Department of Electrical Engineering, IIT Madras

ESB-350, G-Slot   Aug-Nov, 2017

EE 5151: Communication Techniques

Motivation: This course is to expose students to several design problems in communication systems where the solution can be obtained by a combination of intuitive reasoning and fairly simple numerical techniques. We take examples from the classical public switched telephone network, modern wireless cellular communications, and data networks, to bring out the elegance of several engineering solutions which have been developed and commercially deployed over the last 60 years of telecommunications.

Part-1: From "*Digital Telephony*", J.C.Bellamy, 3rd Ed (John Wiley)
1.1 Chapter 1 – Introduction: reading
1.2 Chapter 2 – Why digital representation and trasmission? reading
1.3 Signal representation, Sampling of band-pass signals (Notes)
1.4 Chapter 4 – Digital transmission & multiplexing of digital streams – examples from elastic buffers, bit-stuffing, and marker detection for framing
1.5 Chapter 5 – Digital switching for Voice -- Multistage switches, Non-blocking and Blocking switches, Blocking Probability versus Complexity, (5.1--5.4; excluding 5.2.3 to 5.2.6), Digital Trunking for Voice – interpretation from Erlang-B formula (Notes)

Part-2: From "*Wireless Communications*", T.S.Rappaport, (Pearson Ed.)
2.1 Chapter 1 – Introduction to wireless communications: reading
2.2 RF Principles, Path Loss, Receiver Sensitivity, Wireless Communication Link Budget, Analog repeater (relay) design, BER of Analog Repeater and Regenerative Repeater (Notes)
2.3 Chapter 2 – Cellular concept – System design fundamentals
(emphasis on co-channel interference and system capacity, and trunking efficiency), user capacity of cellular TDMA and DS-CDMA systems (also from Chapter 8)

Part-3: From "*Data Networks*", Bertsekas and Gallager, 2nd Ed, (Prentice Hall India)
3.1 Elements of Packet Switching – Motivation, ARQ Protocols, Pipelining, Flow Control
3.2 What is hybrid ARQ (HARQ) in 4G LTE systems?

Assessment Method:
Quiz1 – 20; Quiz2 – 20; End Sem – 40; The remaining 20 marks will be awarded to take-home assignments and/or "short quizzes" for 10-15mins duration. The TAs for this course will be notified soon. Contact me at ESB-334B, x4420, giri@ee.iitm.ac.in, for more details. Soft-copies of additional material will be made available at www.ee.iitm.ac.in/~giri and/or on Moodle.

K. Giridhar, April 20, 2017
Revised on July 27, 2017