

**B.Sc. CYBER SECURITY****CHOICE BASED CREDIT SYSTEM –****LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)**

**(Applicable to the candidates admitted from the academic year 2022-2023 onwards)**

Sem.	Part	Course	Title	Ins. Hrs	Credit	Exam Hours	Marks		Total
							Int.	Ext.	
I	I	Language Course – I Tamil \$ / Other Languages + #		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	Programming in C and Data Structures	5	5	3	25	75	100
		Core Practical – I (CP)	Programming in C Lab	4	4	3	40	60	100
	III	First Allied Course – I (AC)		4	4	3	25	75	100
		First Allied Course – II (AC)		3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
<b>TOTAL</b>				<b>30</b>	<b>21</b>	-	-	-	<b>600</b>
II	I	Language Course - II Tamil \$ / Other Languages + #		6	3	3	25	75	100
	II	English Course - II		6	3	3	25	75	100
	III	Core Course – II (CC)	Programming in Java	5	5	3	25	75	100
		Core Practical – II (CP)	Programming in Java Lab	4	4	3	40	60	100
	III	First Allied Course – II (AC)		3	2	3	25	75	100
		First Allied Course – III (AC)		4	4	3	25	75	100
	IV	Add on Course – I ##	Professional English – I	6*	4	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Language Proficiency for Employability - Effective English	-	2	3	25	75	100
<b>TOTAL</b>				<b>30</b>	<b>29</b>	-	-	-	<b>900</b>

	I	Language Course – III Tamil \$ / Other Languages + #		6	3	3	25	75	100
	II	English Course - III		6	3	3	25	75	100
III	Core Course – III (CC)	Programming in Python	5	5	3	25	75	100	
	Core Practical - III (CP)	Programming in Python Lab	4	4	3	40	60	100	
	Second Allied Course – I (AC)		4	4	3	25	75	100	
	Second Allied Practical (AP)		3	-	-	-	-	-	
	Add on Course – II ##	Professional English - II	6*	4	3	25	75	100	
	Non-Major Elective - I Those who choose Tamil in Part I can choose a non-major elective course offered by other departments.								
IV	Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied upto 10 <sup>th</sup> & 12 <sup>th</sup> std.		2	2	3	25	75	100	
	<b>TOTAL</b>		<b>30</b>	<b>25</b>	-	-	-	<b>700</b>	
IV	I	Language Course –IV Tamil \$ / Other Languages + #		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	Core Course - IV (CC)	Fundamentals of Cyber Security	5	5	3	25	75	100	
	Core Practical - IV (CP)	Cyber Security Lab	4	4	3	40	60	100	
	Second Allied Practical (AP)		3	2	3	40	60	100	
	Second Allied Course – III (AC)		4	4	3	25	75	100	
	Non-Major Elective II Those who choose Tamil in Part I can choose a non-major elective course offered by other departments.								
	Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied upto 10 <sup>th</sup> & 12 <sup>th</sup> std.		2	2	3	25	75	100	
	VI	Naan Mudhalvan Scheme (NMS) @@	Digital Skills for Employability	-	2	3	25	75	100
	<b>TOTAL</b>		<b>30</b>	<b>25</b>	-	-	-	<b>800</b>	

V	III	Core Course -V (CC)	Cyber Crimes and Mitigation Techniques	5	5	3	25	75	100		
		Core Course – VI (CC)	Social Web Analytics	5	5	3	25	75	100		
		Core Course – VII (CC)	Ethical Hacking	5	5	3	25	75	100		
		Core Practical -V (CP)	Ethical Hacking Lab	4	4	3	40	60	100		
	IV	Major Based Elective – I (Any one)	1. Web and information Security	5	4	3	25	75	100		
			2. Fundamentals of Cryptography								
		Skill Based Elective I	Linux Programming	4	2	3	25	75	100		
		Soft Skills Development			2	2	3	25	75	100	
<b>TOTAL</b>				<b>30</b>	<b>27</b>	-	-	-	<b>700</b>		
VI	III	Core Course - VIII (CC)	Introduction to Block Chain Technology	6	5	3	25	75	100		
		Core Course - IX (CC)	Cloud Computing Security	6	5	3	25	75	100		
		Core Practical – VI (CP)	Cloud Computing Lab	4	4	3	40	60	100		
		Major Based Elective – II (Any one)	1. Cyber Law and Defence Techniques	5	4	3	25	75	100		
			2. Penetration Testing								
	IV	Project		4	3	-	20	80	100		
		Skill Based Elective – II	Mobile Application Development	4	2	3	25	75	100		
	V	Gender Studies		1	1	3	25	75	100		
		Extension Activities **		-	1	-	-	-	-		
	VI	Naan Mudhalvan Scheme (NMS) @@		-	2	3	25	75	100		
<b>TOTAL</b>				<b>30</b>	<b>27</b>	-	-	-	<b>800</b>		
<b>GRAND TOTAL</b>				<b>180</b>	<b>154</b>	-	<b>180</b>	-	<b>4500</b>		

### **List of Allied Courses**

#### **First Allied Course**

Mathematics

#### **Second Allied Course**

Applied Physics

- \$ For those who studied Tamil upto 10<sup>th</sup> +2 (Regular Stream).
- + Syllabus for other Languages should be on par with Tamil at degree level.
- # Those who studied Tamil upto 10<sup>th</sup> +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.
- ## The Professional English – Four Streams Course is offered in the 2<sup>nd</sup> and 3<sup>rd</sup> Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).
- \* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.
- @ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.
- \*\* Extension Activities shall be outside instruction hours.
- @@ Naan Mudhalvan Scheme.

#### **SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES**

<b>Sl. No.</b>	<b>Part</b>	<b>Types of the Courses</b>	<b>No. of Courses</b>	<b>No. of Credits</b>	<b>Marks</b>
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	8	40	800
4.		Core Practical	7	29	700
5.		Allied Courses I & II	4	16	400
6.		Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Add on Courses	2	8	200
9.		Project	1	3	100
10.	IV	Non-Major Elective Courses (Practical)	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.		Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.	V	Gender Studies	1	1	100
16.		Extension Activities	1	1	--
17.	VI	Naan Mudhalvan Scheme	3	6	300
		<b>Total</b>	<b>46</b>	<b>154</b>	<b>4500</b>

## **PROGRAM OBJECTIVES:**

The educational objectives of the program are:

- To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
- To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.
- To develop graduates that can identify, analyze, and remediate computer security breaches.

## **PROGRAMME OUTCOMES:**

Upon completion of the degree program, students will be able to:

- Analyze and evaluate the cyber security needs of an organization.
- Conduct a cyber-security risk assessment.
- Measure the performance and troubleshoot cyber security systems.
- Implement cyber security solutions.
- Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.

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**First year**

**CORE COURSE I  
PROGRAMMING IN C AND  
DATA STRUCTURES**

**Semester I**

**Code:**

**(Theory)**

**Credit: 5**

**COURSE OBJECTIVES:**

- To know about the basics of C Programming, Control and Looping Structures and programming with it.
- To understand Arrays, Pointers and String Processing in C language
- To know about the basic concepts in Data Structures.

**UNIT - I:**

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements.

**UNIT - II:**

Loops Structures: For Loop, While, Do-while loop – Arrays: - One Dimensional Array, Two-dimensional Arrays, Character Arrays and Strings – Functions: Function with arrays- Function with decision and looping statements - Recursion.

**UNIT - III:**

Pointers: Introduction – Pointer Expressions – Chain of Pointers – Pointers and Arrays – Array of Pointers – Pointers as function arguments – Functions returning Pointers – Pointers to Functions – Function pointer – Structures - declaration, initialization, Array of Structures – Pointer to structures, Structures and functions – Typed of Enumerated data types, Unions.

**UNIT - IV:**

Strings Processing, Standard string library functions – Files: introduction and files functions – Writing and reading in Text mode – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – File IO – Reading and writing structures.

**UNIT - V:**

Stack: LIFO concept, Stack operations, Array implementation of stack – Queue: FIFO concept, Queue operations, Array implementation of queue – Singly Linked List: concepts, operations – Doubly Linked List: concepts,

operations – Trees: General trees, Binary trees.

#### **UNIT VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

#### **REFERENCES:**

1. E. Balagurusamy, “Programming in ANSI C”, Tata McGraw Hill, New Delhi, Seventh Edition, 2016.
2. E.Horowitz, S.Sahni and Susan Anderson Freed, “Fundamental Data Structures in C”, 2ed, Orient BlackSwan Publisher, 2009.
3. Byron S. Gottfried, “Programming with C”, Schaum’s Outline Series, Tata- McGraw Hill Edition, New Delhi, 1991.
4. E. Karthikeyan, “A Textbook on C Fundamentals, Data Structures and Problem Solving”, Prentice-Hall of India Private Limited, New Delhi, 2008.
5. Yashavant Kanetkar, “Let us C”, BPB Publications, Tenth Edition, New Delhi, 2010.
6. Szuhay, Jeff, and Szuhay, Jeff, “Learn C Programming: A Beginner's Guide to Learning C Programming the Easy and Disciplined Way”, Packt Publishing, 2020.
7. Jena, Sisir Kumar, and Jena, Sisir Kumar, “C Programming: Learn to Code”, CRC Press, 2021.
8. <https://www.tutorialspoint.com/cprogramming/index.htm>
9. <https://www.w3schools.in/data-structures/intro>

#### **COURSE OUTCOMES:**

Upon successful completion of this course the students would be able to:

- Summarize the basic knowledge to develop C programs
- Manipulate Looping, arrays and functions
- Apply and write programs for solving real world problems
- Create open, read, manipulate, write and close files.
- Understand the basic concepts in data structures.

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**First Year**

**CORE PRACTICAL I  
PROGRAMMING IN C LAB**

**Code:**

**(Practical)**

**Semester I**

**Credit: 4**

**COURSE OBJECTIVES:**

- To understand the programming fundamentals of C language.
  - To impart writing skill of C programming and data structures for a list of problems.
  - To impart hands-on training for writing a C program using computers.
1. Write a Program
    - (i) To convert temperature from degree Centigrade to Fahrenheit,
    - (ii) Find whether given number is Even or Odd,
    - (iii) Find the greatest of three numbers.
  2. Write a Program to display Monday to Sunday using switch statement
  3. Write a Program to display first Ten Natural Numbers and their sum.
  4. Write a Program to perform Multiplication of Two Matrices.
  5. Write a Program
    - (i) To find the maximum number in an Array using pointer.
    - (ii) To reverse a number using pointer.
    - (iii) To add two numbers using pointer.
  6. Write a Program to solve Quadratic Equation using functions.
  7. Write a Program to find factorial of a number using Recursion.
  8. Write a Program to demonstrate Call by Value and Call by Reference.
  9. Write a Program to create a file containing Student Details.
  10. Write a program to implement a stack using singly linked list, Implement Queue using Linked List.

**COURSE OUTCOMES:**

Upon successful completion of this course the students would be able to:

- Relate the use of language constructs to solve simple programs
- Develop programs for various concepts in C language
- Understand and trace the execution of the list of programs
- Understand the usage of file handling in C programming
- Solve data problems related to data structures.

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**First Year**

**CORE COURSE II  
PROGRAMMING IN JAVA**

**Semester II**

**Code:**

**(Theory)**

**Credit: 5**

**COURSE OBJECTIVES:**

- To acquire the programming skills with java.
- To implement the object-oriented concepts with java language
- To learn the art of GUI programming with Applet.

**UNIT - I:**

Foundation, Essentials, Control Statement and Classes & Objects, Stage of Java – origin of Java – challenges – features – Object - Oriented Programming; Java Essentials: Elements - API - variables - primitive data types – String Class - operators – combined assignment operators - conversion – scope – comments - keyboard input; Control Statements: if, if-else, nested if & if-else-if statements – logical operators – comparison – conditional operator – switch – increment and decrement – while, do-while & for loops – nested loops – break and continue; Classes and Objects: classes and objects -modifiers - passing arguments– constructors - package & import - static class members –method overloading– constructor overloading –returning objects – this variable – recursion – nested & inner classes – abstract classes & methods.

**UNIT - II:**

Arrays, String Handling, Inheritance, Interface and Packages, Introduction – processing array – passing arrays – returning arrays – String arrays – two Dimensional Arrays - Arrays with Three or More Dimensions; String Handling : String class – concatenation – comparison – substring – methods – other methods–String Buffer, String Builder & String Tokenizer classes; Inheritance: basics –inheriting and overriding superclass methods – calling superclass constructor – polymorphism – inherit from different classes – abstract classes – final Class; Interfaces: Basics – multiple Interfaces – multiple inheritance using interface – multilevel interface – Packages – Create and access packages in Net Beans IDE – static Import and package class – access specifiers.

**UNIT - III:**

Exception Handling, I/O and File Handling and Multithreading, Introduction - try and catch block - multiple catch block - nested try - finally Block – throw Statement – exception propagation – throw Clause - custom exception – built-in exception; Multithreading: Introduction – threads – thread creation – life cycle – joining a thread – scheduler & priority – synchronization – inter-thread communication – thread control – thread Pool – thread group – daemon thread; Files and I\O Streams: file Class – streams – byte streams – filtered byte streams – Random Access File class – character streams.

**UNIT - IV:**

Applet and GUI Part I, Fundamentals – applet class – life cycle – steps for applet program – passing values through parameters – graphics – event

handling; GUI I:GUI – creating windows – dialog boxes – layout managers – AWT component classes – Swing component classes – applications of AWT controls.

#### **UNIT - V:**

GUI Part II and Java Database Connectivity, Event handling – AWT components – AWT graphics classes – Swing controls – application using Swing and AWT; Java Database Connectivity: types of drivers – JDBC architecture – JDBC classes &interfaces – steps in JDBC applications – creating a new Database and table with JDBC.

#### **UNIT VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

#### **REFERENCES:**

1. S.Sagayaraj, R.Denis, P.Karthik & D.Gajalakshmi, “Constructive Java Programming”, Universities Press, 2021.
2. E. Balagurusamy, “Programming with JAVA”, Tata McGraw Hill, New Delhi, 2019.
3. C. Muthu, “Programming with JAVA”, Vijay Nicole Imprints Private Limited, Chennai, Second Edition, 2011.
4. Bruce Eckel, Chuck Allison, “Thinking in Java”, Prentice Hall Publications, 2006
5. Malina Pronto, "Java: How To Learn Java Programming: How To Improve Your Java Coding In 2020/2021: 5 Programming Languages To Learn For Beginners In Tech", Independently Published, 2020.
6. Nick Samoylov, “Learn Java 12 Programming: A Step-by-step Guide to Learning Essential Concepts in Java”, Packt Publishing, 2019.
7. <https://www.javatpoint.com/java-tutorial>

#### **COURSE OUTCOMES:**

Upon successful completion of this course the students would be able to:

- Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify members of a class and to implement them
- Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifiers, and create user define package for specific task,(reusability concepts) error exception handling)
- Develop programs using the Java standard class library.
- Develop software using Java programming language, (using applet, AWT controls, and JDBC).

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**First Year**

**CORE PRACTICAL II  
PROGRAMMING IN JAVA LAB  
(Practical)**

**Semester II**

**Code:**

**Credit: 4**

**COURSE OBJECTIVES:**

- To understand the basics of JAVA programs and their execution.
  - To learn concepts like inheritance, packages and interfaces.
  - To understand the life cycle of the applets, database connectivity and their functionality.
1. Write a program to sort the given numbers using arrays.
  2. Write a program to implement the FIND and REPLACE operations in the given text.
  3. Write a program to implement a calculator to perform basic arithmetic Operations, doing with constructors
  4. Write a program to find the student's percentage and grade using command line arguments.
  5. Write a program to draw circle or triangle or square using polymorphism and inheritance.
  6. Implement multiple inheritance concepts in java using interface, you can choose your own example of a company or education institution or a general concept which requires the use of interface to solve a particular problem.
  7. Write a program to create threads and perform operations like start, stop, suspend, resume
  8. Write a program to develop an applet to play multiple audio clips using multithreading.
  9. Write a program to retrieve employee data from a file
  10. Write a program to retrieve student data from a Database

**Course Outcomes:**

Upon successful completion of this course the students would be able to:

- Develop java programs to understand the OOP concepts.
- Write java programs for classes and objects
- Develop simple programs with multiple threads
- Write java programs using Applets
- Develop java programs to connect databases and files.

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**Second Year**

**CORE COURSE III  
PROGRAMMING IN PYTHON  
(Theory)**

**Semester III**

**Code:**

**Credit: 5**

**COURSE OBJECTIVES:**

- To develop programs using functions and pass arguments in Python.
- To write programs using loops and decision statements in Python.
- To design and program Python applications.

**UNIT - I:**

Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.

**UNIT - II:**

Flow Control: Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

**Unit - III:**

Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. File Handling- Directories in Python.

**UNIT - IV:**

Object-Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism.

**UNIT - V:**

Exception Handling: Built-in Exceptions-Handling Exceptions-Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns-Character Classes-Special Character Classes - Repetition Cases -

findall() method - compile() method.

## **UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):**

An Introduction to Interactive Programming in Python - Study on Julia – an high level language approach.

### **REFERENCES:**

1. Jeeva Jose and P. Sojan Lal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Book Publishing Co, 2016.
2. Mark Summerfield. —Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
3. Martin C. Brown, —PYTHON: The Complete Reference, McGraw-Hill, 2001
4. Wesley J. Chun, “Core Python Programming”, Prentice Hall Publication, 2006.
5. Timothy A Budd, “Exploring Python”, Tata McGraw Hill, New Delhi, 2011
6. Jake Vander Plas, “Python Data Science Handbook: Essential Tools for Working with Data”, O'Reilly Media, 2016.
7. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016
8. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

### **COURSE OUTCOMES:**

Upon successful completion of this course the students would be able:

- To recall and understand the features of python programming language
- To illustrate various programming mechanism used in python
- To apply various language construct to write simple programs in python
- To examine the application of object oriented concept in python
- To distinguish the various constructs used in python.

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**Second Year**

**CORE PRACTICAL III  
PROGRAMMING IN PYTHON LAB  
(Practical)**

**Semester III**

**Code**

**Credit: 4**

**COURSE OBJECTIVES:**

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- To represent compound data using Python lists, tuples, and dictionaries.

1. Flow controls, Functions and String Manipulation
2. Operations on Tuples and Lists
3. Operation on sets
4. Operations on Dictionary
5. Simple OOP– Constructors – create a class for representing a car
6. Method Overloading – create classes for vehicle and Bus and demonstrate method overloading
7. Files – Reading and Writing – perform the basic operation of reading and writing with student file
8. Regular Expressions
9. Modules
10. Packages
11. Exception Handling

**COURSE OUTCOMES:**

Upon successful completion of this course the students would be able to:

- Write simple programs using control structures, functions and strings
- Develop programs using tuples, lists, sets and dictionary
- Write simple programs using Constructors, Method overloading and inheritance
- Develop programs using files and regular expressions
- Write simple programs using packages and exception handling

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**Second Year**

**CORE COURSE IV  
FUNDAMENTALS OF CYBER SECURITY  
Code (Theory)**

**Semester IV**

**Credit: 5**

**COURSE OBJECTIVES:**

- To introduce the basic concepts of cyber security
- To acquire knowledge on cyber threats and attacks
- To become aware of significant security technologies and tools

**UNIT - I INTRODUCTION TO INFORMATION SECURITY:**

Components of Information System - Software Development Life Cycle -Security Software Development Life Cycle - Security Professionals and the Organisation - Communicates Of Interest

**UNIT - II NEED FOR SECURITY:**

Introduction - Business Need First - Threats - Attacks - Secure Software Development.

**UNIT - III SECURITY TECHNOLOGIES:**

Introduction - Access Control – Firewall - Protecting Remote Connections - Intrusion Detection and Prevention System – Honeypots, Honeynets and Padded Cell - System Scanning and Analysis Tools - Biometric Access Control

**UNIT - IV CRYPTOGRAPHY:**

Foundation of Cryptology - Cipher Methods – Cryptographic Algorithms – Cryptographic Tools –Protocols for Communication - Attacks on cryptosystems

**UNIT - V RISK MANAGEMENT:**

Introduction – An over view of Risk Management – Risk Identification – Risk Assessment – Risk Control Strategies – Selecting a Risk Control Strategy – Risk management Discussion Points - Recommended Risk Control Practices.

**UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

**REFERENCES:**

1. Michael E. Whitman, Herbert J. Mattord," Principles of Information Security", CENGAGE Learning, 4th Edition. (I,II,III,IV,V UNIT)  
(Unit I Chapter 1, Unit II Chapter 2, Unit III Chapter 6,7, Unit IV Chapter 8, Unit V Chapter 4).

2. Principles of Information Security By Michael E. Whitman and Herbert J. Mattord.
3. William Stallings," Cryptography and Network Security – Principles and Practice", Pearson Education, 7th Edition.
4. Atul Kahate," Cryptography and Network Security", McGraw Hill, 4th Edition
5. Elementary Information Security By Richard E. Smith.
6. Fundamentals of Information Systems Security By David Kim and Michael G. Solomon.

### **COURSE OUTCOMES:**

On the completion of the course, the students will be able to:

- Understand the basic concepts, need, approaches, principles and components of security.
- Explain the various cyber threats and attacks.
- Describe the various Security Technologies and Tools.
- Explain the basic principles of cryptography and algorithms.
- Examine the various protocols for secure communication.
- Explore the significant aspects of cyber security.

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**Second Year**

**CORE PRACTICAL IV  
CYBER SECURITY LAB  
(Practical)**

**Semester IV**

**Code**

**Credit: 4**

**COURSE OBJECTIVES:**

- To understand various reconnaissance tools.
- To Explore Wire shark tool for packet capturing.
- To Explore Security aspect of Windows Operating System.

**LIST OF EXPERIMENTS**

1. Working with Network Reconnaissance tools such as nslookup, traceroute, dig and Whois
2. Capturing and Exploring packets with Wireshark packet sniffer
3. Exploring Windows Firewall Security
4. Configuring security for Web Browsers
5. Hardening Windows Operating System
6. Exploring Windows Group Policy
7. Working with Ciphers
8. Working with SHA-1 algorithm
9. Perform encryption and decryption using following transposition techniques
  - a. Rail fence - Row & Column Transformation
10. Prevent Eavesdropping attack using SSH

**COURSE OUTCOMES:**

On the completion of the course, the students will be able to:

- Demonstrate and exhibits skills with reconnaissance tools such as nslookup, trace route, dig and who is.
- To Capture and Analyze the packets using Wireshark Tool
- Configure and Secure the Windows Firewall and Group Policy in Windows OS
- Configure and Secure the Web Browsers and harden the Windows OS.
- Identify and Prevent Eavesdropping attack using SSH.

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**Third Year**

**CORE COURSE V  
CYBER CRIMES AND MITIGATION  
TECHNIQUES  
(Theory)**

**Semester V**

**Code**

**Credit: 5**

**COURSE OBJECTIVES:**

- To overview of crimes involving the use of computer technology and the internet
- To know how computer related crimes are committed and how they are investigated.
- To understand computer crime scene management and the legal issues involved in the prosecution of computer crimes.

**UNIT – I    Fundamentals of Cybercrime:**

Cybercrime: Introduction, Motivation and Methods - The Scale of the Problem and Reasons for the Growth of Cybercrime - Profiling Cybercriminals - Challenges for Criminal Justice and Law Enforcement - The Future of Cybercrime .

**UNIT – II    Unauthorized Access Offences in Cyberworld:**

Emerging Threats: Expected Targets and Forms - Criminal Statutes - 2.3 Other Offences Associated with Hacking.

**UNIT – III    Injection of Malicious Code in Application:**

Introduction - Types of Malicious Code - Threats Posed by Viruses, Worms, and Trojan Horses - Legislative Approaches.

**UNIT – IV    Attempts and Impact of Phishing in Cyberworld:**

The Problem of Phishing - Impact and Harm Generated by Phishing - Mechanisms of Cyberspace Phishing - Dragnet Method - Rod—and—Reel Method - Lobsterpot Method - Gillnet Phishing - Political Phishing.

**UNIT – V    Anonymity, Privacy and Security Issues in Cyberworld:**

Introduction - Anonymity in Cyberspace Impact and Harm Generated by Anonymity - Regulating Anonymity in Cyberspace -The Case Law.

**UNIT – VI    CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

## **REFERENCES:**

1. Studies in Computational Intelligence, Volume 593, Series editor Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland. Springer. (**UNIT - I,II,III,IV,V**)
2. Computer Forensics & Digital Investigation with EnCase Forensic V7, by Suzanne Widup.
3. Computer Forensics: Investigating Network Intrusions and Cyber Crime
4. Cyber Criminology: Exploring Internet Crimes and Criminal Behavior 2011, by K. Jaishankar.
5. The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics 2019, by Izzat Alsmadi.
6. Cyber Security on Azure: An IT Professional's Guide to Microsoft Azure Security Center, 2017 Apress, by Marshall Copeland (auth.)

## **COURSE OUTCOMES:**

On completion of the course, student will be able to:

- Identify different types of cyber crime
- Describe cybercrime and criminal groups that engage in cyber crime
- Identify and discuss the structures and characteristics of criminal groups that engage in cyber crime
- Explain and analyse the ways in which information and communication technology is used to commit cyber crime
- Critically evaluate the measures used to counter cyber crime

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**Third Year**

**CORE COURSE VI  
SOCIAL WEB ANALYTICS  
(Theory)**

**Semester V**

**Code**

**Credit: 5**

**COURSE OBJECTIVES:**

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in social web and related communities.

**UNIT – I INTRODUCTION SOCIAL NETWORK DATA ANALYTICS:**

An Introduction to Social Network Data Analytics - Online Social Networks: Research Issues - Research Topics in Social Networks - Statistical Properties of Social Networks – Preliminaries - Static Properties - Dynamic Properties

**UNIT – II GRAPH THEORY AND SOCIAL NETWORKS:**

Graphs - Strong and Weak Ties - Networks in Their Surrounding Contexts - Positive and Negative Relationships

**UNIT – III RANDOM WALKS IN SOCIAL NETWORKS AND THEIR APPLICATIONS:**

Introduction - Random Walks on Graphs: Background - Algorithms - Applications - Evaluation and datasets

**UNIT – IV COMMUNITY DISCOVERY IN SOCIAL NETWORKS:**

Community Discovery in Social Networks: Applications, Methods. Introduction - Core Methods - Emerging Fields and Problems

**UNIT – V NODE CLASSIFICATION IN SOCIAL NETWORKS:**

Problem Formulation - Methods using Local Classification - Random Walk based Methods - Applying Node Classification to Large Social Networks - Related approaches - Variations on Node Classification.

**UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

**REFERENCES:**

1. C Charu C. Aggarwal Editor Social Network Data Analytics ( unit I ,III,IV,V)
2. David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010. Press, 2014.( unit II - CHAPTER I)
3. Jeffrey C Johnson, Martin G Everett, Stephen P Borgatti," Analyzing Social

- Networks”, sage publication,2013.
4. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, 1st Edition, Springer, 2011.
  5. Dion Goh and Schubert Foo,” Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
  6. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.
  7. John Scott, “Social Network Analysis”, 3<sup>rd</sup> Edition, SAGE Publications Ltd 2013.

### **COURSE OUTCOMES:**

On completion of the course, student will be able to:

- An ability to identify metrics used in network analysis.
- An ability to classify the network related data.
- Identify the aim of graph in computational models.
- Apply the knowledge in predicting the user behaviours.
- Visualization of a social network using tools.

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**Third Year**

**CORE COURSE VII  
ETHICAL HACKING  
(Theory)**

**Semester V**

**Code**

**Credit: 5**

### **COURSE OBJECTIVES:**

- To introduce the basic concepts of Ethical Hacking and Penetration Testing
- To acquire knowledge about gathering information about the victim
- To demonstrate Enumeration and Port Scanning

### **UNIT – I INTRODUCTION TO ETHICAL HACKING:**

Important Terminologies - Categories of Penetration Test - Writing Reports - Structure of PT report - Vulnerability Assessment Summary - Risk Assessment Methodology - Detailed Findings Reports

### **UNIT – II INFORMATION GATHERING:**

Active Information Gathering - Passive Information Gathering - Sources of Information Gathering - Copying Website - locally yougetsignal.com - NeoTrace - Intercepting a Response - Acunetix Vulnerability Scanner - NetCraft - Google Hacking - Interacting with DNS Servers - DNS Cache Snooping - Sniffing SNMP Passwords - SNMP Brute Force and Dictionary Attack Tool

### **UNIT – III ENUMERATION AND PORT SCANNING:**

Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - TCP Three-way handshake - TCP Flags Port Status - Types TCP SYN Scan - TCP Connect Scan - NULL, FIN and XMAS SCAN - NULL Scan - FIN Scan - XMAS Scan - TCP ACK Scan - Responses UDP Port Scan Scanning a vulnerable host - Performing an IDLE scan with NMAP - Service Version Detection - OS Fingerprinting

### **UNIT – IV VULNERABILITY SCANNING:**

What Are Vulnerability Scanners and How Do They Work - Vulnerability Assessment with Nmap - Testing SCADA Environments with Nmap- Nessus Vulnerability Scanner - Installing Nessus - Adding a user - Creating a new policy - Safe Checks - Silent Dependencies - Port Range - Preferences

### **UNIT – V NETWORK SNIFFING (chapter 6):**

Introduction - Types of Sniffing - Hubs vs. Switches - Promiscuous Mode vs. Non-Promiscuous Mode - MITM Attacks - ARP Protocol Basics - How ARP works - ARP attacks- DoS Attacks - Sniffing with Wireshark - DNS Spoofing - DHCP Spoofing- Hijacking the Session

## **UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFERENCES:**

1. Rafay Baloch, Ethical Hacking and Penetration Testing Guide , CRC Press Taylor & Francis Group, 2015.(Unit – I, Unit – II, Unit – III, Unit – IV, Unit – V)
2. Jon Erickson, Hacking the Art of Exploitation, No Starch Press, San Francisco, 2nd Edition, 2008.
3. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical
4. Hackers Handbook, TMH, 3rd Edition, 2011.
5. Patrick Engebretson, “The Basics of Hacking and Penetration Testing – Ethical Hackingand
6. Penetration Testing Made Easy”, Second Edition, Elsevier, 2013.
7. EC-Council, “Ethical Hacking and Countermeasures: Attack Phases”, Cengage Learning, 2010.
8. <https://www.jstor.org/stable/resrep12574.6>

### **COURSE OUTCOMES:**

On the completion of the course, the students will be able to:

- Understand the basic concepts of Ethical Hacking and Penetration Testing and will be able to prepare penetration testing reports.
- Demonstrate information gathering about the victim using various tools such acunetix, netcraft and google hacking
- Enumerate and perform different types of scanning and demonstrate nmap.
- Explore the vulnerability scanners: nmap and Nessus.
- Understand and demonstrate sniffing, MITM attacks, ARP attacks and DoS attacks.

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**Third Year**

**CORE PRACTICAL V  
ETHICAL HACKING LAB  
(Practical)**

**Semester V**

**Code**

**Credit: 4**

**COURSE OBJECTIVES:**

- The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security.
- To get knowledge on various attacks and their detection.
- To collect tools and techniques used by the target

**LIST OF EXPERIMENTS:**

1. Write a code to demonstrate DoS attacks
2. Create a social networking website login page using phishing techniques
3. Study of Techniques uses for Web Based Password Capturing.
4. Write a script or code to demonstrate SQL injection attacks
5. Install rootkits and study variety of options
6. Setup a honey pot and monitor the honey pot on network
7. Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto
8. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suit tool
9. Study on Fingerprinting with NMAP
10. Working with Nessus Vulnerability Scanner
11. Working with Acunetix Vulnerability Scanner
12. Demonstrating different types of port scanning

**COURSE OUTCOMES:**

On the completion of the course, the students will be able to:

- Gain the knowledge of the use and availability of tools to support an ethical hack.
- Gain the knowledge of interpreting the results of a controlled attack.
- Apply the skills and duplicate a website for web spoofing.
- Identify the weakness of the target by finding the tools and techniques used.
- Examine and find out the vulnerabilities of the web application.

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**Third Year**

**MAJOR BASED ELECTIVE I**

**Semester V**

**Code**

**1. WEB AND INFORMATION SECURITY**

**(Theory)**

**Credit: 4**

### **COURSE OBJECTIVES:**

- Describe fundamental concepts of information security and system auditing.
- Understand the difference between security metrics and audits.
- Understand the implement web technology security

### **UNIT - I INTRODUCTION TO INFORMATION SECURITY:**

Computer Security Concepts - Threats, Attacks, and Assets - Security Functional Requirements - Fundamental Security Design Principles - Attack Surfaces and Attack Trees - Computer Security Strategy.

### **UNIT - II IT SECURITY MANAGEMENT AND RISK ASSESSMENT:**

IT Security Management - Organizational Context and Security Policy - Security Risk Assessment - Detailed Security Risk Analysis - Case Study: Silver Star Mines

IT Security Controls, Plans, and Procedures - IT Security Management Implementation - Security Controls or Safeguards - IT Security Plan - Implementation of Controls - Monitoring Risks - Case Study: Silver Star Mines

### **UNIT - III WEB:**

Browser Attacks: Browser Attack Types - How Browser Attacks Succeed: Failed Identification and Authentication - Web Attacks Targeting Users - False or Misleading Content- Malicious Web Content - Protecting Against Malicious Web Pages - Foiling Data Attacks - Email Attacks - Fake Email - Fake Email Messages as Spam - Fake (Inaccurate) Email Header Data - Phishing -Protecting Against Email Attacks

### **UNIT - IV NETWORKS:**

Threats to Network Communications: Interception: - Eavesdropping and Wiretapping Modification,- Interruption: Loss of Service Port Scanning Wireless Network Security- WiFi Background - Vulnerabilities in Wireless Networks - Failed Countermeasure: WEP (Wired Equivalent Privacy) - Stronger Protocol Suite: WPA (WiFi Protected Access) - Denial of Service

### **UNIT - V DETAILS OF CRYPTOGRAPHY:**

Cryptology - Cryptanalysis - Statistical Analysis - Asymmetric Encryption with RSA -The RSA Algorithm - Hash Functions - Digital Signatures - El Gamal and Digital Signature Algorithms- Quantum Cryptography: Quantum Physics- Photon Reception- Cryptography with Photons- Implementation

## **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFERENCES:**

1. Computer Security Principles and Practice (3<sup>rd</sup> Edition). (Unit I,II)
2. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education (Unit III, IV , V)
3. Andrew Vladimirov, Konstantin Gavrilenko, and Andriej Michajlowski," Assessing Information Security strategies tactics logic and framework".
4. Marty M. Weiss and Michael G. Solomon," Auditing IT Infrastructure for compliance", Jones & Bartlett Learning, 2016
5. B. Sullivan, V. Liu, and M. Howard, "Web Application Security", A B Guide. New York: McGraw-Hill Education, 2011.
6. D. Stuttard and M. Pinto,"2nd ed. Indianapolis", IN: Wiley, John Sons, 2011
7. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008.
8. Thomas Erl, " Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005

### **COURSE OUTCOMES:**

- Describe fundamental concepts of information security and system auditing.
- Understand the difference between security metrics and audits.
- Students will be able to understand web security
- Students would be able authenticate for different application.
- Students would be able to implement sessions and security principles

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**Third Year**

**MAJOR BASED ELECTIVE I  
2. FUNDAMENTALS OF CRYPTOGRAPHY**

**Semester V**

**Code**

**(Theory)**

**Credit: 4**

**COURSE OBJECTIVES:**

- To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
- To familiarize Digital Signature Standard and provide solutions for their issues.

**UNIT – I INTRODUCTION:**

**INTRODUCTION:** Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. **CLASSICAL ENCRYPTION TECHNIQUES:** Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography

**UNIT – II BLOCK CIPHER AND DATA ENCRYPTION STANDARDS:**

Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles

**UNIT – III PUBLIC KEY CRYPTOGRAPHY AND RSA:**

Principles Public key crypto Systems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, , Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

**MESSAGE AUTHENTICATION AND HASH FUNCTIONS:** Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs.

**UNIT – IV EMAIL SECURITY:**

Pretty Good Privacy (PGP) and S/MIME. **IP SECURITY:** Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT – V WEB SECURITY:**

Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. **FIREWALL:** Firewall Design principles, Trusted Systems

## **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFERENCES:**

1. William Stallings (2006), Cryptography and Network Security: Principles and Practice, 4th edition, Pearson Education, India. (UNIT I,II,III,IV,V)
2. William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.
3. Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd edition, Prentice Hall of India, New Delhi.
4. AtulKahate (2008), Cryptography and Network Security, 2nd edition, Tata McGrawhill, India.
5. Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata McGrawhill, India

### **COURSE OUTCOMES:**

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

- Use symmetric and asymmetric key algorithms for cryptography
- Design a security solution for a given application
- Analyze Key Management techniques and importance of number Theory.
- Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.
- To examine the issues and structure of Authentication Service and Electronic Mail Security

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**Third Year**

**SKILL BASED ELECTIVE I  
LINUX PROGRAMMING  
(Theory)**

**Semester V**

**Code**

**Credit: 2**

**COURSE OBJECTIVES:**

- To introduce the concepts of Linux operating system
- To explain the various constructs associated with Linux
- To explain the methods of securing files in Linux

**UNIT – I      Exploring the Desktops:**

Examining the Graphical Login Screen - Logging In and Using the GNOME Desktop - Playing with the Panel - Managing Applets on the Panel - Choosing Items from the Applications Menu in Fedora Core - Choosing Items from the Places Menu in Fedora Core - Choosing Items from the Desktop Menu in Fedora Core - Choosing Items from the Applications Menu on Enterprise Linux - Choosing Actions from the Actions Menu in Enterprise Linux - Using the Nautilus File Manager - Displaying Your Home Folder - Displaying the Contents of a Folder - Opening Files - Accessing FTP Sites - Using Bookmarks - Adding a Bookmark - Editing Bookmarks - Deleting Bookmarks - Managing Your Files and Folders - Customizing the Nautilus File Manager - Editing File Manager Preferences - Changing the File Manager Background and Icon Emblems - Showing and Hiding Views - Configuring GNOME - Logging Out - Taking a Look at KDE - Managing Applets - Choosing Applications from the Applications Menu - Using the Konqueror File Manager - Logging Out of KDE

**UNIT – II      TCP/IP Networking:**

TCP/IP Explained - Understanding Network Classes - Setting Up a Network Interface Card (NIC) - Configuring the Network Card - Configuring an Internal Network - Understanding Subnetting -Interpreting IP Numbers -Before You Subnet Your Network - Classless Inter Domain Routing -Working with Gateways and Routers -Configuring Dynamic Host Configuration Protocol - Setting Up the Server -Configuring the DHCP Client - Configuring the Network Using the Network Configuration Tool - Adding an Ethernet Device - Adding a Wireless NIC - Adding a Modem Connection - Editing Your Network Configuration - Removing a NIC - Changing the NIC Configuration - Managing DNS Settings - Managing Hosts - Working with Profiles - Configuring IP Masquerading

**UNIT – III      Configuring BIND:**

The Domain Name System - Understanding DNS - Installing the Software - Understanding Types of Domain Servers - Examining Server Configuration Files - The named.conf file - Options - Include - Acl - Logging - server - zones - Zone Files - SOA — Start of Authority - The Reverse Zone File - Configuring a Caching DNS Server - Configuring a Secondary Master DNS Server - Configuring a Primary Master Server - Checking Your Configuration - The Host Program - The dig Program

**UNIT – IV      Providing Web Services:**

Creating Mailing Lists - Completing the Initial Mailman Configuration - Creating a Mailing List - Modifying a Mailing List's Configuration - Performing Common Mailman Administrative Tasks - Adding Multiple List Members - Hiding a Mailing List - Restricting Archives Access - Setting Up Web-Based Email - Connecting to SquirrelMail -

Reconfiguring SquirrelMail - Configuring an RSS Feed - Selecting Content for an RSS Feed - Creating the Feed File - Turning on an RSS Feed - Adding Search Functionality - Getting Started with ht://Dig

**Optimizing Internet Services** - Optimizing LDAP Services - Optimizing DNS Services - Improving the Performance of DNS Clients - Tweaking DNS Servers - Logging - Optimizing Mail Services - Getting More from Sendmail - Getting More from Postfix - Optimizing FTP Services - Optimizing Web Services

## **UNIT – V      Configuring the System at the Command Line:**

Administrating Your System from the Command Line - Managing Processes - Obtaining Process Information - Signaling Processes - Modifying Process Priorities - Maintaining the File System - Working with File Systems - Creating and Manipulating Partitions - Creating and Manipulating File Systems - Working with Files and Directories - Managing Disk Space Usage - Timekeeping - Single-Use Commands - Using the Network Time Protocol - Automating Scripts - Running One-Shot Jobs with at - Running Regularly Scheduled Jobs with cron

## **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

## **REFERENCES:**

1. Red Hat® Linux® Networking and System Administration, Third Edition Terry Collings and Kurt Wall Published by Wiley Publishing, Inc.(Unit I ,II,III,IV,V)
2. Unix and Shell Programming – B. M. Harwani, OXFORD University Press.
3. Linux Administration : A Beginner’s Guide – Wale Soyinka , McGraw Hill Publication
4. Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication
5. Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
6. Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.

## **COURSE OUTCOMES:**

On the completion of the course, the students will be able to

- Understand Linux Architecture, different Linux installation and Linux commands.
- Effectively use Linux Environment using shell, file system, scripts, filters and program development tools
- Perform file I/O management through commands and perform package management, storage management and failure recovery.
- Create backup and do recovery using tools like Rsync and Bacula
- Automate tasks and write simple programs using scripts

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**Third Year**

**CORE COURSE VIII**  
**INTRODUCTION TO BLOCK CHAIN**  
**TECHNOLOGY**  
**(Theory)**

**Semester VI**

**Code**

**Credit: 5**

**COURSE OBJECTIVES:**

- To study the basics of Blockchain technology.
- To learner will explore various aspects of Blockchain technology
- To develop application in Blockchain.

**UNIT – I      Introduction of Cryptography and Blockchain:**

**Blockchain 101**, Introduces the basic concepts of distributed computing on which blockchain technology is based. It also covers history, definitions, features, types, and benefits of blockchains along with consensus mechanisms that are at the core of blockchain technology.

**Decentralization**, Covers the concepts of decentralization and its relationship with blockchain technology. Various methods and platforms that can be used to decentralize a process or system have also been introduced

**UNIT – II    Cryptography and Technical Foundations:**

Introduces the theoretical foundations cryptography, which is necessary to fully understand blockchain technology. Concepts such as public and private key cryptography, with practical examples, are included. Finally, an introduction to financial markets is also included as there are many interesting use cases for blockchain technology in the financial sector.

**Unit – III    Blockchain:**

Structure of a Block - Block Header - Block Identifiers: Block Header Hash and Block Height - The Genesis Block - Linking Blocks in the Blockchain - Merkle Trees - Merkle Trees and Simplified Payment Verification (SPV) - Bitcoin's Test Blockchains - Testnet—Bitcoin's Testing Playground - Segnet—The Segregated Witness Testnet - Regtest—The Local Blockchain - Using Test Blockchains for Development

**UNIT – IV    Blockchain Applications:**

Introduction - Building Blocks (Primitives) - Applications from Building Blocks - Colored Coins - Using Colored Coins - Issuing Colored Coins - Colored Coins Transactions - Counterparty - Payment Channels and State Channels - State Channels—Basic Concepts and Terminology - Simple Payment Channel Example - Making Trustless Channels - Asymmetric Revocable Commitments - Hash Time Lock Contracts (HTLC) - Routed Payment Channels (Lightning Network) - Basic Lightning Network Example - Lightning Network Transport and Routing - Lightning Network Benefits

## **UNIT – V    Introduction to Bitcoin and How Bitcoin Works:**

**Introduction:** What Is Bitcoin? - History of Bitcoin - Bitcoin Uses, Users, and Their Stories - Getting Started - Choosing a Bitcoin Wallet - Quick Start - Getting Your First Bitcoin - Finding the Current Price of Bitcoin - Sending and Receiving Bitcoin -

**How Bitcoin Works:** Transactions, Blocks, Mining, and the Blockchain - Bitcoin Overview - Buying a Cup of Coffee - Bitcoin Transactions - Transaction Inputs and Outputs - Transaction Chains - Making Change - Common Transaction Forms - Constructing a Transaction - Getting the Right Inputs - Creating the Outputs - Adding the Transaction to the Ledger - Bitcoin Mining - Mining Transactions in Blocks - Spending the Transaction

## **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFERENCES:**

1. Bashir, I. (2017). Mastering blockchain. Packt Publishing Ltd.**(Unit I,II)**
2. Antonopoulos, A. M. (2017). Mastering Bitcoin: Programming the open blockchain. "O' Reilly Media, Inc.". **(Unit III, IV,V)**
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven
4. Goldfeder, Bitcoin and Cryptocurrency Technologies:
5. A Comprehensive Introduction, Princeton University Press (July 19, 2016).
6. Antonopoulos, Mastering Bitcoin.
7. Antonopoulos and G. Wood, Mastering Ethereum.
8. D. Drescher, Blockchain Basics. Apress, 2017.
9. NPTEL online course : <https://nptel.ac.in/courses/106/104/106104220/#>
10. Udemy: <https://www.udemy.com/course/build-your-blockchain-az/>
11. EDUXLABS Online training :<https://eduxlabs.com/courses/blockchain-technologytraining/?tab=tab-curriculum>

### **COURSE OUTCOMES:**

- Understand and explore the working of Blockchain technology.
- Analyze the working of Bitcoin.
- Understand and analyze the working of Hyperledger.
- Apply the learning of solidity and de-centralized apps on Blockchain.
- Apply the real world application of Blockchain technology.

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**Third Year**

**CORE COURSE IX  
CLOUD COMPUTING SECURITY  
(Theory)**

**Semester VI**

**Code**

**Credit: 5**

**COURSE OBJECTIVES:**

- Compare modern security concepts as they are applied to cloud computing
- Assess the security of virtual systems
- Evaluate the security issues related to multi-tenancy

**UNIT – I Cloud Computing Fundamentals:**

Cloud Computing Fundamentals - Cloud Computing Fundamentals - Architectural Influences - Technological Influences - Operational Influences - Outsourcing - IT Service Management.

**UNIT – II Cloud Computing Architecture:**

Cloud Delivery Models - Cloud Software as a Service (SaaS) - Cloud Platform as a Service (PaaS) - Cloud Infrastructure as a Service (IaaS) - Cloud Deployment Models - Expected Benefits.

**UNIT – III Cloud Computing Software Security Fundamentals:**

Cloud Information Security Objectives - Cloud Security Services - Relevant Cloud Security Design Principles - Secure Cloud Software Requirements - Secure Development Practices - Approaches to Cloud Software Requirements Engineering - Cloud Security Policy Implementation and Decomposition - NIST 33 Security Principles - Secure Cloud Software Testing - Testing for Security Quality Assurance - Cloud Penetration Testing - Regression Testing - Cloud Computing and Business Continuity Planning/Disaster Recovery - General Principles and Practices - Using the Cloud for BCP/DRP - Redundancy Provided by the Cloud - Secure Remote Access - Integration into Normal Business Processes.

**UNIT – IV Cloud Computing Security Architecture:**

Architectural Considerations - General Issues - Trusted Cloud Computing - Secure Execution Environments and Communications - Microarchitectures - Identity Management and Access Control - Identity Management - Access Control - Autonomic Security.

**UNIT – V Cloud Computing Security Challenges:**

Security Policy Implementation - Policy Types - Computer Security Incident Response Team (CSIRT) - Virtualization Security Management - Virtual Threats - VM Security Recommendations - VM-Specific Security Techniques.

## **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFERENCES:**

1. Krutz, R. L., & Vines, R. D. (2010). Cloud security: A comprehensive guide to secure cloud computing. Wiley Publishing.(Unit I,II,III,IV,V)
2. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.
3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876], 2010.
4. John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1 edition [ISBN: 1439806802], 2009.
5. J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921] 2011
6. Cloud Security Alliance, "Security Guidance for Critical Areas of Focus in Cloud Computing" 2009.

### **COURSE OUTCOMES:**

- Describe the security architecture of cloud computing and security service models.
- Analyse the Strategies for Secure Operation the cloud architecture and list the security requirements.
- Explain different key strategies for data security and apply the best practice models in real time application.
- Apply the security model for cloud application with network, data and security considerations.
- Develop an information security framework model for cloud operation

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**Third Year**

**CORE PRACTICAL VI  
CLOUD COMPUTING LAB  
(Practical)**

**Semester VI**

**Code**

**Credit: 4**

**COURSE OBJECTIVES:**

- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.

**LIST OF EXPERIMENTS:**

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications usingpython/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.
9. Find procedure to run the virtual machine of different configuration. Check how many virtualmachines can be utilized at particular time.
10. Find procedure to attach virtual block to the virtual machine and check whether it holds thedata even after the release of the virtual machine.
11. Show the virtual machine migration based on the certain condition from one node to the other.
12. Find procedure to install storage controller and interact with it

**COURSE OUTCOMES:**

On completion of this course, the students will be able to:

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

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**Third Year**

**MAJOR BASED ELECTIVE II  
1. CYBER LAW AND DEFENCE TECHNIQUES**

**Semester VI**

**Code**

**(Theory)**

**Credit: 4**

**COURSE OBJECTIVES:**

- To introduce the cyber world and cyber law in general.
- To explain about the various facets of cybercrimes.
- To Analyze various types of cybercrime and formulate procedures for real world cybercrime Investigations

**UNIT – I Classification of Cyber Crimes:**

Taxonomy of Cyber Crime - Classifications of Cyber Crimes - Cyber Crimes against Persons - Crimes against Persons' Property - Cybercrimes Against Government - Cybercrimes Against Society at large - Causes of Cyber Crime - Impact and Effects of Cyber Crimes - Cyber Crime: Some Landmark Occurrence.

**UNIT – II Information Technology Law : A Bird's Eye:**

Cyber World vis-a-vis need of Legal Protection - Information Technology Act, 2000: A Beginning - Objectives of Information Technology Act, 2000 - Scope of Information Technology Act, 2000 - Applicability of Information Technology Act, 2000 - Information Technology Act, 2000: A Snapshot - Information Technology (Amendment) Act, 2008 - Recompense of Information Technology Law - Limitation of Information Technology Law.

**UNIT – III Legal Protection against Cyber Crimes:**

Criminal Liabilities under Information Technology Act, 2000 - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Civil Liabilities under Information Technology Act, 2000 - Civil Liability for Corporate - Cyber Crimes under IPC and Special Laws - The Indian Penal Code, 1860 - Cyber Crimes under the Special Acts.

**UNIT – IV Cyber Crime: Landmark of Judgements – 1:**

Sanjay Kumar vs. State of Haryana - Fatima Riswana vs. State Rep. by ACP, Chennai & Ors - Avnish Bajaj vs. State (N.C.T.) of Delhi - Syed Asifuddin and Ors. vs. The State of Andhra Pradesh And Another - D'zine Garage Pvt. Ltd. rep. by its Director Mr. Hari Sethuraman vs. D'zine Café FZE & D'zine Café FZE vs. D'zine Garage Pvt. Ltd. rep. by its Director Mr. Hari Sethuraman - SMC Pneumatics (India) Pvt. Ltd. vs. Jogesh Khatra - Nasscom vs. Ajay Sood & Others - State of Tamil Nadu vs. Suhas Kuttu - Google India Pvt.Ltd. vs. M/s. Visaka Industries Limited and another - Microsoft Corporation vs. Yogesh Papat - Autodesk, Inc. & Another vs. Mr. Prashant Deshmukh & Others - Travel India Times vs. India Times Travel - Cubby, Inc vs. CompuServe, Inc

## **UNIT – V Cyber Crime: Landmark of Judgements – 2:**

State Bank of India vs. Rizvi Exports Ltd - Groff vs. America Online, Inc - Diebold Systems Pvt Ltd. vs. The Commissioner of Commercial Taxes - Manish Kathuria vs. State - State of Maharashtra vs. Anand Ashok Khar - Firos vs. State of Kerala - State of Tamilnadu vs. Dr.Prakash - Benususan Restaurant Corp. vs. King - Ashcroft , Attorney General et al vs. Free Speech Coalition, et al - State vs. Amit Prasad - R vs. Graham Waddon - The Arzika case - Air Force Bal Bharti School & Anr. vs. Delhi School Tribunal & Ors - Sri Prabhakar Singh vs. Union of Indi - Washington Post vs. Total News

## **UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

### **REFEREENCES:**

1. "CYBER CRIME LAW AND PRACTICE" by CS Mamta Binani Published by The Institute of Company Secretaries of India, 2016.(Unit I,II,III,IV,V,VI)
2. Suni Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd, 2011.
3. Zeinab Karake Shalhoub and Sheikha Lubna Al Qasimi," Cyber Law and Cyber Security in Developing and Emerging Economies", Edward Elgar Publishing Limited, 2010.
4. Nandan Kamath: "Law Relating to Computers, Internet, and E-Commerce".
5. Cyber Laws and the Information Technology Act 2000 with Rules and Notifications, Second Edition, Universal Law Publishing Co., New Delhi, 2000.
6. Jennifer L. Bayuk, Jason Healey, Marcus H. Sachs, "Cyber Security Policy Guidebook", Wiley Publication-2012.

### **Course Outcomes:**

On completion of the course, the students will be able to:

- Understand the various aspects of cyber law.
- Apply diverse viewpoints to ethical cybercrime in the information technology field and recommend appropriate actions.
- Analyze and evaluate the cyber security needs of an organization.
- Learn the cyber security and trust in cyber space.
- Give Learners in Depth Knowledge Of cyber security policy and issues to follow the Government.

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**Third Year**

**MAJOR BASED ELECTIVE II  
2 PENETRATION TESTING  
Code (Theory)**

**Semester VI**

**Credit: 4**

### **COURSE OBJECTIVES:**

- To Understand the Penetration Testing, Methodologies.
- To Engage in An Authorized Penetration Test.
- To Conduct Online Intelligence Gathering.

### **UNIT – I Penetration Testing & Setting Up Your Virtual Lab:**

The Stages of the Penetration Test - Installing VMware - Setting Up Kali Linux - Target Virtual Machines - Creating the Windows XP Target - Setting Up the Ubuntu 8.10 Target - Creating the Windows 7 Target

### **UNIT – II Using Kali Linux & Programming:**

Linux Command Line - The Linux Filesystem - Learning About Commands - User Privileges - File Permissions - Editing Files - Data Manipulation - Processes and Services - Managing Networking - Netcat: The Swiss Army Knife of TCP/IP Connections

### **UNIT – III Information Gathering & Finding Vulnerabilities:**

Open Source Intelligence Gathering - Port Scanning - Finding Vulnerabilities: From Nmap Version Scan to Potential Vulnerability - Nessus - The Nmap Scripting Engine - Running a Single NSE Script - Metasploit Scanner Modules - Metasploit Exploit Check Functions - Web Application Scanning - Manual Analysis

### **UNIT – IV ;**

Using Burp Proxy - SQL Injection - XPath Injection - Local File Inclusion - Remote File Inclusion - Command Execution - Cross-Site Scripting - Cross-Site Request Forgery - Web Application Scanning with w3af.

### **UNIT – V Using the Smartphone Pentest Framework:**

Mobile Attack Vectors - The Smartphone Pentest Framework - Remote Attacks - Client-Side Attacks - Malicious Apps - Mobile Post Exploitation

### **UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned.

**REFERENCES:**

1. Georgia Weidman," Penetration Testing: A Hands-On Introduction to Hacking", 1st Edition (Unit I,II,III,IV,V)
2. Patrick Engebretson," The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing Made Easy", Elsevier Inc., 2011.
3. Michael Rash, "Linux Firewalls", No Starch Press, ISBN: 978-1-59327-141-1, October 2007

**Course Outcomes:**

On completion of the course the student will be able to

- Understand the concepts of Penetration Testing.
- Get knowledge of Penetration Testing, Network security and its protocols to protect applications.
- Test windows password strength.
- Implement open password- protected files.
- Design and implement subvert vulnerable software applications.

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The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

**ASSESSMENT/EVALUATION/VIVA VOCE:****1. PROJECT REPORT EVALUATION (Both Internal & External)**

I. Plan of the Project - 20 marks

II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc. and presentation of the report. - 45 marks

III. Individual initiative - 15 marks

2. Viva-Voce / Internal & External - 20 marks

**TOTAL** - **100 marks**

**PASSING MINIMUM:**

Project	<b>Vivo-Voce 20 Marks</b> 40% out of 20 Marks (i.e. 8 Marks)	<b>Dissertation 80 Marks</b> 40% out of 80 marks (i.e. 32 marks)
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A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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**Third Year**

**SKILL BASED ELECTIVE II  
MOBILE APPLICATION DEVELOPMENT**

**Code**

**(Theory)**

**Semester VI**

**Credit: 2**

**COURSE OBJECTIVES:**

- To gain a basic knowledge of Android application development
- To understand about user Interfaces for the Android platform.
- To familiarize of the Android Studio development tool.

**UNIT - I:**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file

**UNIT - II:**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions

**UNIT - III:**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation

**UNIT - IV:**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

**UNIT - V:**

Using Common Android APIs: Using Android Data and Storage APIs, managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

**UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):**

Contemporary Developments Related to the Course during the Semester Concerned

**REFERENCES:**

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2011.
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2010
3. Mark L Murphy, "Beginning Android3", Apress Publications, 2011.
4. Bill Phillips, Chris Stewart, Kristin Marsicano, Brian Gardner, "Android Programming", Big Nerd Ranch, 2019.

5. Barry Burd, John Paul Mueller, "Android Application Development All in one for Dummies", Wiley Publications, 2020.
6. Namrata Bandekar, Darryl Bayliss, Fuad Kamal, "Android Apprentice (Fourth Edition) Beginning Android Development with Kotlin", R R BOWKER LLC, 2021.
7. <https://www.javatpoint.com/android-tutorial>

### **COURSE OUTCOMES:**

Upon successful completion of this course the students would be able to:

- Identify various concepts of mobile application programming in Android platform
- Implement the business logic in an app with java
- Understand Android User Interface Design with XML
- Know about Common Android APIs
- Deploy applications to the Android marketplace for distribution.

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