Suggested Practicals

It is suggested that the following tools/e-resources can be explored during the practical sessions • Wireshark • COFEE Tool • Magnet RAM Capture • RAM Capture • NFI Defragger • Toolsley • Volatility

1. Study of Network Related Commands (Windows)

2. Study of Network related Commands(Linux)

3. Analysis of windows registry

4. Capture and analyze network packets using Wireshark. Analyze the packets captured.

5. Creating a Forensic image using FTK Imager/ Encase Imager: creating forensic image, check integrity of data, analyze forensic image

6. Using System internal tools for network tracking and process monitoring do the following:

   a. Monitor live processes

   b. Capture RAM

   c. Capture TCP/UDP packets

   d. Monitor Hard disk

   e. Monitor Virtual Memory

   f. Monitor Cache Memory

DSC20/DSC08/GE8a: INFORMATION SECURITY

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		

Information Security	**4**	**3**	**0**	**1**	**Pass in Class XII**	**NIL**

Course Objective

The goal of this course is to make a student learn basic principles of information security. Over the due course of time, the student will be familiarized with cryptography, authentication and access control methods along with software security. Potential security threats and vulnerabilities of systems are also discussed along with their impacts and countermeasures. This course also touches upon the implications of security in cloud and Internet of Things (IoT).

Learning Outcomes

On successful completion of this course, a student will be able to

- Identify the major types of threats to information security.
- Describe the role of cryptography in security.
- Discover the strengths and weaknesses of private and public key cryptosystems.
- Identify and apply various access control and authentication mechanisms.
- Discuss data and software security and related issues.
- Explain network security threats and attacks.
- Articulate the need for security in cloud and IoT.

Syllabus

Unit 1 **(3 hours)**

Overview: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Fundamental Security Design Principles.

Unit 2 **(6 hours)**

Cryptographic tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data.

Unit 3 **(10 hours)**

User authentication and Access Control: Digital User Authentication Principle, Password-Based Authentication, Remote User Authentication, Security Issues for User Authentication

Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control, Attribute-Based Access Control, Identity, Credential, and Access Management, Trust Frameworks.

Unit 4 **(5 hours)**

Database and Data Center Security:

The Need for Database Security, SQL Injection Attacks, Database Access Control.

Unit 5 **(8 hours)**

Software Security: Types of Malicious Software, Advanced Persistent Threat, Propagation — Infected Content - Viruses, Propagation — Vulnerability Exploit - Worms, Propagation — Social Engineering — SPAM E-Mail, Trojans, Payload — System Corruption, Payload — Attack Agent — Zombie, Bots, Payload — Information Theft — Keyloggers, Phishing, Spyware, Payload — Stealthing — Backdoors, Rootkits, Countermeasures. **Overflow Attacks -** Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks. **Software Security Issues -** Handling Program Input, Writing Safe Program Code, Handling Program Input.

Unit 6 **(6 hours)**

Network Security: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Overview of Intrusion Detection, Honeypots, The Need for Firewalls, Firewall Characteristics and Access Policy, Types of Firewalls, Public-Key Infrastructure.

Unit 7 **(7 hours)**

Wireless, Cloud and IoT Security: Cloud Computing, Cloud Security Concepts, Cloud Security Approaches, The Internet of Things, IoT Security. Wireless Security Overview, Mobile Device Security.

References

1. W. Stallings, L. Brown, *Computer Security: Principles and Practice,* 4th edition, Pearson Education, 2018.

Additional References

1. Pfleeger C.P., Pfleeger S.L., Margulies J. *Security in Computing*, 5th edition, Prentice Hall, 2015.
2. Lin S., Costello D.J., *Error Control Coding: Fundamentals and applications*, 2nd edition, Pearson Education, 2004.
3. Stallings W. *Cryptography and network security*, 7th edition, Pearson Education, 2018.
4. Berlekamp E. *Algebraic Coding Theory*, World Scientific Publishing Co., 2015.

5. Stallings W. *Network security essentials Applications and Standards*, 6th edition, Pearson Education, 2018.
6. Whitman M.E., Mattord H.J., *Principle of Information Security*, 6th edition, Cengage Learning, 2017.
7. Bishop M., *Computer Security: Art and Science*, 2nd Revised edition, Pearson Education, 2019.
8. Anderson R.J., *Security Engineering: A guide to building Dependable Distributed Systems*, 2nd edition, John Wiley & Sons, 2008.

Suggested Practical List

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois.
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Use nmap/zenmap to analyze a remote machine.
4. Use Burp proxy to capture and modify the message.
5. Implement caesar cipher substitution operation.
6. Implement monoalphabetic and polyalphabetic cipher substitution operation.
7. Implement playfair cipher substitution operation.
8. Implement hill cipher substitution operation.
9. Implement rail fence cipher transposition operation.
10. Implement row transposition cipher transposition operation.
11. Implement product cipher transposition operation.

GE8c/DSE: INTRODUCTION TO PARALLEL PROGRAMMING

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		