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

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



Scheme of Examination for Under-Graduate Programmes
**Bachelor of Computer Applications (Cloud Technologies & Information Security)**
**BCA (CTIS): SCHEME D**
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)

**Kurukshetra University Kurukshetra**
**Scheme of Examination for Undergraduate programmes**
**Subject: BCA (Cloud Technologies and Information Security)**
**According to**
**Curriculum Framework for Undergraduate Programmes**
**as per NEP 2020** (Multiple Entry-Exit, Internships and Choice Based Credit System)

| Sem | Course Type | Course Code | Nomenclature of paper | Credits | Contact hours | Internal marks | End term Marks | Total Marks | Duration of exam (Hrs) T + P |
|---|---|---|---|---|---|---|---|---|---|
| 1 | CC-A1 | B23-CTS-101 | Problem Solving through C | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B1 | B23-CTS-102 | Foundations of Computer Science | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C1 | B23-CTS-103 | Logical Organization of Computer | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M1 | B23-CTS-104 | Mathematical Foundations for Computer Science-I | 1 | 1 | 10 | 20 | 30 | 3 |
| | | | Practical | 1 | 2 | 5 | 15 | 20 | 3 |
| | MDC1 | To be taken from other department | | | | | | | |
| | SEC1 | To be taken from SEC Pool | | | | | | | |
| | VAC1 | To be taken from VAC Pool | | | | | | | |
| | AEC1 | To be taken from AEC Pool | | | | | | | |
| 2 | CC-A2 | B23-CTS-201 | Object Oriented Programming using C++ | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CC-B2 | B23-CTS-202 | Introduction to Web Technologies | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C2 | B23-CTS-203 | Concepts of Operating Systems | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M2 | B23-CTS-204 | Mathematical Foundations for Computer Science-II | 1 | 1 | 10 | 20 | 30 | 3 |
| | | | Practical | 1 | 2 | 5 | 15 | 20 | 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 | | | | | | | |
| 3 | CC-A3 | B23-CTS-301 | Java OOP Foundations | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B3 | B23-CTS-302 | Linux and Shell programming | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C3 | B23-CTS-303 | Data Base Technologies | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M3 | B23-CTS-304 | Quantitative Foundations of Computer Science | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | MDC-3 | To be taken from other department | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SEC-3 | To be taken from SEC Pool | | | | | | | |
| | AEC-3 | To be taken from AEC Pool | | | | | | | |
| 4 | CC-A4 | B23-CTS-401 | Data Structures and Applications | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B4 | B23-CTS-402 | Front-end Development | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C4 | B23-CTS-403 | Computer Graphics | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | AEC-4 | To be taken from AEC Pool | | | | | | | |
| | VAC-3 | To be taken from VAC Pool | | | | | | | |
| | CC-M4(V) | B23-CTS-404 | Introduction to Information Security | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| 5 | CC-A5 | B23-CTS-501 | Software Engineering | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B5 | B23-CTS-502 | Back-end Development | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C5 | B23-CTS-503 | Network Infrastructure and Data Communication Technologies | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M5(V) | B23-CTS-504 | Introduction to Cloud Computing | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |

| Sem | | Course Code | Course | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SEC-4 | | Internship @ 4 Credits | | | | | | |
| 6 | CC-A6 | B23-CTS-601 | Programming using Python | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-B6 | B23-CTS-602 | Advanced Web Development | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-C6 | B23-CTS-603 | Artificial Intelligence | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M6 | B23-CTS-604 | Storage Management and Data Centers | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| | CC-M7(V) | B23-CTS-605 | Principles of Virtualization | 3 | 3 | 20 | 50 | 70 | 3 |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 |
| 7 | CC-H1 | B23-CTS-701 | Cryptography and Network Security | 4 | 4 | 30 | 70 | 100 | 3 |
| | CC-H2 | B23-CTS-702 | Cloud Migration | 4 | 4 | 30 | 70 | 100 | 3 |
| | CC-H3 | B23-CTS-703 | Cyber Forensics and Investigations | 4 | 4 | 30 | 70 | 100 | 3 |
| | DSE-H1 | B23-CTS-704 | Cloud Applications and Web Security | 4 | 4 | 30 | 70 | 100 | 3 |
| | | Or | | | | | | | |
| | | B23-CTS-705 | Cloud Web Services | 4 | 4 | 30 | 70 | 100 | 3 |
| | PC-H1 | B23-CTS-706 | Practical | 4 | 8 | 30 | 70 | 100 | 6 |
| | CC-HM1 | B23-CTS-707 | Internet of Things | 4 | 4 | 30 | 70 | 100 | 3 |
| 8 | CC-H4 | B23-CTS-801 | Containerization using Dockers | 4 | 4 | 30 | 70 | 100 | 3 |
| | CC-H5 | B23-CTS-802 | Cloud Administrator | 4 | 4 | 30 | 70 | 100 | 3 |
| | CC-H6 | B23-CTS-803 | Infrastructure Solutions on Cloud | 4 | 4 | 30 | 70 | 100 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DSE-H2 | B23-CTS-804 | Security Threats and Trends | 4 | 4 | 30 | 70 | 100 | 3 |
| | Or | | | | | | | |
| | B23-CTS-805 | Ethical Hacking | 4 | 4 | 30 | 70 | 100 | 3 |
| PC-H2 | B23-CTS-806 | Practical | 4 | 8 | 30 | 70 | 100 | 6 |
| CC-HM2 | B23-CTS-807 | IoT Security | 4 | 4 | 30 | 70 | 100 | 3 |
| OR | | | | | | | | |
| CC-H4 | B23-CTS-801 | Containerization using Dockers | 4 | 4 | 30 | 70 | 100 | 3 |
| CC-H5 | B23-CTS-802 | Cloud Administrator | 4 | 4 | 30 | 70 | 100 | 3 |
| CC-HM2 | B23-CTS-807 | IoT Security | 4 | 4 | 30 | 70 | 100 | 3 |
| Research | B23-CTS-808 | Project/ Dissertation | 12 | | | | 300 | |

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

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



Syllabus of Examination (1$^{st}$ Semester) for Under-Graduate Programmes
**Bachelor of Computer Applications**
**(Cloud Technologies & Information Security)**
**BCA (CTIS)**
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 (Cloud Technologies and Information Security) | | |
| Semester | I | | |
| Name of the Course | Problem Solving through C | | |
| Course Code | B23-CTS-101 (Common with B23-CAP-101, B23-CAI-101, B23-CSD-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: <br> 1. learn the basics of C program, data types and input/output statements. <br> 2. understand different types of operators, their hierarchies and also control statements of C. <br> 3. implement programs using arrays and strings. <br> 4. get familiar with advanced concepts like structures, union etc. in C language. <br><br> 5*. to implement the programs based on various concepts of C. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours | 3 | 2 | 5 |
| **Max. Marks:100(70(T)+30(P))** <br> **Internal Assessment Marks:30(20(T)+10(P))** <br> **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** <br> 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. <br> 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 | Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant.<br>Input/output: Formatted I/O Function-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(),<br>output functions viz. printf(), putch(), 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,<br>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.<br>Functions: definition, prototype, function call, passing arguments to a function: call by value; call by reference, recursive functions.<br>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.<br>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:<br> Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:<br>• To read radius of a circle and to find area and circumference<br>• To read three numbers and find the biggest of three<br>• To check whether the number is prime or not<br>• To read a number, find the sum of the digits, reverse the number and check it for palindrome<br>• To read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers<br>• To read percentage of marks and to display appropriate message (Demonstration of else-if ladder)<br>• To find the roots of quadratic equation<br>• 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

| | End Term Examination: A three hour exam for both theory and practicum. |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/class test etc.: 5<br>• Mid-Term Exam: 10<br><br>➢ **Practicum**<br>• Class Participation: 5<br>• Seminar/Demonstration/Viva-voce/Lab records etc.: 5<br>• Mid-Term Exam:   NA | |

## Part C-Learning Resources

**Recommended Books/e-resources/LMS:**
- 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 (Cloud Technologies and Information Security) | | |
| Semester | I | | |
| Name of the Course | Foundations of Computer Science | | |
| Course Code | B23-CTS-102 (Common with B23-CAP-102, B23-CAI-102, B23-CSD-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: <br> 1. understand the basics of computer <br> 2. learn about I/O devices and operating systems <br> 3. understand internet and its services <br> 4. learn about the threats and security concepts on computers <br><br> 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))** <br> **Internal Assessment Marks:30(20(T)+10(P))** <br> **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

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

| Unit | Topics | Contact Hours |
|---|---|---|
| | three-hour duration. | |
| 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 track ball, 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, Keylogers, 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: <br> • Starting with basics of Operating Systems and its functionalities <br> Computer Basics: <br> • Identify the various computer hardware <br> • Understanding the working of computer <br> • Understanding various types of software | 25 |

| | Internet and E-mail:<br>• Using Internet for various tasks<br>• Creating and using e-mail.<br>Security:<br>• Understanding various threats<br>• How to be safe from virus threats<br>• Various software to get safe from virus attacks. | |
|---|---|---|

| **Suggested Evaluation Methods** | | |
|---|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/class test etc.: 5<br>• Mid-Term Exam: 10<br><br>➢ **Practicum**<br>• Class Participation: 5<br>• Seminar/Demonstration/Viva-voce/Lab records etc.: 5<br>• 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:**<br>• Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB.<br>• Dromey, R.G., How to Solve it By Computer, PHI.<br>• Norton, Peter, Introduction to Computer, McGraw-Hill.<br>• Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World.<br>• 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 (Cloud Technologies and Information Security) |
| Semester | I |
| Name of the Course | Logical Organization of Computer |
| Course Code | B23-CTS-103 (Common with B23-CAP-103, B23-CAI-103, B23-CSD-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: <br> 1. understand number systems, error detecting correcting code and representations of numbers in a computer system. <br> 2. understand computer arithmetic and Boolean algebra and simplification of Boolean expressions. <br> 3. understand working of logic gates and design various combinational circuits using these logic gates. <br> 4. understand working of different types of flip-flops and design different types of registers. <br> _____ <br> 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))** <br> **Internal Assessment Marks:30(20(T)+10(P))** <br> **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**

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-Complimenting Code, Cyclic Code.<br>Error Detecting and Correcting Codes. Character representations: ASCII, EBCDIC and Unicode.<br>Number Representations: Integer numbers - sign-magnitude, 1's &amp; 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 Compliment representations, Addition and subtraction with BCD representations.<br>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 &amp; Theorems, Kaurnaugh-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.<br>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.<br>Flip-flops characteristics & Excitation Tables.<br>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:<br>Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:<br>Number System:<br>• Problems based on Number System and their conversion.<br>• Programs based on Number System conversion.<br>Binary Arithmetic<br>• Problems based on Binary Arithmetic. | 25 |

| | |
|---|---|
| <ul><li>Programs based on Binary Arithmetic.</li><li>Problems based on Boolean Expression and their simplification</li></ul>Logic Gates<ul><li>Understanding working of logic Gates.</li></ul>Combinatorial Circuits:<ul><li>Designing and understanding various combinational circuits.</li></ul>Sequential Circuits:<ul><li>Designing and understanding various sequential circuits.</li></ul> | |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<ul><li>Class Participation: 5</li><li>Seminar/presentation/assignment/quiz/class test etc.: 5</li><li>Mid-Term Exam: 10</li></ul>➢ **Practicum**<ul><li>Class Participation: 5</li><li>Seminar/Demonstration/Viva-voce/Lab records etc.: 5</li><li>Mid-Term Exam:   NA</li></ul> | **End Term Examination:** A three hour exam for both theory and practicum. |

| Part C-Learning Resources |
|---|
| **Recommended Books/e-resources/LMS:**<ul><li>M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.</li><li>V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall.</li><li>Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd.</li><li>Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill.</li></ul> |

*Applicable for courses having practical component.

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

| | |
|---|---|
| **Session: 2023-24** | |
| **Part A - Introduction** | |
| Subject | BCA (Cloud Technologies and Information Security) |
| Semester | I |
| Name of the Course | Mathematical Foundations for Computer Science-I |
| Course Code | B23-CTS-104 (Common with B23-CAP-104, B23-CAI-104, B23-CSD-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: <br> 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. <br> 2. Have the knowledge of the basic concepts of complex numbers and acquire skills to solve linear quadratic equations. <br> 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. <br> 4. Understand the concept of differentiation <br> 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))** <br> **Internal Assessment Marks:15(10(T)+5(P))** <br> **End Term Exam Marks:35(20(T)+15(P))** | **Time: 3 Hrs.(T), 3Hrs.(P)** |
| **PartB-Contentsofthe 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:<br>Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:<br>**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:<br>• Problems related to union, intersection, difference and complement of sets.<br>• Problems based on De Morgan's Laws.<br>• Problems related to Venn diagrams.<br>• Problems to find inverse of a matrix.<br>• Problems to find determinant of a square matrix of order 3.<br>• Problems to find nth term of A.P., G.P. and H.P.<br>• Problems to find sum of n terms of A.P., G.P. and H.P.<br>• Problems to find A.M., G.M. and H.M. of given numbers.<br>• Problems involving formulation and solution of quadratic equations in one variable.<br>• Problems to find first derivatives of functions. | 25 |
| | **Suggested Evaluation Methods** | |
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 4 | | **End Term Examination:**<br>**A three hour exam** |

| | |
|---|---|
| • Seminar/presentation/assignment/quiz/class test etc.: NA<br>• Mid-Term Exam: 6<br><br>➢ **Practicum**<br>  • Class Participation: NA<br>  • Seminar/Demonstration/Viva-voce/Lab records etc.: 5<br>  • Mid-Term Exam:   NA | **for both theory and practicum.** |

| **PartC-Learning Resources** |
|---|

**Text /Reference Books:**
- C. Y. Young (2021). *Algebra and Trigonometry*. Wiley.

- S.L. Loney (2016). *The Elements of Coordinate Geometry (Cartesian Coordinates)* (2$^{nd}$ Edition). G.K. Publication Private Limited.

- Seymour Lipschutz and Marc Lars Lipson (2013). *Linear Algebra.* (4$^{th}$ Edition) Schaum's Outline Series, McGraw-Hill.

- C.C. Pinter (2014). *A Book of Set Theory*. Dover Publications.

- J. V. Dyke, J. Rogers and H. Adams (2011). *Fundamentals of Mathematics* (10$^{th}$ Edition), Brooks/Cole.

- A.Tussy, R. Gustafson and D. Koenig (2010). *Basic Mathematics for College Students* (4$^{th}$ Edition). Brooks Cole

\*Applicable for courses having practical component.