

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI**  
**B.E: Electronics & Communication Engineering / B.E: Electronics & Telecommunication Engineering**  
**NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**  
**(Effective from the academic year 2021 – 22)**

**V Semester**

Computer Communication Networks			
Course Code	21EC53	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

**Course objectives:** This course will enable students to:

1. Understand the layering architecture of OSI reference model and TCP/IP protocol suite.
2. Understand the protocols associated with each layer.
3. Learn the different networking architectures and their representations.
4. Learn the functions and services associated with each layer.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L): the traditional lecture method, or a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various concepts in networking.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Demonstrate implementation of various protocols to help better understand the functioning of various concepts in networking.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

**Introduction:** Data communication: Components, Data representation, Data flow, Networks: Network criteria, Physical Structures, Network types: LAN, WAN, Switching, The Internet. (1.1,1.2, 1.3 (1.3.1 to 1.3.4 of Text)).

**Network Models:** TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP. (2.2, 2.3 of Text)

**Data-Link Layer:** Introduction: Nodes and Links, Services, Two Categories' of link, Sublayers, Link Layer addressing: Types of addresses, ARP (9.1, 9.2 (9.2.1, 9.2.2))

<b>Teaching-Learning Process</b>	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation of OSI and TCP-IP protocol suites, Example of ARP and RARP. <b>Self-Study:</b> Internet standards and administration, <b>RBT Level:</b> L1, L2, L3
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**Module-2**

Data Link Control (DLC) services: Framing, Flow and Error Control. (11.1 of Text)

Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. (12.1 of Text).

**Connecting Devices:** Hubs, Switches, Virtual LANs: Membership, Configuration, Communication between Switches, Advantages. (17.1,17.2 of text)

**Wired and Wireless LANs:** Ethernet Protocol, Standard Ethernet. (13.1, 13.2 (13.2.1 to 13.2.5 of Text))



Introduction to wireless LAN: Architectural Comparison, Characteristics, Access Control. (15.1 of Text)	
<b>Teaching-Learning Process</b>	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animations showing Framing, CSMA, Connecting devices, Problems on ALOHA, CSMA, Framing and Standard ethernet. <b>Self-Study:</b> Fast Ethernet, Gigabit ethernet & IEEE802.11 wireless LANs <b>RBT Level:</b> L1, L2, L3
<b>Module-3</b>	
<b>Network Layer:</b> Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution (18.1(excluding 18.1.3), 18.2, 18.4 of Text) <b>Network Layer Protocols:</b> Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPV4 Datagrams. (19.1of Text), IPV6 addressing and Protocol (22.1 and 22.2). <b>Unicast Routing:</b> Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing. (20.1, 20.2 of Text)	
<b>Teaching-Learning Process</b>	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation of DHCP, routing protocols, Numericals on Addressing, <b>Self-Study:</b> Network Layer performance, RIP, OSPF <b>RBT Level:</b> L1, L2, L3
<b>Module-4</b>	
<b>Transport Layer:</b> Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go-BackN Protocol, Selective repeat protocol, Piggybacking (23.1, 23.2.1, 23.2.2, 23.2.3, 23.2.4, 23.2.5 of Text) <b>Transport-Layer Protocols in the Internet:</b> User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control L1, L2, L3 Protocol: TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Error control, TCP congestion control. (24.2, 24.3.1, 24.3.2, 24.3.3, 24.3.4, 24.3.6, 24.3.8, 24.3.9 of Text) <b>*Note: Exclude FSMs for CIE and SEE</b>	
<b>Teaching-Learning Process</b>	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation/Implementation of Flow control protocols and TCP using simulators, <b>Self-Study:</b> Flow Control in TCP <b>RBT Level:</b> L1, L2, L3
<b>Module-5</b>	
<b>Application Layer:</b> Introduction: providing services, Application- layer paradigms, Standard Client - Server Protocols: Hyper Text Transfer Protocol, FTP: Two connections, Control Connection, Data Connection, Electronic Mail: Architecture, Domain Name system: Name space, DNS in internet, Resolution, DNS Messages, Registrars, DDNS, security of DNS. (25.1, 26.1.2, 26.2, 26.3, 26.6 of Text) Quality of Service (30.1, 30.2.) Network Security (31.1)	
<b>Teaching-Learning Process</b>	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation/Implementation of HTTP, FTP, DNS using network simulators, <b>Self Study:</b> WWW, TELNET <b>RBT Level:</b> L1, L2, L3
<b>Course outcomes (Course Skill Set)</b> At the end of the course the student will be able to: <ol style="list-style-type: none"> <li>1. Understand the concepts of networking thoroughly.</li> <li>2. Identify the protocols and services of different layers.</li> <li>3. Distinguish the basic network configurations and standards associated with each network.</li> <li>4. Discuss and analyse the various applications that can be implemented on networks.</li> </ol>	
<b>Assessment Details (both CIE and SEE)</b> The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end	



examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

### Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

6. At the end of the 13<sup>th</sup> week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

### Suggested Learning Resources:

#### Text Books:

Forouzan, "Data Communications and Networking", 5<sup>th</sup> Edition, McGraw Hill, 2013, ISBN: 1-25-906475-3.

#### Reference Books:

1. James J Kurose, Keith W Ross, "Computer Networks", Pearson Education.
2. Wayne Tomasi, "Introduction to Data Communication and Networking", Pearson India, 1<sup>st</sup> edition.
3. Andrew Tannenbaum, "Computer Networks", Prentice Hall.
4. William Stallings, "Data and Computer Communications", Prentice Hall.

### Web links and Video Lectures (e-Resources)

- <https://nptel.ac.in/courses/106105183>.
- TCP/IP Tutorial and Technical Overview, (IBM Redbook) - Download From <http://www.redbooks.ibm.com/abstracts/gg243376.html>
- TCP/IP Guide, Charles M Kozierok, Available Online - <http://www.tcpipguide.com/>
- Request for Comments (RFC) - IETF - <http://www.ietf.org/rfc.html>
- <https://cosmolearning.org/courses/computer-networks-524/video-lectures/>
- [https://www.eecis.udel.edu/~bohacek/videoLectures/ComputerNetworking/ComputerNetworking\\_v2.html](https://www.eecis.udel.edu/~bohacek/videoLectures/ComputerNetworking/ComputerNetworking_v2.html)

### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Implementation of simple networks and various networking protocols and algorithms using simulators like NCTUns / CISCO packet tracer and measurement of various parameters using WireShark
- Implementation of simple networks and various networking protocols and algorithms in C/C++/Python

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