**Computer Network In-Sem 1**

**Syllabus**

**Week – 1 :** Readings: Textbook Chap 1.1 to 1.4

* Sample socket program structure.
* What is Internet
* Nuts and bolts perspective, User perspective and services offered.
* Network components.
* packets, delays.
* Constituents of delay.
* What is a protocol?
* Distributed algorithm.
* Clock synchronization.

**Week – 2 :** Readings: Chap 1.5, 2.1

* Internet abstractions,
* layered architecture.
* Internet topology.
* DAIICT intranet schematic.  
  Network application example and classification.
* Quality of service (QoS) - reliability, delay, rate, delay jitter etc.
* Client server applications.
* Protocol design priniciples - message flow, language, handling various error conditions.Timing issues.

**Week – 3 : Readings:**Chap 2.1, 2.2. Network Programming Guide

* Socket program structure.
* Client-server architecture. Server and Client differences.
* Protocol design principles. Timing issues. Transaction handling. Language design - syntax and semantics issues.
* Transport layer services - TCP and UDP services. Connection, data integrity, data ordering, data error handling.
* Browsing protocol - HTTP. Over Persistent and non-persistent connection. Comparision. Request-response protocols.
* HTTP protocol

**Week – 4 :** Readings: Chap 2.2.4, 2.2.5, Chap 2.3 (email).

* Improving performance of application protocols - delay, bandwidth, processing constraints.
* Offload server work to client, bring server closer to client, and replicate server content.
* HTTP uses Cookies and Proxy server to accomplish these goals.
* Email protocol
* Mapping IP addresses to named addresses.
* How to provide scalable and distributed solution to this problem. Role of Hierarchy in scalability.
* Domain Name Service.

**Week – 5 :** Readings: Chap 2.5

* P2P application - motivtion. Scaling, no single point of failure.
* Application architecture.
* Resource search and distribution issues.
* Cooperation in P2P

**Transport Layer**

**Week – 6 :** Readings: Chap 3.1-3.4

* Transport layer functionalities.
* UDP as a bare-bones layer with multiplexing (port) functionality.
* TCP - reliability. Pipelining, efficiency of the stop and wait protocol. GBN and selective repeat protocols.
* buffer and window size requirements.

**Week – 7 :** Readings: Chap 3.1-3.4

* TCP and UDP header sturcuture.
* TCP RTT estimate.
* TIme out value.
* TCP connection orientation.
* Three-way handshake.
* Connection termination.

**Network Layer**

**Week – 8 :** Readings: Chap 4.1

* Internet architecture overview.
* Network core as an imperfect store and forward network.
* Packetization and packet parameters.
* Routing problem. Graph model of a network. Shortest path, Djikstra's algorithm.
* Network topology changes and Network discovery problem.

**Week – 9 :** Readings: Chapter 4.2

* Router functions - routing (global) and forwarding or switching (local).
* Scheduling for quality of service.
* Router internals. Switching bottlenecks.
* Bus versus interconnect for parallel operation.
* Packet scheduling.
* Token bucket algorithm.

**Week – 10 :** Readings: Chapter 5.1, 5.2

* Routing basics.
* Distributed approach.
* Flooding based network discovery.
* Shortest path routing.
* Different metrics for link weights.
* Distance vector based routing**(Self-study)**.
* Routing table lookup.
* Trie data structure.

**Week – 11 & 12 :** Chapter 4.3

* IPv4 and v6 standards.
* Address space expansion.
* Simplification of the IPv6 header to improve switching efficiency.
* IPv4 address classes.
* NAT protocol to allow use of local addresses for global communication.
* DHCP protocol for dynamic allocation of IP addresses.
* CIDR protocol for classless routing (**self-study**)

**Data Link Layer/MAC protocols**

**Week – 13 & 14 :** Chapter 6.3.1, 6.3.2, 6.4.1, 6.4.2, 6.4.3

* Local Area Networks (LAN).
* Problems in sharing a channel. FDMA, TDMA.
* Concept of random access for distributed dynamic access to the channel.
* CSMA. Collision detection
* random backoff - binary exponential backoff.
* 1-persistent CSMA/CD
* ALOHA protocols. Efficiency.
* CSMA in wireless channels.
* Virtual sensing, RTS and CTS mechanism.
* CSMA/CA
* Ethernet addressing.
* ARP protocol for MAC to IP address mapping.
* Link Layer Switching devices.
* Virtul LAN (VLAN) concepts and configurations.