

Pokhara University
Bachelor of Engineering in Information Technology

Year III Semester VI

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	CMP 241	Computer Graphics			3	3	1	2
2	CMP 335	Computer Networks			3	3	0	2
3	CMP 456	Intelligent Systems			3	3	0	2
4	CMP 481	Information Systems			3	3	0	2
5	CMP 321	Object Oriented Design and Modeling through UML			3	3	1	3
6	CMP 390	Project II			2	0	0	4

Computer Networks (3 – 0 - 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

This course provides the overall communication infrastructure including wired and wireless Media for computer networking, models of network. It also highlights the operation of layer-wise network communication, different addressing mechanisms, routing algorithms, security in the computer network and overview of server configuration for complete networking systems.

Course Contents:

- 1. Introduction to Computer Network** **3 hrs**
 - 1.1. Definition, merits, Demerits
 - 1.2. Network Models
 - 1.2.1. PAN, LAN, Campus Area Network (CAN), MAN, Country Area Network (CAN*), WAN, GAN.
 - 1.2.2. Topological Models (star, bus, distributed bus, mesh, tree, hybrid, ring)
 - 1.2.3. Client/Server, Peer-to-Peer & Active Network Model
- 2. Reference Model** **4 hrs**
 - 2.1. Protocols and Standards
 - 2.2. Interfaces and Services
 - 2.3. OSI Layers
 - 2.4. TCP/IP layers
 - 2.5. Comparison of OSI & TCP/IP
 - 2.6. Networking hardware: NIC, Hub, Repeater, Switches, Bridge, Router
- 3. Physical Layer** **4 hrs**
 - 3.1. Guided Media: Copper, Fiber cabling and its capacity standards
 - 3.2. Unguided Media: Bluetooth, Wi-Fi/Wireless-LAN, Satellite Communication Basics (Micro waves, Radio waves)
 - 3.3. Circuit/packet/message switching
 - 3.4. ISDN Signaling & Architecture
 - 3.5. Network Performance: Bandwidth, Throughput, Latency, Bandwidth-Delay Product, Jitter
- 4. Data Link Layer** **8 hrs**
 - 4.1. LLC and MAC sub-layer overview
 - 4.2. Physical (MAC) addressing overview
 - 4.3. Framing
 - 4.4. Flow control (stop and wait, go-back-N, selective-repeat-request)
 - 4.5. Error Control Mechanisms
 - 4.5.1. Error Detection: Parity Check, CRC

4.5.2. Error Correction: Hamming code	
4.6. Channel Access	
4.6.1. ALOHA Systems	
4.6.2. CSMA, CSMA/CD	
4.7. 802.3 Ethernet, Fast Ethernet, Gigabit Ethernet	
4.8. 802.4 Token Bus, 802.5 Token Ring	
4.9. Virtual Circuit Switching: Frame Relay, ATM & X.25	
5. Network/Internet Layer Protocols and Addressing	8 hrs
5.1. Logical addressing	
5.1.1. IPv4 addressing, subnetting, supernetting, CIDR, VLSM	
5.1.2. IPv6 addressing overview	
5.1.3. IPv4 and IPv6 header protocol format	
5.1.4. IPv4 & IPv6 feature comparison	
5.2. Routing Algorithm overview	
5.2.1. Classful and Classless Routing	
5.2.2. Adaptive and non-adaptive routing	
5.2.3. Distance vector and link-state routing	
5.2.4. Interior and exterior routing	
5.2.5. Unicast & multicast routing	
5.2.6. Routing Algorithms: RIP, OSPF, BGP	
6. Transport Layer and protocols	4 hrs
6.1. Port addressing overview	
6.2. Process to process delivery: multiplexing and de-multiplexing	
6.3. TCP services, features, segment headers, well known ports & Handshaking	
6.4. UDP Services, features, segment Headers, well known ports	
6.5. Concept of Socket programming: TCP & UDP socket	
7. Congestion Control & Quality of services	3 hrs
7.1. Congestion Control: Open loop and Closed Loop	
7.2. Traffic Shaping (leaky bucket and token bucket)	
7.3. TCP congestion control	
8. Application Layer, Servers & Protocols	5 hrs
8.1. Domain addressing, DNS server & Queries	
8.2. HTTP, FTP & proxy server overview.	
8.3. DHCP principles.	
8.4. E-mail server Protocol: SMTP, POP, IMAP	
9. Network management and Security	6 hrs
9.1. Introduction to Network management.	
9.2. SNMP	
9.3. Principles of cryptography (Symmetric key: DES, Asymmetric key: RSA)	
9.4. Key Exchange Protocols (Diffie-Hallman, Kerberos)	
9.5. VPN	
9.6. Overview of IPSEC	
9.7. Firewall & its types	

Laboratory Work:

1. Network commands testing: ping-pong, netstat, nslookup, ipconfig/ifconfig, tracert/traceroute...
2. Setting up Client/Server network system in Microsoft and Linux environment
3. UTP CAT6 cabling: Straight and Cross wiring, testing and verification
4. Internet Packet header analysis using TCPDUMP/WIRESHAK
5. Router Configuration, use of packet tracer or other simulator software
6. OSPF configuration & practices
7. Web, Proxy, FTP server configuration
8. Implementation of Router ACL, Proxy Firewall, IPTables.
9. Case Study: Network Design Standards (eg: building Network design with servers including NCR)

Text Book:

Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, Tata McGraw Hill.

References:

1. A.S. Tanenbaum, "Computer Networks", 3rd Edition, Prentice Hall India, 1997.
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.
3. Kurose Ross : Computer Networking: A top down approach, 2nd Edition, Pearson Education