LAB Manual

Subject: CNL

Course Code	Course Name	Teaching Scheme (Hrs. / Week)	Credits	Examination scheme
310248	Computer Network Lab	2	1	TW: 25 Marks PR: 50 Marks

Course Objectives:

- To establish communication among the computing nodes in P2P and Client-Server Architecture.
- Configure the computing nodes with understanding of protocols and technologies.

- Use different communicating modes and standards for communication

- Use modern tools for network traffic analysis

- To learn network programming.

Course Outcomes:

CO1: Demonstrate LAN and WAN protocol behavior using Modern Tools.

CO2: Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.

CO3: Demonstrate basic configuration of switches and routers.

CO4: Develop Client-Server architectures and prototypes by the means of correct standards and Technology.

CO MAPPING

Sr. No	Title of experiment	CO Mapping
A1.	Study of Existing LAN: Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration of machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wire-shark Packet Analyzer Tool. Extend the same Assignment for Wireless using Access Point	CO2, CO1, CO3
A2.	Program for calculating CRC using Modulo-2 and Polynomial methods.	CO1
A3	Write a program in Java/Python to demonstrate sub netting and find the sub net masks.	CO3
A4	Installing and configure DHCP server and write a program (C++\Python\Java) to install the software on remote machine.	CO4, CO1
A5	Write a program in C/C++ using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.	CO4 CO2 CO1
A6	Write a program in C/C++ using TCP socket for wired network for following - Say Hello to Each other (For all students) - File transfer (For all students) - Calculator (Arithmetic) (50% students) - Calculator (Trigonometry) (50% students) Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.	CO4, CO2 CO1
A7.	Write a program in C/C++ to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3.TCP 4. UDP	CO2
A8.	Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.	CO2, CO3
B1	Study of any network simulation tools - To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1	CO1
B2	Use network simulator NS2 to implement: Monitoring traffic for the given topology, Analysis of CSMA and Ethernet protocols Network Routing: Shortest path routing, AODV. Analysis of congestion control (TCP and UDP).	CO1
B3	Configure RIP/OSPF/BGP using packet Tracer.	CO3
B4	Program using UDP sockets for wired network to implement Peer to Peer Chat and Multiuser Chat	CO4, CO2

CO310248.I: Demonstrate LAN and WAN protocol behavior using Modern Tools.

CO310248.II: Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.

CO310248.III: Demonstrate basic configuration of switches and routers.

CO310248.IV: Develop Client-Server architectures and prototypes by the means of correct standards and technology.

CO-PO Mapping:

CO	Program Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO3102485.I	M	L	M		M		L		M			M
CO310248.II	L	M			L			M				
CO310248.III	L		L	L	M			L				
CO310248.IV	M		M		L	M						M
Avg	M	M	M	L	M	M	L	M	M			M

Overall: M

CO – PSO mapping:

CO \ PSO	PSO I	PSO II
CO310245.I	M	M
CO310245.II	L	M
CO310245.III	--	–
CO310245.IV	M	L
Overall avg.	**M**	**M**

Assignment Measures:

Direct Measures	Unit test
	Class tutorial / assignments
Indirect Measures	Presentations
	Home Assignments
	Group Activity

ASSIGNMENT NO. A1

TITLE	LAN SET UP
PROBLEM STATEMENT /DEFINITION	**Part A:** Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration of machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wire-shark Packet Analyzer Tool. **Part B:** Extend the same Assignment for Wireless using Access Point
OBJECTIVE	• Understand Network types and design selection of case studies. • To provide hands on experience on tools techniques and technologies, related to LAN formation to complement core domain knowledge. • Understand straight and crossover connections. • Understand LAN Standards and crimping process to setup a LAN.
OUTCOME	• Design and configure a LAN with min 4 nodes.
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse, 8 port switch,RJ-45 connectors, crimping tool.
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 - 2
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	• AIM • Problem Definition • Objective: Intention behind study • Software & Hardware requirements • concept related theory • Experimental setup/Diagram/Algorithm • test cases • Conclusion

ASSIGNMENT NO. A2

TITLE	**IMPLEMENTATION OF HAMMING CODE AND CRC**
PROBLEM STATEMENT /DEFINITION	Write a program in C/C++ for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode. (50% students will perform Hamming Code and others will perform CRC)
OBJECTIVE	Understand and implement methods for error detection and correction.
OUTCOME	Ability to implement error detection and correction methods.
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++ Latest Open source update of Eclipse Programming frame work ,Wireshark
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A3

TITLE	SUBNETTING
PROBLEM STATEMENT /DEFINITION	Write a program in java/python to demonstrate sub netting and find the sub net masks.
OBJECTIVE	Learn and understand concept and purpose of subnetting . Decide a Network design criteria of an organization as per requirements and assign formation of the subnets.
OUTCOME	Demonstration of subnetting and subnet masks. Justify use of subnet masks
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A4

TITLE	INSTALLATION AND CONFIGURATION OF DHCP SERVER
PROBLEM STATEMENT /DEFINITION	Installing and configure DHCP server and write a program (C++\Python\Java) to install the software on remote machine.
OBJECTIVE	Understand working of DHCP protocol Learn installation and configuration steps of DHCP server Demonstrate Dynamic IP address assignment using DHCP
OUTCOME	Install DHCP client and server Demonstrate IP dynamic IP addressing
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A5

TITLE	FILE TRANSFER USING UDP SOCKETS
PROBLEM STATEMENT /DEFINITION	Write a program in C/C++ using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
OBJECTIVE	To understand basics of Socket Programming. understand, design and implement Connection less client server services using UDP protocol.
OUTCOME	Design and develop client server application using UDP sockets.
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 http://beej.us/guide/bgnet/output/print/bgnet_A4.pdf Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A6

TITLE	**FILE TRANSFER AND COMMUNICTION USING TCP SOCKETS**
PROBLEM STATEMENT /DEFINITION	Write a program in C/C++ using TCP socket for wired network for following Say Hello to Each other (For all students) File transfer (For all students) Calculator (Arithmetic) (50% students) Calculator (Trigonometry) (50% students) Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
OBJECTIVE	To understand basics of Socket Programming. understand, design and implement Connection oriented client server services using TCP protocol.
OUTCOME	Design and develop client server application using TCP sockets.
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 http://beej.us/guide/bgnet/output/print/bgnet_A4.pdf Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A7

TITLE	**ANALYSIS OF ETHERNET,IP,TCP,UDP PACKET FORMATS**
PROBLEM STATEMENT /DEFINITION	Write a program in C/C++ to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3.TCP 4. UDP
OBJECTIVE	Analysis of Ethernet,TCP,UDP and IP packet format
OUTCOME	Demonstrate various fields in header structure of TCP/IP/UDP and Ethernet packets
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 http://beej.us/guide/bgnet/output/print/bgnet_A4.pdf Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. A8

TITLE	**STUDY BEHAVIOUR OF DNS LOOKUP**
PROBLEM STATEMENT /DEFINITION	Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.
OBJECTIVE	Learn and understand behavior of DNS implementation to find the appropriate path from URL to IP address
OUTCOME	Demonstration of DNS lookup
S/W PACKAGES AND H/W APPARATUS USED	PC with the configuration as Pentium IV 1.7 GHz. 128M.B RAM, 40 G.B HDD, 15''Color Monitor, Keyboard, Mouse. Operating Systems (64-Bit)64-BIT Fedora 20 or latest 64-BIT Update of Equivalent Open source OS Programming Tools (64-Bit) GCC/G++
REFERENCES	Mansfield K., Antonakos J., "An Introduction to Computer Networking", Perason Education, 2002, ISBN 81 - 7808 - 828 – 2 Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7
STEPS	Refer to student activity flowchart
INSTRUCTIONS FOR WRITING JOURNAL	- AIM - Problem Definition - Objective: Intention behind study - Software & Hardware requirements - concept related theory - Experimental setup/Diagram/Algorithm - test cases - Conclusion

ASSIGNMENT NO. B1

TITLE	TRAFFIC SIMULATION BETWEEN 3 NODES
PROBLEM STATEMENT /DEFINITION	Study of any network simulation tools - To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1
OBJECTIVE	To learn installation and configuration of network simulation tool ns2 Learn and implement FTP communication using ns-2 Learn communication between 2 nodes via a third node using sockets in ns-2
OUTCOME	Demonstration of FTP traffic flow from source to destination via an intermediate node.
S/W PACKAGES AND HARDWARE APPARATUS USED	Operating Systems (64-Bit)64-BIT Fedora 17 or latest 64-BIT Update of Equivalent Open source OS or latest 64-BIT Version and Simulation tool NS-2.35(latest) ,Waf,GNUPlot(Latest).GTK+
REFERENCES	http://www.nsnam.org
INSTRUCTIONS FOR WRITING JOURNAL	- Date - Assignment no. - Problem definition - Learning objective - Learning Outcome - Related Mathematics - Class Diagram - Concepts related Theory - Program code with proper documentation. - Output of program. - Conclusion and applications (the verification and testing of outcomes).

ASSIGNMENT NO. B2

TITLE	IMPLEMENTATION AND ANALYSIS OF CSMA AND ETHERNET PROTOCOLS,ROUTING AND CONGESTION CONTROL USING NS2
PROBLEM STATEMENT /DEFINITION	Use network simulator NS2 to implement: Monitoring traffic for the given topology Analysis of CSMA and Ethernet protocols Network Routing: Shortest path routing, AODV. Analysis of congestion control (TCP and UDP).
OBJECTIVE	To learn installation and configuration of ns-2 Learn and implement Ethernet,Csma and routing protocols using ns-2 Analyze congestion control in TCP and UDP
S/W PACKAGES AND HARDWARE APPARATUS USED	Operating Systems (64-Bit)64-BIT Fedora 17 or latest 64-BIT Update of Equivalent Open source OS or latest 64-BIT Version and 2. Simulation tool NS-3.17(latest) ,Waf,GNUPlot(Latest). GTK+
REFERENCES	http://www.nsnam.org
INSTRUCTIONS FOR WRITING JOURNAL	- Date - Assignment no. - Problem definition - Learning objective - Learning Outcome - Related Mathematics - Class Diagram - Concepts related Theory - Program code with proper documentation. - Output of program. - Conclusion and applications (the verification and testing of outcomes).

ASSIGNMENT NO. B3

TITLE	**CONFIGURE RIP/OSPF/BGP USING PACKET TRACER.**
PROBLEM STATEMENT /DEFINITION	configure RIP/OSPF/BGP Using packet tracer.
OBJECTIVE	Learn and understand steps for Configuration of RIP/BGP/OSPF using packet tracer
S/W PACKAGES AND HARDWARE APPARATUS USED	Operating Systems (64-Bit)64-BIT Fedora 17 or latest 64-BIT Update of Equivalent Open source OS or latest 64-BIT Version and 2. Simulation tool NS-3.17(latest) ,Waf,GNUPlot(Latest). GTK+
REFERENCES	https://www.itechtics.com/cisco-packer-tracer-6-3-offline-installer-link/
INSTRUCTIONS FOR WRITING JOURNAL	• Date • Assignment no. • Problem definition • Learning objective • Learning Outcome • Related Mathematics • Class Diagram • Concepts related Theory • Program code with proper documentation. • Output of program. • Conclusion and applications (the verification and testing of outcomes).

ASSIGNMENT NO. B4

TITLE	**IMPLEMENTATION OF PEER TO PEER AND MULTIUSER CHAT**
PROBLEM STATEMENT /DEFINITION	Write a program using UDP sockets for wired network to implement a. Peer to Peer Chat b. Multi user Chat Demonstrate the packets captured traces using Wire shark Packet Analyzer Tool for peer to peer mode
OBJECTIVE	Design and implement peer to peer chart and multi user chat application
S/W PACKAGES AND HARDWARE APPARATUS USED	Operating Systems (64-Bit)64-BIT Fedora 17 or latest 64-BIT Update of Equivalent Open source OS or latest 64-BIT Version and 2. Simulation tool NS-3.17(latest) ,Waf,GNUPlot(Latest). GTK+
REFERENCES	http://www.nsnam.org
INSTRUCTIONS FOR WRITING JOURNAL	- Date - Assignment no. - Problem definition - Learning objective - Learning Outcome - Related Mathematics - Class Diagram - Concepts related Theory - Program code with proper documentation. - Output of program. - Conclusion and applications (the verification and testing of outcomes).