**Techno India NJR Institute of Technology**



**Course File**

**Computer Networks (6EC4- 02)**

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**Course Overview:**

This 38 hours course provides an introduction to computer networks, Students will Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, and web and email protocols. Besides the theoretical foundations, students acquire practical experience by programming reduced versions of real Internet protocols.

This course is extremely important for the students who aim to make their career in the field of networks. This subject has significant weightage in the exams like GATE.

**Course Outcomes:**

|  |  |  |
| --- | --- | --- |
| **CO. NO.** | **Cognitive Level** | **Course Outcome**  |
| 1 | Knowledge | Students will learn how networked computing devices pass data to each other along data connections  |
| 2 | Knowledge | Student will study different application level protocols such as FTP, SMTP and, HTTP |
| 3 | Application | Students will study different routing algorithms. The will be able to apply the concept of sub-netting and derived IPs for subnets. |
| 4 | Application | Student should learn and apply the leaky and token bucket algorithms for traffic shaping. |
| 5 | Knowledge | Students will learn about types of errors, and error detection & correction methods such as stop and weight, Go-Back-N. They will also study about ALOHA and Slotted ALOHA.  |

**Course Outcome Mapping with Program Outcome:**

|  |  |
| --- | --- |
| **Course Outcome**  | **Program Outcomes (PO’s)** |
| **CO. NO.** | **Domain Specific (PO)** | **Domain Independent (PO)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| CO1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 0 | 1 | 2 |
| CO2 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 0 | 1 | 2 |
| CO3 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 0 | 1 | 2 |
| CO4 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 0 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 0 | 1 | 2 |
| 1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)  |

**Course Coverage Module Wise:**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Unit** | **Topic** |
|  | **1** | **Introduction:** Objective, scope and outcome of the course. |
|  | **2** | **Introductory Concepts** |
| **3** | 2 | Queuing Theory |
| **4** | 2 | Pure Birth death |
| **5** | 2 | Mathematical formats |
| **6** | 2 | Little’s formula |
| **7** |  **3** | **Application Layer** |
| **8** |  3 | WWW |
| **9** |  3 | DNS |
| **10** |  3 | Multimedia, Electronic mail |
| **11** |  3 | FTP |
| **12** |  3 | HTTP, SMTP |
| **13** |  3 | Introduction to network security |
| **14** | 4 | **Transport Layer** |
| **15** | 4 | Transport service |
| **16** | 4 | Elements of transport protocols |
| **17** | 4 | User Datagram Protocol |
| **18** | 4 | Transmission Control Protocol |
| **19** | 4 | Quality of service |
| **20** | 4 | Leaky Bucket and Token Bucket algorithm |
| **21** | 5 | **Network Layer** |
| **22** | 5 | Design issues |
| **23** | 5 | Routing algorithms |
| **24** | 5 | IPV4, IPV6, Address mapping |
| **25** | 5 | ARQ, RARQ |
| **26** | 5 | Congestion control |
| **27** | 5 | Unicast, Multicast, Broadcast routing protocols |
| **28** | 5 | Quality of Service, Internetworking |
| **29** | 6 | **Data Link Layer** |
| **30** | 6 | Error Detection and Correction, Types of Errors, Two dimensional parity check |
| **31** | 6 | Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes |
| **32** | 6 | Checksum, Standardized Polynomial Code |
| **33** | 6 | Error Correction Methods |
| **34** | 6 | Forward Error Correction, Protocols |
| **35** | 6 | Stop and wait, Go-back-N ARQ |
| **36** | 6 | Selective Repeat ARQ, Sliding window, Piggy backing |
| **37** | 6 | Pure ALOHA, Slotted ALOHA |
| **38** | 6 | CSMA/CD, CSMA/CA |

**TEXT/REFERENCE BOOKS**

1. Tanenbaum; Computer Network, 4th Ed., Pearson.
2. Kurose; Computer Networking, 3rd Ed., Pearson.
3. Peterson, Davie; Computer Networks, 4rd Ed., ELSEVIER

**Course Level Problems (Test Items):**

|  |  |
| --- | --- |
| **CO.NO.** | **Problem description** |
| **1** | 1. List any 4 differences between OSI and TCP/ IP model.
2. What do you understand by ALOHA?
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| **2** | 1. A pure ALOHA network transmit 200-bits frames on a shared channel of 200 kbps. What is the throughput if the system produces 1000 frames per second?
2. Explain Leaky bucket and Token bucket algorithms in details.
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| **3** | 1. Write the difference between IPV4 and IPV6
2. Explain the IP addressing with subnet masking.
3. A sender needs to send 4 data items OX3456, OXABCC, OX02BC and OXEEEE. Answer the followings:
	1. Find the checksum at the receiver site if the second data item is changed to OXABCE and the third data item is changed to OX02BA
	2. Find the checksum at receiver site if there is no error
 |
| **4** | 1. What is the difference between network layer and transport layer?
2. List any 3 differences between UDP and TCP protocol.
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| **5** | 1. Explain HTTP header.
2. Explain SMTP header
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**Assessment Methodology:**

1. Assignments one from each unit.
2. Midterm subjective paper where they have to write algorithms to perform different operations on different data structures as mentioned in the modules. (Twice during the semester)
3. Final paper at the end of the semester subjective.

**Teaching and Learning resources unit-wise:**

**Unit-1**

Teaching and Learning Materials:

* + 1. <https://www.javatpoint.com/computer-network-topologies>
		2. <https://www.javatpoint.com/computer-network-tutorial>
		3. <https://www.javatpoint.com/computer-network-models>
		4. <https://www.javatpoint.com/osi-model>
		5. <https://www.javatpoint.com/computer-network-tcp-ip-model>
		6. <https://www.javatpoint.com/computer-network-digital-transmission>
		7. <https://www.javatpoint.com/transmission-media>
		8. <https://www.javatpoint.com/guided-transmission-media>

Problem Solving:

1. <https://www.youtube.com/watch?v=81n3arf3FOw>

**Unit-2**

Teaching and Learning Materials:

1. <https://www.javatpoint.com/data-link-layer>
2. <https://www.javatpoint.com/computer-network-error-detection>
3. <https://www.javatpoint.com/computer-network-error-correction>
4. <https://www.javatpoint.com/data-link-controls>

**Unit-3**

Teaching and Learning Materials:

1. <https://www.javatpoint.com/network-layer>
2. <https://www.javatpoint.com/network-addressing>
3. <https://www.javatpoint.com/computer-network-routing>
4. <https://www.javatpoint.com/network-layer-protocols>

Problem Solving:

1. <https://www.youtube.com/watch?v=bCbkIJwjvtI>
2. <https://www.youtube.com/watch?v=0-andtjj31w>

**Unit-4**

Teaching and Learning Materials:

1. <https://www.javatpoint.com/computer-network-transport-layer>
2. <https://www.javatpoint.com/computer-network-transport-layer-protocols>
3. <https://www.geeksforgeeks.org/leaky-bucket-algorithm>
4. <https://www.javatpoint.com/tcp-vs-udp>
5. <https://www.javatpoint.com/ipv4-vs-ipv6>

**Unit-5**

Teaching and Learning Materials:

1. <https://www.javatpoint.com/computer-network-application-layer>
2. <https://www.javatpoint.com/computer-network-client-and-server-model>
3. <https://www.javatpoint.com/computer-network-dns>
4. <https://www.javatpoint.com/computer-network-ftp>
5. <https://www.javatpoint.com/computer-network-telnet>
6. <https://www.javatpoint.com/simple-mail-transfer-protocol>
7. <https://www.javatpoint.com/simple-network-management-protocol>
8. <https://www.javatpoint.com/computer-network-http>

**Previous Year Question Papers:**

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