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| **Course code** | | | **Data Communication and Networks** | | | | | | | | | | **L** | **T** | **P** | **J** | **C** |
| **CSI1011** | | |  | | | | | | | | | | **3** | **0** | **2** | **0** | **4** |
| **Pre-requisite** | | |  | | | | | | | | **Syllabus version** | | | | | | |
|  | | |  | | | | | | | | V.1 | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | |
| 1. Build an understanding of the fundamental concepts of computer networking, protocols, architectures, and applications  2. Gain expertise in design, implement and analyze performance perspective of TCP/IP layered Architecture  3. Deal with the major issues of the layers of the model. | | | | | | | | | | | | | | | | | |
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| **Expected Course Outcomes:** | | | | | | | | | | | | | | | | | |
| 1. Describe the layered structure of a typical networked architecture  2. Identify and analyze the different types of network topologies, error and flow control mechanisms  3. Design sub-netting and enhance the performance of routing mechanisms.  4. Compare various congestion control mechanisms and identify suitable Transport layer protocol for real time applications  5. Identify various Application layer protocols for specific applications  6. Design and Implement various Network protocols | | | | | | | | | | | | | | | | | |
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| **Student Learning Outcomes (SLO):** | | | | | **2,5,6** | | | | | | | | | | | | |
| 2. Having a clear understanding of the subject related concepts and of contemporary issues  5. Having design thinking capability  6. Having an ability to design a component or a product applying all the relevant standards and with realistic constraints | | | | | | | | | | | | | | | | | |
| **Module:1** | | Introduction to Data Communication and Computer Network | | | | | **5 hours** | | | **CO:1** | | | | | | | |
| Definition and Uses of Computer Network, Criteria for a Data Communication Network, Components of Data Communication, Classification of Computer network, Network Topology, Network Models:OSI, TCP/IP- Networking Devices: Hubs, Bridges, Switches, Routers, and Gateways – Performance Metrics – Introduction to Sockets – Port numbers in Socket Programming | | | | | | | | | | | | | | | | | |
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| **Module:2** | | Physical Layer: | | | | | **5 hours** | | | **CO:1** | | | | | | | |
| Transmission Impairments, Transmission Medium, Data Encoding: Line Encoding, Types of Line Coding, Analog-to-Digital Conversion- Pulse code modulation (PCM), Delta modulation (DM); Transmission Modes- Half and Full Duplex- Signals – Bandwidth and Data Rate – Multiplexing – Shift Keying | | | | | | | | | | | | | | | | | |
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| **Module:3** | | Data Link Layer: | | | | | **9 hours** | | | **CO:2** | | | | | | | |
| Error Detection and Correction- One and two dimensional parity checks, Hamming code, Cyclic redundancy check (CRC); Flow Control: Protocols: Protocols for Noiseless Channels and Noisy Channels – Ethernet- Access Control Protocols: CSMA, CSMA/CA, CSMA/CD, Token Ring- Token Passing, TDMA, FDMA, CDMA-Virtual LAN- Wireless LAN (802.11). | | | | | | | | | | | | | | | | | |
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| **Module:4** | | Network Layer | | | | | **8 hours** | | | **CO:3** | | | | | | | |
| IP Addressing Scheme, Subnet Addressing, Subnet Masks, IPV4 Addressing, IPV6 Addressing, Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP).Unicast Routing: Routing Characteristics, Routing Algorithms: Distance Vector Routing Protocol, Link State Routing Protocol – Multicast Routing- Wireless Routing | | | | | | | | | | | | | | | | | |
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| **Module:5** | | Transport Layer | | | | | **6 hours** | | **CO:4** | | | | | | | | |
| Services of Transport Layer,Socket Programming, TCP Phases,Transport Layer Protocols: TCP, UDP,SCTP,RTP,Transport Layer Security Protocols:SSL,TLS | | | | | | | | | | | | | | | | | |
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| **Module:6** | | Traffic Engineering Principles | | | | | **4 hours** | | **CO:4** | | | | | | | | |
| Congestion Control Algorithms- Congestion prevention policies; Quality of Service- Traffic shaping, Leaky bucket algorithm, Token bucket algorithm; Integrated Services. | | | | | | | | | | | | | | | | | |
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| **Module:7** | | Application Layer | | | | | **6 hours** | | **CO:5** | | | | | | | | |
| Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), TELNET,SNMP,DNS, Hypertext Transfer Protocol (HTTP), World Wide Web (WWW), Security in Internet, E-mail Security. | | | | | | | | | | | | | | | | | |
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| **Module:8** | | **Contemporary issues:** | | | | | **2 hours** | | **CO:6** | | | | | | | | |
| Recent Trends in Data Communication and Computer Networks | | | | | | | | | | | | | | | | | |
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|  | | **Total Lecture hours:** | | | | | **45 hours** | |  | | | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | | | | | | |
| 1. | Data Communications and Networking, Behrouz A. Forouzan, McGraw Hill Education, 5th Ed.,2012 | | | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | | | |
| 1  2  3  4  5 | Data and Computer Communications, William Stallings, Pearson Education,10th Ed,2013.  Computer Networking: A Top-Down Approach Featuring the Internet, J.F.Kurose and K.W.Ross,6th Ed., Pearson Education,2012.  Computer Networks: A Systems Approach, Larry Peterson and Bruce Davie, 5th Ed**,** The Morgan Kaufmann Series, Elsevier, 2011.  Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill, 2012.  Andrew S Tanenbaum, “Computer Networks”, 5th Edition, Pearson, 2011. | | | | | | | | | | | | | | | | |
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| Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar | | | | | | | | | | | | | | | | | |
| **List of Challenging Experiments (Indicative)** | | | | | | | **CO:6** | | | | | | | | | | |
| 1. | Basic Networking **Commands** using Linux | | | | | | | | | | | 1 hours | | | | | |
| 2. | Error detection and correction mechanisms | | | | | | | | | | | 4 hours | | | | | |
| 3. | Flow control mechanisms | | | | | | | | | | | 4 hours | | | | | |
| 4. | IP addressing – Classless addressing | | | | | | | | | | | 4 hours | | | | | |
| 5. | Routing Protocol Implementation and Performance Analysis of Routing protocols | | | | | | | | | | | 4 hours | | | | | |
| 6 | Socket Programming | | | | | | | | | | | 4 hours | | | | | |
| 7 | Transport Layer Security Protocol Implementation | | | | | | | | | | | 4 hours | | | | | |
| 8 | Congestion Control Protocol | | | | | | | | | | | 3 hours | | | | | |
| 9 | Study about Network Simulation tools | | | | | | | | | | | 2 hours | | | | | |
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| Total Laboratory Hours | | | | | | | | | | | | 30 hours | | | | | |
| Mode of evaluation: Assignment, CAT / Assignment / Quiz / FAT | | | | | | | | | | | | | | | | | |
| Recommended by Board of Studies | | | | DD-MM-YYYY | | | | | | | | | | | | | |
| Approved by Academic Council | | | | No. xx | | Date | | DD-MM-YYYY | | | | | | | | | |