Pool														
Internship	24UN-BCA-205	Internship of 4 credits of 4-6 weeks duration after 2nd semester													

Semester-3

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A3	24UN-BCA-301	Java OOP Foundations	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B3	24UN-BCA-302	Linux and Shell programming	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C3	24UN-BCA-303	Data Base Technologies	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M3	To be taken from other department														
MDC-3	To be taken from other department														
SEC-3	To be taken from SEC pool														
AEC-3	To be taken from AEC Pool														

Semester-4

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A4	24UN-BCA-401	Data Structures and Applications	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B4	24UN-BCA-402	Front-end Development	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C4	24UN-BCA-403	Computer Graphics	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M4(V)	To be taken from VOC Pool														
AEC-4	To be taken from AEC Pool														
VAC-3	To be taken from VAC Pool														
Internship	24UN-BCA-404	Internship of 4 credits of 4-6 weeks duration after 4th semester													

Semester-5

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A5	24UN-BCA-501	Software Engineering	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B5	24UN-BCA-502	Back-end Development	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C5	24UN-BCA-503	Network Infrastructure and Data Communication Technologies	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M5(V)	To be taken from VOC Pool														
SEC-4	Internship @ 4 Credits														

Semester-6

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L:Lecture P:Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
CC-A6	24UN-BCA-601	Programming using Python	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-B6	24UN-BCA-602	Advanced Web Development	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-C6	24UN-BCA-603	Artificial Intelligence	4	3	1	3	2	5	20	10	50	20	100	3	3
CC-M6	To be taken from other department														
CC-M7(V)	To be taken from VOC Pool														

Semester-7

Course Type	Course Code	Nomenclature of the Course	Credits			Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Tutorial/ Practical (P)	L	T	Total	T	P	T	P		T	P
CC-H1	24UN-BCA-701	Principles & Paradigms of Programming Languages	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-H2	24UN-BCA-702	Software Testing	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-H3	24UN-BCA-703	Data Mining and Warehousing	4	4	0	4	0	4	30	-	70	-	100	3	-
DSE-H1	24UN-BCA-704	NoSQL Databases	4	4	0	4	0	4	30	-	70	-	100	3	-
	Or														
	24UN-BCA-705	Cyber Security	4	4	0	4	0	4	30	-	70	-	100	3	-
PC-H1	24UN-BCA-706	Practical	4	0	4	0	8	8	-	30	-	70	100	-	6
CC-HM1		Cloud Computing	4	0	4	4		4	30	--	70	--	100	3	

Semester-8 (Honours without research)

Course Type	CourseCode	Nomenclature of the Course	Credits			Contact hoursL: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
			Total	Theory (T)	Tutorial/Practical	L	T	Total	T	P	T	P		T	P
CC-H4	24UN-BCA-801	Design & Analysis of Algorithms	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-H5	24UN-BCA-802	Software Project Management	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-H6	24UN-BCA-803	Emerging Trends in Information Security	4	4	0	4	0	4	30	-	70	-	100	3	-
DSE-H2	24UN-BCA-804	Big Data	4	4	0	4	0	4	30	-	70	-	100	3	-
	OR														
	24UN-BCA-805	Machine Learning	4	4	0	4	0	4	30	-	70	-	100	3	-
PC-H2	24UN-BCA-806	Practical	4	0	4 Practical	0	8 P	8	-	30	-	70	100	-	6
CC-HM2	24UN-BCA-807	Internet of Things (IoT)	4	4	0	4	0	4	30	-	70	-	100	3	-

Ch. Bansi Lal Univeristy, Bhiwani, Haryana

OR															
<u>Semester-8 (Honours with research)</u>															
CC-H4	24UN-BCA-801	Design & Analysis of Algorithms	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-H5	24UN-BCA-802	Software Project Management	4	4	0	4	0	4	30	-	70	-	100	3	-
CC-HM2	24UN-BCA-807	Internet of Things (IoT)	4	4	0	4	0	4	30	-	70	-	100	3	-
Research	24UN-BCA-808	Project/ Dissertation	12										300		

Session:2024-25		
Part A-Introduction		
Subject	BCA	
Semester	I	
Name of the Course	Problem Solving through C	
Course Code	24UN-BCA-101	
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC	
Level of the course(As per Annexure-I	100-199	
Pre-requisite for the course(if any)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basics of C program, data types and input/output statements. 2. understand different types of operators, their hierarchies and also control statements of C. 3. implement programs using arrays and strings. 4. get familiar with advanced concepts like structures, union etc. in C language.	
	5*.to implement the programs based on various concepts of C.	
Credits	Theory	Practical
	3	1
	3	2
Contact Hours		
Max.Marks:100(70(T)+30(P))		
InternalAssessmentMarks:30(20(T)+10(P))	End Term Exam Marks:	Time:3Hrs.(T),3Hrs.(P)
70(50(T)+20(P))		
Part B-Contents of the Course		
Instructions for Paper-Setter		
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.Candidate will have to attempt five questions in all, selecting one question from each unit. First Question will be compulsory. Practicum will be evaluated by an external and and internal examiner. Examination will be of three-hour duration.		

Unit	Topics	Contact Hours
I	Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant. Input/output: Formatted I/O Function-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(); output functions viz. printf(), putchar(), puts().	10
II	Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion. Decision making with if statement, if-else statement, nested if statement, else-if ladder, switch and break statement, goto statement, Looping Statements: for, while, and do-while loop, jumps in loops.	10
III	Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation. Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions. Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring.	10
IV	Pointers in C: Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays. User defined data types: Structures - Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: - To read radius of a circle and to find area and circumference - To read three numbers and find the biggest of three - To check whether the number is prime or not - To read a number, find the sum of the digits, reverse the number and check it for palindrome - To read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers - To read percentage of marks and to display appropriate message (Demonstration of else-if ladder) - To find the roots of quadratic equation - To read marks scored by n students and find the average of	25

	Marks (Demonstration of single dimensional array) • To remove Duplicate Element in a single dimensional Array • To perform addition and subtraction of Matrices • To find factorial of a number • To generate Fibonacci series • To remove Duplicate Element in a single dimensional Array • To find the length of a string without using built in function • To demonstrate string functions • To read, display and add two m x n matrices using functions • To read a string and to find the number of alphabets,digits, vowels, consonants, spaces and special characters' • To Swap Two Numbers using Pointers • To demonstrate student structure to read& display records of n students • To demonstrate the difference between structure &union.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • ClassParticipation:5 • Seminar/presentation/assignment/quiz/classtestetc.:5 • Mid-TermExam:10 ➤ Practicum • ClassParticipation:5 • Seminar/Demonstration/Viva-voce/Labrecordsetc.:5 • Mid-TermExam: NA	End Term Examination: A three hour exam for both theory and practicum.	
PartC-Learning Resources		
RecommendedBooks/e-resources/LMS: • Gottfried,ByronS.,Programmingwith C,TataMcGrawHill. • Balagurusamy,E.,ProgramminginANSIC,TataMcGraw-Hill. • JeriR.Hanly&ElliotP.Koffman,ProblemSolvingandProgramDesigninC,Addison Wesley. • YashwantKanetker,Let usC,BPB. • Rajaraman,V.,ComputerProgramminginC,PHI. • YashwantKanetker,WorkingwithC, BPB.		

*Applicable for courses having practical component.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Foundations of Computer Science		
Course Code	24UN-BCA-102		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand the basics of computer 2. learn about I/O devices and operating systems 3. understand internet and its services 4. learn about the threats and security concepts on computers 5*. to understand the working of operating system, internet and security related concepts.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 (70(T)+30(P)) Internal Assessment Marks: 30 (20(T)+10(P)) End Term Exam Marks: 70 (50(T)+20(P))		Time: 3Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Unit	Topics	Contact Hours
I	Computer Fundamentals: Evolution of Computers through generations, Characteristics of Computers, Strengths and Limitations of Computers, Classification of Computers, Functional Components of a Computer System, Applications of computers in Various Fields. Types of Software: System software, Application software, Utility Software, Shareware, Freeware, Firmware, Free Software. Memory Systems: Concept of bit, byte, word, nibble, storage locations and addresses, measuring units of storage Capacity, access time, concept of memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory.	10
II	I/O Devices: I/O Ports of a Desk Top Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices-mouse, touch pad and trackball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, ink jet, dot-matrix. Plotter. Introduction to Operating System: Definition, Functions, Features of Operating System, Icon, Folder, File, Start Button, Task Bar, Status Buttons, Folders, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.	10
III	The Internet: Introduction to networks and internet, history, Internet, Intranet & Extranet, Working of Internet, Modes of Connecting to Internet. Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines.	10
IV	Threats: Physical & non-physical threats, Virus, Worm, Trojan, Spyware, Keyloggers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking. Computer Security Fundamentals: Confidentiality, Integrity, Authentication, Non-Repudiation, Security Mechanisms, Security Awareness, Security Policy, anti-virus software & Firewalls, backup & recovery.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Operating System: - Starting with basics of Operating Systems and its functionalities Computer Basics: - Identify the various computer hardware - Understanding the working of computer - Understanding various types of software	25

	Internet and E-mail: • Using Internet for various tasks • Creating and using e-mail. Security: • Understanding various threats • How to be safe from virus threats • Various software to get safe from virus attacks.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.	
Part C- Learning Resources		
Recommended Books/e-resources/LMS: • Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB. • Dromey, R.G., How to Solve it By Computer, PHI. • Norton, Peter, Introduction to Computer, McGraw-Hill. • Leon, Alexis & Leon, Mathews, Introduction to Computers, LeonTech World. • Rajaraman, V., Fundamentals of Computers, PHI.		

*Applicable for courses having practical component.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Logical Organization of Computer		
Course Code	24UN-BCA-103		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of Mathematics (10 th Level)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand number systems, error detecting correcting code and representation of numbers in a computer system. 2. understand computer arithmetic and Boolean algebra and simplification of Boolean expressions. 3. understand working of logic gates and design various combinational circuits using these logic gates. 4. understand working of different types of flip-flops and design different types of registers. 5*. to understand the practical aspects of logical organization of computer.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max.Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	

Part B- Contents of the Course

Instructions for Paper-Setter

Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Number Systems: Binary, Octal, Hexadecimal etc. Conversions from one number system to another, BCD Number System. BCD Codes: Natural Binary Code, Weighted Code, Self-Complementing Code, Cyclic Code. Error Detecting and Correcting Codes. Character representations: ASCII, EBCDIC and Unicode. Number Representations: Integer numbers - sign-magnitude, 1's & 2's complement representation. Real Numbers normalized floating point representations.	10
II	Binary Arithmetic : Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division using 1's and 2's Complement representations, Addition and subtraction with BCD representations. Boolean Algebra: Boolean Algebra Postulates, basic Boolean Theorems, Boolean Expressions, Boolean Functions, Truth Tables, Canonical Representation of Boolean Expressions: SOP and POS, Simplification of Boolean Expressions using Boolean Postulates & Theorems, Karnaugh-Maps (upto four variables), Handling Don't Care conditions.	10
III	Logic Gates: Basic Logic Gates- AND, OR, NOT, Universal Gates- NAND, NOR, Other Gates - XOR, XNOR etc. Their symbols, truth tables and Boolean expressions. Combinational Circuits: Design Procedures, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers, Demultiplexers, Decoder, Encoder, Comparators, Code Converters.	10
IV	Sequential Circuits: Basic Flip-Flops and their working. Synchronous and Asynchronous Flip-Flops, Triggering of Flip-Flops, Clocked RS, D Type, JK, T type and Master-Slave Flip-Flops. State Table, State Diagram and State Equations. Flip-flops characteristics & Excitation Tables. Sequential Circuits: Designing registers- Serial-In Serial-Out (SISO), Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO), Parallel-In Parallel-Out (PIPO) and shift registers.	10

V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Number System* - Problems based on Number System and their conversion. - Programs based on Number System conversion. Binary Arithmetic - Problems based on Binary Arithmetic.	25
	- Programs based on Binary Arithmetic. - Problems based on Boolean Expression and their simplification Logic Gates - Understanding working of logic Gates. Combinatorial Circuits: - Designing and understanding various combinational circuits. Sequential Circuits: - Designing and understanding various sequential circuits.	
Suggested Evaluation Methods		
Internal Assessment: > Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 > Practicum - Class Participation: 5 - Seminar/Demonstration/Viva-voce/Lab record etc.: 5 - Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall. - Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd. - Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill.		

*Applicable for courses having practical component.

Session:2024-25			
PartA-Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Mathematical Foundations for Computer Science-I		
Course Code	24UN-BCA-104		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-M		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After learning this course student will be able: 1. Gain the knowledge of set theory, types of sets and operations on sets. Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants. 2. Have the knowledge of the basic concepts of complex numbers and acquire skills to solve linear quadratic equations. 3. Gain the knowledge of the concepts of Arithmetic progression, Geometric progression and Harmonic progression, and find A.M., G.M. and H.M. of given numbers. 4. Understand the concept of differentiation 5. * Attain the skills to make use of the learnt concepts of Introductory Mathematics in multidisciplinary learning contexts and to know their applications		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Max.Marks:50(30(T)+20(P)) Internal Assessment Marks:15(10(T)+5(P)) End Term Exam Marks:35(20(T)+15(P))		Time:3Hrs.(T),3Hrs.(P)	

PartB-Contents of the Course

Instructions for Paper- Setter

Unit	Topics	Contact Hours
I	Sets and their representations, Empty set, Finite and infinite sets, Subsets, Equal sets, Power sets, Universal set, Union and intersection of sets, Difference of two sets, Complement of a set, Venn diagram, De-Morgan's laws and their applications.	4
II	An introduction to matrices and their types, Operations on matrices, Symmetric and skew-symmetric matrices, Minors, Co-factors. Determinant of a square matrix, Adjoint and inverse of a square matrix, Solutions of a system of linear equations up to order 3.	4
III	Quadratic equations, Solution of quadratic equations. Arithmetic progression, Geometric progression, Harmonic progression, Arithmetic mean (A.M.), Geometric mean (G.M.), Harmonic mean (H.M.), Relation between A.M., G.M. and H.M.	4
IV	The concept of differentiation, differentiation of simple functions, Use of differentiation for solving problems related to real-life situations. Differentiation of simple algebraic, trigonometric and exponential functions.	4
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Problem Solving- Questions related to the practical problems based on following topics will be worked out and record of those will be maintained in the Practical Note Book: • Problems related to union, intersection, difference and complement of sets. • Problems based on De Morgan's Laws. • Problems related to Venn diagrams. • Problems to find inverse of a matrix. • Problems to find determinant of a square matrix of order 3. • Problems to find nth term of A.P., G.P. and H.P. • Problems to find sum of n terms of A.P., G.P. and H.P. • Problems to find A.M., G.M. and H.M. of given numbers. • Problems involving formulation and solution of quadratic equations in one variable. • Problems to find f' • nst derivatives of functions.	25
Suggested Evaluation Methods		

Internal Assessment: > Theory • Class Participation: 4	End Term Examination: A three hour exam
• Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record setc.: 5 • Mid-Term Exam: NA	for both theory and practicum.
Part C-Learning Resources	
Text/Reference Books: • C.Y. Young(2021). <i>Algebra and Trigonometry</i>. Wiley. • S.L. Loney(2016). <i>The Elements of Coordinate Geometry (Cartesian Coordinates)</i> (2nd Edition). G.K. Publication Private Limited. • Seymour Lipschutz and Marc Lars Lipson(2013). <i>Linear Algebra</i>. (4th Edition) Schaum's Outline Series, McGraw-Hill. • C.C. Pinter (2014). <i>A Book of Set Theory</i>. Dover Publications. • J.V. Dyke, J. Rogers and H. Adams(2011). <i>Fundamentals of Mathematics</i> (10th Edition), Brooks/Cole. • A. Tussy, R. Gustafson and D. Koenig(2010). <i>Basic Mathematics for College Students</i> (4th Edition). Brooks/Cole	

*Applicable for courses having practical component.

Semester-II

Session:2024-25

Part A-Introduction

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	II		
Name of the Course	Object Oriented Programming using C++		
Course Code	24UN-BCA-201		
CourseType:(CC/MCC/MDC/C- M/DSEC/VOC/DSE/PC/AEC/V AC)	CC		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course(ifany)			
Course Learning Outcomes(CLO):	Aftercompletingthis course,the learnerwill beable to: 1. learntheinput/outputstatements and functions in C++. 2. getfamiliarwithOOPS concepts along with constructors and destructors in C++ language. 3. Learn the various concepts of operator overloading and inheritance. 4. getfamiliarwithconcepts of virtual functions and exception handling in C++ language. 5*.toimplementtheprogramsbasedonvariouscon ceptsof C++.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max.Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) EndTermExamMarks:70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type question covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit.First			

Question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Input Output in C++: Unformatted and Formatted I/O Operations. I/O using insertion and extraction operators and streams in C++. Functions: Declaration and Definition, return values, arguments, passing parameters by value, call by reference, call by pointer, Recursion, Inline Functions, Function overloading. Pointers, structures, and union in C++.	10
II	Object-oriented features of C++: Class and Objects, Data hiding & encapsulation, abstraction, Data Members and Member Functions, accessing class members, empty class, local class, global class, Scope Resolution Operator and its Uses, Static Data Members, Static Member Functions, Structure vs Class, Friend function and friend class. Constructors and Destructors: Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Dynamic initialization of objects.	10
III	Operator Overloading: Overloading unary and binary operators: arithmetic operators, manipulation of strings using operators. Inheritance: Derived class, base class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.	10
IV	Virtual Functions, pure virtual functions; Polymorphism & its types Exception Handling in C++: exception handling model, exception handling constructs - try, throw, catch, Order of catch blocks, Catching all exceptions, Nested try blocks, handling uncaught exceptions.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: - Write a C++ program to print the following lines: - Your introduction - Your institute introduction - Write a program that accepts principle, rate, and time from the user and prints the simple interest. - Write a program to swap the values of two variables. - Write a program to check whether the given number is even or odd (using ?: ternary operator). - Write a program to check whether the given number is positive or negative (using ?: ternary operator). - Write a program that inputs three numbers and displays the largest number using the ternary operator. - WAP to initialize data members of the class using the constructor. - Pass values to the constructor and initialize the members of that class to those values.	25

	• Create a class called cube with the data members Length, Breadth, Height • Members functions: • To accept the details. • To calculate the volume of the cube. • To display the details. • WAP to calculate the sum using constructor overloading. • WAP to demonstrate the use of destructor. • Create a C++ Program to show the order of constructor and destructor. • C++ Program to Find the Number of Vowels, Consonants, Digits, and White Spaces in a String • C++ Program to Multiply Two Matrices by Passing Matrix to Function • Increment ++ and Decrement -- Operator Overloading in C++ Programming • C++ Program to Add Two Complex Numbers • C++ Program to Show Function Overriding • C++ Program to Show Polymorphism in Class • C++ Program to Show Function Overloading • C++ Program to Show Inheritance	
Suggested Evaluation Methods		
InternalAssessment: ➤ Theory • ClassParticipation:5 • Seminar/presentation/assignment/quiz/classstestetc.:5 • Mid-TermExam:10 ➤ Practicum • ClassParticipation:5 • Seminar/Demonstration/Viva-voce/Labrecordsetc.:5 • Mid-TermExam: NA	End-TermExamination: A three-hourexam for boththeory andpracticum. EndTermExamMarks:70(50(T)+20(P))	
PartC -Learning Resources		
Recommended Books/e-resources/LMS: • Herbert Scildt, C++, The Complete Reference, Tata McGraw-Hill • Robert Lafore, Object Oriented Programming in C++, SAMS Publishing • Bjarne Stroustrup, The C++ Programming Language, Pearson Education • Balaguruswami, E., Object Oriented Programming In C++, Tata McGraw-Hill. • Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning.		

*Applicablefor courses havingpractical components.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	II		
Name of the Course	Introduction to Web Technologies		
Course Code	24UN-BCA-202		
CourseType:(CC/MCC/MDC /CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As perAnnexure-I	100-199		
Pre-requisiteforthecourse(ifany)			
CourseLearningOutcomes(CLO):	Aftercompletingthis course,thelearner willbeableto: 1. learnthebasicsoweb development. 2. understand different types of web pages and web sites. 3. implementHTML and CSS for web page designing. 4. Understand the design of web crawlers and search engines. 5*. to implement the programs based on variousconceptsof web development.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max.Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) EndTermExamMarks:70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
Part B-Contents of the Course			
Instructions for Paper-Setter Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicumwillbeevaluatedbyanexternalandaninternalexaminer.Examination willbeofthree-hourduration.			

Unit	Topics	Contact Hours
I	Introduction to Internet and World Wide Web (WWW); Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Hypertext Transfer Protocol, URLs; Searching, Search Engines and Search Tools. Web Publishing: Hosting website; Internet Service Provider; Planning and designing website; Web Graphics Design, Steps For Developing website	10
II	Creating a Website and Introduction to Mark up Languages (HTML and DHTML), HTML Document Features & Fundamentals, HTML Elements, Creating Links; Headers; Text styles; Text Structuring; Text colour and Background; Formatting text; Page layouts, Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes, HTML5	10
III	Introduction to CSS (Cascading Style Sheets): Features, Core Syntax, Types, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Positioning, and other useful Style Properties; Features of CSS3.	10
IV	The Nature of JavaScript: Evolution of Scripting Languages, JavaScript-Definition, Programming for Non-Programmers, Introduction to Client-Side Programming, Enhancing HTML Documents with JavaScript. Static and Dynamic web pages	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Create a web page using ordered list and unordered list. • Design a web page to show your institute with hyperlinks. • Create your resume on HTML page. • Create a web page divide the web page into four frames. In one frame create three links that will display different HTML forms in the remaining three frames respectively. • Create a web page to show the record of the college in the form of a table. • Write a HTML code to add internal CSS on a webpage • Design a blog-style personal website.	25

• Design a web page to display your college with hyperlinks. • Write a JavaScript function to calculate the sum of two numbers. • Write a JavaScript program to find the maximum number in an array. • Write a JavaScript function to check if a given string is a palindrome (reads the same forwards and backward). • Write a CSS file and attach it to any 3 HTML webpages. • Use Div and span in a page and color two words with the same colors. • Using HTML, CSS create a styled checkbox with animation on state change • Design a web page that is like a compose page of e-mail. It should have: a) Text boxes for To, CC, and BCC respectively. b) Text field for the message. c) Send button. d) Option for selecting a file for attachment • After clicking the send button a new page should open with the display message "Message has been sent".	
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill. • Ramesh Bangia, Multimedia and Web Technology, Firewall Media. • Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill • Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill. • Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI • David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide. • Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.	

*Applicable for courses having practical components.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	II		
Name of the Course	Concepts of Operating Systems		
Course Code	24UN-BCA-203		
CourseType:(CC/MCC/MDC /CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (ifany)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of operating systems and their services along with process management. 2. understand the concept of process scheduling and acquire knowledge of process synchronization. 3. learn about memory management and virtual memory concepts. 4. learn to work with directory structure and security aspects. 5*.toimplement the programs based on the operating system.		
Credits	Theory	Practical	Total
	3	1	4
ContactHours	3	2	5
Max.Marks;100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) EndTermExamMarks:70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
PartB- Contents of the Course			
<u>Instructions for Paper-Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory.Remaining eight questions will be set from four unit selecting two questions from each unit.Examinationwillbeofthree-hourduration.Allquestionswillcarryequalmarks.Firstquestion			

Will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introductory Concepts: Operating System, Functions and Characteristics, Historical Evolution of Operating Systems, Operating System Structure. Types of Operating System: Real-time, Multiprogramming, Multiprocessing, Batch processing. Operating System Services, Operating System Interface, Service System Calls, and System Programs. Process Management: Process Concepts, Operations on Processes, Process States, and Process Control Block. Inter-Process Communication.	10
II	CPU Scheduling: Scheduling Criteria, Levels of Scheduling, Scheduling Algorithms, Multiple Processor Scheduling, Algorithm Evaluation. Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization, Monitors. Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.	10
III	Memory Management Strategies: Memory Management of Single-user and Multiuser Operating Systems, Partitioning, Swapping, Contiguous Memory Allocation, Paging and Segmentation; Virtual Memory Management: Demand Paging, Page Replacement Algorithms, Thrashing.	10
IV	Implementing File System: File System Structure, File System Implantation, File Operations, Type of Files, Directory Implementation, Allocation Methods, and Free Space Management. Disk Scheduling algorithm - SSTF, Scan, C- Scan, Look, C-Look. SSD Management.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: - Working with various operating systems, and performing different operations using operating systems. - Write a program to print file details including owner access permissions, and file access time, where file name is given as argument. - Write a program to copy files using system calls.	25

	• Write a program to implement the FCFS scheduling algorithm. • Write a program to implement the Round Robin scheduling algorithm. • Write a program to implement the SJF scheduling algorithm. • Write a program to implement a non-preemptive priority-based scheduling algorithm • Write a program to implement preemptive priority-based scheduling algorithm. • Write a program to implement the SRJF scheduling algorithm. • Write a program to calculate the sum of n numbers using the thread library. • Write a program to implement first-fit, best-fit, and worst-fit allocation strategies.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C- Learning Resources		
Recommended Books/e-resources/LMS: • Silberschatz A., Galvin P.B., and Gagne G., Operating System Concepts, John Wiley & Sons. • Godbole, A.S., Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi. • Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York. • Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi.		

*Applicable for courses having practical components.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	II		
Name of the Course	Mathematical Foundations for Computer Science-II		
Course Code	24UN-BCA-204		
Course Type:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course(if any)			
Course Learning Outcomes(CLO):	After learning this course student will be able: 1. Understand the concept of integration. 2. Acquire cognitive and technical knowledge about a variety of methods of representation of statistical data. 3. Understand methods of measure of central tendency. Analyze the problem and apply the best measure of central tendency to draw inferences from the available data. 4. Understand the concept of correlation, and correlation methods and conclude about the type of correlation for the available data. Comprehend the skills of curve fitting. 5. * Attain a range of cognitive and technical skills to integrate various functions. Have technical and practical skills required for selecting and using suitable methods for data representation and measure of central tendency.		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Max.Marks:50(30(T)+20(P)) InternalAssessmentMarks:15(10(T)+5(P)) EndTermExamMarks:35(20(T)+15(P))		Time:3Hrs.(T),3Hrs.(P)	

PartB- Contents of the Course		
Unit	Topics	Contact Hours
I	Integration of simple algebraic, trigonometric, and exponential functions. Presentation of data: Frequency distribution and cumulative frequency distribution, Diagrammatic and graphical presentation of data, Construction of bar, Pie diagrams, Histograms, Frequency polygon, Frequency curve, and Ogives.	4
II	Measures of central tendency: Arithmetic mean, Median, Mode, Geometric mean, and Harmonic mean for ungrouped and grouped data. Measures of dispersion: Concept of dispersion, Mean deviation and its coefficient, Range, Variance and its coefficient, Standard deviation.	4
III	Correlation: Concept and types of correlation, Methods of finding correlation: Scatter diagram, Karl Pearson's coefficients of correlation, Rank correlation.	4
IV	Linear regression: Principle of least square, Fitting of a straight line, Two lines of regression, Regression coefficients.	4
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: Problem Solving- Questions related to the practical problems based on the following topics will be worked out and a record of those will be maintained in the Practical Note Book: • Demonstrate skills in finding integration of simple functions. • Representation of data using Bar and pie diagrams. • Representation of data using Histogram, Frequency polygon, Frequency curves, and Ogives. • Problems to compute measures of central tendency. • Problems to calculate measures of dispersion. • Problem to calculate Karl Pearson's coefficient of correlation. • Problem to fit the straight line for the given data. • Problem to find lines of regression.	25
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA		End Term Examination: A three- hour exam for both theory and practicum. End Term Exam Marks: 35(20(T)+15(P))

Part C-Learning Resources

Text/Reference Books:

- S.C. Gupta and V.K. Kapoor (2014). Fundamentals of Mathematical Statistics, S. Chand & Sons, Delhi.
- R.V. Hogg, J. W. McKean and A. T. Craig (2013). Introduction to Mathematical Statistics (7 th edition), Pearson Education.
- J. V. Dyke, J. Rogers and H. Adams (2011). Fundamentals of Mathematics, Cengage Learning.
- A.S. Tussy, R. D. Gustafson and D. Koenig (2010). Basic Mathematics for College Students. Brooks Cole.
- G. Klammbauer (1986). Aspects of calculus. Springer-Verlag.

*Applicable for courses having practical components.

Session:2024-25			
PartA-Introduction			
Subject	BCA		
Semester	III		
Nameofthe Course	Java OOP Foundations		
CourseCode	24UN-BCA-301		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Levelofthecourse(Asper Annexure-I	100-199		
Pre-requisite for thecourse(if any)	Knowledge of any Computer Programming Language		
CourseLearningOutcomes(CLO):	Aftercompletingthis course,the learnerwill beable to: 1. Implementsimplejavaprograms. 2. ImplementmultipleinheritanceusingInterfaces 3. Implement Exception Handling and File Handling. 4. UseAWT to design GUI applications. 5*develop theprojectusing java.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	

PartB-Contents of the Course

Instructions for Paper-Setter

Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Object Oriented Programming and Java Fundamentals: Structure of Java programs, Classes and Objects, Data types, Type Casting, Looping Constructs.	10
II	Interfaces: Interface basics; Defining, implementing and extending interfaces; Implementing multiple inheritance using interfaces Packages: Basics of packages, Creating and accessing packages, System packages, Creating user defined packages	10
III	Exception handling using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, multiple catch statements, creating user defined exceptions. File Handling Byte Stream, Character Stream, FileI/O Basics, File Operations	10
IV	AWT and Event Handling: The AWT class hierarchy, Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Creating GUI applications using AWT.	10

V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • WAP to find the sum of 10 numbers, entered as command line arguments. • WAP to find the area of rectangle and circle using Interface. • WAP to implement multiple inheritance. • WAP to show the concept of packages. • WAP to handle the Exception using try and multiple catch blocks and a finally block. • WAP for Implementing Calculator in an Applet, use appropriate Layout Manager. • Write Applet code to add two integers in text box and their sum should appear in third textbox. • Write AWT program in Java to find the sum, Multiplication and average of three numbers entered in three Text fields by clicking the corresponding Labeled Button. The result should be appearing in fourth text field. • Write Applet code to show all the activities of Mouse using MouseListener and MouseMotionListener. • What are various stream classes in Java? Write Java code to read character from a file and write into another file. • What are AWT Classes? Write Java Program to generate Even numbers and Odd Numbers in TextField "T1 and T2 respectively" while pressing Button "Even" and "Odd". • Write a program to Copy the text from one file to another using byte stream.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Schildt, H. (2018). Java: The Complete Reference. 10th edition. McGraw-Hill Education. • Balaguruswamy E. (2014). Programming with JAVA: A Primer. 5th edition. India: McGraw Hill Education • Horstmann, C.S. (2017). Core Java- Vol. I- Fundamentals (Vol. 10). Pearson Education • Schildt, H., & Skrien, D. (2012). Java Fundamentals- A Comprehensive Introduction. India: McGraw Hill Education.		

*Applicable for courses having practical component.

Session:2024-25			
PartA-Introduction			
Subject	BCA		
Semester	III		
Nameofthe Course	Linux and Shell Programming		
CourseCode	24UN-BCA-302		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Levelofthecourse(Asper Annexure-I	100-199		
Pre-requisite for thecourse(if any)	Musthavebasicknowledgeofcomputer		
CourseLearningOutcomes(CLO):	Aftercompletingthis course,the learnerwill beable to: 1.understand Linuxarchitecture. 2 usevariousLinuxcommandsthatareusedto manipulate system operations. 3 acquireknowledgeofLinuxFile System. 4 understandandmakeeffectiveuseofi/Oandshell scripting language to solve problems. 5*.toimplementtheprogramsbasedonvariousshell commands and programs in linux.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) InternalAssessmentMarks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
Part B-Contents of the Course			
<u>Instructions forPaper-Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			
Practicumwillbeevaluatedbyanexternalandaninternalexaminer.Examinationwillbeof three-hourduration.			

Unit	Topics	Contact Hours
I	Introduction to Linux: Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, Logging in and Logging out, Comparison of Linux with other operating systems.	10
II	Commands in Linux: General-Purpose commands, File oriented commands, directory oriented commands, Communication-oriented commands, process oriented commands, etc. Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, grep; Introducing regular expressions.	10
III	Linux file system: Linux files, inodes and structure and file system, file system components, standard file system, file system types. Processes in Linux: Starting and Stopping Processes, Initialization Processes, Mechanism of process creation, Job control in linux using at, batch, cron & time.	10
IV	Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in linux.	10
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Basic Linux command • Basic Shell Programming (Fibonacci Series generation, Factorial of a given number, Checking for Armstrong number) • Designing an Arithmetic calculator • Generation of Multiplication table • Base Conversion (Decimal to Binary, Binary to Decimal) • Finding the information about the Login name and File name. • Write a shell script to exchange the contents of two variables. • Write a shell script, which accepts three subject marks scored by a student and declare the result. • Write a shell script program to find area of a square, rectangle, circle and triangle. • Write a shell script to print integer numbers from 1 to 20.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum		End Term Examination: A three hour exam for both theory and practicum.

• ClassParticipation:5 • Seminar/Demonstration/Viva-voce/Labrecordsetc.:5 • Mid-TermExam: NA	
PartC-LearningResources	
RecommendedBooks/e-resources/LMS: • YashwantKanetkar,Unix & Shell programming-BPB Publications. • RichardPetersen,TheCompleteReference- Linux,McGraw-Hill. • M.G.Venkateshmurthy,IntroductiontoUnix&ShellProgramming,Pearson Education. • StephenPrata,Advanced UNIX-AProgrammer'sGuide,SAMSPublication. • SumitabhaDas,YourUnix-TheUltimateGuide,TataMcGraw-Hill.	

*Applicableforcourses havingpracticalcomponent.

Session:2024-25			
Part A-Introduction			
Subject	BCA		
Semester	III		
Name of the Course	Data Base Technologies		
Course Code ¹	24UN-BCA-303		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the concepts of problem solving on computer 2. understand the basics of C programming along with various I/O functions 3. understand various operators and branching statements in C 4. understand loops, functions and arrays in C 5*. to design programs based on theoretical concepts of C.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max.Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time:3Hrs.(T),3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
Unit	Topics		Contact Hours
I	Basic Concepts–Data, Information , Records, Files, Schema and Instance etc. Limitations of File Based Approach,		10

	Characteristics of Database Approach, Database Management System (DBMS), Components of DBMS Environment, DBMS Functions and Components, Database Interfaces, Advantages and Disadvantages of DBMS. Database Users :Data and Database Administrator, Role and Responsibilities of Database Administrator, Database Designers, Application Developers etc. Database System Architecture – 1-Tier, 2-Tier & Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances, Data Independence – Logical and Physical Data Independence. .	
II	Data Models: Hierarchical, Network and Relational Data Models. Entity-Relationship Model: Entity, Entity Sets, Entity Type, Attributes: Type of Attributes, Keys, Integrity Constraints, Designing of ER Diagram, Symbolic Notations for Designing ER Diagram,	10
III	SQL: Meaning, Purpose and Need of SQL, Data Types, SQL Components: DDL, DML, DCL and DQL, Basic Queries, Join Operations and Sub-queries, Views, Specifying Indexes. Constraints and its Implementation in SQL. Relational Algebra: Basic Operations: Select, Project, Join, Union, Intersection, Difference, and Cartesian Product etc. Relational Calculus: Tuple Relational and Domain Relational Calculus. Relational Algebra Vs. Relational Calculus.	10
IV	Relational Model: Functional Dependency, Characteristics, Inference Rules for Functional Dependency, Types of Functional Dependency, Normalization: Benefits and Need of Normalization, Normal Forms Based on Primary Keys- (1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies, 4NF, Joindependencies, 5NF, Domain Key Normal Form.	10
V*	The following activities be carried out/discussed in the lab during the period of the semester. Programming Lab: - Performing various SQL statement. Creating various tables and performing all possible queries based on syllabus. - Understanding relational model concepts - Understanding normalization - Understanding various concepts of databases.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10		End Term Examination: A three hour exam for both theory and practicum.

➤ Practicum • Class Participation: 5 • Seminar/Demonstration/Viva-voce/Lab record etc.: 5 • Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Elmasri & Navathe, Fundamental of Database Systems, Pearson Education. • A Silberschatz, H Korth, S Sudarshan, Database System and Concepts, McGraw-Hill. • Thomas Connolly Carolyn Begg, Database Systems, Pearson Education. • C.J. Date, An Introduction to Database Systems, Addison Wesley.	

*Applicable for courses having practical component

Session: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	IV		
Name of the Course	Data Structures and Applications		
Course Code	24UN-BCA-401		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basics of data structure and algorithm complexities. 2. acquire knowledge of arrays and strings. 3. understand the idea of implementation for linked lists and stacks. 4. learn various searching and sorting techniques along with the implementation of queues. 5* develop the project with data structures.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Unit	Topics	Contact Hours
I	Data Structure Definition, Data Type vs. Data Structure, Classification of Data Structures, Data Structure Operations, Applications of Data Structures. Algorithm Specifications: Performance Analysis and Measurement (Time and Space Analysis of Algorithms- Average, Best and Worst Case Analysis).• Arrays: Introduction, Linear Arrays, Representation of Linear Array in Memory, Two Dimensional and Multidimensional Arrays, Sparse Matrix and its Representation, Operations on Array: Algorithm for Traversal, Selection, Insertion, Deletion and its implementation.	11
II	String Handling: Storage of Strings, Operations on Strings viz., Length, Concatenation, Substring, Insertion, Deletion, Replacement, Pattern Matching Linked List: Introduction, Array vs. linked list, Representation of linked lists in Memory, Traversing a Linked List, Insertion, Deletion, Searching into a Linked list, Type of Linked List.	11
III	Stack: Array Representation of Stack, Linked List Representation of Stack, Algorithms for Push and Pop, Application of Stack: Polish Notation, Postfix Evaluation Algorithms, Infix to Postfix Conversion, Infix to Prefix Conversion, Recursion. Introduction to Queues: Simple Queue, Double Ended Queue, Circular Queue, Priority Queue, Representation of Queues as Linked List and Array, Applications of Queue. Algorithm on Insertion and Deletion in Simple Queue and Circular Queue. Priority Queues.	12
IV	Tree: Definitions and Concepts, Representation of Binary Tree, Binary Tree Traversal (Inorder, postorder, preorder), Binary Search Trees – Definition, Operations viz., searching, insertions and deletion; Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Write a program that uses functions to perform the following operations on an array i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on strings i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a singly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal. • Write a program that uses functions to perform the following operations on a doubly linked list i) Creation ii) Insertion iii) Deletion iv) Traversal • Write a program that implement stack (its operations) using i) Arrays ii) Linked list(Pointers).	30

	• Write a program that implements Queue (its operations) using i) Arrays and ii) Linked lists (Pointers). • Write a program that implements the following sorting i) Bubble sort ii) Selection sort iii) Quick sort. • Write programs for various types of tree traversals.	
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines. • Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures Using C, Pearson Education. • Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw-Hill. • Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley.		
* Applicable for courses having practical components.		

Session: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	IV		
Name of the Course	Front-end Development		
Course Code	24UN-BCA-402		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	24UN-BCA-202		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concept of objects and regular expressions in JavaScript; 2. acquire knowledge of JavaScript events and DOM 3. learn to use forms and BOM in JavaScript; 4. get familiar with jQuery 5*. Understand the programming of web pages and handling events using JavaScript and jQuery.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Objects in JavaScript: Introduction to objects, Type of objects in JavaScript, creating objects, Object methods, Constructor function, Prototype in JavaScript, Inheritance using prototype chain. Regular Expressions: Introduction to RegExp, Regular expression usage, Modifiers, RegExp patterns, RegExp methods, String methods for RegExp, Type conversion in JavaScript.	11
II	Event handling: JavaScript events, Event handler, Event flow, Event bubbling and BCAturing, Event listeners, Event types. Document Object Model (DOM): Introduction to DOM, Types of DOM, DOM standards and methods, Manipulating documents using DOM, Handling images, Table manipulation, Animation, Node and Node-list handling	11
III	Browser Object Model (BOM): Introduction to BOM, DOM vs BOM differences, Window object and methods, BOM navigator, BOM history, BOM location, BOM timer, Introduction to Cookies, Session and persistent cookies. Form Handling: Introduction to forms, Form processing, Forms object, Accessing data from forms, Form validation, Additional features in forms, Validation APIs	12
IV	Introduction to jQuery: jQuery Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery HTML, jQuery Traversing, jQuery AJAX, jQuery Misc.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Use of JavaScript in Web page designing • Effective web page design • Creation of Event listeners in JavaScript • Update and modify website elements dynamically using asynchronously retrieved data • Style HTML content with JavaScript • Iterate over arrays and objects using JavaScript for syntax. • JavaScript Program to Create Objects (4 Different Ways) • JavaScript Program to Iterate Over an Object • JavaScript Program to Find Max/Min Value of an 'Attribute in an Array of Objects • JavaScript Program to Remove Duplicates from an Array of Objects • Writing programs for event handling in JavaScript. • Write a JavaScript function to add rows to a table. • Write a JavaScript program to remove items from a drop-down list. • Write a JavaScript program to calculate sphere volume.	30

	• Write a JavaScript program to get the window width and height • Using BOM navigation and location • Creating cookies and sessions. • How can you create forms and perform validations on the forms? • How can you use jQuery and perform various functions using jQuery?	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide. • Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd. • JavaScript and jQuery: Interactive Front-End Web Development by Jon Duckett • Head First JavaScript Programming: A Brain-Friendly Guide by Elisabeth Robson and Eric Freeman		

*Applicable for courses having practical components.

Session: 2024-25			
Part A - Introduction			
Subject	BCA		
Semester	IV		
Name of the Course	Computer Graphics		
Course Code	24UN-BCA-403		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the concepts of computer graphics 2. learn and implement point, line, and circle drawing algorithms. 3. acquire knowledge of two-dimensional transformations and line clipping algorithms. 4. understand 3-D graphics concepts and acquire skills for designing 3-D graphics 5*. to design programs based on theoretical concepts of Computer Graphics.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Instructions for Paper-Setter Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction: History of Computer Graphics (CG), Applications of Computer Graphics, Components of interactive graphics systems Display devices: Refresh CRT, Color CRT, Plasma Panel displays LCD Panels, Raster-scan System, Random scan System, Graphic software, Input/Output Devices, Tablets	11
II	Output Primitives: Points and Lines, Line Drawing Algorithms: DDA algorithm, Bresenham's algorithm, Circle drawing Algorithms: Polynomial Method, Bresenham's algorithm. Parametric representation of Cubic Curves, Bezier Curves	11
III	2D Transformation: Use of Homogeneous Coordinates Systems, Composite Transformation: Translation, Scaling, Rotation, Mirror Reflection, Rotation about an Arbitrary Point. Clipping and Windowing, Clipping Operations. Line Clipping Algorithms: The Mid-Point subdivision method, Cohen-Sutherland Line Clipping Algorithms, Polygon Clipping, Sutherland Hodgeman Algorithms, Text Clipping.	12
IV	3-D Graphics: 3-D object representations, , 3-D Transformations: Translation, Rotation, Scaling, Projections, Hidden surface elimination: Back face removal, Depth Buffer algorithm, Scan-line algorithm, Depth sort algorithm, Shading.	11
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: - Implement DDA line drawing algorithm for all types of slope. - Implement Bresenham's line drawing algorithm for all types of slopes. - Implement Bresenham's Circle drawing algorithm. - Implement Bresenham's Ellipse drawing algorithm. - Implement various 2-D transformations on objects like lines, rectangles, etc. - Implement to clip a line using the Mid-Point subdivision algorithm - Implement to clip a line using Cohen-Sutherland algorithm - Implement 3-D transformations on objects.	30
Suggested Evaluation Methods		
Internal Assessment: > Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 > Practicum		End Term Examination: A three-hour exam for both theory and practicum. End Term Exam

• Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education. • J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education. • Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill. • Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill. • Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.	

*Applicable for courses having practical components.