COURSE DESCRIPTION FORM

INSTITUTION National University of Computer and Emerging Sciences-FAST

PROGRAM (S) TO BE EVALUATED Artificial Intelligence & Data Science, Computer Science, Cyber Security, Software Engineering

A. Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

Course Code	CL3001
Course Title	Computer Network Lab
Credit Hours	01
Prerequisites by Course(s) and Topics	CS2001-Data Structures
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	Mid:25 Lab Activity:25 Final: 50
Course Coordinator	Dr. Farrukh Salim
URL (if any)	
Current Catalog Description	This course will significantly benefits security officers, auditors, security professionals, site administrators, and anyone who is concerned about the integrity of their network infrastructure.
Textbook (or **Laboratory Manual** for Laboratory Courses)	Lab Manuals
Reference Material	Cisco Labs

Course Goals

The goal is to enable the students to model their problem in the domain of object oriented programming.in this course this is done by using C++ as the programming language.

A. Course Learning Outcomes (CLOs)

CLO	Course Learning Outcome (CLO)	Domain	Taxonomy Level	PLO	Tools
01	Applying networking, networking media, network topologies and protocol data units	Cognitive	3	1,6,10	LA, M, F
02	Demonstrate and explain switches, their configuration and their usage in VLANs..	Cognitive	3	2,3,4,5	LA,M, F
03	Explain routers, subnetting and their configuration, static routing and dynamic routing	Cognitive	2	3,5	LA, A, F

Tool:, Lab Activities = LA, Assignment=A , M = Midterm, F=Final

B. Course Learning Outcomes (CLOs)

1. Applying networking, networking media, network topologies and protocol data units.
2. Demonstrate and explain switches, their configuration and their usage in VLANs.
3. Explain routers, subnetting and their configuration, static routing and dynamic routing.

C. Program Learning Outcomes

PLO		Program Learning Outcome (PLO) Statement
1	**Computing Knowledge**	Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems.

	2	**Problem Analysis**	Identify, formulate, research literature, and analysis complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences
	3	**Design/Develop Solutions**	Design solutions for complex computing problems and design application, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
	4	**Investigation & Experimentaction**	Conduct investigation of complex computing problems using research based knowledge and research based methods
	5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modelling for complex computing problems.
	6	**Society Responsibility**	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems
	7	**Environment & Sustainability**	Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems
	8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice.
	9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
	10	**Communication**	Communicate effectively on complex computing activities with the computing community and with society at large.
	11	**Project Management & Finance**	Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member or a team.
	12	**Life Long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological

		C. Relation between CLOs and PLOs (CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)											
		PLOs											
		1	2	3	4	5	6	7	8	9	10	11	12
	1	✔					✔				✔		
	2		✔	✔	✔	✔							
	3			✔		✔							
	4												
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												

Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)

Week	Topics Covered	CLO
1	This lab introduces the foundational concepts of computer networks, including various network topologies, the OSI model, and the TCP/IP model. Students will familiarize themselves with basic network commands such as tracert and ipconfig. Additionally, the lab covers IP classful addressing (Classes A–E), identifying network and host addresses, and understanding the default subnet mask.	1
2	This lab introduces Cisco Packet Tracer, focusing on the configuration and simulation of network devices and hosts. Students will explore key concepts related to DHCP and perform hands-on exercises to build simple network setups.	
3	This lab focuses on the fundamentals of socket programming, enabling students	1

		to understand the principles of client-server communication. Through practical exercises, students will create basic socket-based applications to send and receive data over a network.	
	4	This lab introduces Wireshark, a powerful network analysis tool. Students will learn to capture and analyze network traffic, focusing on protocols such as HTTP, HTTPS, and DNS. The lab emphasizes practical skills in identifying key network interactions and packet details.	1
	5	This lab covers the fundamentals of application layer protocols, including FTP and SMTP. Students will also advance their skills in Wireshark by analyzing complex network traffic and gaining insights into higher-layer protocol behaviors.	1
SDN	6	This lab introduces NS3, a discrete-event network simulator. Students will explore its architecture and functionality, perform basic simulations, and analyze the results to understand network performance and behaviors in a simulated environment.	2,3
		Theory Mid-I Week	
	7	In this lab, students will learn to configure and use Telnet and SSH for remote network management. They will also explore the implementation of Access Control Lists (ACL) to control network traffic and enhance security.	2,3
		Lab Mid Term	
	8	This lab focuses on Network Address Translation (NAT) and introduces Software-Defined Networking (SDN) using Mininet. Students will gain hands-on experience in configuring NAT and simulating SDN environments.	1,2
		Theory Mid-II Week	
			2,3

	9	Building on the previous lab (Lab 08), this session delves deeper into Mininet by introducing the Overflow API. Students will learn to programmatically interact with and control Mininet simulations, enhancing their understanding of SDN.	
	10	This lab focuses on subnetting and introduces students to the concept of custom subnet masks. Through practical exercises, students will learn to calculate subnets, assign IP ranges, and optimize network design for efficiency.	2,3
	11	In this lab, students will explore dynamic routing protocols, including RIP, OSPF, and BGP. They will configure and analyze these protocols to understand their roles in managing and optimizing network routing.	2,3,4
	12	This lab introduces VLAN configurations and their applications in network segmentation. Students will also gain an overview of cloud networking concepts and explore IoT network setups, emphasizing integration and real-world applications.	2,3,4
		Lab Final Exam	

Laboratory Projects/Experiments Done in the Course					
Programming Assignments Done in the Course	Semester Assignments will target Network Application which uses cloud components to implement various domains.				**Problem An**
Class Time Spent on (in credit hours)	**Theory**	30%	60%	-	
		10%	30%	60%	