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COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

Programme Name/s : **Electronics & Computer Engg.**
Programme Code : **TE**
Semester : **Sixth**
Course Title : **COMPUTER SECURITY AND NETWORK MANAGEMENT**
Course Code : **316345**

I. RATIONALE

The network management and security course is designed to provide students with theoretical knowledge and hands-on experience required to manage, maintain, and secure computer networks. The course aims to build a solid foundation in network fundamentals, emphasizing practical skills required for real-world small-scale and large-scale network administration.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

To develop effective network management skills and security required to maintain security.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Apply network management and administration techniques to manage network server environment.
- CO2 - Apply role assignment for Server Environment.
- CO3 - Identify the cyber security threat landscape.
- CO4 - Apply network security techniques to maintain secure and reliable computer networks.
- CO5 - Use the cryptographic algorithms to provide a basic level security , firewall and intrusion detection system to ensure data security in a network.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory			Based on LL & TL				Based on SL		Total Marks
														Practical								
				CL	TL	LL					FA-TH	SA-TH	Total	FA-PR		SA-PR		SLA				
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		
316345	COMPUTER SECURITY AND NETWORK MANAGEMENT	AML	DSE	4	-	2	2	8	4	3	30	70	100	40	25	10	25#	10	25	10	175	

Total IKS Hrs for Sem. : Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe the features of Network Operating Systems TLO 1.2 Describe the features of different editions of Windows Server. TLO 1.3 Explain the features of Linux Environment w.r.t. Server Management and Administration. TLO 1.4 Illustrate the process of configuring Active Directory. TLO 1.5 Illustrate the process of deploying Domain Controller. TLO 1.6 Describe the significance of group policies.	**Unit - I Introduction to Network Server Environment and deployment** 1.1 Network Operating Systems (NOS), Key features of NOS 1.2 The Windows Server family(and editions), Key features - Security features, support for hybrid cloud environments, performance and scalability, Hardware requirements 1.3 Overview of Linux Environment w.r.t. Server Management and Administration. 1.4 Active Directory and Domain Services (ADDS) - Fundamentals -Domain, tree domain, Forest, Organizational Units (OUs), Comparing a domain with a workgroup 1.5 Installing and configuring ADDS - Promoting a server to a domain controller, Managing domain users, groups, and computers, Organizational Units 1.6 Group Policy - Managing, Configuring and Processing Group Policy Objects, Group Policy Editors	Presentations Hands-on Lecture Using Chalk-Board
2	TLO 2.1 Configure Web Server. TLO 2.2 Install DNS, DHCP Server. TLO 2.3 Manage Remote access services. TLO 2.4 Apply backup and recovery strategy.	**Unit - II Role Assignment for Server Environment** 2.1 IP address –IPV4, Classification of IP address, overview of IPV6, Sub netting, Super netting a network 2.2 Server Roles – Web Server, FTP, DNS, DHCP, telnet 2.3 Installing Server Roles Using Server Manager – Add Roles and Features Wizard, Select Server Role and features 2.4 Post installation tasks for server roles, Managing and Removing Roles.Backup and Data Recovery - Configuring Windows Server Backup, Restoring data from backups, File and Folder Backup, Recovery options (VSS, system state backup)	Lecture Using Chalk-Board Demonstration Presentations
3	TLO 3.1 Explain the need of information security. TLO 3.2 State criteria for information classification. TLO 3.3 Identify various types of attacks. TLO 3.4 Enlist types of Malware.	**Unit - III Introduction to Computer and Information Security** 3.1 Foundations of computer security: Definition and Need of Computer Security, Security Basics: Confidentiality, Integrity, Availability, Accountability, Authentication, Non - repudiation and Reliability 3.2 Information Security Overview: Introduction to information, need and importance of information security, Information classification, Criteria for information classification 3.3 Type of Attacks: Active and Passive attacks, Masquerade Attack, Denial of Service, Backdoors and Trapdoors, Sniffing, phishing, Spoofing, Man in the Middle, Replay, TCP/IP Hacking, Social Engineering 3.4 Types of Malwares: Virus, Worms, Trojan horse, Spyware, Adware, Ransom ware, Logic Bombs, Rootkits, Key loggers.	Demonstration Presentations Lecture Using Chalk-Board

COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Apply different types of authentication methods. TLO 4.2 Apply various methods to prevent password from attacks. TLO 4.3 Illustrate the given biometric patterns. TLO 4.4 Explain the purpose of authorization. TLO 4.5 Compare DAC, MAC, RBAC and ABAC on the basis of given parameters.	**Unit - IV User Authentication and Access Control** 4.1 Identification and Authentication methods : Electronic user authentication, user name and password, multi-factor authentication, token-based authentication 4.2 Password attacks : Guessing password, Piggybacking, Shoulder surfing, Dumpster diving 4.3 Biometrics: Finger prints, Hand prints, Retina scan patterns, Voice patterns, Face recognition, Signature and Writing patterns, Keystrokes 4.4 Authorization: Introduction to authorization, goals of authorization 4.5 Access controls : Definition, Authentication mechanism, Access control principles, Access rights and permission Access control policies: Discretionary access control (DAC), Mandatory access control (MAC), Role- based access control(RBAC),Attribute-based access control (ABAC)	Lecture Using Chalk-Board Presentations Case Study
5	TLO 5.1 Explain the process of encryption and decryption. TLO 5.2 Compare symmetric and asymmetric cryptography on the basis of given parameters. TLO 5.3 Use the substitution techniques on given text. TLO 5.4 Apply the transposition techniques on given text. TLO 5.5 Differentiate between hardware and software firewalls. TLO 5.6 Explain various firewall policies. TLO 5.7 Compare Network Based and Host-Based IDS.	**Unit - V Cryptography , Firewall and IDS** 5.1 Introduction: Plain text, Cipher text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption 5.2 Symmetric and Asymmetric cryptography : Introduction, working, key management, asymmetric cryptography -public key distribution 5.3 Substitution techniques : Caesar cipher, Play fair cipher, Vigenere cipher, Vernam cipher(One-timepad) 5.4 Transposition techniques: Railfence technique, Simple columnar technique 5.5 Firewall: Need of firewall, Types of firewalls: Packet filters, Stateful packet filters, Application gateways, Circuit gateways 5.6 Firewall policies, Configuration, Limitations, Demilitarized zone (DMZ) 5.7 Intrusion Detection System(IDS):Network-based IDS, Host-based IDS, Honeypots	Presentations Lecture Using Chalk-Board Hands-on

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Install Network Operating System.	1	* Installation of Network Operating Systems a. Windows Server b. Linux	2	CO1
LLO 2.1 Install Active Directory for creating various objects.	2	Install the Active Directory on a Windows Server	2	CO1

COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 Create and manage user accounts.	3	* Creating user accounts a. Create Domain users in Windows Server with rights and permissions b. Create user accounts in Linux using command-line / GUI with rights and permissions	2	CO1
LLO 4.1 Configure the network simulator tool	4	* Configuration of cisco packet tracer network simulator tool, and elaborate the various facilities / Features available in the cisco packet tracer.	2	CO2
LLO 5.1 Implement the LAN and configure a configure DHCP server	5	* Configuration of simple network with a router that connects two LAN with a DHCP server using Cisco Packet Tracer.	2	CO2
LLO 6.1 Use IP address and appropriate subnet mask for given problem statement.	6	Configure Static IP Address in Operating system with appropriate subnet mask for given problem.	2	CO2
LLO 7.1 Implement IP address for intranet in class A , class B class c.	7	Implement classful address in given network node ip Identify range IP address in various classes ii) Justify the reason to choose various IP address classes for creating given network	2	CO2
LLO 8.1 Configure Antivirus Software.	8	*Configuration of an Antivirus software on the operating system.	2	CO3
LLO 9.1 Apply access control security.	9	*Application of access control security to the file , folder, applications.	2	CO4
LLO 10.1 Inspect the Symmetric key algorithm.	10	* Execution of DES Symmetric key algorithm in cryptography tool(e.g. cryptool)	2	CO5
LLO 11.1 Create digital signature and use it.	11	Testing of digital signature using any cryptography tool (eg. cryptool)	2	CO5
LLO 12.1 Implement the LAN and configure a firewall for network security.	12	Configuration of simple network with a router that connects two LANs and add firewall security in the above designed network.	2	CO5
LLO 13.1 Use IDS Software and analyze the result	13	Configuration of IDS SNORT and detect intrusions with its types in a network.	2	CO5
LLO 14.1 Use IDS Software and analyze the result.	14	Configuration of WinPatrol IDS software and detect the intrusions(if any) with its types in a network.	2	CO5
LLO 15.1 Install a network management tool and use it to test the network performance. LLO 15.2 Configure Cryptography tool (e.g Cryptool)	15	*Configuration of Cryptography tool (e.g cryptool)	2	CO5
LLO 16.1 Install a network and configure backup monitoring and reporting tool LLO 16.2 Execute symmetric key algorithm.	16	Execution of Transposition symmetric key algorithm in any cryptography tool.(e.g cryptool)	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Design physical network (minimum 5 computers , 1 server , 1 printer) and assign dynamic IP addresses to computers with the help of DHCP pool.
- Write a program to convert domain name to IP address and vice versa.
- Design physical network (minimum 5 computers , 1 server , 1 printer) with proxy server and its services.
- Write a program to execute the symmetric key cryptography algorithm.
- Design secured network using Firewall and IDS.

Assignment

- Prepare a mini report on Latest Security tools used in Network technology
- Prepare a mini report on Latest Networking Technology
- Explain the architectural considerations in network management.
- Outline the step-by-step process of DNS resolution, from entering a domain name in a browser to receiving the corresponding IP address.
- Study the Network Security techniques and its usage in the Network Management
- Explain the network security services for network management

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system (Any computer system with basic configuration, connected to LAN) Network operating system Wireshark or any other similar software to capture and investigate packets Cisco Packet Tracer or any other similar software Backup Eagle Software LibreNMS software SNORT Software PRTG software	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Network Server Environment and deployment	CO1	10	4	4	4	12

COMPUTER SECURITY AND NETWORK MANAGEMENT **Course Code : 316345**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
2	II	Role Assignment for Server Environment	CO2	12	2	6	6	14
3	III	Introduction to Computer and Information Security	CO3	14	4	4	8	16
4	IV	User Authentication and Access Control	CO4	12	2	4	8	14
5	V	Cryptography , Firewall and IDS	CO5	12	2	6	6	14
Grand Total				**60**	**14**	**24**	**32**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- A continuous assessment based on term work. Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 60% weightage to process, 40% weightage to product.

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	1	-	2	2	-	3			
CO2	1	1	-	2	2	-	3			
CO3	1	2	-	1	2	1	3			
CO4	1	2	-	2	2	1	3			
CO5	1	2	-	3	2	1	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Forouzan Behrouz A.	Data Communication and Networking 5E	McGraw Hill Education (India), New Delhi, 2005, ISBN-13:978-1-25-906475-3
2	Craig Zacker	The Complete Reference Networking	McGraw-Hill Education ISBN-10 9780070474161
3	Bruce Hallberg	Networking A Beginner's Guide	McGraw-Hill Osborne ISBN-10.0071812245
4	Dieter Gollmann	Computer Security	Wiley Publication, New Delhi, ISBN:978-0-470-74115-3
5	Commer Douglas E	Internet Working with TCP/IP	PHI Learning , ISBN:0-13-018380-6

Sr.No	Author	Title	Publisher with ISBN Number
6	Dr. Brijendra Pratap Singh, Manoj Madhava Gore	Computer Networks: Theory & Practical's	All India Council for Technical Education ISBN:978-81-961834-5-5

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.coursera.org/courses?query=computer%20networks	Offers courses from top universities like Stanford and Princeton on topics like Internet architecture, IP addressing, and advanced networking technologies.
2	https://onlinecourses.nptel.ac.in/noc25_ee12/preview	A network is a set of devices (nodes) connected through communication links. Computer network indicates a collection of autonomous computers interconnected by means of communication infrastructure. Two computers are said to be interconnected if they are able to exchange information. The connection might be via a copper wire, fiber optics, microwaves, infrared, and communication satellites.
3	https://activedirectorypro.com/configure-dhcp-server/	Install and Configure DHCP Server on Windows Server
4	https://www.backup-eagle.com/	Backup Monitoring and Reporting
5	https://www.paessler.com/prtg/download	Network Monitoring tool
6	https://www.cryptool.org/en/ct1/downloads/	Cryptographic tool
7	https://www.wireshark.org/download.html	Network traffic analyzer
8	https://prelogin-authoring.netacad.com/courses/packet-tracer	Cisco Packet Tracer is a cross-platform visual simulation tool

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students