

Lectures for the course: Communication Systems and Networking (IT 60103)

Week 1

Lecture 1 – 22/07/2013

- Introduction to the course
- Evaluation Guidelines

Lecture 2 – 23/07/2013

- Data communication and networking introductory notes

Lecture 3 – 24/07/2013

- ISO OSI model and its significance
- Physical layer, data link layer and network layer functionality

Week 2

Lecture 4+5 – 29/07/2013

- Transport Layer, Session, Presentation and Application layer functionality
- TCP/IP layers and their relation with ISO OSI
- Some TCP/IP protocols at each layer
- Impact of TCP/IP and reasons for its success

Lecture 6 – 30/07/2013

- Introduction to physical layer
- Types of data and signals (analog and digital)
- Time and frequency domain representations
- Periodic and aperiodic signals
- Frequency, Time period, wavelength
- Bit rate
- Composite signal – bandwidth
- Baseband transmission of digital signal through low-pass channel

Lecture 7 – 31/07/2013

- Broadband transmission of digital signal
- Transmission impairment – attenuation, distortion, noise
- Data rate limits: Nyquist bit rate and Shannon channel capacity
- Performance – bandwidth, throughput, delay

Week 3

Lecture 8+9 – 05/08/2013

- Digital transmission
- Various types of line coding
- Characteristics
- Unipolar, polar and bipolar approaches
- Multilevel
- Multitransition

Lecture 10 – 06/08/2013

- Block coding
- Scrambling
- Pulse code modulation
- Nyquist theorem
- Delta modulation
- Transmission modes – asynchronous, synchronous, isochronous

Lecture 11 – 07/08/2013

- Analog transmission
- ASK, FSK, PSK, QAM
- AM, FM, PM

Week 4

Lecture 12+13 – 12/08/2013

- Modulation
- Spread spectrum

Lecture 14 –13/08/2013

- Transmission media
- Guided and unguided media
- Switching
- Circuit switching

Lecture 15 –14/08/2013

- Packet switching
- Datagram and virtual circuit

- Switch construction
- Banyan switch

Week 5

Lecture 16+17 – 19/08/2013

- Class Test 1 held

Lecture 18 – 20/08/2013

- Error detection and correction
- Block code
- Linear block code
- Hamming distance
- Parity check

Lecture 19 – 21/08/2013

- Hamming Code
- Error correction using Hamming code
- Burst error correction using Hamming code
- Cyclic codes
- CRC
- Hardware implementation of CRC

Week 6

Lecture 20+21 – 26/08/2013

- Class test 1 script shown and feedback given
- Polynomial representation of CRC coding
- Choice of generator polynomial
- Checksum
- Data Link Control
- Framing
- Flow and error control
- Simple protocols
- Stop-and-Wait ARQ

Lecture 22 – 27/08/2013

- Go-Back-N ARQ
- Selective Repeat ARQ
- Piggybacking

Lecture 23 – 28/08/2013

- HDLC
- PPP

Lecture 24 – 28/08/2013

- Practice problems

Week 7

Lecture 25+26 – 02/09/2013

- Multiple Access
- Random access protocols
- ALOHA, CSMA, CSMA/CD and CSMA/CA
- Controlled access protocols
- Reservation, Polling and Token passing

Lecture 27 – 03/09/2013

- Channelization protocols
- Wired LANs- Ethernet
- LLC and MAC
- MAC Frame format
- Minimum frame size and maximum network length
- Ethernet address

Lecture 28 – 04/09/2013

- Fast Ethernet
- Gigabit Ethernet
- 10GB Ethernet

Lecture 29 – 04/09/2013

- Practice problems

Week 8

Lecture 30+31 – 09/09/2013

- Wireless LAN
- IEEE 802.11
- DCF and PCF

- Frame format and addressing
- Hidden and Exposed Station problems
- Physical layer for IEEE 802.11

Lecture 32 – 10/09/2013

- Connecting Devices, backbone network, VLAN
- Hubs and repeater
- Bridges and Layer 2 switches
- Spanning tree algorithm for bridges
- VLAN

Lecture 33 – 11/09/2013

- Practical demonstration of networking in the department and the building

Lecture 34 – 11/09/2013

- Practice problems

Week 9

Lecture 35+36 – 16/09/2013

- Random variables
- Discrete and continuous random variables
- Probability distribution and probability density functions
- Moments
- Expectations of various distributions

Lecture 37 – 17/09/2013

- Joint distribution
- Conditional probability
- Memoryless nature of exponential and geometric distribution
- Random processes
- Time parameter and state space
- Continuous parameter and discrete parameter processes
- Chains
- First order and joint distributions
- Stationary processes

Lecture 38 – 18/09/2013

- Markov process and Markov chain

- Time homogeneity
- DTMC and CTMC
- Details of DTMC
- Chapman-Kolmogorov equation
- One step and n-step transition probabilities of homogeneous DTMCs
- Transient probabilities
- State sojourn time

Lecture 39 – 18/09/2013

- Practice problems

Week 10

Mid-sem exams held

Week 11

Lecture 40 – 01/10/2013

- CTMC
- Birth death process
- Mid-sem scripts shown and feedback given

Week 12

Lecture 41+42 – 07/10/2013

- Queuing theory
- Kendall's notation
- Various types of queues
- Little's theorem
- Performance measures

Lecture 43 – 08/10/2013

- Practice problems on queuing theory

Week 13

Lecture 44+45 – 21/10/2013

- IP Addressing
- IPv4 addressing
- Classful and Classless addressing

- NAT
- IPv6 addressing

Lecture 46 – 22/10/2013

- Internet Protocol Ver. 4
- Internet Protocol Ver. 6
- Transition from IPv4 to IPv6

Lecture 47 – 23/10/2013

- ARP
- ICMP error and query messages
- Ping and Traceroute

Lecture 48 – 23/10/2013

- Practice problems on network layer

Week 14

Lecture 49+50 – 28/10/2013

- Class test 2 held
- IGMP
- ICMPv6

Lecture 51 – 29/10/2013

- Delivery
- Forwarding

Lecture 52 – 30/10/2013

- Unicast routing protocols

Lecture 53 – 30/10/2013

- Class test 2 scripts shown and feedback given

Week 15

Lecture 54+55 – 04/11/2013

- Multicast routing

- Introduction to Transport Layer

Lecture 56 – 06/11/2013

- UDP
- TCP Header
- TCP Connection setup, data transfer and connection release

Week 16

Lecture 57+58 – 11/11/2013

- Flow Control
- Error Control
- Congestion Control
- Traffic Shaping

Lecture 59 – 12/11/2013

- Course Summary