### Syllabus of B.Voc (Cyber Security)

#### Semester I

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
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<tr>
<td>EN1111.4</td>
<td>Speaking and Listening Skills</td>
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<td>4</td>
<td>CY12</td>
<td>Introduction to Cryptography</td>
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<td>CY11</td>
<td>Introduction to IT</td>
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<td>Introduction to Programming</td>
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<td>MM1131.10</td>
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<td>Fundamentals of information Security</td>
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<td>CY21</td>
<td>Fundamentals of Cyber Forensics</td>
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<td>CS1221</td>
<td>Environmental Studies</td>
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<td>CY22</td>
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<td>CY34</td>
<td>Forensics Tools &amp; Techniques</td>
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<td>CY32</td>
<td>Legal &amp; Ethical Studies</td>
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<td>CY35</td>
<td>Interactive Programming With Python</td>
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<td>CY41</td>
<td>Free and Open Source Softwares (FOSS)</td>
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<td>CY44</td>
<td>Software Engineering</td>
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<td>CY42</td>
<td>Data Mining</td>
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<td>4</td>
<td>CY45</td>
<td>Malware Analysis</td>
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<td>CY43</td>
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<td>CY46</td>
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# Semester V

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<tr>
<td>No.</td>
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<tr>
<td>CY51</td>
<td>Threats in social media</td>
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<tr>
<td>CY52</td>
<td>Principles of secure coding</td>
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<tr>
<td>CY53</td>
<td>Ethical Hacking</td>
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<tr>
<td>CY57</td>
<td>Major Project (I(^{st}) Phase)</td>
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<tr>
<td>CY58</td>
<td>Study Tour</td>
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# Semester VI

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<tr>
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<tr>
<td>CY61</td>
<td>Software Forensics and Vulnerability Analysis</td>
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<td>CY62</td>
<td>Internet of Things (IoT)</td>
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<td>CY63</td>
<td>Mobile and Wireless Security</td>
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<td>CY67</td>
<td>Major Project (II(^{nd}) Phase)</td>
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# Division of marks (Lab examination)

1. First program should be sufficiently simple – 25 marks
   (Logic – 10 marks, Successful compilation – 10 marks, Result – 5 marks)
2. Second program should be based on advanced concepts - 30 marks
   (Logic – 15 marks, Successful compilation – 10 marks, result – 5 marks)
3. Viva Voce - 15 marks
4. Lab Record - 10 marks

Total Marks - 80 marks

# EN 1111.4: SPEAKING AND LISTENING SKILLS
AIM
1. To familiarize students with English sounds and phonemic symbols.
2. To enhance their ability in listening and speaking.

OBJECTIVES: On completion of the course, the students should be able to
1. Listen to lectures, public announcements and news on TV and radio.
2. Engage in telephonic conversation.
3. Communicate effectively and accurately in English.
4. Use spoken language for various purposes.

COURSE OUTLINE


Module II :Listening Skills :Difference between listening and hearing – active listening –barriers to listening – academic listening - listening for details - listening and note-taking - listening for sound contents of videos - listening to talks and descriptions - listening for meaning - listening to announcements - listening to news programmes.


Module IV: Dialogue Practice (Students should be given ample practice in dialogue, using core and supplementary materials.

COURSE MATERIAL

Further reading:
The following One-act plays prescribed:
1. Serafin and Joaquin Alvarez Quinters - A Sunny Morning
2. H.H.Munro - The Death Trap
3. Vincent Godefroy - Fail Not Our Feast
AIM:

1. To create overall generic awareness about scope of the field of IT and to impart basic personal Computing skills.
2. To create background knowledge for the various courses in the Programme.

OBJECTIVES:

1. To introduce the basic terminology in the field of IT
2. To impart functional knowledge about PC hardware, operations and concepts
3. To impart functional knowledge in the use of GUI Operating System
4. To impart functional knowledge in a standard office package (word processor, spread sheet and Presentation softwares) and popular utilities
5. To impart functional knowledge about networks and internet.
6. To give an overview of computer application in various fields and an overall generic awareness about the scope of the field of IT

COURSE MATERIAL

Module–I: Computer characteristics: Speed, storage, accuracy, diligence; Digital signals, Binary System, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, Mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet PC; Hardware & Software; Von Neumann model.

Module–II: Hardware: CPU, Memory, Input devices, output devices. Memory units :RAM(SDRAM, DDRRAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD-Writer; Input devices- keyboard, mouse, scanner, speech input devices, digital camera, Touch screen, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.

Module-III: Software- System software, Application software; concepts of files and folders, Introduction to Operating systems, Different types of operating systems: single user, multi-tasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows &Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application softwares: Generic Features of Word processors, Spreadsheets and Presentation softwares; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses& Protection, Free software, open source.

Module–IV: Computer Networks- Connecting computers, Requirements for a network: Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, introduction to HTML.

COURSE MATERIAL


MM1131.10 MATHEMATICS I
AIM: To introduce mathematical concepts and techniques that have applications in computer science field

OBJECTIVES:
1. To introduce advanced differential calculus
2. To introduce solutions of differential equations
3. To introduce Number theory
4. To introduce Complex Number Theory.

COURSE OUTLINE

Module–I: Review of basic differentiation, Differentiation of hyperbolic functions, derivatives of hyperbolic functions, inverse hyperbolic functions logarithmic differentiation, implicit differentiation, Lebnitz’s theorem, Mean value theorem, Rolle’s theorem, Lagrange’s mean-value theorem, Maxima and minima.


Module–III: Theory of Numbers, prime numbers, unique factorization theorem, Euclidean algorithm, congruences, Fermat’s theorem, Wilson’s theorem

Module–IV: Complex Numbers, Separation into real and imaginary parts, Complex mapping

Assignments and Activities: Markov processes. Harmonic analysis and Fourier series, Linear Programming

COURSE MATERIAL
2. Shanthi Narayan, Differential Calculus, S Chand & Company
4. RudraPratap, Getting Started with MATLAB, Oxford University Press

CY12 INTRODUCTION TO CRYPTOGRAPHY

AIM: To cover the security of information systems based cryptographic approaches

OBJECTIVE: Awareness of Cryptographic techniques, Algorithms types and Modes and algorithm

COURSE OUTLINE
Module I: Symmetric Cipher Models- Substitution techniques- Transposition techniques-. Simplified DES- Block Cipher principles- The Data Encryption Standard, Strength of DES Differential and linear Cryptanalysis. Block Cipher Design principles- Block Cipher modes of operations- Steganography

Module III: Public key Cryptography: - Principles of Public key Cryptography Systems, Number theory-Fundamental Theorem of arithmetic, Fermat’s Theorem, Euler’s Theorem, Euler’s Totient Function, Extended Euclid’s Algorithm, Modular arithmetic. RSA algorithm-Key Management - Diffie-Hellman Key Exchange, Elliptic curve Cryptography


COURSE MATERIAL

CY13 INTRODUCTION TO PROGRAMMING

AIM: To Expose students to algorithmic thinking and problem solving and impart moderate skills in Programming in an industry-standard programming language.

OBJECTIVES:
1. To expose students to algorithmic thinking and algorithmic representations.
2. To introduce students to basic data types and control structures in C.
3. To introduce students to structured programming concepts.
4. To introduce students to standard library functions in C language.

COURSE OUTLINE
Module I: Introduction to programming; Algorithm and flow charts: definitions, Symbols used to draw flow charts, Program Writing – Structure of the program, Source code, Object code, Executable File, Variables and constants. Rules for naming variables/identifiers; Basic data types in C- int, char, float, double; storage capacity-range of all data types.

Module-II: Basic Elements: Operators and Expressions: Expression Evaluation (Precedence of Operators); Simple I/O statements, Control structures, if, if else, switch-case, for, while, do-while, break, continue. Arrays, Defining simple arrays, Multi-dimensional arrays, declaration, initialization and processing;


Module–IV: Advanced features: Array & pointer relationship, pointer to arrays, array of pointers. Strings: String handling functions; Structures and unions; File handling: text and binary files, file operations, Library functions for file handling, Modes of files.
COURSE MATERIAL


CY14 FUNDAMENTALS OF INFORMATION SECURITY

AIM: To create overall general awareness about security for Information assets.

OBJECTIVE: To introduce the basic terminology of information security.

COURSE OUTLINE

Module–II: - Introduction to security attacks-Compromises to individual property, Deliberate software attacks, Espionage, Sabotage, Theft, Attacks- DOS,DDOS, Information Leakage, Regular File Access, Misinformation, Special File/Database Access, Remote Arbitrary Code Execution, Elevation of privileges, Man-in-the-middle, Spam, Social Engineering (Concepts only)


Module–IV: firewall, characteristics of firewall, packet filters, application level gateways, firewall architecture, trusted systems. IDS-infrastructure, classification, host based IDS, network based IDS, anomaly, signature detection, Intrusion detection tools-snort, tripwire

COURSE MATERIAL

2. Pachghare, V.K., Cryptography and Information Security, PHI.

REFERENCE
CY15 C PROGRAMMING LAB

**AIM:** To provide an opportunity for hands-on practice of basic features of DOS, Windows, software tools (word processor, spread sheet, presentation s/w) and algorithmic thinking and problem solving in an industry standard programming language.

**OBJECTIVES:** After the completion of this course, the student should be able to:

1. Create, Save, Copy, Delete, Organize various types of files and manage the desk top in general
2. Programming situations with a focus on writing, debugging and analyzing structured programs: Basic data types in C, basic control structures in C, arrays, structures and files, standard library functions in C language.
3. Solving moderately complex problems involving the above and requiring selection of appropriate data structures and efficient algorithm.

**COURSE MATERIAL**

1. Familiarization of important DOS/Windows/Linux features
2. Practice on basic features of word processor, spread sheet and presentation software.

**Part A**

*The C laboratory work will consist of 15 Experiments*

1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.

**Part B**

2. 1-D Arrays: A variety of programs to declare, initialize, read, print and process 1-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.
3. Pointers: A large number of trivial programs involving all possible data types to familiarize the syntax of pointers in a variety of situations and to draw memory diagrams based on the observations.
4. Structures: A variety of programs to declare, initialize, read, print and process structures made up of a variety of data types and structures.
5. 2-D Arrays: A variety of programs to declare, initialize, read, print and process 2-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.
6. Array of Structures and Structure of Arrays: Programs to demonstrate declaration and processing of structure of arrays and array of structures.
7. Pointers to Arrays: A number of programs to demonstrate handling of 1-D and 2-D arrays using pointers and to draw memory diagrams based on the observations.
8. Pointers to Structures: A number of programs to demonstrate use of pointers to structures and to draw memory diagrams based on the observations.
9. Functions –I: Simple Examples of declaring and using functions of the following categories
   (i) no argument, no return, (ii) argument, no return, (iii) no argument, return, (iv) argument, return, all pass by value
10. Functions –II: Declaring and using functions with pass by reference, Passing and Returning structures, Recursive functions.
11. Files: Simple Example involving use of multiple files: declaring, opening, closing, reading from and writing to text files.
12. Files: Example involving use of multiple files: declaring, opening, closing, reading from and writing to binary files.
13. Library functions: A variety of Examples demonstrating (i) string processing functions (ii) a variety of selected library functions

**COURSE MATERIAL**

1. Deitel & Deital, *C: How to Program*, Pearson Education

**CY16 IT LAB**

**AIM:** To provide awareness on cryptographic approaches.

**OBJECTIVE:** To impart functional knowledge in various algorithms used in cryptography.

**COURSE OUTLINE**

Windows: Starting windows
File Management through Windows explorer.
Alter Taskbar, Start Menu and Toolbar properties
Experience using the Search Tools
Make changes to the Control Panel
Use the features of Interface enhancements
Excel: Opening Worksheets and Workbooks
Headers and Footers, Entering Data
Editing Cell Data, Find and Replace, Go To Cell Data
Merge Cells, Cell Styles
Cropping, Rotating an image
Adding a Hyperlink
Embedding an Object
HTML Familiarize Creating an HTML document
Mark up Tags
HTML Tags.
Working with Text
Lists, Tables and Frames
Hyperlinks, Images and Multimedia
Forms and controls.

**EN 1211.4: WRITING AND PRESENTATION SKILLS**

**AIM**
1. To familiarize students with different modes of general and academic writing.
2. To help them master writing techniques to meet academic and professional needs.
3. To introduce them to the basics of academic presentation
4. To sharpen their accuracy in writing.

**OBJECTIVES:** On completion of the course, the students should be able to
1. Understand the mechanism of general and academic writing.
2. Recognize the different modes of writing.
3. Improve their reference skills, take notes, refer and document data and materials.
4. Prepare and present seminar papers and project reports effectively.

**COURSE OUTLINE**

Module I Writing as a skill – its importance – mechanism of writing – words and sentences - paragraph as a unit of structuring a whole text – combining different sources – functional use of writing – personal, academic and business writing – creative use of writing.

Module II Writing process - planning a text – finding materials - drafting – revising – editing - finalizing the draft - computer as an aid – key board skills - word processing - desk top publishing.


Module IV Presentation as a skill - elements of presentation strategies – audience – objectives – medium – key ideas -structuring the material - organizing content - audio-visual aids – handouts - use of power point - clarity of presentation - non-verbal communication - seminar paper presentation and discussion.

**COURSE MATERIAL**


**CS1221 ENVIRONMENTAL STUDIES**

**AIM:** To create better understanding about the deteriorating condition of our environment among students

**OBJECTIVES:** On completion this course, student should:

1. Have better awareness and concern about current environmental issues
2. Develop a healthy respect and sensitivity to environment
3. Develop pride in social and environmental activism.

**COURSE OUTLINE**

Module I: Environmental Studies: Introduction, Multidisciplinary nature, Scope and importance, Concept of sustainability and sustainable development. Ecosystems- Structure, function, Energy flow, food chains, food webs and ecological succession, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Natural Resources -Renewable and Non-renewable Resources, land resources and use, land degradation, soil erosion and desertification, Deforestation -Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations, Water: Use and over-exploitation of surface and ground water, floods, droughts, conflict over water -international & interstate, Energy resources renewable and non-renewable, use of alternate energy sources, growing energy needs.
Module II: Biodiversity and Conservation - Levels of biological diversity: genetic, species and ecosystem diversity; Bio geographic runes of India; Biodiversity patterns and global biodiversity hot spots, endangered and endemic species of India, Threats - habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Eco system and bio-diversity services: Ecological, economic, social, ethical, aesthetic and Informational value.


Module IV: Human Communities and the Environment –Human population growth: Impacts on environment, human health and welfare; Resettlement and rehabilitation of project affected persons; case studies; Disaster management: floods, earthquake, cyclones and landslides, Environmental movements: Chipko Silent valley, Bishno is of Rajasthan, Environmental ethics: Role of Indian and other religions and cultures in environmental conservation., Environmental communication and public awareness, Fire & safety: Fire Detection Systems, Fire Control Systems, Care, maintenance, and Inspection

COURSE MATERIAL

MM1231.10 MATHEMATICS II

AIM: To introduce mathematical concepts and techniques that have applications in computer science field

OBJECTIVES:
1. To introduce proof methods in mathematics and mathematical logic
2. To review concepts and techniques of set theory, relations and functions
3. To introduce various algebraic structures
4. To introduce graph theory
5. To develop an excitement in mathematics by highlighting its hidden beauty and significance

COURSE OUTLINE

Module–II: Set Theory, Relations, Functions: Review of Set theory concepts, set operations, characteristic functions, fuzzy set theory basics, Relations: operations on relations, equivalence relations & partitions, partial orders, ordered sets, Warshal’s algorithm, Functions, Recursion,

Module–III: Algebraic Structures: Algebra, DeMorgan’s Law, Group, Ring, Polish expressions, Communication Model and error corrections, Hamming Codes

Module–IV: Graph Theory: Introduction, Graph Notation, Topological sort, Graph Propagation algorithm, Depth First, Breadth-first searches, Shortest Path algorithms, directed acyclic graphs

**COURSE MATERIAL**

1. Ramaswamy, *Discrete Mathematical Structures with Applications to Combinatorics*, Universities Press
2. RajendraAkerkar, RupaliAkerkar, *Discrete Mathematics*, Pearson Education
3. R MSomasundaram, *Discrete Mathematical structures*

**CY21 FUNDAMENTALS OF CYBER FORENSICS**

**AIM:** Introduce basis of cyber forensic

**OBJECTIVE:** Understanding of cyber forensics concept such as acquisition and analysis

**COURSE OUTLINE**


**Module III ANALYSIS AND VALIDATION:** Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics


**COURSE MATERIAL**
6. Computer Investigation (Forensics, the Science of crime-solving) – Elizabeth Bauchner, Mason Crest Publishers, 2005

**CY22 OPERATING SYSTEMS**

**AIM:** To introduce students to basic functions and the theoretical underpinnings of modern operating systems.

**OBJECTIVES:** To introduce students to:

1. Fundamental concepts of systems software
2. Functions of operating systems as a resource manager
3. Strategies for constrained resource allocation
4. Memory and I/O Management techniques

**COURSE OUTLINE**

Module I: Introduction to Operating System: Introduction, Operating system structures- operating system operations, operating system services, user operating system interface, system programs, system calls, Types of System Calls, operating system structure.


Deadlocks: deadlock characterization, methods for handling deadlock- deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery.

Module III: Memory Management & Protection: Basic Hardware, Address binding, logical versus physical address space, Swapping, Contiguous memory allocation memory mapping and protection, memory allocation, fragmentation, Non-contiguous allocation- paging, segmentation. Virtual memory-Demand Paging, page replacement, Allocation of frames, Thrashing, Allocating Kernel Memory.

Protection and Security: Protection -principles of protection, domain of protection, access matrix, access control; Security- threats, user authentication.

Module IV: Storage management: File system Interface — file concept, access methods, directory structure, File Sharing. File system implementation- file system structure & implementation, directory implementation, allocation methods, free space management; Mass storage management - disk structure, disk scheduling, RAID; I/O Systems- I/O hardware, Application I/O interface, kernel I/O subsystem.
COURSE MATERIAL
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles
2. Achyut S Godbole, Operating systems, Mc-Grawhill, Third Edition

Assignments and Activities: case study of popular Operating Systems like Android, Windows, Sim Solaris, IOS etc

CY23: DATA STRUCTURES

AIM: To introduce students to various data structures and their features and applicability.

OBJECTIVES: By the end of the course, students should:
1. Be able to write well-structured programs in C
2. Be familiar with data structures like array, structures, lists, stacks, queues, trees and graphs
3. Able to appreciate various searching and sorting strategies

COURSE OUTLINE
Module I: Sequential searching, binary searching, Hashing-linear hashing, hash functions, hash table searching, sorting: bubble sort, selection sort. Stacks and Queues: FIFO and LIFO data structures-stacks using (i) pointers and (ii) arrays. Queues using (i) pointers and (ii) arrays, Operations on stack and queues, applications, polish notation.

Module II: Linked Lists: Concept of static versus dynamic data structures, implementation of linked lists using pointers, operations on linked lists: insertion, deletion and traversing. Doubly linked lists and circular linked lists, applications of linked lists.

Module III: Trees: Concept of linear versus non-linear data structures, various types of trees -biliary, binary search trees. Creating a binary search tree, traversing a binary tree (in-order, pre-order and post-order), operations on a tree -insertion, deletion and processing, expression trees, implementation using pointers, applications.

Module IV: Graphs, graph traversal— Depth first and Breadth first traversal of graphs, applications.

COURSE MATERIAL

Assignments and Activities: Multi-way search trees, B-trees, Hauffman trees, case studies.

CY24: DATA STRUCTURES LAB
The laboratory work will consist of experiments like
Part A
• Linked list: traversal, node deletion, node insertion in singly, doubly and circular lists.
• Implementation of different searching techniques.
• Implementation of different sorting techniques.
Part B
• Stacks: matrix representation and linked list representation: Push, Pop
Queues; matrix representation and linked list representation: Add, delete
Circular queue implementation
Evaluation of expression using stacks
Tree traversal
Evaluation of expression using binary trees.
Infix to postfix and prefix conversion
Creating and processing binary search tree

CY25 CYBERFORENSICS LAB

**AIM:** Understand the cyber forensic concepts

**OBJECTIVE:** Understand the practical and recent tools used in cyber forensics for analysis.

**COURSE OUTLINE**
*The CYBER FORENSICS laboratory work will consist of 8 Experiments, these can extended writ to topics related to cyber forensic*
1. Survey of Latest developments in Cyber Forensics
2. Registry Editing and Viewing using native tools of OS
3. Hex analysis using Hex Editors
4. Bit level Forensic Analysis of evidential image using FTK, Encase and ProDiscover Tools
5. Hash code generation, comparison of files using tools like HashCalc etc.
6. File analysis using Sleuthkit etc.
7. Graphical File analysis and Image Analysis
8. Email Analysis involving Header check, tracing route, performing a check on Spam mail and Non-Spam mail.

CY31 DATA ANALYTICS

**AIM:** To understand the concept of big data

**OBJECTIVES:** The Student Should Be familiarized
1. Be Exposed To Big Data.
2. Learn Different Ways of Data Analysis.
3. Be Familiar with Data Streams.
4. Learn Mining and Clustering techniques.
5. Be Familiar with Visualization techniques.

**COURSE OUTLINE**

Module II: DATA ANALYSIS: Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule Induction – Neural Networks: Learning and
Generalization, Competitive Learning, Principal Component Analysis and Neural Networks; Fuzzy Logic: Extracting Fuzzy Models from Data, Fuzzy Decision Trees, and Stochastic Search Methods.


Module IV: Real time Analytics Platform (RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

**COURSE MATERIAL**


**CY32 LEGAL AND ETHICAL STUDIES**

**AIMS:** To impart knowledge required for the student to emerge as computer professional

**OBJECTIVES:** By the end of this course, the student should be:

1. Having a clear view of what professionalism is
2. Aware of ethical issues in computing profession
3. Aware of managing quality
4. Aware of quality certifications
5. Having an Exposure to Cyber law

**COURSE OUTLINE**

Module–I: What is a profession – who is a professional – core qualities of a professional – Environments and their impact and complexity – social attitudes, beliefs and values


Module-III: Quality Management. Concept of quality, total quality management, 7 sigma principles, ISO certifications, Component maturity models, CMM Levels.


COURSE MATERIAL
1. M Govindarajan, S Natarajan, V S Senthil Kumar, Engineering Ethics, PHI, 81-203-2578-8, Rs 150/-

CY33 MATHEMATICS & STATISTICS FOR COMPUTING

AIM: To provide a foundation for integrated studies in mathematics and computer sciences

OBJECTIVE
1. To understand concepts of counting
2. To understand concepts of functions
3. To understand basic concepts of cryptography

COURSE OUTLINE
Module I: Counting- Basic counting-, Permutations and Subsets- Binomial coefficients-Pascal’s Triangle, A proof using the Sum Principle, The Binomial Theorem, Labeling and trinomial coefficients, equivalence relations and counting-The Symmetry Principle, Equivalence Relations, The Quotient Principle, Equivalence class counting

Module II: Functions, Functions as relations, One -to-One, Onto and Invertible functions, Mathematical Induction, Graphs, Spanning trees, Rooted Trees, Warshall’s algorithm: Shortest paths, Linked representation of directed graphs, Pruning algorithm for shortest path, Dijkstra’s shortest path algorithm,


Module IV: Recursion Trees, Three Different Behaviors, Master Theorem, Solving More General Kinds of Recurrences

COURSE MATERIAL

CY34 FORENSICS TOOLS & TECHNIQUES

AIM: The goal is to perform crime investigations by using evidence from digital data
OBJECTIVE: To understand basic concepts of tools and techniques related to forensics methodology

COURSE OUTLINE

Module I: Examination on a Live Windows / Linux System-Volatile Data collection methodology-Preservation of volatile data, Collecting Subject System details, Identifying Users logged into the system, Inspect Network Connections and activity, Current and recent network connections, Collecting process information, Non-volatile Data collection from a live Windows system

Module II: Memory Forensics: Analyzing Physical and Process Dumps for Malware Artifacts- Memory Forensics methodology, Old School Memory Analysis, Windows Memory Forensics Tools, Active, and Windows Memory Forensics Tools work, Linux Memory Forensics Tools work,

Module III: Discovering and Extracting Malware and Associated Artifacts from Windows Systems and Linux systems- Forensic Examinations of Compromised Windows / Linux Systems, Functional Analysis Resuscitating a Windows / Linux Computer, Malware Discovery and Extraction from a Windows/ Linux system

Module IV: Legal considerations- Framing the issues, Statutory limits of authority, protected data, Tools for acquiring data, Acquiring data across Borders, Involving Law Enforcement

COURSE MATERIAL

3. Unix and Linux Forensic Analysis DVD ToolKit - Chris Pogue, Cory Altheide, Todd Haverkos, Syngress Inc., 2008

CY35 INTERACTIVE PROGRAMMING WITH PYTHON

AIM: To understand basic programming Python programming concepts

OBJECTIVE.

1. Basic Elements of Programming (Such As Expressions, Conditionals, and Functions).
2. Familiarization of writing plugins in Python as well as network secure programming

COURSE OUTLINE

Module-II: Creating Python Programs: Input and Output Statements, Control statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass)
Module-III: Structures: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments.


COURSE MATERIAL


REFERENCE
2. T. Budd, Exploring Python, TMH, 1st Ed, 2011
3. Python Tutorial/Documentation www.python.or 2010
4. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: learning with Python , Freely available online.2012
7. http://www.ibiblio.org/g2swap/byteofpython/read/

CY36 DATABASE MANAGEMENT SYSTEM

AIM: To introduce basic concepts of data bases, and related techniques and tools

OBJECTIVES:
1. Be aware of basic concepts of data bases and data base management systems
2. Be aware of concepts of relational data bases.
3. Know to normalize relational data bases
4. Skilled in using relational algebra and relational calculus
5. Develop skills to write database queries

COURSE OUTLINE

Module I: Introduction: evolution of data base systems, overview of database management systems, Relational data model, mathematical definition, candidate, primary and foreign keys, set operations on relations, insertion, deletion and update operations, attribute domains.

Module II: The E-R Model, Entities and attributes, relationships - one to one and many to one, many-many. Security- Physical and Logical, Design and maintenance issues, integrity.

Module III: Relational algebra and relational calculus, Introduction to SQL, Table creation, selection, projection and join using SQL

Module IV: Functional Dependencies- inference axioms, Normalization, INF, 2NF, 3NF and Boyce-Codd Normal forms, Lossless and lossy decompositions.

COURSE MATERIAL
2. Atul Kahate, Introduction to Data Base Management Systems, Pearson Education

Assignments and activities: Study of features of MS Access, Open Office Base, Oracle, mySQL, emerging areas.

**CY37 DATABASE LAB**

**AIM:** This course will provide hands-on practice in the following topics, under a variety of computing situations with a focus on writing and analyzing SQL statements:

1. Installing and configuring a proper SQL tool
2. Database design and implementation 8 Writing and analyzing SQL statements
3. Create user interface (using java AWT) and study the working of a data base in a front end application

**COURSE OUTLINE**

The laboratory work will consist of 15-20 Experiments.

Tools to be used include: Personal Oracle 8/ MS Access/OpenOffice Base/Java. Experiments will cover creating tables including defining relations between them, practicing SQL. Experiments designed around a case study, miscellaneous topics including security, connecting databases to front-end applications. Some sample topics are given below:

**PART A**

1. SQL statements for creating, listing, dropping, checking, updating tables
2. Record manipulation using—insert, delete, update
3. Experiments that clarify the importance of keys (Except foreign key)
4. Queries with an Expression and a column alias
5. A simple query that aggregates (groups) over a whole table
6. A query with a literal string in the SELECT list.
7. Query using the "IS NULL" syntax to list (compare ‘=NULL’ instead of IS NULL”)
8. Queries with sub string comparison and ordering
9. Finding values within a certain range
10. Using the- "BETWEEN" keyword
11. SQL functions (String, Numeric, Date functions)
12. Aggregate Functions

**PART B**

13. Join between two tables (Natural Join, Theta Join etc.)
14. Foreign Key
15. Nested queries
16. The EXISTS and UNIQUE function in SQL
17. Renaming attributes and joined tables
18. Statements related with VIEWs

**CY38 PYTHON LAB**

**AIM:** To provide an opportunity for hands-on practice of basic operation of PYTHON

**OBJECTIVES:**

1. After the completion of this course, the student should be able to:
2. Solving moderately complex problems involving PYTHON programming.

**COURSE OUTLINE**

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user’s choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user.
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series for n terms: \(1 - 2/2! + 3/3! - \ldots - n/n!\)
7. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python):

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects I. curve II. sphere III. cone IV. arrow V. ring VI. Cylinder.
2. WAP to read n integers and display them as a histogram.
3. WAP to display sine, cosine, polynomial and exponential curves.
4. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.
5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula \(m=60/(t+2)\), where t is the time in hours. Sketch a graph for t vs. m, where \(t>=0\).
6. A population of 1000 bacteria is introduced into a nutrient medium. The population \(P\) grows as follows: \(P(t) = (15000(1+t))/(15+ e)\) where the time \(t\) is measured in hours. WAP to determine the size of the population at given time \(t\) and plot a graph for \(P\) vs \(t\) for the specified time interval.
7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion: I. velocity wrt time \((v=u+at)\) II. distance wrt time \((s=u*t+0.5*a*t*t)\) III. distance wrt velocity \((s=(v*v-u*u)/2*a)\)

**CY41 Free and Open Source Soft wares (FOSS)**

**AIM:** To introduce different free and open source softwares

**OBJECTIVES:** At the end of this course, the students will be able to

1. Explain the features of free & open source software
2. Familiarization with LINUX
3. Work with PHP
4. Demonstrate the working of MySQL

**COURSE OUTLINE**

Module I: Open source software: Features, advantages over proprietary software, examples, Free software: concepts, features, free software Vs Open Source software, free software movements. Policies, GPL, Free OS, History and Features of Linux, Various flavours of Linux, Linux Kernel and Shell, Graphical Desktops- GNOME, KDE, Linux File System and Directories

Module-II: The building blocks of PHP: variables, globals & superglobals 
Data types: Set type, type casting, test type, Operators & Expressions, Flow control functions in PHP, Functions: Defining a
function variable scope, calling a function, returning values ,setting default values for arguments, passing variable reference Arrays: creating arrays(associative & multidimensional), Array related functions

Module-III: Forms in PHP: Creating a simple input form, combining HTML & PHP code on a single page, redirecting the user ,creating a send mail form, File upload form
Cookies: Introduction, setting a cookie with PHP, deleting a cookie, session function overview: starting a session,working with session variables, passing session IDs in the query string, destroying sessions & unsetting variables

Module-IV: Database concepts: Open source database software: MySQL
MySQL features
MySQL data types: Numeric ,date & time, string
Table creation in MySQL: insert, select, where clause, ordering the result, like operator
Selecting Multiple tables :using join, using queries
Modifying records :update command, replace command, delete command date & time functions in MySQL
Interacting with MySQL using PHP: connecting to MYSQL, Executing queries, Retrieving error messages, inserting data with PHP, retrieving data with PHP

COURSE MATERIAL
1. Julie C.Meloni, PHP, MySQL and Apache, Pearson Education
2. Ivan Byross, HTML, DHTML, Javascript, Perl, BPB Publication

CY42 DATA MINING

AIM: To get an entry-level understanding of the concepts of Data Mining

OBJECTIVES:
1. To get an understanding of the general properties of data in large databases
2. Understand a variety of real-world applications that require mining
3. To get an overview of data warehousing and different data mining techniques
4. How to discover useful patterns and associations in huge quantities of data

COURSE OUTLINE
Module I: Overview: Data, Information, Knowledge; Knowledge Discovery; Types of data for Mining; Application Domains; Data Mining Functionalities; Data Processing – Understanding Data, Pre-processing Data –Forms of Data Pre-processing, Data Cleaning (Definition and Phases only), Need of Data Integration, Steps in Data Transformation, Need of Data Reduction;

Module II: Data Warehouse: Database Systems & Data Warehouses – Difference; Data Warehouse – Definition & Features; Multidimensional Data Model – Data Cubes ; OLAP (Definition and Functions only); Market Basket Analysis; Association Rule – Overview; Criteria for classifying Frequent Pattern Mining ; Mining Single Dimensional Boolean Association Rule – Apriori Algorithm;

Module III: Classification: Classification vs Prediction; Issues; Use of Decision Trees for Classification; Bayesian Classification – Bayes’ Theorem, Naïve Bayesian Classifier; Lazy Learners - k–Nearest Neighbour Method; Rule-Based Classification – Using IF-THEN rules for classification;

Module IV: Cluster Analysis: Introduction & Requirements; Characteristics of Clustering Techniques; Types of Data in Cluster Analysis; Categories of Clustering- Partitioning Methods; Outlier Detection in Clustering; Activities and Assignments: Mining Web, Temporal, Text, Multimedia, Medical data and
other Applied Data Mining areas; OLAP tools; Introduction to RapidMiner and other free and open-source data mining tools

**COURSE MATERIAL**
1. Sunitha Tiwari & Neha Chaudhary, Data Mining and Warehousing, Dhanpat Rai & Co
2. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Elsevier
3. Arun K Pujari, Data Mining Techniques, Universities Press
4. G.K Gupta, Introduction to Data Mining With Case Studies, PHI.

**CY43 DATA AND CYBER SECURITY**

**AIM:** To make awareness of overall cyber security and data concepts

**OBJECTIVE:**
1. To understand the need of protecting sensitive and personal information
2. Importance of Data rights and ownership
3. Basic concepts cyber forensic investigation and evidence recovery

**COURSE OUTLINE**

Module I-DATA AND EVIDENCE RECOVERY- Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files, Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK) etc, Use computer forensics software tools to cross validate findings in computer evidence-related cases.


Module III-CYBER FORENSICS INVESTIGATION- Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking


**COURSE MATERIALS**

CY44 SOFTWARE ENGINEERING

1. AIM:
   - To introduce the basic concepts of software engineering

2. OBJECTIVES: At the end of the course, the students should be able to
   - Understand the importance of basic processes in software Development life cycle.
   - Understand the various activities incorporate with different models and know their significance.
   - Create a systematic approach in software development.
   - Familiarize students with requirements in engineering and classical software design techniques.
   - Familiarize with various software testing techniques and tools.

3. SYLLABUS:


   Module 3: Function oriented design: Problem partitioning, abstraction, modularity, Top-down and Bottom-up Strategies, coupling, cohesion, design notations-structure charts, structured design, Data Flow Diagrams, Developing the DFD Model of a system, Entity Relationship Diagram, Developing ERD of a system, Decision Trees, Decision Tables, Structured English, first-level factoring, factoring input, output and transform branches, transaction analysis, verification.

   Module 4: Object-oriented design: Object-oriented design concepts, Comparison between Algorithmic Decomposition and Object-Oriented Decomposition Unified Modelling Language, Object Oriented Design using UML, Class Diagram, Sequence Diagram, Collaboration Diagram; detailed design, algorithm design, state modelling of classes, design walkthroughs, critical design review, consistency checkers Testing error, fault and failure, test oracles, test cases, Black Box Testing, Equivalence Class Partitioning, Boundary Value Analysis, Cause Effect Graphing, White Box Testing- control flow based and data-flow based testing, test plan, test case specifications

4. REFERENCES:
   4.1 Core
   4.2 Additional
   - Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa
- Software Engineering (Seventh edition), Ian Sommerville – Addison Wesley.

### 4.3 Internet Resources:
- [http://www.omg.org/gettingstarted/what_is_uml.htm](http://www.omg.org/gettingstarted/what_is_uml.htm)
- [www.rspa.com](http://www.rspa.com)

### 5. Activities and Assignments:
Preparing various documents, case studies, preparing test plans, UML diagrams, Metrics for various development phases, Agile Programming Methodologies, extreme Programming, Formal Methods, CASE Tools

### CY45 MALWARE ANALYSIS

**AIM:** To study the process of determining the functionality, origin and potential of malwares and to determine if they are malware and the impact that malware might have on the systems within a system

**OBJECTIVE:** Study the life cycle of malware, its design using open source and VIRUS analysis

### COURSE OUTLINE

#### Module I - INTRODUCTION

Computer Infection Program- Life cycle of malware- Virus nomenclature-Worm nomenclature- Tools used in computer virology.

#### Module II – IMPLEMENTATION OF COVERT CHANNEL:
Non self-reproducing Malware- Working principle of Trojan Horse- Implementation of Remote access and file transfer- Working principle of Logical Bomb- Case Study: Conflicker C worm.

#### Module III - VIRUS DESIGN AND ITS IMPLICATION:
Virus components- Function of replicator, concealer and dispatcher- Trigger Mechanisms- Testing virus codes- Case Study: Brute force logical bomb.

#### Module IV - MALWARE DESIGN USING OPEN SOURCE:
Computer Virus in Interpreted programming language- Designing Shell bash virus under Linux- Fighting over infection- Anti –antiviral fighting – Polymorphism- Case study: Companion virus.

### COURSE MATERIAL

3. Unix and Linux Forensic Analysis DVD ToolKit - Chris Pogue, Cory Altheide, Todd Haverkos, Syngress Inc., 2008
5. Windows Forensic Analysis- Harlan Carvey, Dave Kleiman, Syngress Inc., 2007

CY46 NETWORK SECURITY

AIM: Familiarize the concepts about security in network.

OBJECTIVE
To understand security related to windows and wireless systems.
To understand need of integrated security

COURSE OUTLINE


Module IV : Integrated cyber security- Validating your security- overview, Current state of penetration testing, Formal penetration testing methodology, Steps to explore a system, Data Protection, Endpoint security, Insider threats and data protection, Critical problems facing.

COURSE MATERIAL

**CY47 BIOMETRIC SECURITY**

**AIM:** Fundamental knowledge in Biometrics Course Educational

**OBJECTIVE:** To provide students with understanding of biometrics, biometric equipment and standards applied to security. Course Outcomes:
1. Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
2. Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications

**COURSE OUTLINE**

Module I Biometrics- Introduction - benefits of biometrics over traditional authentication systems - benefits of biometrics in identification systems - selecting a biometric for a system - Applications - Key biometric terms and processes - biometric matching methods - Accuracy in biometric systems


Module IV: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens - executive decision - implementation plan

**COURSE MATERIAL**


**CY48 NETWORK SECURITY LAB**

**AIM:** To provide an opportunity for hands-on practice for security tools in networks.
**OBJECTIVES:** After the completion of this course, the student should be able to:

1. Manipulate the port scanning tools.
2. Familiarize with practical concepts about Firewall, IDP

**COURSE MATERIAL**

1. Port Scanning using NMap, Superscan
2. Enumeration-SNMP, SMTP, Unix/Linux, LDAP, NTP
3. Monitoring Live Network capturing packets and analyzing over the live network using Wireshark
4. Vulnerability Scanning
5. Firewall, Intrusion detection and Honey pots
6. Password Guessing and Password cracking
7. Buffer overflow attacks

**CY49 INDUSTRIAL TRAINING**

Students should go to a software firm and undergo training on an emerging tool.

**CY51 THREATS IN SOCIAL MEDIA**

**AIM:** It helps to understand the cyber threats in social media

**OBJECTIVE:** On successful completion of the course the student should have understood the cyber threats in Social websites, classify their types, discuss the cyber threats and its impact

**COURSE OUTLINE**

Module I: Media & Journalism - Overview – History, Types , advantages and disadvantages of various media – Journalism – Types of Journalism, Investigative Journalism – Yellow Journalism – Ethics of a Journalist

Module II: Social Media – Print and Television media – Social Networking Sites, Types, advantages and disadvantages, Social Media ethics – Do’s and Don’ts in various social medias


**COURSE MATERIAL**

5. https://onlinecourses.nptel.ac.in/noc16_cs07

**CY52: PRINCIPLES OF SECURE CODING**

**AIM:** To safeguards computer software against the accidental security vulnerabilities.

**OBJECTIVE:** Introduction to secure coding in different languages.

**COURSE OUTLINE**

Module I – INTRODUCTION: Need for secure systems- Proactive security development process- Security principles to live by and threat modeling.

Module II - SECURE CODING IN C: Character strings- String manipulation errors – String Vulnerabilities and exploits – Mitigation strategies for strings- Pointers – Mitigation strategies in pointer based vulnerabilities – Buffer Overflow based vulnerabilities.


Module IV- DATABASE AND WEB SPECIFIC INPUT ISSUES: Quoting the Input – Use of stored procedures- Building SQL statements securely-XSS related attacks and remedies.

**COURSE MATERIAL**


**CY53 ETHICAL HACKING**

**AIM:** Familiarize methods preventive measures for vicious attacks

**OBJECTIVE:** Introduction to reconnaissance methods, different cyber attacks

**COURSE OUTLINE**


Module III: End point and server hacking- hacking windows, UNIX, Infrastructure hacking- remote connectivity and VOIP hacking, wireless hacking, hacking hardware.

Module IV: Reconnaissance, Web-based Exploitation, Maintaining Access with Backdoors and Rootkits.

**COURSE MATERIAL**

2. The Basics of Hacking and Penetration Testing by Patrick Engebretson, Syngress Basics Series, edition 01,

**CY54 STATISTICAL ANALYSIS WITH R**

**AIM:** Familiarize with concepts of R

**OBJECTIVE:** Introduction to programming concepts of R, probability Statistics

**COURSE OUTLINE**

Module I: Probability& Statistics: Introduction to Statistics- Descriptive Statistics, Summary Statistics Basic probability theory, Statistical Concepts (uni-variate and bi-variate sampling, distributions, re-sampling, statistical Inference, prediction error),

Module II: Probability Distribution (Continuous and discrete- Normal, Bernoulli, Binomial, Negative Binomial, Geometric and Poisson distribution) , Bayes’ Theorem, Central Limit theorem, Data Exploration & preparation, Concepts of Correlation, Regression, Covariance, Outliers etc.


Module IV: working with objects, Viewing Objects within Objects, Constructing Data Objects, Building R Packages, Running and Manipulating Packages, Non parametric Tests- ANOVA, chi-Square, t-Test, U-Test, Introduction to Graphical Analysis, Using Plots(Box Plots, Scatter plot, Pie Charts, Bar charts, Line Chart), Plotting variables, Designing Special Plots, Simple Liner Regression, Multiple Regression

**COURSE MATERIAL**

1. Statistical Analysis with R for Dummies (For Dummies (Computers))
2. A Handbook of Statistical Analyses Using R Brian S. Everitt and Torsten Hothorn
3. R Programming for Data Science Roger D Peng
4. Data Analysis with R Fischetti, Tony
5. Statistical Analysis of Network Data with R - Gabor Csardi Eric Kolaczyk CsardiKolaczyk

**CY55 R Programming LAB**
AIM: To get an idea of R Programming

OBJECTIVE: Introduce R Programming using nults and bolts, control structures and clustering.

COURSE OUTLINE
The 11 number of experiments.
1. Introduction R Nults and Bolts (I)
2. RNults and Bolts (II)
3. Getting Data In and Out of R
4. Control Structures and Functions
5. Loop Functions
6. Data Manipulation (duly, reshape2 packages)
7. String Operations (stringr package)
8. Packaging, Debugging and Object Oriented Programming
9. Data Visualization (ggplot2 package)
10. Clustering
11. Regression and Classification

CY56 ETHICAL Hacking LAB

AIM: To understand the security attacks and preventive measures to be taken.

OBJECTIVE: After completion of this lab, they will be able to:
1. Monitor networks attacks
2. Penetration testing
3. Familiarize with steganographic tools

COURSE OUTLINE: This course consist of following concepts:
1. Monitoring Network Communication: Working with Trojans, Backdoors and sniffer
2. Client side script injection to a web application using XSS
3. Wireless Network attacks, Bluetooth attacks
4. Website mirroring using HTTrack and hosting on a Local Network
5. Penetration testing and justification of penetration testing through risk analysis, SQL injection Attacks
6. Steganographic Tools

CY57 MAJOR PROJECT (1st PHASE)
The guide lines given for the course CS342 has to be followed for this course.
An analysis and design report should be submitted at the end of this course. This report should be valued internally and marks should be awarded.
Up to coding should be finished in 5th semester.
Coding should begin in the 6th semester

CY58 STUDY TOUR
Students should be taken for at least 3-5 day tour any of the software industry and the credits should be awarded based on the study tour report submitted.

**CY61 SOFTWARE FORENSICS AND VULNERABILITY ANALYSIS**

**AIM:** To familiarize software security, operations and service level security.

**OBJECTIVE:** To understand the need for software security and awareness of application-Level Threats and Vulnerabilities

**COURSE OUTLINE**


**COURSE MATERIAL**


**CY62 INTERNET OF THINGS**
AIM: IoT is aimed at enabling the interconnection and integration of the physical world and the cyber space. It represents the trend of future networking and leads the third wave of the IT industry revolution.


COURSE OUTLINE


Module II: Engineering IoT Networks: Smart Objects - Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects: Communications Criteria IoT Access Technologies


COURSE MATERIAL
2. Graham Meikle “The Internet of Things”, Polity Press, 2017,

CY63 MOBILE AND WIRELESS SECURITY

AIM: To enhance students learning in security architectures

OBJECTIVE: Student will be familiarized with mobile/wireless communications security concepts

COURSE OUTLINE

Module II - MOBILE SECURITY Mobile system architectures, Overview of mobile cellular systems, GSM and UMTS Security & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.

Module III - SECURING WIRELESS NETWORKS Overview of Wireless security, Scanning and Enumerating 802.11 Networks, Attacking 802.11 Networks, Attacking WPA protected 802.11 Networks, Bluetooth Scanning and Reconnaissance, Bluetooth Eavesdropping, Attacking and Exploiting Bluetooth, Zigbee Security, Zigbee Attacks


COURSE MATERIAL

CY64: WINDOWS AND LINUX FORENSIC ANALYSIS

AIM: To addresses topics in the area of forensic analysis of systems running WINDOWS and LINUX.

OBJECTIVE: To familiarize Windows Forensic Analysis, Registry Analysis, Rootkit Detection, Linux Forensic Analysis

COURSE OUTLINE


Module III: Rootkits, Rootkit Detection-Live Detection, GMER, Helios, MS Strider GhostBuster, F-Secure BlackLight, Sophos Anti-Rootkit, Postmortem Detection, Prevention.

Module IV: Linux Forensic Analysis- Live Response Data Collection- Prepare the Target Media, Format the Drive, Gather Volatile Information, Acquiring the Image, Initial Triage and Live Response
COURSE MATERIAL
1. Unix and Linux Forensic Analysis DVD ToolKit - Chris Pogue, Cory Altheide, Todd Haverkos, Syngress Inc., 2008

CY 65 RISK ASSESSMENT & SECURITY AUDIT

AIM: To process, analyse and evaluate the security risks, and determine the mitigation measures to reduce risk and also risk assessment to provide appropriate levels of security for information

OBJECTIVE: To provide an idea on risk assessment, data collection and cybercrime investigation.

COURSE OUTLINE


Module III – Introduction: What is risk, risk management –overview of risk management, identification, Risk analysis, Incident Management: Incident notification, Incident classification

Module IV –Incident Response: Incident Response team, Incident response process: Incident recording, Incident notification, Incident classification, Incident Tracking, Response

COURSE MATERIAL

CY66 CLOUD ARCHITECTURE AND SECURITY

AIM: Equip students to protect data, applications and the associated infrastructure of cloud computing.

OBJECTIVE: Students will be familiarized with cloud applications, technologies and cloud security concepts.

COURSE OUTLINE
Module I- CLOUD COMPUTING FUNDAMENTALS: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture.

Module II- CLOUD APPLICATIONS : Technologies and the processes required when deploying web services- Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages- Development environments for service development; Amazon, Azure, Google App.

Module III- SECURING THE CLOUD Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS. E.g. User authentication in the cloud.

Module IV- VIRTUALIZATION SECURITY : Multi-tenancy Issues: Isolation of users/VMs from each other- How the cloud provider can provide this- Virtualization System Security Issues: e.g. ESX and ESXi Security, CLOUD SECURITY MANAGEMENT : Security management in the cloud – security management standards- SaaS, PaaS, IaaS

COURSE MATERIAL

CY67 MAJOR PROJECT (II\textsuperscript{nd} PHASE)

1. \textbf{AIM}: To expose student to industry-standard project practices based on cyber forensics and security practices, applying the knowledge acquired through various courses.

2. \textbf{OBJECTIVES}: To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem
   1. To provide an opportunity to apply security and forensics practices for software development, network monitoring, malware analysis etc.
   2. To introduce the student to a professional environment and/or style typical of a global IT industry
   3. To provide an opportunity for practical as well real life scenarios in midst of an threat or attack
   4. To provide an opportunity for effective, real-life protection and detection of threats
   5. To provide an opportunity to practice cryptographic algorithms.

3. \textbf{PROJECT GUIDELINES}

   Group Size – Maximum 3

   No. of records – No. of group members + 1 (Department copy)
Certificate should include the names of all members.

The minimal phases for the project are: Project search, finalization and allocation, Investigation of system requirements, Data and Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.

3.1 **Planning the Project:** The Major Project is an involved Exercise which has to be planned well in advance. The topic should be chosen in Semester 4 itself and the case study of Course should as far as possible, be based on the project topic, though on Exceptional cases, for valid reasons, the project guide may waive this condition. Related reading, training and discussions should start from semester 5 itself.

3.2 **Selection of project work:** Project work could be of 3 types:

a) Developing solution for a real-life problem: In this case, a requirement for developing cyber security based solution already exists and the different updated versions of system or application is to be implemented successfully. Examples are modified cryptography algorithms & tools, application which can produce security, detection or prevention etc. The scope for creativity and Exploration in such projects is limited, but if done meticulously, valuable Experience in the industrial context can be gained.

(b) Innovative Product development: These are projects where a clear-cut requirement for developing a computer based solution may not be existing, but a possible utility for the same is conceived by the proposer.

(c) Research level project: These are projects which involve research and development and may not be as structured and clear cut as in the above case... These projects provide more challenging opportunities to students, but at EX level is a difficult choice. If any student identifies proper support in terms of guidance, technology and references from External organizations and also the supervisors are convinced of the ability of the student(s) to take up the project, it shall be permitted. The methodology and reporting of such projects could be markedly different from type (a) and is left to the proposer/external supervisor of the projects.

3.3 **Selection of Team:** To meet the stated objectives, it is imperative that Major Project is done through a team effort. Though it would be ideal to select the team members at random(drawing lots) and this should be strongly recommended, due to practical considerations, students may also be given the choice of forming themselves into teams with 3 to 5 members (teams less than 3 members may be permitted in Exceptional cases, for valid reasons). A gender mix should also be strongly suggested. A team leader shall be elected through drawing lots. Teams shall maintain team meeting minutes and ensure that every team member has tasks assigned in writing. Team meeting minutes shall form a part of the Project Report. Even if students are doing projects as groups, each one must independently take up different modules of the work and must submit the reports also independently (though, in such cases, some common materials is permissible). Evaluation will also be done independently.

3.4 **Selection of Tools:** No restrictions shall be placed on the students in the choice of platforms/tools/languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation of the project.

3.5 **Selection of Organization& Guide:** No restrictions shall be placed on the students in the choice of organization where project work may be done, in terms of locality, type (public/private) etc. It is the duty of the Head of Institute/Principal of College to ensure that the Aim, Objectives and full project guidelines...
are communicated to the external organization. The guide should ideally be a post-graduate with minimum 2 years of work experience.

Students may also choose to do project in the college/institute (or partially in the college/institute and partially in an external organization), especially product-based work, but in such cases the supervisors must ensure that (i) industry practices are followed (ii) the students undertake a planned visit to an IT industry with international operations to make up for the loss of experience and (iii) the services of an external guide with industry experience is obtained.

3.6 **Project Management:** Head of Institute/Principal of College should publish a list of students, projects topics, internal guide and external organization (if any) and teams agreed, before the end of semester 5. Changes in this list may be permitted for valid reasons and shall be considered favorably by Head of Institute/Principal of College any time before commencement of the project. Any request for change after commencement should considered by a committee of 3 teachers and their recommendation shall be accepted by Head of Institute/Principal of College.

Gantt-chart of proposed activities and a draft statement of project deliverables (which may subsequently be altered if justified) should be prepared before the commencement of the project. The actual completion of each phase should be noted on the chart in the course of the project work. Students should submit a fortnightly report of progress which could be indication of percentage of completion marked on the original Gantt-chart, with any notes attached. Students should ideally keep a daily activity log sheet. Team meetings should be documented in the format given at the end. Changes in the submitted documents are possible, as project development is essentially an evolutionary process. The project guide must ensure that changes are necessary due to the knowledge gained in succeeding phases of the project. The date of completion of a phase should be brought forward if the changes made are deemed to be errors and not due to additional knowledge gained from a succeeding phase.

3.7 **Documentation:**

The following are the major guidelines:

The final outer dimensions of the report shall be 21cm X 30 cm. The color of the flap cover shall be light green.

Only hard binding should be done, with title of the thesis and the words “<BRIEF TITLE> BSc (CS) Project Report 200…” displayed on the spine in 20 point, Bold, Times New Roman, as in example below.

In case the title is too long, a shorter version of it may be used (Like “Image Pro” instead of ”Image Pro – An Interactive Image Processing package”). It is highly recommended that Latex be used for documentation.

• The text of the report should be set in 12 pt, Times New Roman, Single Spaced.
• Headings should be set as follows: CHAPTER HEADINGS 20 pt., Times New Roman, Bold, All Caps, and Centered.

**MATRIX BASED SHOULDER SURFING SECURITY SYSTEM:** BVoc (CY) PROJECT 2018

1. SECTION HEADINGS 12 pt, Times New Roman, Bold, All Caps, Left Adjusted.
1.1 Section Sub-headings 12 pt, Times New Roman, Bold, Left Adjusted.
Titles of Figures, Tables etc are done in 12 point, times New Roman, Italics, and Centered.
Some general guidelines on documentation stylistics are:

• Double quotes and single quotes ("", ") should be used only when essential. In most cases words put in quotes are better highlighted by setting them in italics. Eg: This process is known as “morphing”. This process is known as morphing.

• Page numbers shall be set at right hand top corner, paragraph indent shall be set as 3.

• Only single space need be left above a section or sub-section heading and no space may be left after them.

• Certificate should be in the format: “Certified that this report titled....................... is a bonafide record of the project work done by Sri/Kum....................... under our supervision and guidance, towards partial fulfillment of the requirements for the award of the Degree of BVoc(Cyber Security) of the University of Kerala” with dated signatures of Internal; Guide, external guide and also Head of Institute/College.

• If the project is done in an external organization, another certificates on the letterhead of the organization is required: “Certified that his report titled....................... is a bonafide record of the project work done by Sri/Kum....................... under any supervision and guidance, at the ..................Department of.................. (Organization) towards partial fulfillment of the requirements for the award of the Degree of BVoc (Cyber Security) of the University of Kerala”.

• References shall be IEEE format (see any IEEE magazine or transaction). Take care in use of italics and punctuation. While doing the project, keep note of all books you refer, in the correct format, and include them in alphabetical order in your reference list. Eg: A book is cited as: Kartalopoulos, S V Understanding Neural Networks and Fuzzy Logic, BPB Publishers, 1996, pp. 21-27. (Pp.21-27 indicates that pages 21-27 have been referred. If the whole book is being referred, this may be omitted. If a single page is referred, say 7, it may be cited as p.7 Report writing is NOT a hasty activity done after finishing the project. Students must try to develop the report along with the work, so as to give it flesh and blood. Drafts should be read, modified, spell checked and grammar checked at least thrice during the course of the project and before a final printout is taken, the same may be got approved from the internal guide. The students should send two interim reports to internal guides. This will also help the students in their report writing.

The Gantt chart, fortnightly progress reports, and team meeting minutes mentioned in section 3.5 should appear as appendix to the project report. Regarding the body of the report, as an indicative Example, the following is given (though students should not attempt to fit every kind of project report into this format):

- Overview (background objectives purpose, scope, and applicability)
- survey of technologies
- Requirements and analysis (problem definition, requirements specification, software and hardware requirements, conceptual models)
- System design (basic modules, procedural design, logic diagrams, algorithms design)
- user interface design
- Implementation and testing (implementation approaches, coding details and code efficiency
  Testing approach (e.g. unit testing, integrated testing etc.))
- Results and discussion
- future scope

3.8 Methodology:
The project report should generally contain details of the following steps (though students should not attempt to fit every kind of project into this format):
(a) Analysis
  – Study of existing systems and its drawbacks (general)
  – Understanding the functionalities of the system (detailed)
  – Preparation of requirement
  – Conduct of Feasibility study
  – Identification of relevant modules
  – Relationship between modules
(b) Design
  – Design of each subsystems
  – Design of each modules
  – Design of communications between modules
  – Design of Algorithms for problem solving
  – User interface Design
  – Any other steps if necessary
(c) Coding and Implementation
(d) Testing
(e) Security, Backup and Recovery Mechanisms
(f) Online help and User Manuals
(g) Upgradability Possibilities

3.9 Project IPR & Utilisation: The intellectual property rights in all project work done by the students shall vest with the University of Kerala, except in cases where some external organizations seek undertaking from students to concede IPR in all work done in their organization or under their guidance. Where possible, students should attempt to obtain at least a joint IPR for the University. In cases where project works are of public utility, students shall be asked to publish their work including source code and documentation, in so far as their rights are clear.

COURSE MATERIAL

5. Frederic P B, Mythical Man-month, Essays on Software Engineering, Addison Wesley
David Lamport,

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
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<td>b. Output</td>
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<td>c. Candidate role and contribution in the project</td>
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<td>d. Demo</td>
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<td>e. Overall quality</td>
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Total 80 marks