

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

Week 1

Lecture 1 – 16/07/2014

- Introduction to the course
- Evaluation Guidelines

Week 2

Lecture 2+3 – 21/07/2014

- Basic components of communication systems and networks
- Topologies
- LAN, WAN

Lecture 4 – 22/07/2014

- Basics of OSI model
- Physical, data link, network and transport layer functionality

Lecture 5 – 23/07/2014

- Session, presentation and application layer functionality
- Overview of TCP/IP
- Layers of TCP/IP vis-à-vis OSI

Week 3

Lecture 6+7 – 28/07/2014

- 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 8 – 30/07/2014

- Broadband transmission of digital signal

- Transmission impairment – attenuation, distortion, noise
- Data rate limits: Nyquist bit rate and Shannon channel capacity
- Performance – bandwidth, throughput, delay, jitter

Week 4

Lecture 9+10 – 04/08/2014

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

Lecture 11 – 05/08/2014

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

Lecture 12 – 06/08/2014

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

Week 5

Lecture 13+14 – 11/08/2014

- Multiplexing
- FDM, WDM and TDM
- Spread Spectrum
- FHSS and DSSS

Lecture 15 – 12/08/2014

- Transmission media
- Guided and unguided media
- UTP, Coax, Fiber
- Radio wave characteristics and propagation

Lecture 16 – 13/08/2014

- Switching
- Circuit switching and packet switching
- Virtual circuit networks
- Space-division switching
- TSI
- Space-time switching
- Banyan tree structure

Week 6

Lecture 17 – 19/08/2014

- Introduction to data link layer
- Error detection and correction
- Block codes and convolutional codes
- Linear block codes
- Error detection and correction capabilities
- Hamming codes
- Error correction using Hamming codes

Lecture 18 – 20/08/2014

- Cyclic codes
- CRC
- Impact of generator polynomial of error detection capability of CRC

Week 7

Lecture 19+20 – 25/08/2014

- Class test 1 held
- Checksum

Lecture 21 – 26/08/2014

- Framing
- Flow and error control
- Stop-and-wait, Go-back-N, Selective Repeat

Lecture 22 – 27/08/2014

- HDLC
- PPP

Week 8

Lecture 23+24 – 01/09/2014

- Multiple access
- Random access protocols
- Controlled-access protocols
- Introduction to channelization protocols

Lecture 25 – 02/09/2014

- CDMA
- Class test scripts shown and feedback given

Lecture 26 – 03/09/2014

- Wired LAN
- Ethernet – Standard, 100MBPS, Gigabit Ethernet, 10GB Ethernet

Week 9

Lecture 27+28 – 08/09/2014

- Wireless LAN

Lecture 29 – 09/09/2014

- Connecting devices, backbone network
- VLAN

Lecture 30 – 10/09/2014

- Practical demonstration of the institute network connections

Week 10

Mid-sem exam held

Week 11

Lecture 31 – 24/09/2014

- Random variable
- Discrete and continuous random variables
- Various types of discrete and continuous random variables

- Moments

Lecture 32+33 – 24/09/2014 (afternoon)

- Memoryless properties of exponential distribution
- Relationship between Exponential and Poisson distribution
- Joint distribution
- Conditional probability
- Bayes theorem
- Random processes
- Markov process and Markov Chain
- Mid-sem scripts shown and feedback given

Week 12

Lecture 34 – 07/10/2014

- Discrete Time Markov Chain
- Chapman-Kolmogorov equation for DTMC
- One step and multiple step transition probabilities
- State sojourn time

Lecture 35 – 08/10/2014

- Continuous time Markov chain
- Chapman-Kolmogorov equation for CTMC
- Generator matrix
- Birth death process

Week 13

Lecture 36+37 – 13/10/2014

- Kendall's notation
- M/M/1 queue
- M/M/ ∞ queue
- M/M/m queue
- M/M/1/K finite buffer queue
- M/M/m/m m-server loss system

Lecture 38 – 14/10/2014

- Problems on queuing theory

Lecture 39 – 15/10/2014

- Network Layer
- IP addressing
- Classful and classless addressing in IPV4

Week 14

Lecture 40+41 – 20/10/2014

- Private addresses and NAT
- IPv6 addressing
- Internet Protocol (IPv4)

Lecture 42 – 21/10/2014

- Fragmentation in IPv4
- Checksum
- Options
- IPv6
- Base header and extension headers
- Flow label
- Transition from IPv4 to IPv6

Lecture 43 – 22/10/2014

- ARP
- ICMP

Week 15

Lecture 44+45 – 27/10/2014

- Class test 2 held

Lecture 46 – 28/10/2014

- Routing table
- Forwarding
- Class test 2 scripts shown and feedback given

Lecture 47 – 29/10/2014

- Intra-domain and inter-domain routing
- Distance vector routing

- RIP
- Link state routing
- Dijkstra's algorithm
- OSPF

Week 16

Lecture 48+49 – 03/11/2014

- BGP
- Multicast routing

Lecture 50 – 05/11/2014

- Transport layer
- UDP

Week 17

Lecture 51+52 – 10/11/2014

- TCP
- Segment header format
- Byte to segment conversion
- Connection set up, data transfer and connection termination
- Error and flow control

Lecture 53 – 11/11/2014

- Congestion control in TCP
- Various stages of congestion handling
- Flavors of TCP

Lecture 54 – 12/11/2014

- Fundamental concepts in QoS
- Scheduling
- Traffic shaping
- Course Summary