

Savitribai Phule Pune University
Third Year of Computer Engineering (2015 Course)
310248: Computer Networks Lab

Teaching Scheme: PR: 02 Hours/Week	Credit 01	Examination Scheme: TW: 25 Marks PR: 50 Marks
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Companion Course: 310245 Computer Networks (CN)

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:

On completion of the course, student will be able to—

- Demonstrate LAN and WAN protocol behavior using Modern Tools.
- Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
- Demonstrate basic configuration of switches and routers.
- Develop Client-Server architectures and prototypes by the means of correct standards and technology.

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student's for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of Hungarian notation, proper indentation and comments. Use of open source software is to be encouraged.

In addition to these, instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.

Set of suggested assignment list is provided in groups- A and B. Each student must perform at least 8 assignments (4-Mandatory plus 4 from remaining 8 assignments) from group A and 4 from group B (2-Mandatory plus 2 from remaining 5 assignments).

Operating System recommended :- 64-bit Open source Linux or its derivative

Programming tools recommended: - Open Source C,C++, JAVA, PYTHON,
Programming tool like G++/GCC, Wireshark, Etheral and Packet Tracer

Books:

References:

1. Thomas D. Nadean and Ken Gray, –Software Defined Networks”, O'REILLY, ISBN: 13:978-93-5110-264-9
2. Robert Faludi, –Building Wireless Sensor Networks”, O'REILLY, ISBN: 13:978-93-5023-289-7

Suggested List of Laboratory Assignments

Group A

All assignments should be implemented using Open Source Linux flavors, Open Source Tools: Wireshark and Packet Tracer and C/C++, JAVA, PYTHON.

1. **Lab Assignment on Unit I: (Mandatory Assignment)**
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 machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wireshark Packet Analyzer Tool.
Part B: Extend the same Assignment for Wireless using Access Point
2. **Lab Assignment on Unit II: (Use C/C++)**
Write a Program with following four options to transfer-
a. Characters separated by space b. One Strings at a time
b. One Sentence at a time c. file
between two RS 232D or USB ports using C/C++. (To demonstrate Framing, Flow control, Error control).

3.	Lab Assignment on Unit II: (Use C/C++) Write a program 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)
4.	Lab Assignment on Unit II: (Use JAVA/PYTHON) Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode and demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
5.	Lab Assignment on Unit IV: (Use JAVA/PYTHON) Write a program to demonstrate subnetting and find the subnet masks.
6.	Lab Assignment on Unit IV: (Use JAVA/PYTHON) Write a program to simulate the behavior of link state routing protocol to find suitable path for transmission.
7.	Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++) Write a program using TCP socket for wired network for following <ul style="list-style-type: none"> a. Say Hello to Each other (For all students) b. File transfer (For all students) c. Calculator (Arithmetic) (50% students) d. Calculator (Trigonometry) (50% students) Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
8.	Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++) Write a program 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.
9.	Lab Assignment on Unit V: (Mandatory Assignment) (Use C/C++) Write a program to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3. TCP 4. UDP
10.	Write a program to simulate the behavior of Slow Start and AIMD (Additive Increase and Multiplicative Decrease) congestion control protocols. (Use JAVA/PYTHON)
11.	Lab Assignment on Unit VI: (Use JAVA/PYTHON) Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.
12.	Lab Assignment on Unit VI: Installing and configure DHCP server and write a program to install the software on remote machine.
Group B	
1.	Lab Assignment on Unit II: (Use JAVA/PYTHON) Write a Program to transfer- By using Bluetooth <ul style="list-style-type: none"> a. Characters separated by space b. One Strings at a time c. One Sentence at a time d. File
2.	Lab Assignment on Unit IV: (Use JAVA/PYTHON) 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
3.	Lab Assignment on Unit V: (Use JAVA/PYTHON) Write a program using TCP sockets for wired network to implement <ul style="list-style-type: none"> a. Peer to Peer Chat b. Multiuser Chat

	Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
4.	Lab Assignment on Unit V: (Use JAVA/PYTHON) Write a program using UDP sockets for wired network to implement <ol style="list-style-type: none">Peer to Peer ChatMultiuser Chat Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
5.	Lab Assignment on Unit V: (Use JAVA/PYTHON) Write a program to prepare TCP and UDP packets using header files and send the packets to destination machine in peer to peer mode. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.
6.	Lab Assignment on Unit IV and Unit V: (Mandatory Assignment) Use network simulator NS2 to implement: <ol style="list-style-type: none">Monitoring traffic for the given topologyAnalysis of CSMA and Ethernet protocolsNetwork Routing: Shortest path routing, AODV.Analysis of congestion control (TCP and UDP).
7.	Lab Assignment on Unit IV: (Mandatory Assignment) Configure RIP/OSPF/BGP using packet Tracer.