Computer Network **Lab**

(PCC-CS692)

Laboratory Instructor's Manual

Last Revised

July, 2022

Dept. of CSE
Techno Main, Salt Lake

GENERAL INSTRUCTIONS FOR STUDENTS

1. Do not enter the Laboratory without prior permission.
2. Switch off your mobile phones during Lab class and maintainsilence.
3. Save your files only on the specific destination folders as instructed.
4. Do not play games, watch movies, chat or listen to music during the class.
5. Do not change desktop setting, screen saver or any other systemsettings.
6. Do not use any external storage device without prior permission.
7. Do not install any software without prior permission.
8. Do not browse any restricted, illegal or spamsites.

GENERAL ADDRESS FOR LABORATORY TEACHERS

1. Submission of documented lab reports related to completed lab assignments should be done during the following lab session.
2. The promptness of submission should be encouraged by way of marking and evaluation patterns as reflected in the lab rubric which eventually will benefit the students**.**

Program Outcomes (PO)

PO1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural and engineering sciences.

PO3. **Design/Development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety and the cultural societal and environmental considerations.

PO4. **Conduct investigations of complex problems:** Use research based knowledge including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PO10. **Communications:** Communicate effectively with the engineering community and with the society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.

PO11. **Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Abilityto develop the solutions for scientific, analytical and research-oriented problems in the area of Computer Science and Engineering.

PSO2: Ability to apply suitable programming skills integrated with professional competence to develop applications catering to the industrial and societal needs in the field of Computer Science and Engineering and its allied areas.

NAME OF THE PROGRAM: *CSE*	**DEGREE:** *B.Tech*
COURSE NAME: *Network Lab*	**SEMESTER:** *6th*
COURSE CODE: *CS692*	**COURSE CREDIT:** *2*
COURSE TYPE: *LAB*	**CONTACT HOURS:** *3P*

SYLLABUS

1. IPC (Message queue)
2. NIC Installation & Configuration (Windows/Linux)
3. Familiarization with
    a. Networking cables (CAT5, UTP)
    b. Connectors (RJ45, T-connector)
    c. Hubs, Switches
4. TCP/UDP Socket Programming
5. Multicast & Broadcast Sockets
6. Implementation of a Prototype Multithreaded Server
7. Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
8. Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
9. Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

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Course Outcomes (COs)

CO-1: **Build** client-server applications based on various advanced IPC mechanisms and several transport layer protocols for Internetworking communication.

CO-2: **Develop** applications to simulate the behavioral principles of several Data-link layer protocols.

CO-3: **Experiment with** physical connection of computer systems and different networking tools and commands for analyzing the network traffic for few transport layer and application layer protocols.

CO-4: Prepare well documented report with appropriate test-cases on the experiments performed by working as an individual or in a team.

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Exp. No.	List of Experiments	CO Mapping	PO/ PSO Mapping	Week No.
1.	a) Take a decimal number from user. Convert it to different bases (e.g.: 2,8,16 etc.) and send those values to message queue. Write three separate programs to read and display the binary, octal and hex value from the message queue distinctively. b) Create a message queue. One process will take name and roll number of 'N' students and send those to message queue. Second process will read the names, sort those and send back to message queue; third process will do the same on roll numbers. Then first process will read the entire data and print.	**CO1, CO4**	**PO1,PO2, PO3, , PO5 PSO1,PSO2**	**Week 1**
2.	Write C Programs to implement a simple client-server application using Unix File socket. The client will take a bit-stream from the user and send it to server. The server will add a parity bit to it and send the modified bit-stream to the corresponding client. The client will print the result.	**CO1, CO4**	**PO1,PO2, PO3, PO5 PSO1,PSO2**	**Week 2**
3.	Write C Programs to implement a simple client-server application. The client will take a data word and divisor from the user and send them to server. The server will find out the codeword using CRC and return it back to the client. Use Unix File socket for communication.	**CO1, CO2, CO4**	**PO1,PO2, PO3, PO5 PSO1,PSO2**	**Week 3**
4.	a) CAT-5/CAT-6 cable preparation with RJ-45 connector; both straight and cross cabling. b) IP address configuration (both Static and DHCP) on Linux and Windows systems. c) Introduction to important network related tools and commands, e.g. ifconfig, ip, hostname, ping, netstat, route, tcpdump, Wireshark, etc.	**CO3, CO4**	**PO1, PO5 PSO2**	**Week 4**
5.	Write C programs to implement TCP Socket. The client will take a bit-stream from the user and send it to the server. The server will implement bit stuffing and send the stream back to the client. The client will print it.	**CO1, CO2, CO4**	**PO1,PO3,PO5 PSO1,PSO2**	**Week 5**
6.	Create a multi-client TCP server. A client will send an IPv4 address (a.b.c.d) to the server. The server will verify whether the address is valid or not and send back 'YES' or 'NO' as a result to the client.	**CO1, CO4**	**PO1,PO2, PO5 PSO1,PSO2**	**Week 6**
7.	Write client-server programs using UDP socket. The client will take a data word from the user and send it to the server. The server will find the codeword (use Hamming code error correction technique) and send it back to the client.	**CO1, CO2, CO4**	**PO1,PO2, PO3, PO5 PSO1,PSO2**	**Week 7**

8.	Write C programs to implement a simple chat server (single client, single server) by using UDP Socket.	**CO1, CO4**	**PO1,PO3, PO5 PSO1,PSO2**	**Week 8**
9.	Write C programs to implement group chat using multicast UDP socket.	**CO1, CO4**	**PO1,PO3, PO4, PO5, PO9 PSO1,PSO2**	**Week 9**
10.	Write two programs one for the sender and another for the receiver, where the sender will broadcast a message taken as user input and all the receivers (at least three) will print the received message. This will continue forever until the user enters "QUIT" at the sender.	**CO1, CO4**	**PO1,PO3, PO5 PSO1,PSO2**	**Week 10**
11.	Demonstrate data transmission using FTP and HTTP protocols and analyze the network traffic through Wireshark or tcpdump.	**CO3, CO4**	**PO1,PO3, PO5, PO9 PSO2**	**Week 11**
12.	Simulate Data Link Layer flow control mechanism (Stop & Wait ARQ) using TCP Socket.	**CO1, CO2, CO4**	**PO1,PO3, PO4, PO5 PSO1,PSO2**	**Week 12**

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Rubrics for Lab

Criteria / Score	Excellent (10-8)	Good (7-6)	Average (5-4)	Poor (3-1)	CO Mapping	PO/PSO Mapping
Lab Participation (Following Procedure + Lab Techniques+ Subject Knowledge + Contribution)	Student demonstrates an accurate understanding of the lab assignments. The student can correctly answer questions and if appropriate, can explain concepts to fellow classmates. Student is eager to develop new ideas and assists when needed.	Student arrives on time to lab, but may be underprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped. Able to follow the instruction and somehow managed to execute the program.	Student unpreparedness makes it impossible to fully participate. If able to participate, student has difficulty explaining key lab concepts.	There was no attempt to make prior arrangements to make up the lab. Attendance is not regular. Not able to run the program even after getting help from the peers.	**CO5**	**PO1/PO2/PO3, PSO1**
Interaction with Group (Team work)	Very good participation with a good leadership quality; is respectful of others and their point of view; makes sure that everyone gets a turn; conscious of time	Good participation; appears interested; enthusiastic but talks over teammates; try to help group complete tasks; somewhat conscious of time	Minimal participation; shows little interest; doesn't pay attention to other group members; may argue to get point across; helps group only when asked; little emphasis on time	No participation; sits on the sidelines with no interaction; disinterested; no stake in time management	**CO5**	**PO9**

Criteria / Score	Excellent (10-8)	Good (7-6)	Average (5-4)	Poor (3-1)	CO Mapping	PO/PSO Mapping
Execution and Debugging (Modern tool usage)	Follow the logical ideas; can develop suitable program from specific algorithm; debug the program with proficiency; Able to check the reliability	Can develop suitable program from specific algorithm with the help of the instructor; debug the program with proficiency; Able to check the reliability	Can develop suitable program from specific algorithm with the help of the instructor; debug the program with the help of technical assistant; Not able to check the reliability.	Not be able to develop suitable program from specific algorithm; need assistance to debug the program. Not able to check the reliability	**CO1, CO2, CO3, CO4, CO5**	**PO5 PSO1, PSO2**
Lab Report	Student demonstrates an accurate understanding of the lab concepts. Questions are answered completely and correctly. Output of each program is neat, creative and includes complete titles. Errors, if any are minimal	Student has a basic knowledge of content, but may lack some understanding of some concepts. Questions are answered fairly well and/or output could have been done more neatly, accurately or with more complete information	Student has problems with both the output and the answers. Student appears to have not fully grasped the lab content and the code possess multiple errors	Student turns in lab report late or the report is so incomplete and/or so inaccurate that it is unacceptable.	**CO5**	**PO10**