

CSI3002	Applied Cryptography and Network Security	L	T	P	J	C
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Pre-requisite	Nil	Syllabus version				
		1.0				
Course Objectives:						
<div><div></div><div><div>1.</div><div>To learn the emerging concepts of cryptography and algorithms</div></div><div><div>2.</div><div>To defend the security attacks on information systems using secure algorithms and Authentication process</div></div><div><div>3.</div><div>To categorize and analyze the key concepts in network and wireless security</div></div></div>						
Course Outcome:						
<div><div></div><div><div>1.</div><div>Infer the need of security to introduced strong cryptosystems.</div></div><div><div>2.</div><div>Analyze the cryptographic algorithms for information security.</div></div><div><div>3.</div><div>Identify the authentication schemes for membership authorization.</div></div><div><div>4.</div><div>Identify computer and network security threats, classify the threats and develop a security model for detect and mitigate the attacks.</div></div><div><div>5.</div><div>Identify the requirements for secure communication and challenges related to the secure web services</div></div><div><div>6.</div><div>Identify the need of ethical and professional practices, risk management using emerging security solutions.</div></div></div>						
Student Learning Outcomes (SLO):		1, 9, 18				
Module:1	Introduction to Cryptography				4 hours	
Security trends, Security attacks, Security mechanism, Elementary number theory, Pseudo-random bit generation. <b>Basic security services:</b> confidentiality, integrity, availability, non-repudiation, privacy.						
Module:2	Symmetric Key Cryptography				4 hours	
Block Ciphers: DES, Triple-DES, AES, Modes of Operation, Stream Cipher						
Module:3	Asymmetric Key Cryptography				4 hours	
RSA, Elgamal, Elliptic Curve Cryptography (ECC), Diffie-Hellman key exchange protocol						
Module:4	Hash Functions and Authentication				4 hours	
Message Authentication Code (MAC), MD5, Secure Hash algorithms (SHA), HMAC, Digital Signatures, Digital Signature Standard (DSS).						
Module:5	Basic Applied Cryptography				3 hours	
Key management and distribution, digital certificates, identity-based encryption, Identification and authentication, zero knowledge protocols						
Module:6	Advanced Applied cryptography				5 hours	
Side-channel attack, Pretty Good Privacy (PGP), S/MIME, Kerberos, Homomorphic encryption, Quantum Cryptography, DNA Cryptography, Chaos Based Cryptosystem						
Module:7	Web and Wireless Security				4 hours	
IPsec: AH and ESP, IKE- SSL/TLS, Types of Firewalls, Intrusion detection and Prevention systems, Wireless Application Protocol (WAP)						
Module:8	Recent Trends				2 hours	
Total Hours:					30 hours	
List of Experiments						
1	Implement DES, Triple DES and AES Key Algorithms				4 Hours	
2	Implement RSA, ECC and Diffie-Hellman Key Establishment.				4 Hours	
3	Implement a Secret-Sharing algorithm and Homomorphic Encryption algorithm				2 Hours	
4	Implement message authentication (MAC) and HASH algorithms				3 Hours	
5	Consider and examine the Wireless network security and technology				2 Hours	

	integration for compliance using the case study of Cisco.	
6	Explore the Snort Intrusion Detection Systems. Study Snort IDS, a signature-based intrusion detection system used to detect network attacks. Snort can also be used as a simple packet logger. For the purpose of this lab the students will use snort as a packet sniffer and write their own IDS rules	4 Hours
7	Explore ways to perform wireless attacks and understand potential defences. The attacks that will be covered are inspecting & modifying wireless card parameters, changing the wireless transmission channel, flooding attacks, and cracking keys of WPA2 protected networks.	4 Hours
8	Pretty Good Privacy – <ul style="list-style-type: none"><li>• Create a public/private key pair in PGP</li><li>• Create a revocation key</li><li>• Exchange PGP keys with other students</li><li>• Signing the new key</li><li>• Encrypting a file using your partner’s public key</li><li>• Decrypting the file using your private key</li><li>• Encrypting and signing a file</li><li>• Verifying the signature</li><li>• Sending secure Email with PGP</li><li>• Adding a public key and sending secure email.</li></ul>	4 Hours
9	Send and receive an encrypted email message using S/MIME.	3 Hours
	<b>Total Lecture hours:</b>	<b>30 hours</b>
<b>Text Book(s)</b>		
1.	W. Stallings, Cryptography and Network Security: Principles and Practice, 7 <sup>th</sup> Ed. Pearson Publishers, 2017.	
2.	Behrouz A. Forouzan, Cryptography and Network Security:6 <sup>th</sup> Ed. McGraw-Hill, 2017.	
<b>Reference Books</b>		
1.	Kaufman, Perlman and Speciner. Network Security: Private Communication in a Public World., 2 <sup>nd</sup> edition, Pearson Publishers, 2002.	
2	Menezes, van Oorschot, and Vanstone, The Handbook of Applied Cryptography, 20 <sup>th</sup> Edition, WILEY, 2015	
3	H. Silverman, A Friendly Introduction to Number Theory, 4 <sup>th</sup> Ed. Boston: Pearson, 2012.	
Mode of Evaluation: CAT / Assignment / Quiz / FAT / Lab		
Recommended by Board of Studies		11-02-2021
Approved by Academic Council		No. 61      Date      18.02.2021