

**SECOND SEMESTER 2023-2024**

# Course Handout Part II

**Date: 09.01.2024**

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

*Course No.* : **CS F303**

## Course Title : **Computer Networks**

Instructor in Charge :Paresh Saxena (psaxena@hyderabad.bits-pilani.ac.in)

## Instructors. :GGeethakumari, Rajib R.Maiti,Dipanjan Chakraborty and NikumaniChoudhury

**Scopeof the Course:** This is a fundamentalcomputer networking course focusing on the relevant and state-of-the-art networking protocols and architectures. The course will cover the problems of computer networks and the standard ways to approach and resolve these problems. The goals of the course are to build on basic networking course material in providing a deep understanding of existing technology with concrete experience of the challenges through a series of lab exercises. The course aims to provide deep understanding ofnetwork architecture, protocols, and message structures at different layers of the protocol stack.

**Objectives of the Course:**

* This course will give you a breakdown of the applications, communications protocols, and network services that make a computer network work.
* We will follow a top-down approach to computer networking, which will enable you to learn the basics and then built upon them. This will also enable us to understand each layer and the services that a layer provides to the other layers.
* To gain hands-on experience with the networking protocols.
* Real-life examples with suitable demonstration through various tools in order to understand how network and internetwork operates.

**Textbooks:**

[T1]James F. Kurose and Ross, Computer networking: a top-down approach featuring the Internet, 7th Ed., Pearson, 2017.

**Reference books**

1. [R1] Behrouz A. Forouzan. Data Communications and Networking. McGraw Hill Pub., 5th edition, 2013.
2. [R2] Andrew S. Tanenbaum. Computer Networks. Fourth Edition, Pearson Education, 2006.
3. [R3] L. Peterson andB.Davie.Computer Networks: ASystemsApproach.FourthEdition, MK, 2007.
4. [R4] W. Richard Stevens, “TCP/IP Illustrated Volume 1, The protocol”, 2nd Ed. Addison-Wesley,2011.

**Course Plan:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S..No.** | **No. of Lectures** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| **INTRODUCTION** | | | | |
| 1 | 1 | - To understand the course components and structure. | Basic introduction to the course, explanation of exams and evaluations, lab project, etc. | Class Notes |
| 2 | 1 | - To understand the basics of networks and protocol layers. | Basic introduction to protocol layers, some key performance metrics, and networks. | Class Notes |
| **PART A: APPLICATION LAYER** | | | | |
| 3 | 1 | - To learn principles of network applications. | Network Application Architecture and Services | T1: Chapter 2,  Class Notes |
| 4 | 3 | - To understand application layer protocols – their functioning and implementation in the protocol stack | Prtocols including HTTP, SMTP, DNS and Peer-to-peer applications | T1: Chapter 2,  Class Notes |
| **PART A: TRANSPORT LAYER** | | | | |
| 5 | 1 | - To understand the basics of User Datagram Protocol (UDP) | UDP protocol, UDP segment structure, UDP checksum. | T1: Chapter 3,  Class Notes |
| 6 | 2 | - To learn reliable data transfer protocols | Go-Back-N and Selective Repeat protocols | T1: Chapter 3,  Class Notes |
| 7 | 4 | -To understand the basics of TCP and TCP variants | TCP connection, TCP segment structure, round trip time, understanding congestion, congestion control algorithms, TCP variants, Fairness | T1: Chapter 3,  Class Notes |
| 8 | 1 | - To learn socket programming | UDP/TCP sockets and their usage | Class Notes |
| 9 | 2 | - To learn modern transport layer protocols | SPDY, QUIC, Multipath TCP (MPTCP) and Multipath QUIC (MPQUIC) | Class Notes |
| **PART B: NETWORK LAYER** | | | | |
| 10 | 3 | -To introduce network layer and network service models | CBR ATM network service, ABR ATM network service, routers, queueing. | T1: Chapter 4,  Class Notes |
| 11 | 4 | - To understand the Internet Protocol (IP) | IP datagram, IPv4 addressing, NAT, IPv6, Quality of service in IP networks. | T1: Chapter 4,  Class Notes |
| 12 | 3 | - To understand routing algorithms | Link-State (LS), Distance-Vector (DV), Hierarchical routing, RIP, OSPF, BGP, | T1: Chapter 4,  Class Notes |
| **PART C: LINK LAYER** | | | | |
| 13 | 2 | - To introduce link layer and error detection techniques. | Link layer services, error detection and correction techniques | T1: Chapter 5,  Class Notes |
| 14 | 3 | - To learn link layer protocols | Channel partitioning protocols, random access protocols, FDDI, DOCSIS | T1: Chapter 5,  Class Notes |
| 15 | 3 | - To understand local area networks | Link-layer addressing, ARP, Ethernet, Link layer switching, VLANs, MPLS | T1: Chapter 5,  Class Notes |
| **PART D: WIRELESS AND MOBILE NETWORKS** | | | | |
| 16 | 3 | - To understand wireless LAN architectures and protocols | Single-hop, Multi-hop infrastructures, IEEE 802.11 architecture and protocol, Bluetooth, Zigbee | T1: Chapter 6,  Class Notes |
| 17 | 3 | - To understand Cellular Internet Access | 2G, 3G and 4G cellular data networks, Introduction to 5G: current status and future | Class Notes |
|  | **Total number of Lectures: 40** |  |  |  |

**Evaluation Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Mid-term examination | 90 min | 30% | 13/03 - 2.00 - 3.30PM | Closed book |
| Class Room Participation | -- | 10% | - | Closed book |
| Laboratory evaluation | 120 min | 20% (10% before mid-semester exam) | Continuous Evaluation | Open book |
| Comprehensive examination | 180 min | 40% | 11/05 AN | Closed book |

**Chamber Consultation Hour:**TBA

**Notices:** To bedisplayed onCMS.

**Make-up Policy:**

Make up will be allowed only in extreme situations and institute rules will apply. However, *prior permission* from the IC is compulsory.

**Academic Honesty and Integrity Policy:**

Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**

**CS F303**