

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A+’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (1st & 3rd Semester) 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)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Problem Solving through C		
Course Code	B23-CAP-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)	None		
Course Learning Outcomes(CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 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. <hr/> <p>5*. to implement the programs based on various concepts of C.</p>		
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. The remaining eight questions will be set from four units, selecting two questions from each. 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 must attempt five questions, selecting one from each unit. The 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	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().	11
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.	11
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.	12
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; the difference between Structure and Union.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:	30

	<ul style="list-style-type: none"> • To read the radius of a circle and to find the 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 the keyboard continuously till the user presses 999 to find the sum of only positive numbers • To read the percentage of marks and to display an appropriate message (Demonstration of else-if ladder) • To find the roots of the quadratic equation • To read marks scored by n students and find the average of marks (Demonstration of the single dimensional array) • To remove Duplicate Elements in a single dimensional Array • To perform addition and subtraction of Matrices • To find the factorial of a number • To generate Fibonacci series • To remove Duplicate Elements in a single dimensional Array • To find the length of a string without using the 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		
<p>Internal Assessment:</p> <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 	<p>End Term Examination: A three-hour exam for both theory and practicum.</p>	
Part C-Learning Resources		
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Gottfried, Byron S., Programming with C, Tata McGraw Hill. • Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. 		

- Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
- Yashwant Kanetker, Let us C, BPB.
- Rajaraman, V., Computer Programming in C, PHI.
- Yashwant Kanetker, Working with C, BPB.

*Applicable for courses having practical component.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Foundations of Computer Science		
Course Code	B23-CAP-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)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. understand the basics of computer 2. learn about I/O devices and operating systems 3. understand the Internet and its services 4. learn about the threats and security concepts on computers <hr style="width: 50%; margin: 10px auto;"/> 5*. to understand the working of the 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: 3 Hrs.(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. 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 must attempt five questions, selecting one from each unit. The 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	<p>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, the concept of the memory hierarchy. Primary Memory - RAM, ROM, PROM, EPROM. Secondary Memory - Types of storage devices, Magnetic Tape, Hard Disk, Optical Disk, Flash Memory.</p>	11
II	<p>I/O Devices: I/O Ports of a Desktop Computer, Device Controller, Device Driver. Input Devices: classification and use, keyboard, pointing devices - mouse, touchpad and trackball, joystick, magnetic stripes, scanner, digital camera, and microphone Output Devices: speaker, monitor, printers: classification, laser, inkjet, 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.</p>	12
III	<p>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.</p>	11
IV	<p>Threats: Physical & non-physical threats, Viruses, worms, Trojans, 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.</p>	11

V*	<p>Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:</p> <p>Operating System:</p> <ul style="list-style-type: none"> • Starting with basics of Operating Systems and its functionalities <p>Computer Basics:</p> <ul style="list-style-type: none"> • Identify the various computer hardware • Understanding the working of computer • Understanding various types of software <p>Internet and E-mail:</p> <ul style="list-style-type: none"> • Using Internet for various tasks • Creating and using e-mail. <p>Security:</p> <ul style="list-style-type: none"> • Understanding various threats • How to be safe from virus threats • Various software to get safe from virus attacks. 	30
Suggested Evaluation Methods		
<p>Internal Assessment:</p> <p>> Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>> Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 	<p>End Term Examination: A three-hour exam for both theory and practicum.</p>	
Part C-Learning Resources		
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • 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, Leon Tech World. • Rajaraman, V., Fundamentals of Computers, PHI. 		

*Applicable for courses having practical component.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Logical Organization of Computer		
Course Code	B23-CAP-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):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. understand number systems, error detecting correcting code, and representations of numbers in a computer system. 2. understand computer arithmetic and Boolean algebra and simplification of Boolean expressions. 3. understand the working of logic gates and design various combinational circuits using these logic gates. 4. understand the working of different types of flip-flops and design different types of registers. <hr style="width: 20%; margin-left: 0;"/> <p>5*. to understand the practical aspects of the logical organization of computers.</p>		
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. 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 must attempt five questions, selecting one from each unit. The 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	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.	11
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.	11
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.	11
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),	12

	Serial-In Parallel-Out (SIPO), Parallel-In Serial-Out (PISO) Parallel-In Parallel-Out (PIPO) and shift registers.	
V*	<p>Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:</p> <p>Number System:</p> <ul style="list-style-type: none"> • Problems based on Number System and their conversion. • Programs based on Number System conversion. <p>Binary Arithmetic</p> <ul style="list-style-type: none"> • Problems based on Binary Arithmetic. • Programs based on Binary Arithmetic. • Problems based on Boolean Expression and their simplification <p>Logic Gates</p> <ul style="list-style-type: none"> • Understanding working of logic Gates. <p>Combinatorial Circuits:</p> <ul style="list-style-type: none"> • Designing and understanding various combinational circuits. <p>Sequential Circuits:</p> <ul style="list-style-type: none"> • Designing and understanding various sequential circuits. 	30
Suggested Evaluation Methods		
<p>Internal Assessment:</p> <ul style="list-style-type: none"> > Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 		<p>End Term Examination: A three-hour exam for both theory and practicum.</p>
Part C-Learning Resources		
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • 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.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	I		
Name of the Course	Mathematical Foundations for Computer Science-I		
Course Code	B23-CAP-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)	None		
Course Learning Outcomes (CLO):	<p>After learning this course student will be able to:</p> <ol style="list-style-type: none"> 1. Gain 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. Know 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 learned 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))		Time: 3 Hrs.(T), 3Hrs.(P)	

Internal Assessment Marks:15(10(T)+5(P))		
End Term Exam Marks:35(20(T)+15(P))		
Part B-Contents of the Course		
<u>Instructions for Paper-Setter</u>		
<p>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. 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 must attempt five questions, selecting one from each unit. The first question will be compulsory.</p> <p>The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.</p>		
Unit	Topics	Contact Hours
I	Sets and their representations, Empty sets, Finite and infinite sets, Subsets, Equal sets, Power sets, Universal sets, 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, and 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.	3
IV	The concept of differentiation, differentiation of simple functions, and Use of differentiation for solving problems related to real-life situations. Differentiation of simple algebraic, trigonometric, and exponential functions.	4
V*	<p>Practicum:</p> <p>Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <p>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:</p> <ul style="list-style-type: none"> • Problems related to union, intersection, difference and complement of sets. 	30

	<ul style="list-style-type: none"> • Problems based on De Morgan’s Laws. • Problems related to Venn diagrams. • Problems to find the inverse of a matrix. • Problems to find the determinant of a square matrix of order 3. • Problems to find the nth term of A.P., G.P., and H.P. • Problems to find the 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 the first derivatives of functions. 	
Suggested Evaluation Methods		
<p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: NA 	<p>End Term Examination: A three-hour exam for both theory and practicum.</p>	
Part C-Learning Resources		
<p>Text /Reference Books:</p> <ul style="list-style-type: none"> • 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.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	III		
Name of the Course	Java OOP Foundations		
Course Code	B23-CAP-301		
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: <ol style="list-style-type: none"> 1. Implement simple Java programs. 2. Implement multiple inheritance using Interfaces 3. Implement Exception Handling and File Handling. 4. Use AWT to design GUI applications. 5* develop the project using java.		
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. 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 must attempt five questions, selecting one from each unit. The 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	Object Oriented Programming and Java Fundamentals: Structure of Java programs, Classes and Objects, Data types, Type Casting, Looping Constructs.	11
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	11
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, File I/O Basics, File Operations	11
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.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: <ul style="list-style-type: none"> • 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 textbox 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. 	30

	<ul style="list-style-type: none"> • 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 a Java Program to generate Even numbers and Odd Numbers in TextField “T1 and T2 respectively” while pressing Buttons “Even” and “Odd”. • Write a program to Copy the text from one file to another using byte stream. 	
Suggested Evaluation Methods		
<p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 	<p>End Term Examination:</p> <p>A three-hour exam for both theory and practicum.</p>	
Part C-Learning Resources		
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • 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.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	III		
Name of the Course	Linux and Shell Programming		
Course Code	B23-CAP-302		
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)	Must have basic knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none"> 1. understand Linux architecture. 2 use various Linux commands that are used to manipulate system operations. 3 acquire knowledge of Linux File System. 4 understand and make effective use of I/O and shell scripting language to solve problems. <hr style="width: 50%; margin-left: 0;"/> 5*. to implement the programs based on various shell commands and programs in Linux.		
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.			

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 must attempt five questions, selecting one from each unit. The first question will be compulsory. The practicium will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

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.	11
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.	11
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, and Job control in Linux using at, batch, cron & time.	11
IV	Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: <ul style="list-style-type: none"> • 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, 	30

	rectangle, circle and triangle. <ul style="list-style-type: none"> • Write a shell script to print integer numbers from 1 to 20. 	
Suggested Evaluation Methods		
Internal Assessment: <ul style="list-style-type: none"> > Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 > Practicum <ul style="list-style-type: none"> • 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.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: <ul style="list-style-type: none"> • Yashwant Kanetkar, Unix & Shell programming – BPB Publications. • Richard Petersen, The Complete Reference – Linux, McGraw-Hill. • M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education. • Stephen Prata, Advanced UNIX-A Programmer’s Guide, SAMS Publication. • Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill. 		

*Applicable for courses having practical component.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	III		
Name of the Course	Data Base Technologies		
Course Code	B23-CAP-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: <ol style="list-style-type: none"> 1. understand the concepts of database and its architecture 2. understand the various types of data models 3. understand various concepts in SQL and relational algebra 4. understand the relational model and normalization in detail. <hr style="width: 50%; margin-left: 0;"/> 5*. to implement various SQL queries.		
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>			
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. 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. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	<p>Basic Concepts – Data, Information, Records, Files, Schema and Instance etc. Limitations of File-Based Approach, Characteristics of Database Approach, Database Management System (DBMS), Components of DBMS Environment, DBMS Functions and Components, Database Interfaces, Advantages and Disadvantages of DBMS.</p> <p>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.</p>	11
II	<p>Data Models: Hierarchical, Network, and Relational Data Models.</p> <p>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,</p>	11
III	<p>SQL: Meaning, Purpose, and Need of SQL, Data Types, SQL Components: DDL, DML, DCL and DQL, Basic Queries, Join Operations and Sub-queries. Constraints and its Implementation in SQL.</p> <p>Relational Algebra: Basic Operations: Select, Project, Join, Union, Intersection, Difference, and Cartesian Product, etc.</p> <p>Relational Calculus: Tuple Relational and Domain Relational Calculus.</p>	12
IV	<p>Relational Model: Functional Dependency, Characteristics, Inference Rules for Functional Dependency, Types of Functional Dependency,</p> <p>Normalization: Benefits and Need of Normalization, Normal Forms Based on Primary Keys- (1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF,</p>	11

	Domain Key Normal Form.	
V*	<p>The following activities be carried out/ discussed in the lab during the period of the semester.</p> <p>Programming Lab:</p> <ul style="list-style-type: none"> • 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. 	30
Suggested Evaluation Methods		
<p>Internal Assessment:</p> <p>➤ Theory</p> <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 <p>➤ Practicum</p> <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 		<p>End Term Examination: A three-hour exam for both theory and practicum.</p>
Part C-Learning Resources		
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • Elmasri & Navathe, Fundamentals 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.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Session: 2023-24			
Part A - Introduction			
Subject	BCA		
Semester	III		
Name of the Course	Basics of Data Science using Excel		
Course Code	B23-CAP-304		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-M		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Basic knowledge of mathematics and computer		
Course Learning Outcomes(CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. understand the fundamental concepts of data science and the role of Excel in data analysis. 2. learn data cleaning, preparation, and visualization techniques using Excel. 3. apply statistical analysis and predictive modeling using Excel. 4. To explore advanced Excel functions and data analysis tools. <hr style="width: 50%; margin-left: 0;"/> <p>5*. Implement the various functions in Excel</p>		
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 must attempt five questions, selecting one from each unit. The 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	Introduction to Data Science: Definition, importance, and applications. Overview of Excel: Interface, basic functions, and features. Data Types and Formats in Excel: Text, numbers, dates, and custom formats. Basic Data Manipulation: Sorting, filtering, and basic formulas (SUM, AVERAGE, COUNT).	11
II	Data Import and Export: CSV, TXT, and Excel files. Data Cleaning Techniques: Handling missing values, duplicates, and errors. Data Transformation: Text-to-columns, concatenation, and data validation. Data Visualization: Creating and customizing charts (bar, line, pie).	11
III	Descriptive Statistics: Mean, median, mode, standard deviation, and variance. Inferential Statistics: Hypothesis testing, t-tests, and chi-square tests. Regression Analysis: Simple linear regression and multiple regression. Predictive Modeling: Introduction to basic predictive models and their implementation in Excel.	11
IV	Advanced Excel Functions: VLOOKUP, HLOOKUP, INDEX-MATCH, and PivotTables. Data Analysis ToolPak: Using Excel's built-in data analysis tools such as Descriptive Statistics, Histograms, Correlation, and Regression. What-If Analysis Tools: Scenario Manager, Goal Seek, and Data Tables.	12
V*	The following activities will be carried out/ discussed in the lab during the semester. Familiarize with Excel interface and basic operations. <ul style="list-style-type: none">• Explore Excel ribbons, toolbars, and interface.• Practice data entry, formatting, and basic calculations.• Create a simple spreadsheet and perform basic functions. Import data and perform basic cleaning tasks.	30

	<ul style="list-style-type: none"> • Import datasets from CSV and text files. • Identify and handle missing values. • Remove duplicates and correct data errors. <p>Manipulate data through sorting and filtering.</p> <ul style="list-style-type: none"> • Apply sorting to datasets based on different criteria. • Use filters to analyze subsets of data. • Create custom filters to extract specific data points. <p>Utilize formulas for data transformation.</p> <ul style="list-style-type: none"> • Practice text functions: LEFT, RIGHT, MID, CONCATENATE. • Use date functions: TODAY, DATE, DATEDIF. • Implement basic mathematical formulas: SUM, AVERAGE, COUNT. <p>Calculate and interpret descriptive statistics.</p> <ul style="list-style-type: none"> • Calculate measures of central tendency: mean, median, mode. • Compute measures of dispersion: range, variance, standard deviation. • Use built-in Excel functions for statistical analysis. <p>Apply conditional formulas and formatting.</p> <ul style="list-style-type: none"> • Use IF, SUMIF, and COUNTIF functions for conditional analysis. • Apply conditional formatting to highlight data trends and anomalies. • Create data-based rules for formatting. <p>Create and customize basic charts and graphs.</p> <ul style="list-style-type: none"> • Generate line charts, bar charts, and pie charts. • Customize chart elements: titles, labels, and legends. • Analyse data visually through chart types. <p>Summarize data using PivotTables.</p> <ul style="list-style-type: none"> • Create PivotTables to aggregate data. • Group data and create custom summaries. • Utilize slicers to filter and analyze PivotTable data interactively. <p>Apply lookup and reference functions.</p> <ul style="list-style-type: none"> • Use VLOOKUP and HLOOKUP for data retrieval. • Implement INDEX and MATCH functions for advanced lookups. • Practice using the OFFSET function for dynamic data ranges. <p>Perform statistical analysis using the Data Analysis Toolpak.</p> <ul style="list-style-type: none"> • Install and activate the Data Analysis Toolpak. • Conduct regression analysis and ANOVA. • Explore other statistical tests available in the Toolpak. 	
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Suggested Evaluation Methods	
<p>Internal Assessment:</p> <ul style="list-style-type: none"> ➤ Theory <ul style="list-style-type: none"> • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum <ul style="list-style-type: none"> • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA 	<p>End Term Examination: A three hour exam for both theory and practicum.</p>
Part C-Learning Resources	
<p>Recommended Books/e-resources/LMS:</p> <ul style="list-style-type: none"> • "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett. • "Excel Data Analysis: Modeling and Simulation" by Hector Guerrero. • "Data Analysis Using Microsoft Excel" by Michael R. Middleton. • "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach. • "Practical Statistics for Data Scientists: 50 Essential Concepts" by Peter Bruce and Andrew Bruce. 	

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