**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 and Syllabus of

Bachelor of Computer Applications (BCA)

Cloud Technology and Information Security (CTIS)

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS**

Program Name: Bachelor of Computer Applications (BCA)

Cloud Technology and Information Security (CTIS)

(For the Batches Admitted from 2021-2022)

K**URUKSHETRA UNIVERSITY, KURUKSHETRA**

**NAME OF THE PROGRAMME : BACHELOR OF COMPUTER APPLICATIONS - CLOUD TECHNOLOGY AND INFORMATION SECURITY (BCA- CTIS)**

**DURATION : THREE YEARS**

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| **Semester** | **Course** | | **Paper Code** | **Nomenclature of Paper** | **Work load/ hour/**  **week** | **Exam Time (Hrs)** | | **Internal Marks** | | | **External Marks** | | | **Total Marks** | |
|  |  | |  |  |  | |  | | **Max** | **Pass** | | **Max** | **Pass** | |  | |
| 1 | CC-BCA-CTIS-1A | | BCA-CTIS-101 | Fundamentals of Computer Science | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-102 | Programming with C | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-103 | S/W LAB – I BASED ON Bca-102 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-1B | | BCA-CTIS-104 | Mathematical Foundation of Computer Science | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-105 | Web Designing-I | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-106 | S/W LAB – Ii BASED ON Bca-105 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-1C | | BCA-CTIS-107 | Operating Systems | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-108 | Linux and Shell Programming | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-109 | S/W LAB – Iii BASED ON Bca-108 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| AECC-BCA-CTIS-1D | | BCA-CTIS-110 | Communication Skills | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
|  | |  | **TOTAL** | **32** | | **30** | | **130** | **52** | | **520** | **208** | | **650** | |
| 2 | CC-BCA-CTIS-2A | | BCA-CTIS-201 | Computer Networks | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-202 | Data Structures | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-203 | S/W LAB – I BASED ON Bca-202 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-2B | | BCA-CTIS-204 | Introduction to Cloud Computing | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-205 | Web Designing – II | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-206 | S/W LAB – Ii BASED ON Bca-205 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-2C | | BCA-CTIS-207 | Introduction to Information Security | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-208 | Database Management System | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-209 | S/W LAB – Iii BASED ON Bca-208 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| AECC-BCA-CTIS-2D | | BCA-CTIS-210 | Environment Studies | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
|  | |  | **TOTAL** | **32** | | **30** | | **130** | **52** | | **520** | **208** | | **650** | |
| 3 | CC-BCA-CTIS-3A | | BCA-CTIS-301 | Object Oriented Programming using Java | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-302 | Fundamentals of Storage and Data Centres | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-303 | S/W LAB – I BASED ON BCA-301 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-3B | | BCA-CTIS-304 | Computer Organization and Architecture | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-305 | Principle of Virtualization | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-306 | S/W LAB – II BASED ON BCA-305 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-3C | | BCA-CTIS-307 | Software Engineering | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-308 | Network Security | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-309 | S/W LAB – III BASED ON BCA-307 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| SEC-CTIS-1 | | SEC-CTIS-310 | Personality Development | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
|  | |  | **TOTAL** | **32** | | **30** | | **130** | **52** | | **520** | **208** | | **650** | |
| 4 | CC-BCA-CTIS-4A | BCA-CTIS-401 | | Ethical Hacking | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-402 | | Digital Forensic and Investigation | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-403 | | S/W LAB – I BASED ON BCA-401 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-4B | BCA-CTIS-404 | | Server Administration | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-405 | | Containerization using Dockers | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-406 | | S/W LAB – II BASED ON BCA-404 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| CC-BCA-CTIS-4C | BCA-CTIS-407 | | Internet of Things | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-408 | | Design Enterprise Networking | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-409 | | S/W LAB – III BASED ON BCA-407 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| SEC-CTIS-2 | SEC-CTIS-410 | | Logical Reasoning and Thinking | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
|  |  | | **TOTAL** | **32** | | **30** | | **130** | **52** | | **520** | **208** | | **650** | |
| 5 | DSE- 1 | BCA-CTIS-501 | | ELECTIVE – I | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-502 | | ELECTIVE – II | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-503 | | S/W LAB – I BASED ON BCA-502 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| DSE- 2 | BCA-CTIS-504 | | ELECTIVE – III | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-505 | | ELECTIVE – IV | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-506 | | S/W LAB – II BASED ON BCA-505 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| DSE- 3 | BCA-CTIS-507 | | ELECTIVE –V | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-508 | | ELECTIVE –VI | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-509 | | S/W LAB – III BASED ON BCA-508 | 4 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| SEC-CTIS- 3 | SEC-CTIS-510 | | ELECTIVE – VII | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
|  | **TOTAL** | |  | **32** | | **30** | | **130** | **52** | | **520** | **208** | | **650** | |
| ELECTIVE-I | | | | | | | | | | | | | | | |
| BCA-CTIS-501(I) | | | Cloud Web Services | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-501(II) | | | Infrastructure Solutions on Cloud | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-II | | | | | | | | | | | | | | | |
| BCA-CTIS-502(I) | | | Network Administration | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-502(II) | | | Linux Administration | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-III | | | | | | | | | | | | | | | |
| BCA-CTIS-504(I) | | | Cloud Security | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-504(II) | | | Cyber Security Incident Response Management | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-IV | | | | | | | | | | | | | | | |
| BCA-CTIS-505(I) | | | Mobile Application Development | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-505(II) | | | Programming with Python | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-V | | | | | | | | | | | | | | | |
| BCA-CTIS-507(I) | | | Data Warehousing & Mining | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-507(II) | | | E-Commerce | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-VI | | | | | | | | | | | | | | | |
| BCA-CTIS-508(I) | | | Artificial Intelligence | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-508(II) | | | Data Base Security | 3 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| ELECTIVE-VII | | | | | | | | | | | | | | | |
| SEC -510(II) | | | Entrepreneurship | 2 | | 3 | | 10 | 4 | | 40 | 16 | | 50 | |
| BCA-510(II) | | | Ethics and Value | 2 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| 6 | CC-BCA-CTIS-6 | BCA-CTIS-601 | | Major Project/Internship\* | 28 | | --- | | 100 | 40 | | 400 | 160 | | 500 | |
| BCA-CTIS-602 | | Intellectual Property Rights | 2 | | 3 | | 15 | 6 | | 60 | 24 | | 75 | |
| BCA-CTIS-603 | | Seminar\*\* | 2 | | --- | | 15 | 6 | | 60 | 24 | | 75 | |
|  | **TOTAL** | |  | **32** | | **3** | | **130** | **52** | | **520** | **208** | | **650** | |
| **GRAND TOTAL** | | | | **192** | | **153** | | **780** | **312** | | **3120** | **1248** | | **3900** | |

* **\*The viva-voce for the Major Project/Internship will be conducted by One Internal and One External Examiner**
* **\*\*Seminar will be conducted to check the suitability of the candidate in terms of industry placement/entrepreneurship. The seminar will be evaluated by One internal and One External Examiner.**

1. A student can opt for any one paper out of the list of elective papers provided against each paper code for respective semester.
2. For the purpose of computation of work-load the group size for practical must be as follows:

**Group Size of Practical: 15 students per group**

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| **BCA-CTIS-101: FUNDAMANTALS OF COMPUTER SCIENCE** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to introduce the basic terminology of a computer system, computer hardware, software, memory and fundamentals of problem solving on a computer. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -101.1. Understand basic concepts of Computer and its operations along with number system used in computer science.  BCA-CTIS -101.2. Develop program logic using algorithms, flowchart, decision tables, DFDs, etc.  BCA-CTIS -101.3. Understand basics of memory system and working of storage devices along with working of input/output  devices commonly used in a computer system.  BCA-CTIS -101.4. Learn basics of Internet and its services specifically e-mail services. | |
| **UNIT-I**  **Overview of Computers:** 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.  **Number Systems and Boolean algebra:** Decimal, Binary, Octal, Hexadecimal, Converting Techniques in Number systems, Binary Arithmetic, 1’s Complements, 2’s Complements, Computer Codes, Rules and Laws of Boolean algebra, Basic Gates (NOT, AND & OR) | |
| **UNIT-II**  **Planning the Computer Program:** Techniques of Problem Solving, Program, Types of Program Errors, Debugging a Program, Testing Program, Documentation: Need & different forms.  **Developing Program Logic:** Algorithm, Characteristics of Good Algorithm, Pseudo Code, Flowchart & its Symbols, Data Flow Diagrams (DFDs), Decision Tables & their types and Decision Trees. | |
| **UNIT-III**  **Memory Systems:** Concept of bit, byte, word, nibble, binary cell, 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.  **I/O Devices:** Input Devices: classification and use, keyboard, pointing devices - mouse, touch pad and track ball, joystick, magnetic stripes, scanner, digital camera, microphone, etc., Output Devices: Speaker, monitor, Printers: classification, laser, ink jet, dot-matrix. Plotter. | |
| **UNIT-IV**  **Internet:** Introduction to Internet, WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website  **Electronic Mail:** Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, mailer features. Browsers and search engines. | |
| **Text Books:**   1. Pradeep K. Sinha & Priti Sinha, Computer Fundamentals, BPB Publications. 2. Dromey R.G., How to Solve it By Computer, PHI. | |
| **Reference Books:**   1. A K Sharma, Fundamentals of Computers & Programming, Dhanpat Rai Publications. 2. Norton Peter, Introduction to Computer, McGraw-Hill. 3. Leon Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World. 4. Rajaraman V., Fundamentals of Computers, PHI. | |

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| **BCA-CTIS-102: PROGRAMMING WITH C** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to focus on all the basic concepts, syntax and constructs of the C language. For students, who are new to programming, this unit can be considered as the starting point before taking up any other programming oriented assignment. The students will be implementing the concepts explained here to create simple to complex programs. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -102.1. Learn the basics of C program, data types and input/output statements.  BCA-CTIS -102.2. Understand different types of operators, their hierarchies and also control statements of C.  BCA-CTIS -102.3. Develop programs using functions and arrays  BCA-CTIS -102.4. Analyze pointers and structures along with performing string operations. | |
| **UNIT-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:** Unformatted & Formatted I/O Function, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), output functions viz. printf(), putch(), putchar(), puts(). | |
| **UNIT-II**  **Operators & Expression:** Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators Operator Hierarchy & Associativity. 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:** for, while, and do-while loop, jumps in loops. | |
| **Unit – III**  **Functions:** definition, prototype, function call, passing arguments to a function: call by value, call by reference, recursive functions.  **Arrays:** Definition, types, Initialization, multidimensional arrays, Processing on Arrays.  **Storage Classes:** Auto, Extern, Register and Static and their Scope, Storage & Lifetime. | |
| **Unit – IV**  **Strings:** Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate etc., Search for a Substring.  **Structures:** Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Union: Introduction, Union of Structures. Typedef, Enumerations.  **Pointers:** Pointer Variables, Pointer Operators, Pointer Assignment, Pointer Conversions, Pointer Arithmetic, Pointer Comparison, Pointers and Arrays, Pointers and Functions, Pointers and Strings, Pointer to Pointer, Dynamic Allocation and de-allocation of memory. | |
| **Text Books:**   1. Yashwant Kanetker, Let us C, BPB publications. 2. Gottfried, Byron S., Programming with C, Tata McGraw Hill. 3. Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill. | |
| **Reference Books:**   1. Richie and Kenninghan, The C Programming Language, BPB Publication 2. E. Balagurusamy, Programming in ANSI C, Tata McGraw Hill 3. Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley. 4. Rajaraman, V., Computer Programming in C, PHI. 5. Yashwant Kanetker, Working with C, BPB. | |

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| **BCA-CTIS-104: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to provide the basic knowledge of logic, graph theory, linear algebra and, statistics (descriptive statistics and probability theory) and fundamental of computer science. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -104.1. Understand basic concepts of sets, relations, functions, vectors, logics and their operations  BCA-CTIS -104.2. Understand the concept of matrices and graph theory  BCA-CTIS -104.3. Examine and explore basics of statistics.  BCA-CTIS -104.4. Understand the principles of probability and various probability distributions. | |
| **UNIT-I**  **Set, Relations and Functions:** Sets, Operations on sets, Relations, Relations and functions: Equivalence relations, Partial order relation.  **Fundamentals of Logics:** Sequences. Logic: Propositions and Predicate Logic and Operations, Conditional statements.  **Vector Spaces:** Vector spaces and subspaces, Linear span, Linear independence and dependence, basis and dimension. | |
| **UNIT-II**  **Matrices:** Introduction, Basic operations, Symmetric, skew symmetric, Hermitian-Skew, Hermitian–Unitary orthogonal, Inverse of a matrix, Solution of linear system (Cramer’s rule)- Gauss elimination, Finding the Eigen roots and Eigen vectors of a matrix-Cayley Hamilton theorem(without proof).  **Graph Theory:** Graphs, Sub graphs, Complements and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials, Bipartite graphs, Planar graphs, Euler’s formula. | |
| **UNIT-III**  **Statistics:** History and importance of statistics in different field of research, classification of data, difference between cross sectional and time series data, diagrammatic and graphic representation of data-types of diagram and graphs (One-dimensional and two-dimensional diagrams, pi diagram, Histogram, frequency polygon and ogive).  Measures of central tendency (mean, mode, and median) and measures of dispersion (variance and standard deviation), measures of skewness, moments and kurtosis. | |
| **UNIT-IV**  **Probability Theory and Distributions:** Basic concept of probability, Axiomatic and frequency definition of probability, Addition and multiplication law of probability, conditional probability and Baye’s theorem.  Random variables, types of random variables, probability function and cumulative distribution function, discrete probability distributions (Binomial and Poisson) and Continuous probability distributions (Normal). | |
| **Text Books:**  1. Ralph P Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education.  2. SC Gupta and VK Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons Publication, New Delhi.  3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication. | |
| **Reference Books:**   1. Kenneth Rosen, Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, McGraw Hill Education. 2. S P Gupta, Statistical Methods, Sultan Chand & Sons publication. 3. Greenberg, M.D., Advanced Engineering Mathematics, Pearson Education Inc. | |

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| **BCA-CTIS-105: WEB DESIGNING- I** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of the course is to provide knowledge of web as a tool in presenting information. Each and every product in e-world now needs a website, this course will make student knowing about the concept of web design in general. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS-105.1. Learn about WWW and search engines.  BCA-CTIS-105.2. Understand domain and assigning name to them.  BCA-CTIS-105.3. Understand basic web languages and its components.  BCA-CTIS-105.4. Perform simple web page designing for practical exposure. | |
| **UNIT-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 and Web-Casting Techniques, Search Engines and Search Tools, Scripting Languages. | |
| **UNIT-II**  Web Publishing: Hosting Web Site. Internet Service Provider. Planning and designing Web Site. Web Content Authoring, Web Graphics Design, Web Programming, Steps for Developing Web Site, Choosing the Contents, Home Page, Domain Names, Creating a Website and Markup Languages (HTML, DHTML).  DHTML: Introduction, Features, Events, Dynamic Positioning, Layer Object, Properties of STYLE, Dynamic Styles, Inline Styles, Event Handlers. | |
| **UNIT-III**  Web Development using HTML 5.0: HTML Document Features, HTML and XHTML, Standard XHTML Document Structure, Images, Headers, Text Styles, Text Structuring, Text Colors and Background, Formatting Text, Page Layouts. Hypertext Links, Syntactic Differences between HTML and XHTML. | |
| **Unit – IV**  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.  Cascading Style Sheets (CSS): Basic Concepts, Properties, Creating Style Sheets. Common Tasks with CSS: Text, Fonts, Margins, Links, Tables, Colors. Marquee. Mouse Overs. Filters and Transitions. Adding Links. Adding Tables. Adding Forms. Adding Image and Sound. Use of CSS in HTML Documents Linking and Embedding of CSS in HTML Document. | |
| **Text Books:**   1. Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill. 2. Ramesh Bangia, Multimedia and Web Technology, Firewall Media. | |
| **Reference Books:**   1. Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill 2. Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill. 3. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI. | |

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| **BCA-CTIS-107: OPERATING SYSTEMS** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to introduce students to understand the services provided by and the design of an operating system, understand the structure and organization of the file system, understand what a process is and how processes are synchronized and scheduled, understand different approaches to memory management. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -107.1. Understand the basic concepts of operating systems and its services.  BCA-CTIS -107.2. Understand concept of process management and scheduling.  BCA-CTIS -107.3. Acquire knowledge of process synchronization, deadlock handling and learn about memory management  BCA-CTIS -107.4. learn about virtual memory concepts, secondary storage and file systems. | |
| **UNIT – I**  **Introductory Concepts:** Operating System Functions and Characteristics, Historical Evolution of Operating Systems,  Operating System Structure, Operating System Operations;  **Types of Operating System:** Real time, Multiprogramming, Multiprocessing, Batch processing;  Operating System Services, Operating System Interface, Methodologies for Implementation of Operating System, Service System Calls, System Programs. | |
| **UNIT – II**  **Process Management:** Process Concepts, Operations on Processes, Process States and Process Control Block. Inter-Process Communication;  **Multithreaded Programming:** Multithreading Models, Threading Issues;  **CPU Scheduling:** Scheduling Criteria, Levels of Scheduling, Scheduling Algorithms, Multiple Processor Scheduling; Algorithm Evaluation. | |
| **UNIT – III**  **Synchronization:** Critical Section Problem, Peterson’s Solution, Synchronization Hardware, Semaphores, Classicla Problem of Synchronization, Monitors, Atomic Transactions;  **Deadlocks:** Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.  **Memory Management Strategies:** Memory Management of Single-User and Multiuser Operating System, Partitioning, Swapping, Contiguous Memory Allocation, Paging and Segmentation; | |
| **UNIT – IV**  **Virtual Memory Management:** Demand Paging, Page Replacement Algorithms, Thrashing, Memory Mapped Files.  **Secondary Storage Structure:** Disk Scheduling, Disk Management, Disk Attachment.  **File System:** File Concept, Access Method, Directory and Disk Structure, File System Mounting, File Sharing, File Protection. | |
| **Text Books:**   1. Silberschatz A., Galvin P.B., and Gagne G., Operating System Concepts, John Wiley & Sons. 2. Godbole, A.S., Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi. | |
| **Reference Books:**   1. Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York. 2. Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi. | |

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| **BCA-CTIS-108: LINUX AND SHELL PROGRAMMING** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of the courseis to enable students to **i**dentify and use Linux commands and utilities to create and manage file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS-108.1 Understand Linux architecture.  BCA- CTIS-108.2 Ability to use various Linux commands that are used to manipulate system operations.  BCA- CTIS-108.3 Acquire knowledge of Linux File System.  BCA- CTIS-108.4 Understand and make effective use of I/O and shell scripting language to solve problems. | |
| **UNIT – 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. | |
| **UNIT – 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. | |
| **UNIT – 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. | |
| **UNIT – IV**  Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in linux. | |
| **Text Books:**   1. Yashwant Kanetkar, Unix & Shell programming – BPB Publications. 2. Richard Petersen, The Complete Reference – Linux, McGraw-Hill. 3. M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education. | |
| **Reference Books:**   1. Stephen Prata, Advanced UNIX-A Programmer’s Guide, SAMS Publication. 2. Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill. | |

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| **BCA-CTIS-110: COMMUNICATION SKILLS** | |
| Type: Ability Enhancement Core Course (AECC)  Contact Hours: 02 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 40  External Pass Marks: 16 (i.e. 40%)  Internal Maximum Marks: 10  Total Max. Marks: 50  Total Pass Marks: 20 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to introduce students to understand the usage of grammar, Develop reading and writing skills, Explore the various techniques of listening and speaking skills. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -110.1. Describe the general concepts of grammar and its usage.  BCA-CTIS -110.2. Interpret the various reading techniques.  BCA-CTIS -110.3. Understand the basics of writing skills.  BCA-CTIS -110.4. Explore the techniques of listening skills. | |
| **UNIT-I**  Grammar and Vocabulary Development: Applied Grammar and usage, Parts of Speech, Articles, Tenses, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Clauses, modals, Reported Speech: Direct and Indirect, Sentence Structure, Punctuations. Using Dictionaries and Thesaurus, Synonyms, Antonyms, Homophones, One Word Substitution, Affixation: Prefixes & Suffixes, Basic Grammar & Vocabulary Practice, Synonyms, Antonyms, Analogies, Sentence Completion, Correctly Spelt Words, Idioms, Proverbs, Common Errors. Derivation from root words, Jargon, Scientific Jargon. | |
| **UNIT-II**  Developing Reading Skills: Reading Comprehension, Process, Active & Passive Reading, Reading Speed Strategies, Benefits of effective reading, note-making, note - taking, Reading comprehension of technical material and SQ3R reading technique. | |
| **UNIT-III**  Developing Writing Skills: Planning, Drafting & Editing, Writing with style, right-words selection, writing effective sentences, developing logical paragraphs, art of condensation, précis, essay, technical definition and technical description | |
| **Unit – IV**  Listening Skills: Meaning, process hearing and listening, types, barriers, importance.  Speaking Skills Oral Presentation: Preparation, Delivery using Audio – Visual Aids with stress on body language and voice modulations. (Topics to be selected by the Instructor.)  Phonetic Symbols, Pronunciations | |
| **Text Books:**   1. P.C. Wren and Martin, High School English Grammar & Composition, S Chand and Co Pvt Ltd. 2. P.C,Wren and N.D.V. Prasada Rao, High School English Grammar & Composition, S Chand and Co Pvt Ltd. 3. S. Kumar and P. Lata , English for Effective Communication, Oxford UP, New Delhi. 4. A.J. Thompson and A. V. Martinet, A Practical English Grammar, Oxford UP, New Delhi. 5. U. S. Rai and S.M, Rai, Effective Communication, Himalaya Publishing House. 6. J.S. Korlahalli and R. Pal, Essentials of Business Communication All Courses, Sultan Chand & Sons. | |
| **Reference Books:**   1. A.C. Gimson, An introduction to the Pronunciation of English, ELBS. 2. S. Greenbaum, Thw Oxford English Grammer, Oxford University Press. 3. K.Mohan and M. Raman, Effective English Communication, Tata Mc-Graw Hill. | |

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| **BCA-CTIS-201: COMPUTER NETWORKS** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to introduce students to identify the components required to build different types of networks, Understand the division of network functionalities into layers, Familiarize with the components required to build different types of networks, Evaluate the required functionality at each layer, Learn the flow control and congestion control algorithms. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -201.1. Describe the functions of each layer in OSI and TCP/IP model  BCA-CTIS -201.2. Analyze the functions of various networking devices  BCA-CTIS -201.3. Explain the various functions of network and transport layer  BCA-CTIS -201.4. Demonstrate the functions of troubleshooting the network | |
| **UNIT-I**  Basics of Network and Networking, Advantages of Networking, Types of Networks, Types of Network Architecture, Workgroup Vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling, media connectors, Introduction of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, Comparison between OSI model and TCP/IP model. | |
| **UNIT-II**  **Network Devices**: NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, and Other Networking Devices, Repeater, CSU/DSU, Modem, Ethernet standards, Ethernet Components, Point-to-Point Protocol, Address Resolution Protocol, Message format, transactions, Benefits of Wireless Technology, Types of Wireless Networks, Wireless network Components, wireless LAN standards, wireless security Protocols. | |
| **UNIT-III**  **Network Layer:** Internet Protocol (IP), IP standards, versions, functions, The IPv4 and IPv6 Datagram Format, IPv4 addressing, IPv4 Subnetting, CIDR and VLSM, IPv6 Addressing, Internet Control Message Protocol, Internet Group Management Protocol, Introduction to Routing and Switching concepts,  **Transport Layer:** Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports and Sockets, Application Layer Protocols, Introduction to WAN, WAN Switching techniques, connecting to the Internet, Satellite-Based Services, Cellular Technologies, Technologies used for Connecting LANs | |
| **Unit – IV**  Remote Access Connections and technologies, Authentication and Authorization, Tunnelling and Encryption Protocols, Security Appliances and Security Threats. Trouble Shooting Networks: Command-Line Interface Tools, Network and Internet Troubleshooting, Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools. | |
| **Text Books:**   1. CCNA Cisco Certified Network Associate: Study Guide, Wiley India. 2. CCENT/CCNA ICND1 640-822 Official Cert Guide, Pearson. 3. Michael A. Gallo, William M. Hancock, Computer Communications and Networking Technologies, CENGAGE learning. 4. Andrew S. Tanenbaum, Computer Networks, PHI | |
| **Reference Books:**   1. Routing Protocols and Concepts CCNA Exploration Companion Guide, Pearson. 2. CCNA Exploration Course Booklet: Routing Protocols and Concepts, Pearson. 3. Behrouz A Forouzan, Data Communications and Networking, Mc-Graw Hill. 4. William Stallings, Data and Computer Communications, PHI. | |

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| **BCA-CTIS-202: DATA STRUCTURES** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to make students understand storing and organizing data in a computer so that it can be used efficiently, Analyse different kinds of data structures are suited to different kinds of applications and some are highly specialized to specific tasks and Evaluate the basic concepts of different data structures which are the basic building blocks of Programming and problem solving. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS -202.1. Learn basics of data structure and algorithm complexities and acquire knowledge of arrays  BCA-CTIS -202.2. Acquire knowledge of strings and understand the idea of implementation for linked lists and stacks.  BCA-CTIS -202.3. Learn various searching and sorting techniques along with implementation of queues and basics of tree data structure.  BCA-CTIS -202.4. Implement various operations on graphs in data structure. | |
| **UNIT – 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), Asymptotic Notations and their use in Algorithm Handling.  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, Insertion, Deletion and its implementation. | |
| **UNIT – 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.  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. | |
| **UNIT – III**  Introduction to Queues: Simple Queue, Double 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.  Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort, Quick sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching.  Tree-Definitions and Concepts, Representation of Binary Tree, Binary Tree Traversal (Inorder, postorder, preorder), Threaded Binary Tree, Binary Search Trees – Definition, Operations viz., searching, insertions and deletion; | |
| **UNIT – IV**  Applications of Trees - AVL trees and various operation viz. insertions, deletion, searching, B-tree and B+ trees along with various operations on these trees.  Graph-Matrix Representation Of Graphs, Elementary Graph Operations viz., Traversal and Searching(Breadth First and Depth Searching), Insertions, Deletion; Spanning Trees, Minimal spanning tree;  Applications of Graphs: Topological Sorting, Shortest-Path Algorithms, Dijkstra’s Algorithm, Warshall’s Algorithm. | |
| **Text Books:**   1. Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited. 2. Y. Langsam, M. J. Augenstein, and A. M. Tenenbaum, Data Structures Using C, Pearson Education. | |
| **Reference Books:**   1. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures With Applications, McGraw- Hill. 2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley. | |

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| **BCA-CTIS-204: INTRODUCTION TO CLOUD COMPUTING** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of this course is to provide students with the fundamentals and essentials of Cloud Computing, A sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios, Enable exploring some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS-204.1. Develop the concepts of cloud computing and cloud infrastructure models  BCA-CTIS-204.2. Understand the various clod services  BCA-CTIS-204.2. Compare the various cloud platforms and migration  BCA-CTIS -204.4. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application | |
| **UNIT-I**  **Cloud Computing Basics:** History of Cloud Computing, Characteristics of Cloud Computing, Need for Cloud computing, Advantages and Possible Disadvantages of cloud computing,  **Cloud Deployment Models:** Public, Private, Hybrid, Community, Other deployment Models. Evolving Data Center into Private Cloud, Datacenter Components, Extracting Business value in Cloud Computing, Cloud Security, Cloud Scalability, Time to Market, Distribution over the Internet, Cloud Computing Case Studies. | |
| **UNIT-II**  **Cloud Services:** Introduction to Cloud Services, Infrastructure as a Service (IaaS) – Overview, Virtualization, Container, Pricing Models, Service Level Agreements, Migrating to the Cloud, IaaS Networking options, Virtual Private Cloud(VPC), IaaS Storage – File and Object storage, Data Protection, IaaS security, Benefits, Risks and Examples of IaaS. Platform as a Service (PaaS) – Overview, IaaS vs PaaS, PaaS Examples, benefits and risks. Software as a Service (SaaS) – Introducing SaaS, SaaS Examples – Office 365, Google G Suite, Salesforce.com, Evaluating SaaS – user and vendor perspective, Impact of SaaS, Benefits and risks of SaaS. Other Services on Cloud, Cloud Delivery Models Considerations | |
| **UNIT-III**  **Cloud Platforms:** Introducing Cloud Platforms, Evaluating cloud platforms, Cloud Platform technologies – Amazon Web Services, Microsoft Azure, Google Cloud Platform, Salesforce.com, Impact of Cloud platforms. Private Cloud Platforms – Introducing Private clouds – Microsoft Azure stack, Open stack, AWS Greengrass, Impact of Private clouds  **Cloud Migration**: Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud, Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies | |
| **UNIT – IV**  Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption: Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management.  **Risks and Consequences of Cloud Computing** – Legal Issues, Compliance Issues, Privacy and Security. Managing and Securing Cloud Services, Virtualization and the Cloud, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment, Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources, Cloud Dos and Don’ts. | |
| **Text Books:**   1. Kirk Hausman, Susan L. Cook, TelmoSampaio, CLOUD ESSENTIALS, John Wiley & Sons Inc. 2. Judith Hurwitz  ,‎ Robin Bloor  ,‎ Marcia Kaufman ,‎ Fern Halper, “Cloud Computing for Dummies”, Wiley Publishing Inc. | |
| **Reference Books:**   1. Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson Education 2. Srinivasan, Cloud Computing: A Practical Approach for Learning and Implementation, Pearson Education | |

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| **BCA-CTIS-205: WEB DESIGNING– II** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of the course is to provide knowledge of web designing. Each and every product in e-world now needs a website, this course will make student ready to represent a website and also student will learn to host a site. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS- 205.1. Learn JavaScript and VBScript.  BCA-CTIS- 205.2. Make use of control statement and objects of ASP.  BCA-CTIS- 205.3. Learn advanced web languages like DHTML and CSS along with its components.  BCA-CTIS- 205.4. Implement dynamic web page designing to acquire job as web developer. | |
| **UNIT-I**  Interactivity Tool: JavaScript: Introduction, Features, Data types, Operators, Statements, Functions, Event Handling, Use of Predefined Object and Methods, Frames, Windows, Tables, Images, Links; JQuery Concept, Adding JQuery to Web Page, JQuery Selectors, JQuery Event Methods, JQuery Effects (Hide/Show, Fade, Slide), Insertion of header /footer in HTML Pages using JQuery, Bootstrap | |
| **UNIT-II**  PHP: Versions of PHP, Installation of PHP, Php.ini basics. Testing Installation. Building Blocks of PHP: Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops, Code Blocks and Browser Output, Functions: Meaning, Calling, Defining a function. Return value from user defined function. Saving state with ‘static’ function. Arrays: Creating arrays, Array related functions, Working with String, Date & Time: Formatting String with PHP, Using Date and time Functions with PHP. | |
| **UNIT-III**  Forms: Creating simple input Form. Accessing Form input with user defined arrays, HTML and PHP Code on a single page. Redirecting User. Working with File Upload. Uploading & Downloading.  State management: Using query string (URL rewriting), Using Hidden field, Using cookies, Using session. String matching with regular expression: What is regular expression, Pattern matching in Php, Replacing text, Splitting a string with a Regular Expression. | |
| **UNIT – IV**  Connecting to the MYSQL: Selecting a database, Adding data to a table, Displaying returned data on Web pages, Inserting data, Deleting data, Entering and updating data, Executing multiple queries. Creating web applications involving front-end and back-end. | |
| **Text Books:**   1. Jon Duckett, Beginning Web Programming with HTML, XHTML, CSS and JavaScript –Wiley India Pvt. Ltd. 2. Paul Wilton, Beginning JavaScript – Wiley India Pvt. Ltd. 3. Mitchell and Atikinson, Active Sever Page” – Techmedia Publishing. 4. Adrian Kingsley ,VB Script Programming Reference – Wiley India Pvt. Ltd. | |
| **Reference Books:**   1. Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill. 2. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI. 3. Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill. 4. Ramesh Bangia, Multimedia and Web Technology, Firewall Media. 5. Internet and Web Design, ITLESL Research and Development Wing, Macmillan India. | |

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| **BCA-CTIS-207: INTRODUCTION TO INFORMATION SECURITY** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of the course for students is to gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks, Understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft, Incorporate approaches for incident analysis and response, Understand approaches for risk management and best practices and Implement understanding of cryptography, how it has evolved, and some key encryption techniques used today. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS- 207.1. Examine the fundamental techniques of computer security and CIA  BCA-CTIS- 207.2. Demonstrate foundation knowledge of user identity  BCA-CTIS- 207.3. Understand and implement the security aspects w.r.t. information  BCA-CTIS- 207.4. Demonstrate knowledge of security objectives and policy development for Internet security. | |
| **UNIT-I**  Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation: Security functionality and Ease of Use Triangle. | |
| **UNIT-II**  User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption. | |
| **UNIT-III**  System Security, Desktop and Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares and Spy wares, Windows Registry. | |
| **UNIT – IV**  Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures. Vulnerability Assessment, Penetration Testing**,** Risk Assessment, Threat, Vulnerability, Cyber Laws – Indian Context. | |
| **Text Books:**   1. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, ISC2 Press. 2. Deven N. Shah, Mark Stamp's Information Security: Principles and Practice, Wiley. 3. Thomas R. Peltier, Information Security Risk Analysis, Auerbach Publisher. 4. Mark Rhodes-Ousley, Information Security: The Complete Reference, McGraw Hill Education. 5. Nina Godbole, Sunit Belapure, Cyber Security, Wiley. | |
| **Reference Books:**   1. Michael E. Whitman, Principles of Information Security, Cengage Learning India Private Limited. 2. Micki Krause, Information Security Management Handbook, Volume 4, ISC2 Press. | |

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| **BCA-CTIS-208: DATA BASE MANAGEMENT SYSTEM** | |
| Type: Core Course (CC)  Contact Hours: 03 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 60  External Pass Marks: 24 (i.e. 40%)  Internal Maximum Marks: 15  Total Max. Marks: 75  Total Pass Marks: 30 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** Today almost all real life problems include data**.** The objective of this course to get students aware about the basic concept of Data. In this paper students will learn database management and its implementation. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS-208.1. Learn basic concepts of data base along with its functions, components and architecture.  BCA-CTIS-208.2. Understand different data models along with functional dependency and normalization  BCA-CTIS-208.3. Design an ER diagram of an enterprise and understand the concepts of relational algebra  BCA-CTIS-208.4. Write SQL statements to retrieve information and create procedures in PL/SQL. | |
| **UNIT – I**  **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.  **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. | |
| **UNIT – II**  **Data Models:** Hierarchical, Network and Relational Data Models.  **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, 4 NF, Join dependencies, 5 NF, Domain Key Normal Form. | |
| **UNIT – III**  **Entity-Relationship Model:** Entity, Entity Sets, Entity Type, Attributes: Type of Attributes, Keys, Integrity Constraints, Domain and Tuple Constraint, Relationship: Role Names, Recursive Relationship, Types/ Degree, Cardinality Ratios, Relationship Constraints. Designing of ER Diagram, Symbolic Notations for Designing ER Diagram, Design Issues, and Reduction of ER diagram into Relational Tables. Making ER Diagrams for Inventory, Book Store, Library and Flight Management System etc.  **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. | |
| **UNIT – IV**  **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.  **PL/SQL:** Architecture of PL/SQL Character Set, Data Types, User Defined Subtypes, Literals, Operators, Control Statement of PL/SQL. PL/SQL Arrays, Functions, Packages, Cursors, Procedure and Triggers. | |
| **Text Books:**   1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education. 2. A Silberschatz, H Korth, S Sudarshan, Database System and Concepts, McGraw-Hill. | |
| **Reference Books:**   1. Thomas Connolly Carolyn Begg, Database Systems, Pearson Education. 2. C. J. Date, An Introduction to Database Systems, Addison Wesley. | |

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| **BCA-CTIS-210: ENVIRONMENT STUDIES** | |
| Type: Ability Enhancement Core Course (AECC)  Contact Hours: 02 hours/week.  Examination Duration: 3 Hours  Mode: Lecture  External Maximum Marks: 40  External Pass Marks: 16 (i.e. 40%)  Internal Maximum Marks: 10  Total Max. Marks: 50  Total Pass Marks: 20 (i.e. 40%) | **Instructions To Paper Setter For End Semester Exam:** Examiner will be required to set NINE questions in all. Question No.1 will consist of objective type / short-answer type questions covering the entire syllabus. In addition to Question no. 1, the examiner is required to set EIGHT more questions selecting TWO from each UNIT. Student will be required to attempt FIVE questions in all. Question No.1 will be compulsory. In addition to compulsory question, student will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks. |
| **Course Objectives:** The aim of the course for students is to Understand how science and the scientific method work to address environmental problems, Familiar with the Earth’s major systems (ecosystems and biogeochemical cycles), how they function and how they are affected by human activity (population growth, air, water and soil pollution, ozone depletion, global warming, solid waste disposal), and learn about the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth’s systems. | |
| **Course Outcomes:** At the end of this course, the student will be able to:  BCA-CTIS-210.1. Examine the fundamental concepts of ecology and environment  BCA-CTIS-210.2. Demonstrate foundation knowledge of renewable and non- renewable resources.  BCA-CTIS-210.3. Explore the concepts of pollution, climate change, global warming and associated acts.  BCA-CTIS-210.4. Identify the different human impacts on environment through case- study approach. | |
| **UNIT-I**  Multidisciplinary nature of environmental studies, Concept of sustainability and sustainable development.  **Ecology and Environment**: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid and Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem and Aquatic Ecosystem and Desert Ecosystem. | |
| **UNIT-II**  **Resources:** Land resources  and  land use  change; Land  degradation, Soil erosion and desertification.  **Deforestation**: Causes and impacts due to mining, Dam building on forest biodiversity and tribal population.  **Energy Resources**: Renewable and Non-Renewable resources, Energy scenario and use of alternate energy sources, Case studies.  **Biodiversity:** Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Bio-geographical Classification of India | |
| **Unit – III**  **Pollution:** Types, Causes, Effects and control; Air, Water, soil and noise pollution, Nuclear hazards and human health risks, Solid waste Management; Control measures of urban and industrial wastes, pollution case studies. Climate change and Global Warming (Greenhouse Effect),Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention and control of pollution act, Water Prevention and Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal and Kyoto Protocols and Convention on biological diversity, Nature reserves, tribal population and Rights and human wild life conflicts in Indian context. | |
| **Unit – IV**  Human population growth; impacts on environment, human health and welfare, Resettlement and rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods and Droughts, Cyclones and Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi’s of Rajasthan, Environmental Ethics; Role of Indian and other regions and culture in environmental conservation, Environmental communication and public awareness; Case study. | |
| **Field Work:**   1. Visit to an area to document environmental assets; river/forest/flora-fauna etc. 2. Visit to a local polluted site: urban/ rural/industrial/agricultural. 3. Study of common plants, insects, birds and basic principles of identification. 4. Study of simple ecosystem; pond, river etc. | |
| **Text Books:**   1. De, A. K., Environmental Chemistry, New Age Publishers Pvt.Ltd. 2. Masters, G. M., Introduction to Environmental Engineering and Science, Prentice HallIndia Pvt. Ltd. 3. Odem, E. P., Fundamentals of Ecology, W. B. Sannders Co. | |