NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Technology
Name of Programme:	MTech CSE (Cyber Security)
Course Code:	6CS408CC25
Course Title:	Ethical Hacking and Penetration Testing
Course Type:	Core
Year of Introduction:	2025-26

Credit Scheme

L	T	Practical Component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. summarise the core concepts related to system security and software vulnerabilities and their causes (BL2)
2. examine security and trust in hardware (BL4)
3. choose state-of-the-art tools to exploit the vulnerabilities related to computer system and networks (BL5)
4. solve the security issues in computer systems. (BL6)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	**Introduction to Practical Security:** Introduction to Practical Computer Security, The Computer Security Environment Today, Security Frameworks, CIA, PKI, Cryptocurrency	10
Unit-II	**Cyber Threats and Hacking:** Threats and Attacks, Network-based attacks, Client and Server-side attacks, OWASP Top 10 attacks, Penetration testing using Kali Linux	10
Unit-III	**Detecting and Mitigating Cyber Threats and Attacks:** Introduction to Intrusion Detection and Prevention, Firewalls, Vulnerability assessment, Vulnerability Scanning, Attack graphs	10
Unit-IV	**Proactive Computer Security:** Defence in Depth, Securing and hardening systems: Bastille, CIS, MS Baseline, GDPR	10
Unit-V	**Hardware Security and Protection:** Hardware implementation of Hash and RSA, Hardware Metering, Side channel attacks and countermeasures, Hardware Trojan detection.	05

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Suggested Readings/ References:

1. William Stallings Network Security Essentials: Applications and Standards, Prentice Hall
2. Gus Khwaja, Practical Web Penetration Testing, O'Reilly
3. Open Web Application Security Project, OWASP Top 10: The Top 10 most critical web application security threats
4. An Adams, T Thompson and A Khan, Ethical Hacking: Beginner to Advance Bundle, Code Academy
5. Ebook: Modern Defense In-Depth, A Briefing on Cyber Security in the Era of Cloud (https://www.oracle.com/a/ocom/docs/security/modern-defense-in-depth.pdf)
6. Stephen Gates, Modern Defense in Depth: An integrated approach to better web application security, O'Reilly
7. Debdeep Mukhopadhyay, Rajat Subhra Chakraborty, Hardware Security: Design, Threats and Safeguards, CRC Press.

Suggested List of Experiments:

Sr. No.	Name of Experiments/Exercises	Hours
1	Setting up the Virtual Environment with Kali Linux, Windows, and Metasploitable	02
2	Implementing the Buffer Overflow Attacks	04
3	Implementation of various OWASP Top 10 attacks on the DVWA application	04
4	Demonstrating the BurpSuite Tool	02
5	Implementing the Metasploit Exploit	02
6	Developing a simple application and performing various OWASP attacks on the application	04
7	Implementing User Profile based application	04
8	Implementing the Windows Privilege Escalation	04
9	Developing a secured application.	04