Assam Down Town University

**B. Tech Specialization in Cloud Technology and Information Security**

B.Tech in Cloud Technology and Information Security

**Course Matrix**

**Semester I**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech101 | Communication Skills | 3 | 0 | 1 | 4 |
| 2 | B.Tech102 | Mathematics - I | 3 | 0 | 0 | 3 |
| 3 | B.Tech103 | Engineering Physics - I | 3 | 0 | 0 | 3 |
| 4 | B.Tech104 | Engineering Chemistry - I | 3 | 0 | 0 | 3 |
| 5 | B.Tech105 | Programming in C | 3 | 0 | 1 | 4 |
| 6 | B.Tech106 | Computer Architecture and Organization | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech115 | Programming in C - Laboratory | 0 | 3 | 0 | 2 |
| 8 | B.Tech113 | Engineering Physics –I Laboratory | 0 | 3 | 0 | 2 |
| 9 | B.Tech114 | Engineering Chemistry – I Laboratory | 0 | 3 | 0 | 2 |
| **Total** | | | **18** | **9** | **2** | **26** |

**Semester II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech201 | Reasoning and Thinking -1 | 3 | 0 | 1 | 4 |
| 2 | B.Tech202 | Network Security Basics | 3 | 0 | 1 | 4 |
| 3 | B.Tech203 | Object Oriented Programming using C++ | 3 | 0 | 0 | 3 |
| 4 | B.Tech204 | Data Structures Using C | 3 | 0 | 0 | 3 |
| 5 | B.Tech205 | Operating Systems – Building Blocks | 3 | 0 | 1 | 4 |
| 6 | B.Tech206 | Information Security -I | 4 | 0 | 0 | 4 |
| **Practical** | | | | | | |
| 7 | B.Tech216 | Information Security -I Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech213 | Object Oriented Programming using C++ Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech214 | Data Structure Using C - Lab | 0 | 3 | 0 | 2 |
| **Total** | | | **19** | **9** | **3** | **28** |

**Semester III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech301 | Security Threats and Trends | 3 | 0 | 0 | 3 |
| 2 | B.Tech302 | OSI layer &Network Protocols | 3 | 0 | 0 | 3 |
| 3 | B.Tech303 | Cryptography Fundamentals | 3 | 0 | 0 | 3 |
| 4 | B.Tech304 | Reasoning and Thinking - II | 3 | 0 | 1 | 4 |
| 5 | B.Tech305 | Routing | 3 | 0 | 0 | 3 |
| 6 | B.Tech306 | RDBMS | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech315 | Routing - Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech318 | Network Security - Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech316 | RDBMS - Lab | 0 | 3 | 0 | 2 |
| **Total** | | | **18** | **9** | **1** | **25** |

**Semester IV**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech401 | COBIT VALIT RISKIT | 3 | 0 | 1 | 4 |
| 2 | B.Tech402 | Introduction to Linux/Unix | 3 | 0 | 0 | 3 |
| 3 | B.Tech403 | Fundamentals of Storage Management | 3 | 0 | 0 | 3 |
| 4 | B.Tech404 | Fundamentals of Desktop Operating System | 3 | 0 | 1 | 4 |
| 5 | B.Tech405 | Database Security Fundamentals | 3 | 0 | 0 | 3 |
| 6 | B.Tech406 | Ethical Hacking Basics | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech412 | Introduction to Linux/Unix - Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech414 | Fundamentals of Desktop Operating System - Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech416 | Ethical Hacking Basics - Lab | 0 | 3 | 0 | 2 |
| **Total** | | | **18** | **9** | **2** | **26** |

**Semester V**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech501 | Fundamentals of Virtualization | 3 | 0 | 0 | 3 |
| 2 | B.Tech502 | Fundamentals of Datacenter | 3 | 0 | 1 | 4 |
| 3 | B.Tech503 | Web Technology Fundamentals | 3 | 0 | 0 | 3 |
| 4 | B.Tech504 | Introduction to Cloud Technology | 3 | 0 | 0 | 3 |
| 5 | B.Tech505 | Virtualization and Cloud Security | 3 | 0 | 0 | 3 |
| 6 | B.Tech506 | Installation and Configuration of Server operating System | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech511 | Fundamentals of Virtualization - Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech513 | Web Technology Fundamentals - Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech516 | Installation and configuration of Server Operating system - Lab | 0 | 3 | 0 | 2 |
| **Total** | | | **18** | **9** | **1** | **25** |

**Semester VI**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech601 | Programming with Java | 3 | 0 | 0 | 3 |
| 2 | B.Tech602 | Linux Administration | 3 | 0 | 0 | 3 |
| 3 | B.Tech603 | Cyber Forensics Basics | 3 | 0 | 1 | 4 |
| 4 | B.Tech604 | IT Governance, Risk and Information Security Audit | 3 | 0 | 0 | 3 |
| 5 | B.Tech605 | Elective I | 3 | 0 | 0 | 3 |
| 6 | B.Tech606 | Elective II | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech611 | Programming with Java - Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech612 | Linux Administration - Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech613 | Cyber Forensics - Lab | 0 | 1.5 | 0 | 1 |
| **Total** | | | **18** | **7.5** | **1** | **24** |

**Semester VII**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech701 | Advanced installation and configuration of Server operating system | 3 | 0 | 0 | 3 |
| 2 | B.Tech702 | Cloud Web Services | 3 | 0 | 0 | 3 |
| 3 | B.Tech703 | Desktop Computing Solution | 3 | 0 | 1 | 4 |
| 4 | B.Tech704 | Android Security | 3 | 0 | 0 | 3 |
| 5 | B.Tech705 | Elective III | 3 | 0 | 0 | 3 |
| 6 | B.Tech706 | Elective IV | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 7 | B.Tech711 | Advanced installation and configuration of Server operating system - Lab | 0 | 3 | 0 | 2 |
| 8 | B.Tech712 | Cloud Web Services - Lab | 0 | 3 | 0 | 2 |
| 9 | B.Tech713 | Desktop Computing Solution - Lab | 0 | 3 | 0 | 2 |
| **Total** | | | **18** | **9** | **1** | **25** |

**Semester VIII**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Theory** | | | | | | |
| **SL No.** | **Course Code** | **Title of the Paper** | **Hrs/week** | | | **Credits** |
| **L** | **P** | **T** |
| 1 | B.Tech801 | Elective V | 3 | 0 | 0 | 3 |
| 2 | B.Tech802 | Elective VI | 3 | 0 | 0 | 3 |
| **Practical** | | | | | | |
| 3 | B.Tech821 | Internship/Project | 0 | 12 | 0 | 6 |
| **Total** | | | **6** | **12** | **0** | **12** |

|  |
| --- |
| **Electives** |

**Semester VI - Elective I**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 |  | Mail Servers | 3 | 0 | 0 | 3 |
| 2 |  | Introduction to VOIP | 3 | 0 | 0 | 3 |

**Semester VI - Elective II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 |  | OWASP Framework | 3 | 0 | 0 | 3 |
| 2 |  | Hacktivism, Cyber warfare and Cyber Terrorism | 3 | 0 | 0 | 3 |

**Semester VII - Elective III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 | 41 | ISO27001, PCIDSS and HIPAA | 3 | 0 | 0 | 3 |
| 2 | 41 | Linux Security and Forensics | 3 | 0 | 0 | 3 |

**Semester VII - Elective IV**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 | 42 | Advanced Web Technology | 3 | 0 | 0 | 3 |
| 2 | 42 | Fundamentals of IT Infrastructure Library | 3 | 0 | 0 | 3 |

**Semester VIII - Elective V**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 | 43 | Professional Development Skills | 3 | 0 | 0 | 3 |
| 2 | 43 | DR BCP | 3 | 0 | 0 | 3 |

**Semester VIII - Elective VI**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Course Code** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
| 1 | 44 | Management Theory and Practice | 3 | 0 | 0 | 3 |
| 2 | 44 | Introduction to Public Speaking | 3 | 0 | 0 | 3 |

**Course: Communication Skills**

**Course Objective:** To impart good communication skills in the students and give them more confidence in both professional and personal life

**Module1: Technical vocabulary**

Technical Vocabulary, Punctuation, Numerical Expressions, Expanding Acronyms and Abbreviations, Concord, ‘If’ clauses, Infinitives. Homonyms, Homographs and Homophones, Telephone conversations, Reading Comprehensions, Making of an advertisement

**Module2 Basic skills-reading and speaking skills**

Reading and interpretation, Intensive reading,. Writing reviews on books and films, Descriptions, Process description, Summarizing, Instructions, Oral presentations. Debate.

**Module3: Basic skill: technical writing skill**

Letters – formal, informal, Cover Letter and CV, Synonyms and Antonyms, Indefinite Adjectives, Non-verbal communication, Interactive sessions. Role Plays, Critical reading, Listening and Note taking.

**Module4:  Basic skill: listening and speaking skills**

Active and Passive Voice, Impersonal Passive, Essay Writing, Comprehension Passage, Editing, Correction of errors, Direct and Indirect, Conversations , Dialogue writing, Discourse Markers. Group activities.

**Module5:   Technical writing and communication**

Reports – Types, structure, data collection, content, form, Definitions, extended definition, Recommendations, Memos, Checklists. Group Discussions, Listening and comprehending the conversations.

**Textbooks:**

1. Department of English, Anna University, Mindscapes, ‘English for Technologists and Engineers’, Orient Longman Pvt. Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, ‘‘English for Engineers and Technologists’’ Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
3. M.Ashraf Rizvi, “Effective Technical Communication”,TatamcGraw-Hill Publishing Company Limited, New Delhi.2009.

**Reference Books:**

1. Sumant. S, ‘Technical English’, Second Edition, McGraw-Hill Education (India) Pvt. Ltd., 2008.
2. Dr. M. Hariprasad,” Communicative English “Third Edition, Neelkamal Publications, PVT. LTD.,2007.
3. SangeetaSharma ,Binod Mishra, ‘Communication Skills for Engineers and Scientists, PHI Learning Private Limited., New Delhi, 2009.

**Course: Mathematics – I**

**This will be taught by the University**

**Course: Engineering Physics – I**

**This will be taught by the University**

**Course: Engineering Chemistry– I**

**This will be taught by the University**

**Course: Programming in C**

**Objectives** Even with the introduction of several high level languages and frameworks, the development of procedural codes is important in several commercial app developments. The object oriented platforms and event driven systems use procedural languages for coding integral command content. C is an important procedural language and was developed initially to write the UNIX operating system. UNIX operating system, C compiler and all UNIX application programs are written in C. C is popular because, it is easy to learn, produces efficient programs, can handle low-level activities, and can be compiled on a variety of platforms. This course focuses 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 units. The students will be implementing the concepts explained here to create simple to complex programs.

**Module 1: Overview of Programming:**

**Introduction to computer based problem solving**, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, **Programming environment** – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters

**Module 2: Fundamentals of C programming:**

**Overview of C**, Data Types, Constants & Variables, Operators & Expressions, **Control constructs**-if then, for, while, **Arrays**- single & multidimensional arrays, **Functions**-fundamentals – general form, function arguments, return value, **Basic I/O**-formatted and Unformatted I/O, **Advanced features**- Type modifiers and storage class specifiers for data types, Bit operators, ? Operator, &operator, \* operator, Type casting, type conversion.

**Module 3: Advanced programming techniques:**

**Control constructs**- Do while, Switch statement, break and continue, exit() function, go to and label, **Scope rules**- Local & global variables, scope rules of functions, **Functions**-parameter passing, call by value and call by reference, calling functions with arrays, argc and argv, recursion- basic concepts, ex-towers of Hanoi

**Module 4: Dynamic data structures in C:**

**Pointers**- The & and \* operator, pointer expression, assignments, arithmetic, comparison, mallocvscalloc, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function retuning pointers, **Structures**- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, **Unions** – Declaration, uses, enumerated data-types, typedef

**Module 5: Additional features:**

**File Handling** – The file pointer, file accessing functions, fopen, fclose, puc, getc, fprintf, **C Preprocessor-** #define, #include, #undef, Conditional compilation directives, **C standard library and header files**: Header files, string functions, mathematical functions, Date and Time functions

**Books for Reference**

1. Let us C by YashwantKanetka, 6th Edition, PBP Publication
2. The C programming Language by Richie and Kenninghan, 2004, BPB Publication
3. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill

**Course: Computer Architecture and Organization**

**Course Objective:** This course is intended at teaching the students, features and working of the different components that make up the computer like Language, instruction and memory.

**Module 1: Register Transfer and Micro-operation**

Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer. Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtrator, BinaryIncrementor, Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.

**Module 2: Basic Computer Organization**

Instruction Codes, Computer Registers: Common bus system, Computer Instructions: Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions

**Module 3: Micro Programmed Control Unit**

Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines, Design of Control Unit, Central Processing Unit: Introduction, General Register Organization, Stack Organization: Register stack, Memory stack; Instruction Formats, Addressing Modes

**Module 4: Computer Arithmetic**

Introduction, Addition and Subtraction, Multiplication Algorithms (Booth algorithm), Division Algorithms, Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors

**Module 5: Modes of Data Transfer and Memory Organization**

Modes of Data Transfer: Priority Interrupt, Direct Memory Access, Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory

**Reference Books:**

1. Computer System Architecture by Morris Mano, PHI
2. Computer Organization and Architecture by William Stallings, PHI
3. Digital Computer Electronics: An Introduction to Microcomputers by Malvino, TMH
4. PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson, O’Reilly, 2nd Edition , 2010
5. Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons
6. Fundamental Of computer Organization by Albert Zomaya, 2010

**Course: Programming in C Laboratory**

**List of Programs**

**Part A**

1. Printing the reverse of an integer.
2. Printing the odd and even series of N numbers.
3. Get a string and convert the lowercase to uppercase and vice--versa using getchar() and putchar().
4. Input a string and find the number of each of the vowels appear in the string.
5. Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end.
6. Printing the reverse of a string.

**Part B**

1. Searching an element in an array using pointers.
2. Checking whether the given matrix is an identity matrix or not.
3. Finding the first N terms of Fibonacci series.
4. Declare 3 pointer variables to store a character, a character string and an integer respectively. Input values into these variables. Display the address and the contents of each variable.
5. Define a structure with three members and display the same.
6. Declare a union with three members of type integer, char, string and illustrate the use of union.
7. Recursive program to find the factorial of an integer.
8. Finding the maximum of 4 numbers by defining a macro for the maximum of two numbers.
9. Arranging N numbers in ascending and in descending order using bubble sort.
10. Addition and subtraction of two matrices.
11. Multiplication of two matrices.
12. Converting a hexadecimal number into its binary equivalent.
13. Check whether the given string is a palindrome or not.
14. Demonstration of bitwise operations.
15. Applying binary search to a set of N numbers by using a function.
16. Create a sequential file with three fields: empno, empname, empbasic. Print all the details in a neat format by adding 500 to their basic salary.

**SEMESTER 2**

**Course: Reasoning and Thinking**

**Course Objective:**It is the objective of the course to introduce to the students, concepts like Reasoning and thinking which are very important for any individual in every aspect and walk of life and assists them in taking the right decisions, approach every problem with diligence and perform action accordingly.

**Module 1: Verbal ability**

Synonyms**,** Antonyms and One word substitutes

**Module 2: Basic quantitative aptitude**

Speed, Time and Distance, Time and Work, Linear Equations, Progressions (Sequences & Series), Permutation and Combination, Probability, Functions, Set Theory, Number Systems, LCM and HCF, Percentages, Collection and Scrutiny of data: Primary data, questionnaire and schedule; secondary data, their major sources including some government publications.

**Module 3: Logical Reasoning - I**

Number and Letter Series, Calendars, Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism

**Reference Books:**

1. Richard I Levin, David S. Rubin: Statistics for Management, Pearson Prentice Hall Education Inc. Ltd, NewDelhi, 5th Ed. 2007
2. Bajpai, N. Business Statistics, Pearson, 2010
3. Sharma J.K., Business Statistics, Pearson Education India, 2010.
4. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, WestPublishing Company, 1996.
5. CAT Complete course, UPKAR publications

**Course: Network Security Basics**

**Course Objective:**

The power of computers can be witnessed when multiple computers are connected to form a network and start sharing information amongst them. But when this happens, the entire network becomes an open source and exposed to threats due to many users who log into these networks and their environments. Therefore it becomes important to learn about Network Security, in order to safeguard our networks from hackers and damages. Learning network concepts therefore becomes significant and no study of computers is complete without them.

**Module 1: Introduction to Network Security**

Perimeter Security – Overview of Network Security, Access Control, Device Security, Security features on Switches, Firewall, Types of firewall, Access Management, Multifactor Authentication, Wireless LAN (WLAN) Security and Network Admission Control (NAC)

**Module 2: Threats, Vulnerabilities and Attacks**

Threat; Vulnerabilities; Attacks – Application Attack, Network Attack and Mitigating & Deterring Attacks; Network Security – Security through network devices, Security through Network Technologies and Security through Network Design Elements, Administering a Secure Network

**Module 3: Network Security Management**

Secure Socket Layer (SSL) – Introduction to SSL, Open SSL basics, Problems with SSL, Cryptography, Message Digits Algorithms, Digital Signature and Public Key Infrastructure (PKI); Data Privacy – IPsec VPN, Dynamic Multipoint VPN (DMVPN), Group Encrypted Transport VPN (GET VPN), Secure Sockets Layer VPN (SSL VPN) and Multiprotocol Label Switching VPN (MPLS VPN).

**Module 4: Network Security Controls**

Network Intrusion Prevention – Overview of Intrusion Prevention System (IPS), Intrusion Detection System (IDS),Deploying IPS and IPS high Availability; host Intrusion Prevention; Anomaly Detection and Mitigation

**Module 5: Network Management**

Security Monitoring and correlation; Security Management - Security and Policy Management and Security Framework and Regulatory Compliance; Best Practices Framework, Case Studies.

**Reference/ Text Books:**

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole

**Course: Object Oriented programming UsingC++**

**Objectives:** The main objective is to learn the basic concept and techniques which form the object oriented programming paradigm. Object-oriented programming is a new way of thinking about problem using models organizes around real world concept. The Fundamental construct is the object which combines both data-structure and behaviour in a single entity which is in contrast to conventional programming in which data-structure and behaviour are loosely connected.

**Module 1: Introduction**

Evolution of programming methodologies-Procedure oriented versus Object Oriented Programming-characteristics of OOP, Basics of OOP, Merits and Demerits of OOP. **Data Types:** Different data types, operators and expressions in C++, Keywords in C++. **Input and Output:** Comparison of stido.h and iostream.h, cin and cout. **Decision and loop:** Conditional statement - if-else statement, nested if-else statement, switch, break, continue, and goto statements, Looping statements- for loop, while loop, Do-while loop. **Arrays, String and Structures :** fundamentals-Single dimensional, multi-dimensional arrays, fundamentals of strings, different methods to accept strings, different string manipulations, array of strings, Basics of structures-declaring and defining structure- Accessing structure members, array of structures, Unions difference between structures and Unions, Enumerated data types-declaration and their usage.

**Module 2:**

**Class:** Definition-defining the class, defining data members and member functions, Access specifier-private, public, protected, objects as function arguments, returning objects from the function, scope resolution operator, member function defined outside the class, difference between class and structure, array as class member data, Array of objects. **Functions in C++ :** Function definition, function declaration, Built-in functions, user defined functions, calling the function, passing parameter-actual and formal, different methods of calling the function call by value, call by reference using reference as parameter and pointer as parameter, overload function-different types of arguments-different number of arguments, inline function, default argument, storage classes-automatic, external, static, register. **Constructor and Destructor:** Constructors-constructor with argument, constructor without arguments, constructor with default arguments, Dynamic constructor, constructor overloading, copy constructor, destructors, Manipulating private data members.

**Module 3:**

**Operator overloading:** Defining operator overloading, overloading unary operator, overloading binary operator, manipulation of string using overloaded operator, rules for overloading operator. Data conversion: conversion between Basic types, conversion between objects & Basic types, conversion between objects of different classes. **Inheritance:** Base Class & derived class, defining derived classes, protected access specifier, public inheritance and private inheritance-member accessibility, constructors and destructors in derived classes, Level of inheritance-single inheritance, multiple inheritance, multi-level inheritance, hierarchical inheritance, hybrid inheritance.

**Module 4:**

**Pointer:** Pointer declaration and Access, Pointer to void, pointer and arrays, pointer constant and pointer variable, pointer and functions, pointer, call by pointer arrays, array of pointers to string, printer sort, memory management-new and delete, pointer to object-referencing members using pointers, self containing class, this pointer, returning values using this pointer.  **Virtual function:** Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract class, virtual base class. **Friend functions and static function:** Purpose, defining friend functions, friend classes, static function, accessing static function numbering positive objects.

**Module 5:**

**Templates and Exception Handling:** Introduction to templates, class templates, function templates, Member function templates, Template arguments, Exception handling. **Console IO Operator :**C++ stream and C++ stream classes, unformatted I/O operators, formatted I/O operators-manipulators-user defined manipulators. **Files :** Class for file stream operators, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple object, stream class, file pointer-specifying the position, specifying the object, tellg() function, seekg() function. Command line arguments.

**Books for References:**

1. E. Balaguruswamy: Object Oriented Programming with C++, Tata McGraw Hill. Publications
2. Strousstrup: The C++ Programming Language, Pearson Edition, 3rd Edition
3. Lafore Robert: Object Oriented Programming in Turbo C++, Galgotia Publications
4. Lippman: C++ Primer, 3/e Pearson Education
5. C++ completer reference by Herbert Schildt, Tata McGraw Hill Publications.
6. Let us C++ by YeshwanthKanetkar

**Course: Data Structures using C**

**Objectives:** A data structure is a particular way of storing and organizing data in a computer so that it can be used efficiently. Different kinds of data structures are suited to different kinds of applications and some are highly specialized to specific tasks. This course covers the basic concepts of different data structures which are the basic building blocks of Programming and problem solving.

**Module 1: Introduction to Data structures**

Definition, Classification of data structures: primitive and non primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.

**Module 2: Searching and Sorting**

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort

**Module 3: Stack and Queue**

Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque) , Priority queue , Operations on all types of Queues

**Module 4: Linked List**

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

**Module 5: Tree Graphs and their Applications:**

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth First search, Breadth First search.

**Books for References:**

1. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001
2. Lipschutz: Schaum’s outline series Data structures Tata McGraw-Hill
3. Robert Kruse Data Structures and program designing using ‘C’
4. Trembley and Sorenson Data Structures
5. E. Balaguruswamy Programming in ANSI C.
6. Bandyopadhyay, Data Structures Using C Pearson Education, 1999
7. Tenenbaum, Data Structures Using C. Pearson Education, 200
8. Kamthane: Introduction to Data Structures in C. Pearson Education 2005.
9. Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006
10. Langsam, AusensteinMaoshe& M. Tanenbaum Aaron Data Structures using C and C++ Pearson Education

**Course: Operating System- Building blocks**

**Objectives:** The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. This course covers the concept of operating system and its applications.

**Module 1 – Introduction to Operating System**

Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

**Module 2 – Process Management**

**Processes**: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. **Threads:** Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models. **Process Synchronization:** Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions **Deadlocks:** System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

**Module 3: Storage Management**

**Memory Management**: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. **Virtual Management**: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation **File-System Interface**: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics **File-System Implementation**: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery **Disk Managemen**t: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

**Module 4: Protection and Security**

**Protection**: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Acess Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. **Security:** Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

**Books for Reference**

1. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
2. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
3. Silberschatz / Galvin / Gagne, Operating System,6thEdition,WSE (WILEY Publication)
4. William Stallings, Operating System, 4th Edition, Pearson Education.
5. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
6. Abraham Silberschatz and peter Baer Galvin, Operating System Concepts, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23)

Nutt: Operating Systems, 3/e Pearson Education 2004

**Course: Information Security- I**

**Objectives:** This course enables the students to understand the concepts of IT security, Threats, Vulnerabilities, Impact and control measures. And also to get familiarized with Asset management along with the objective to create awareness in Digital Rights management.

**Module1 Introduction to Information Security**

Introduction: 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.

**Module2 User Identity and Access Management**

User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption

**Module3 System And Server Security**

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

**Module4 Internet Security**

Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures.

**Module5Risk Assessment and Cyber Laws**

Vulnerability Assessment, Penetration Testing**,** Cyber Laws

**Text book:**

1. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

**Reference Book:**

1. Information Security Management Handbook, Volume 4 - Micki Krause, ISC2 Press, 2007

**Course: Object Oriented Programming with C++ Laboratory**

**List of experiments**

**Part A**

1. Number of vowels and number of characters in a string.
2. Write a function called zeros maller () that is passed with two introduce arguments by reference and set the smaller of the number to zero. Write a man() program to access this function.
3. Demonstration of array of object.
4. Using this pointer to return a value ( return by reference).
5. Pointer sort.
6. Demonstration of virtual function.
7. Demonstration of static function.
8. Accessing a particular record in a student's file.

**Part B**

1. Using different methods to write programs to implement function overloading with default arguments for the following problems :
2. To find whether a given number is prime.
3. To find the factorial of a number
4. Write a program to create a database for a bank account contains Name, Account no, Account type, Balance, Including the following a) Constructors b) destructors call) default constructors d) input and output function ; input and output for 10 people using different methods.
5. Create a class to hold information of a husband and another for the wife. Using friend functions give the total salary of the family.
6. Write a program to overload the following operators (any 3)
7. Binary operator '+' to concatenate 2 strings
8. Relational operator '<' to find whether one data is less than the other
9. Unary operator '++' to find the next date of a given date.
10. Create a base class for a stack and implement push and pop operation. Include a derived class to check for stack criteria such as a) stack empty b)stack full c) stack overflow d) stack underflow.
11. Create a database using concepts of files for a student including the following fields: Student- name, Student's Reg No, Student's Attendance (overall % of attendance); and enter data for 10 students and output the same in proper format.
12. Using operator overloading concept implement arithmetic manipulation on two complex numbers.

**Course: Information Security I -Lab**

**List of experiments**

1. System Security Configuration in Windows 7 I

2. System Security Configuration in Windows 7 II

3. Password based Authentication process

4. Hashes and message digests calculation using has calculators

5. Service Management of Windows 7 for prevention of attacks

6. Password cracking tool usage

7. Event logger analysis

8. Windows Registry analysis

9. Securing LAN using firewall

10. DoS attacks and its prevention

11. Install a keylogger , capture useful information and analyze.

12. Usage of vulnerability assessment tool (nmap / wireshark) and analyze the results.

**Course: Data Structures using C Lab**

**List of Programs**

**Part A**

1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10. Write a program to sort N numbers using selection sort.

**Part B**

1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.

6. Sort N numbers using merge sort.

**SEMESTER 3**

**Course: Security Threats and trends**

**Objectives:**Security threats and trends are very important in Information technology. Each year, the Information Security Forum, a non-profit association that researches and analyses security and risk management issues, releases its 'Threat horizon' report to provide a forward-looking view of the biggest security threats over a two-year period.

**Module 1: Viruses & Worms**

Introduction to Viruses &Worms**,** the concept of how Viruses & Worms work, the various types of Viruses &Worms, the infection vectors of Viruses &Worms, managerial, technical & procedural controls to address Viruses & Worms

**Module 2: Malware & Botnets**

Introduction to Malware & Botnets, the concept of how Malware, Trojans & Botnets work, the concept of honeynets and honeypots, Managerial, technical& procedural controls to address Malware, Trojans & Botnets

**Module 3: Trojans & Rootkits**

Introduction to Remote Access Trojans & Rootkits, concepts, their working methods , their security implications and the managerial , technical and procedural controls to address RATs

**Module 4: Cyber Warfare**

Introduction to Advanced Persistent Threats &Information Warfare, concepts, their working methods, their security implications and the managerial, technical and procedural controls to address these threats

**Module 4: V Social Engineering**

Introduction, Human and Computer based Social Engineering, examples of Social Engineering Attacks, Counter measures

**Text Books**:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. The CEH Prep Guide: The Comprehensive Guide to Certified Ethical Hacking, by Ronald L. Krutz (Author), Russell Dean Vines,Wiley Publications

**Course: OSI Layer and Network Protocols**

**Course Objective:** OSI model is a conceptual model developed to explain the basic working of communication system through the concept of abstraction layers. Seven layers are defined as standards and multiple protocols operate at each level and carry out specific tasks. A sound knowledge of OSI layer, its protocols and their specific functions is very important for any computer professional to harness the full capabilities of the system and deliver best output.

Different layers of OSI model are explained to the students, along with protocols in each category. The functions of each protocol are taught in subsequent chapters.

**Module 1 Open Systems Interconnection (OSI) Model**

Introduction to the 7 layers of the OSI model, concept of the OSI model, the Application Layer, the Presentation Layer, the Session Layer, the Transport Layer, the Network Layer, the Data Link Layer &the Physical layer

**Module 2 Security Protocols - Application Layer**

Introduction to Protocol concepts, Important Protocols,File Transfer Protocol, Socket Secure (SOCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet), Transport Layer Security/Secure Sockets Layer (TLS/SSL), Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC)

**Module 3: Transport Layer**

Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP), Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP), Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)

**Module 4: Network Layer**

Introduction to Network Layer**,** Internet Protocol Version 4 (IP4), Internet Protocol Version 6 (IP6), Internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

**Module 5: Data Link Layer:** Introduction to Data Link Layer, the Address Resolution Protocol (ARP), the Open Shortest Path First (OSPF), the Neighbor Discovery Protocol (NDP),theTunneling Protocol (Tunnels) &the Point to Point Protocol (PPP)

**Reference/ Text Books**:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole

**Course: Cryptography Fundamentals**

**Course Objectives:** Security is ubiquitous. With the advent of e-commerce and electronic transactions, the need for development of secured systems has grown tremendously. Cryptography is the study of building ciphers to ensure the confidentiality and integrity of information. Along with it is the activity of analyzing the strength of a cipher by subjecting it to several forms attack. This course covers the basic concepts of Cryptography, certain cryptographic algorithms and its applications.

**Module 1: Introduction to Cryptography**

The Confidentiality, Integrity & Availability (CIA) Triad, Cryptographic concepts, methodologies &practices, Symmetric& Asymmetric cryptography, public& private keys, Cryptographic algorithms and uses, Construction& use of Digital signatures

**Module 2: Types of Algorithms**

The basic functionality of hash/crypto algorithms (DES, RSA, SHA, MD5, HMAC, DSA) and effects on key length concepts in Elliptical Curve Cryptography & Quantum Cryptography

**Module 3: Key Management**

The basic functions involved in key management including creation, distribution, verification, revocation and destruction, storage, recovery and life span and how these functions affect cryptographic integrity

**Module 4: Application of Cryptography**

Major key distribution methods and algorithms including Kerberos, ISAKMP etc., Vulnerabilities to cryptographic functions, the Use and functions of Certifying Authorities (CAs),Public Key Infrastructure (PKI) and System architecture requirements for implementing cryptographic functions

**Books for Reference:**

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Cryptography and Security by C K Shyamala, N Harini and Dr T R Padmanabhan – Wiley Publications, First Edition

**Course: Reasoning and Thinking – II**

**Course Objective:** Students will continue to learn advance concepts in this subject like central tendency and presentation of data which will help them solve complex scenarios

**Module 1: Logical Reasoning - II**

Recap on Reasoning and Thinking -I, Blood Relations; concept of a statistical population and sample from a population; qualitative and quantitative data

**Module 2: Measures of Central Tendency**

Objective of averaging, characteristics of good average, types of average, arithmetic mean of grouped and ungrouped data, correcting incorrect values, weighted arithmetic mean, Median - median of grouped and ungrouped data merit and limitation of median, computation of quartile, decile and percentile, Mode - calculation of mode of grouped and ungrouped data, merits and limitation of mode, relationship between mean, median and mode. Geometric mean and Harmonic mean.

**Module 3: Presentation of Data**

Construction of tables with one or more factors of classification; Diagrammatic and Graphical representation of non-frequency data; Frequency distribution, cumulative frequency distribution and their graphical representation - histogram, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Data Interpretation – Introduction and approaches

**Reference Books:**

1. Richard I Levin, David S. Rubin: Statistics for Management, Pearson Prentice Hall Education Inc. Ltd, New Delhi, 5th Ed. 2007
2. Bajpai, N. Business Statistics, Pearson, 2010
3. Sharma J.K., Business Statistics, Pearson Education India, 2010.
4. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, West Publishing Company, 1996.
5. CAT Complete course, UPKAR publications

**Course: Routing**

**Course Objective:**

This course introduces the architecture, functions, and components of the Internet and computer networks, the principles and structure of IP addressing and subnetting, the fundamentals of Ethernet, the architecture, components and operations of routers, routing protocols and switches in a network. Topics include TCP/IP, Ethernet, IPv4, routers, switches. As we cover these topics, the students will learn how the internals of the Internet work to support the Web and other networked applications. After completing the course the students will develop a detailed understanding of how to configure, implement and troubleshoot widely-used networking technologies

**Module 1: Networking Fundamentals**

The TCP/IP and OSI Networking Models, Fundamentals of Ethernet LANs, Fundamentals of WANs, Fundamentals of IPv4 Addressing and Routing, Fundamentals of TCP/IP Transport and Applications

**Module 2: Ethernet LANs and Switches**

Building Ethernet LANs with Switches, Cisco LAN Switches, Configuring Ethernet Switching.

**Module 3: IP Version 4 Addressing and Subnetting**

Perspectives on IPv4 Subnetting, AnalyzingClassfull IPv4 Networks, Analyzing Subnet Masks, Analyzing Existing Subnets, Implementing IP Version 4: Operating Cisco Routers, Configuring IPv4 Addresses and Routes, Implementing Ethernet Virtual LANs, Troubleshooting Ethernet LANs, Spanning Tree Protocol Concepts, Troubleshooting LAN Switching

**Module 4: LAN Routing**

Configure IPv4 Routing, Configure and Verify Host Connectivity, Advanced IPv4 Addressing Concepts, Describe the boot process of Cisco IOS routers; Operation status of a serial interface; Manage Cisco IOS files; Routing and Routing Protocols; OSPF (multi-area); EIGRP (single AS); Passive Interface

**Module 5: IPv4 Services and IP Version 6**

Basic IPv4 Access Control Lists, Advanced IPv4 ACLs and Device Security, Network Address Translation, Recognize high availability (FHRP); Describe SNMP v2 and v3, IPV6 addressing

**Reference Books:**

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011

**Text Books:**

1. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013
2. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
3. CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

**Course: Relational Database Management Systems**

**Objectives:** A database management system (DBMS) is collection of software meant to manage a Database. Many popular databases currently in use are based on the relational database model. RDBMSs have become a predominant choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data and much more. The course covers the basic concepts of databases in general with an emphasis on relational databases, modeling techniques and writing queries. Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

**Module 1: Introduction**

Purpose of Database System -– Views of data – Data Models – Database Languages –– Database System Architecture – Database users and Administrator – Entity– Relationship model (E-R model ) – E-R Diagrams -- Introduction to relational databases

**Module 2: Relational Model**

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals, Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables, Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL. Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause, Creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and managing User, Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases

**Module 3: Database Design**

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

**Module 4: Transactions**

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock- Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006
2. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision Wesley, 2007.
3. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003

**Course: Routing Laboratory**

**List of experiments:**

1. Switch Configuration - Basic Commands
2. Switch Configuration - Switch Port Security
3. Router - Configuration
4. Configuration of IP Address for a Router
5. Setting up of Passwords
6. PPP Encapsulation, PPP PAP Authentication, PPP CHAP Authentication
7. Configuration of Static and Dynamic Routing
8. Configuration of Default Route
9. Implementation of EIGRP
10. Implementation of OSPF
11. VLAN Configuration
12. Switch Troubleshooting
13. Configuration of Access-lists - Standard & Extended ACLs
14. Cisco Discovery Protocol
15. DHCP, DHCP Relay & DHCP Exclusions
16. Configuring Logging to a Remote Syslog Server

**Course: Network Security Laboratory**

**List of experiments**

1. Firewall Configuration

2. VPN Configuration

3. IDS Configuration

4. Router Security

5. Traffic Monitoring using WireShark

7. Traffic Monitoring

8. Network Security risk assessment

10. Network security policies and standards

12. VLANs & Wireless LANs

14. Defence in Depth & DMZs

16. Network Security for BYODs

**Course: Relational Database Management System -Laboratory**

**List of experiments**

1. Create User in Oracle Database and grant and revoke the privileges and use of commit savepointroleback command.
2. Create the following:

* Synonym sequences and Index
* Create alter and update views.

1. Create PL/SQL program using cursors, control structure, exception handling
2. Create following:

* Simple Triggers
* Package using procedures and functions.

1. Create the table for

* COMPANY database
* STUDENT database and Insert five records for each attribute.

1. Illustrate the use of SELECT statement
2. Conditional retrieval - WHERE clause
3. Query sorted - ORDER BY clause
4. Perform following:

* UNION, INTERSECTION and MINUS operations on tables.
* UPDATE, ALTER, DELETE, DROP operations on tables

1. Query multiple tables using JOIN operation.
2. Grouping the result of query - GROUP BY clause and HAVING clause
3. Query multiple tables using NATURAL and OUTER JOIN operation.

**SEMESTER 4**

**Course Name: COBIT, ValIT and RiskIT**

**Course Objective:**

(COBIT) is a framework created for supporting toolset by which managers could bridge the gap between control requirements, technical issues and business risks.

Val IT is a governance framework used to create business value from IT investments. At the root of Val IT is a set of guiding principles, processes and best practices to support and help executive management and boards at an enterprise level.

The objective of RiskIT is to provide an end-to-end, comprehensive perspective of all risks pertaining to use of IT and deals with thorough treatment of risk management. Its principles can be customized to suit the environment in your organization and is definitely an encouraging aspect for individuals to contribute their skills to the growth of the organization

**Module 1: Introduction to COBIT**

COBIT 5 – Its importance and relevance

5 Principles of COBIT

* Meeting Stakeholders needs
* Covering the Enterprise End-to-End
* Applying a Single Integrated Framework
* Enabling a Holistic approach
* Separating the Governance from the Management

Enablers of COBIT

* Processes
* Organizational Structures
* Culture, Ethics &Behaviour
* Principles, Policies & Frameworks
* Information
* Services Infrastructure Applications
* People, Skills & Competencies

**Module 2: Risk IT & its Importance**

Risk IT – its Importance and Relevance

Interlinkages between Risk IT with COBIT & Val IT

Three domains of Risk IT with their sub processes

Risk Governance

* Establish and Maintain a Common Risk view
* Integrate with Enterprise Risk Management (ERM)
* Make Risk-aware Business Decisions

Risk Evaluation

* Collect data
* Analyze Risk
* Maintain Risk Profile

Risk Response

* Articulate Risk
* Manage Risk
* React to Events

**Module 3: Benefits of Risk IT**

* Connects to Business objectives
* Aligns the management of IT related business risk to ERM
* Balances costs and benefits of managing IT Risk
* Promotes fair and open communication of IT Risk
* Establishes the right tone from the top while defining and enforcing personal accountability for operating within acceptable and well-defined tolerance levels
* Is a continuous process and part of daily activities

**Module 4: VAL IT and its importance**

Val IT, its importance and relevance

Key Val IT terms, Principles and Domains

3 domains covered by Val IT

* + Value Governance
  + Portfolio Management
  + Investment Management

Val IT processes, high-level Management guidelines, maturity models and the relationship between Val IT and COBIT

**Text Book:**

1. ISACA publications on COBIT, ISACA Knowledge Centre
2. ISACA publications on ValIT and Risk IT, ISACA Knowledge Centre

**Course: Introduction to Unix and Linux**

**Objectives**The unit provides an overview of the Linux Operating System, geared toward new users. This course also provides the guidelines for the learners to take up vendor certifications

**Module I Introduction**

Introduction to Multi user System, History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands like who, pwd, cd, mkdir, rm, rmdir, ls, mv, ln, chmod, cp, grep, sed, awk ,tr, yacc etc. getting Started (Login/Logout).

Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line, Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No.

**Module 2 Exploring Linux flavors**

Introduction to various Linux flavors. , Debian and rpm packages, Vendors providing DEBIAN & RPM distribution & Features. Ubuntu. History, Versions, Installation, Features, Ubuntu one. Fedora: History, Versions, Installation, Features.

**Module 3 General Overview of the system**

System Structure, User Perspective, Operating System Services Assumption about Hardware, The Kernel and Buffer Cache Architecture of UNIX Operating System, System Concepts, Buffer Headers, Structure of the Buffer Pool, Scenarios for Retrieval of the Buffer, Reading and Writing Disk Units, Advantages and Disadvantages of Buffer Cache.

**Module 4 Internal Representation of files**

System Calls for the File System, INODES, Structure of Regular File, Directories, Conversions of a Path, name to an INODE, Super Unit, INODE Assignment to a New File, Allocation of Disk Units. Open, Read, Write, File and Record Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode, STAT and FSTAT, PIPES, Mounting and Unmounting Files System, Link, Unlink.

**Module 4 Structures of Processes and process control**

Process States and Transitions Layout of System Memory, The Context of a Process, Manipulation of the Process Address Space, Sleep Process Creation/Termination, The User ID of a Process, Changing the Size of a Process. The Shell. Case Study of Various LINUX Versions.

**Text Books:**

1. The Design of Unix Operating System, Maurice J. Bach, Pearson Education, 2010 (Unit I,II)

2. Advance UNIX, a Programmer‘s Guide, S. Prata, BPB Publications, and New Delhi, 2011 (Unit III,IV)

3. Unix Concepts and Applications, Sumitabh Das, 2010 (Unit V)

**Reference Books:**

1. The UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India. 2009

1. Guide to UNIX Using LINUX, Jack Dent Tony Gaddis, Vikas/ Thomson Pub. House Pvt. Ltd. 2010

**Course: Fundamental of Storage Management**

**Objectives:** Data is all around us, in different forms and amounts. As we are steeping into revolutionizing world of advanced computing like cloud computing, data storage has also undergone many transformations in terms of techniques and hardware used for the same. This makes it significant for a computer student to learn different aspects of data storage. In this course, students will learn fundamentals of data storage, covering topics like demands on data, how storage techniques have evolved over a period of time and vital information about storage topologies like DAS, NAS and SAN, along with their comparison features. The second unit deals with different hardware required for storage like adapters, connectors, cables and their individual features. Different storage protocols used like ATA, SATA, SPI and its sub-categories will be taught to students in the following units. Topics storage security and storage infrastructure are addressed in the final unit.

**Module 1 : Introduction to Information storage and Management**Information Storage: Data – Types of Data –Information - Storage , Evolution of Storage Technology and Architecture, Data Center Infrastructure - Core elements- Key Requirements for Data Center Elements -Managing Storage Infrastructure, Key Challenges in Managing Information, Information Lifecycle - Information Lifecycle Management - ILM Implementation -ILM Benefits ,Summary

**Module 2: Storage System Environment**

Components of a Storage System Environment – Host –Connectivity – Storage, Disk Drive Components –Platter – Spindle - Read/Write Head - Actuator Arm Assembly - Controller - Physical Disk Structure - Zoned Bit Recording - Logical Block Addressing , Disk Drive Performance -1 Disk Service Time , Fundamental Laws Governing Disk Performance , Logical Components of the Host - Operating System - Device Driver -Volume Manager - File System – Application , Application Requirements and Disk Performance, Summary

**Module 3: Backup and Recovery**Backup Purpose -Disaster Recovery - Operational Backup –Archival, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods , Backup Process, Backup and Restore Operations, Backup Topologies - Serverless Backup , Backup Technologies -Backup to Tape - Physical Tape Library - Backup to Disk - Virtual Tape Library

**Module 4 : Local Replication**Source and Target -Uses of Local Replicas, Data Consistency - Consistency of a Replicated File System - Consistency of a Replicated Database , Local Replication Technologies - Host-Based Local Replication - Storage Array-Based Replication , Res tore and Restart Considerations - Tracking Changes to Source and Target , Creating Multiple Replicas, Management Interface

**Module 5: Managing the storage Infrastructure**Monitoring *the* Storage Infrastructure -Parameters Monitored - Components Monitored - Monitoring Examples - Alerts, Storage Management Activities - Availability management - Capacity management - Performance management - Security Management - Reporting- Storage Management Examples, Storage Infrastructure Management Challenges

**Text Book:**

1. Storage Networks: T.he Complete Reference, Robert Spalding, Tata McGraw Hill Publication, 2003

**Reference Book:**

1. Information Storage and Management: Storing, Managing, and Protecting Digital Information, EMC Education Services, Wiley; 1 edition (April 6, 2009)

**Course: Fundamentals of Desktop Operating System**

**Course Objective:** Operating system is the basics of any technology or application that is being developed. A good understanding of any OS is very much essential for every computer technology aspirant to reap maximum performance out of the machines. File systems, storage mechanisms, security aspects, Protocols functioning and policy implementations are some of the basic concepts learnt in this subject.

**Module 1 Introduction to Operating System**

Introduction to Operating System, Evolution of operating system, Structure of Operating, OS Operations OS Organizations, Distributed Systems, Open source Operating systems, Process Management, Memory Management, Storage Management, Computing Environment

**Module 2 Installing, Upgrading and Managing Windows – 7**

Gathering hardware devices, preparing to install windows 7, upgrading and migrating to windows 7, Clean and Image based installation, Configuring Application Compatibility, administrating windows features, Disk management, and installing and configuring device drivers

**Module 3 File Access, Printers and Network Connectivity with Windows – 7**

Introduction to Authentication and Authorization, Managing file access , Shared Folders, File compression, file archiving, managing printers, connecting windows 7 client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA, Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network

**Module 4 Securing, Optimizing and Maintaining Windows 7 Client**

Overview of local security management, local security policy settings, EFS and Bitlocker, Application restrictions, UAC, Windows Firewall, Administrating IE8, Windows Defender

**Module 5 Configuring Mobile Computing and Remote Access in Windows 7**

Configure Mobile computer and device settings, Remote desktop, remote assistance, direct access, branch cache

**Text Book:**

1. Milan Milenkovic - Operating Systems – TATA McGRAW HILL, 2009

**Reference Books:**

1. Operating Systems Fundamentals D. Irtegov, 2005

2. A Short Introduction to Operating Systems (M. Burgess), 2010

3. Operating Systems: Design and Implementation (Second Edition)., Andrew S. Tanenbaum, 2010

**Course Name: Database Security Fundamentals**

**Course Objective:**

Every program and every application that we use, connect with data or information in some way or the other and this data is stored in a systematic manner in a database, which is chosen depending on the requirements of the software and the users. As data forms a very crucial part of IT and is prone to security threats and attacks, it becomes important to protect the data using technology. This course will teach students, methods to protect databases

**Module 1: The Database and DBMS Architecture**

Introduction to Database & DBMS Architecture, Hierarchical Database Management Systems, Network Database Management Systems, Relational Database Management Systems, Object-Oriented Database Management Systems, End-User Database Management Systems, Spreadsheets

**Module 2: Concepts of Database Security**

Concept of Least Privilege in User ID for databases. Concept of NoSQL databases Differences from classical DBMS concepts with NoSQL, Advantages of NoSQL like Elastic Scaling, Big Data, Goodbye DBAs’, Economics/Cost, Flexible Data models.

**Module 3: Concepts of NoSQL**

Non/ partial applicability of ACID (Atomicity, Consistency, Isolation, Durability) guarantees in NoSQL databases as compared to traditional RDBMS databases. Horizontal scalability benefits of NoSQL Databases compared to traditional Databases, Protecting Database - Understanding permissions, Creating and using database roles, using schemas for security, configuring cross-database security

**Module 4: Concepts of Key Value & Tuple Store Databases**

Concept of UnSQL or Unstructured Query Language, Concept of Key Value & Tuple Store Databases, Concept of Graph Databases, Concept of Multi-model Databases, Code and Data Encryption- Using service and database master keys, creating and using symmetric and asymmetric keys, creating and storing hash values, Authenticating stored procedure by signature

**Module 5: SQL Server &Concepts**

Concept of Object Databases, Concept of Grid & Cloud Databases, Concept of XML databases, Concept of Multidimensional and Multi-value Databases

**Module 6:SQL Server Auditing**

Auditing – Using the profiler to audit SQL server access, using DML trigger for auditing data modification, Using DDL triggers for auditing structure modification, configuring SQL server auditing.

**Text Books**:

1. Database security by SilvanaCastano, 2nd Edition, Pub: Addison-Wesley Professional , 2008
2. Microsoft SQL server 2012 Security Cookbook by Rudi Bruchez, Pub: PACKIT publishing, 2012

**Reference Books:**

1. Handbook of database security: Applications and Trends Michael Gertz, SushilJajodia, Pub: Springer, Lib. Of congress. 2008
2. Implementing database security and auditing: a guide for DBAs, ...Ron Ben-Natan, Pub: Elsevier, 2005

**Ethical Hacking Basics**

**Course Objective:**

The course primarily covers the Ethical hacking methodology and its different stages which include the Foot printing, Scanning, Enumeration and System hacking techniques and a broad knowledge about white box and black box testing. The Unit describes a wide range of attacks that can cause adverse negative effects on IT systems that include Denial of service, Session hijacking and severe vulnerabilities that can be seen in Web Applications. The Unit also covers hacking attacks caused in other Operating System environment like Linux and the secret techniques to Evade Firewalls. The Unit not only captures valuable information on vulnerabilities and threats but also covers an effective way of report making methodology that can helps the top level management to take immediate decisions on mitigating the threats.

**Module 1: Introduction to Ethical Hacking**

Hacking Methodology, Process of Malicious Hacking, Footprinting and Scanning: Footprinting, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques

**Module2: Hacking Methodology**

Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques

**Module3: Web and Network Hacking**

SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls

**Module4: Report writing & Mitigation**

Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

**Books for References:**

1. The CEH Prep Guide: The Comprehensive Guide to Certified Ethical Hacking, by Ronald L. Krutz (Author), Russell Dean Vines, Wiley Publications, First Edition

**Course: Introduction to Linux/ Unix Laboratory**

**List of Programs:**

1. Make a report and a presentation on evolution and development of different versions of Unix
2. Report and execute 25 basic commands of unix.
3. Write a few commands available in /bin and /sbin directory
4. Find the guest directory, Write the permissions of guest directory
5. Create a new Directory test in guest directory
6. Write the permissions of test directory
7. Change the permissions of guest directory to 775
8. Change the permissions of /tmp directory to 700
9. Change the permissions of guest directory to 700
10. Report the functionality and modes of VI Editor.
11. Make and alter files using all 3 methods cat touch and vi editor apply all file operations and document it.
12. Install on vm-ware Ubuntu and fedora and document the process (GUI & CLI)

**Course: Fundamentals of Desktop Operating System Laboratory**

**List of Lab Programs:**

1. Installing Windows 7
2. Using Windows Upgrade Advisor or Upgrade Assistance
3. Migrating to Windows 7 using Windows Easy Transfer and User State Migration Tool
4. Creating a Small Office Network or Home Network.
5. Configuring TCP/IP in Windows.
6. Sharing Resources in Windows
7. Creating Users and Groups
8. Performing a Windows Update
9. Capturing image of existing installed operating system and deploy it to another system using imagex.
10. Configuring disk partitions, Virtual HD in Disk Management.

**Course: Ethical Hacking Basics – Lab**

**List of Lab programs**

1. Installing Windows 7
2. Using Windows Upgrade Advisor or Upgrade Assistance
3. Migrating to Windows 7 using Windows Easy Transfer and User State Migration Tool
4. Creating a Small Office Network or Home Network.
5. Configuring TCP/IP in Windows.
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8. Performing a Windows Update
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