



---

**SCHOOL OF COMPUTER ENGINEERING**  
**KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)**  
(Deemed to be University, u/s 3 of UGC Act 1956)

---

**Subject: Computer Networks (5<sup>th</sup> Semester)**

**Subject code: CS-30003**

**Academic Session: Autumn Sem. 2024**

**Contact hours per week:**  
3 hours (LTP: 3-0-0)

**Course coordinator:** Prof. Niranjana Kumar Ray

**Syllabus:**

**UNIT I**

**Data Communications:**

Data Transmission, Multiplexing, Data Encoding Techniques, Introduction to computer networks, Network, Topologies, Reference Models: ISO/OSI Model and TCP/IP Model.

**UNIT II**

**Physical Layer:**

Transmission Media, Analog signals, Digital Signals, Data Link Layer, Error Detection and Correction, Parity, LRC, CRC, Hamming Code, Flow Control and Error Control, Stop and wait, ARQ, Sliding window – IEEE, Ethernet.

**UNIT III**

**Network Layer:**

Packet Switching and Circuit Switching, IP addressing methods, Subnetting, Super netting, Routing Protocols: IP, ARP, RARP, DHCP, Routing Algorithms: Distance Vector Routing, Link State Routing.

**UNIT IV**

**Transport Layer:**

Transport Services, UDP, TCP, Congestion Control, Quality of Services (QOS).

**UNIT V**

**Application Layer:**

Domain Name Space (DNS), Electronic Mail, HTTP, WWW.

**Course Outcome:**

Upon completion of this course, the students will be able to:

CO1: Use of different models for study of computer networks

CO2: Identify the components required to build different types of networks

CO3: Choose the required functionality at each layer for given application

CO4: Identify solution for each functionality at each layer

CO5: Trace the flow of information from one node to another node in the network

CO6: Build networking solutions using the concepts of world wide web and electronic mail technologies

**Course Coverage and Delivery plan:**

| <b>Unit Name and<br/>SDG Mapping</b>           | <b>Topics/Coverage</b>  | <b>No. of<br/>lectures</b> | <b>Lectures<br/>serial nos.</b> |
|--|---|----------------------------|---------------------------------|
| <b>Data<br/>Communications<br/>(SDG: 09)</b>   | <ul style="list-style-type: none"><li>• Introduction to Computer Networks</li><li>• Analog signals and Digital Signals</li><li>• Data Transmission and Multiplexing</li><li>• Data Encoding Techniques</li><li>• Packet Switching and Circuit Switching</li><li>• Network Topologies</li><li>• Reference Models: ISO/OSI Model and TCP/IP Model.</li></ul>  | <b>6</b>                   | <b>1-6</b>                      |
| <b>Application<br/>Layer<br/>(SDG: 08, 11)</b> | <ul style="list-style-type: none"><li>• Domain Name Space (DNS)</li><li>• Electronic Mail</li><li>• HTTP</li><li>• Delay and throughput in Packet-switched Network</li></ul>  | <b>5</b>                   | <b>7-11</b>                     |
| <b>Transport<br/>Layer<br/>(SDG: 09, 11)</b>   | <ul style="list-style-type: none"><li>• Introduction to Transport Layer</li><li>• Transport Layer Services</li><li>• Multiplexing and de-multiplexing</li><li>• Flow Control in Transport Layer<ul style="list-style-type: none"><li>-Stop-and-wait</li><li>-Go-back-N</li><li>-Selective-Repeat</li></ul></li><li>• UDP: Services and Applications, Segment format</li><li>• TCP: Services<ul style="list-style-type: none"><li>-Segment format</li><li>-TCP Connection management</li><li>-State Transition Diagram</li><li>-Windows in TCP</li><li>-Flow Control</li><li>-Congestion Control (Slow start, congestion avoidance, and fast recovery)</li></ul></li><li>• Quality of Services (QOS)</li></ul> | <b>12</b>                  | <b>12-23</b>                    |
| <b>Network Layer<br/>(SDG: 09, 11)</b>         | <ul style="list-style-type: none"><li>• Introduction to Network Layer services</li><li>• IPv4 datagram format</li><li>• DHCP</li><li>• ICMP</li><li>• NAT</li><li>• Routing Algorithms: Link state, Distance vector, Path vector</li><li>• Routing Protocols: OSPF, RIP</li><li>• IP addressing methods</li><li>• Subnetting &amp; Super netting</li><li>• Protocols: IP, ARP, RARP, DHCP</li></ul>   | <b>12</b>                  | <b>24-35</b>                    |
| <b>Physical Layer<br/>(SDG: 11, 12)</b>        | <ul style="list-style-type: none"><li>• Transmission Media</li><li>• Data Link Layer</li><li>• Error, Detection and Correction methods (Parity, LRC, CRC, Hamming Code)</li><li>• Ethernet Frame format</li></ul>   | <b>5</b>                   | <b>36-40</b>                    |

**Text Book:**

Data Communications and Networking with TCPIP Protocol Suite, 6th Edition,  
Behrouz A. Forouzan (ISBN: 9789355320940)

**Reference Book:**

1. W. Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2018.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Sixth Edition, Morgan Kaufmann Publishers, 2011.
3. Nader. F. Mir, "Computer and Communication Networks", First Edition, Pearson Publisher 2007

**Scheme of Evaluation:**

Full marks for the Computer Networks theory is 100, which is divided into the following components.

- Internal Assessment (30 Marks)
- Mid Semester (20 Marks)
- End Semester (50 Marks)

**Activity Details and Schedule: (May vary)**

| Activity | Type                          | Focus                 | Date                                  | Marks | CO  |
|----------|-------------------------------|-----------------------|---------------------------------------|-------|-----|
| 1        | Assignment-1                  | Critical Thinking     | 1 <sup>st</sup> week of August, 24    | 5     | CO1 |
| 2        | Group Activity & Presentation | Creation, Reflections | 4 <sup>th</sup> week of August, 24    | 5     | CO2 |
| 3        | Quiz-1                        | Quiz                  | 1 <sup>st</sup> week of September, 24 | 5     | CO3 |
| 4        | Assignment -2                 | Critical Thinking     | 1 <sup>st</sup> week of October, 24   | 5     | CO4 |
| 5        | Assignment-3                  | Critical Thinking     | 3 <sup>rd</sup> week of October, 24   | 5     | CO5 |
| 6        | Quiz-2                        | Quiz                  | 1 <sup>st</sup> week of November, 24  | 5     | CO6 |

**Links to e-resources (NPTEL, YouTube, Swayam, Virtual lab etc.)**

- <https://www.ietf.org/rfc/rfc793.txt>
- <https://datatracker.ietf.org/doc/html/rfc791>
- <https://datatracker.ietf.org/doc/html/rfc7241>
- <https://datatracker.ietf.org/doc/html/rfc2616>
- <https://www.ietf.org/rfc/rfc1035.txt>
- <https://datatracker.ietf.org/doc/html/rfc5321>

**Coverage for Mid Semester Examination: Data Communication  
to Transport Layer (Lectures serial nos. 1 to 23)**