ECE4131 : Telecommunication Switching Systems and Networks

Programme: **B.Tech. (ECE)**   Year: **3rd/4th** (3rd)   Semester :**Summer/I**

Course : Core/Program/Open/HSS/Science/Math : **Program**   Credits :**3**   Hours : **40**

Course Context and Overview (100 words):

This course is designed to provide a detailed treatment of switching principles and control of switching systems, traffic engineering and queuing models, and signalling and transmission protocols for communication networks.

Prerequisites Courses:
Principles of Communication

Course outcomes(COs):

On completion of this course, the students will have the ability to:
CO1: Should be able to understand transmission, media impairments and various switching hierarchies.
CO2 Will be able to evaluate of probability of blocking for various switching networks
CO3 Will be able to understand different traffic distribution and Queuing theory fundamentals
CO4 Will be able to understand different signalling schemes like SS7 and digital data Network like ISDN
CO5 Become familiar with some of the existing and emerging mechanism in high-performance telecommunications networks

Course Topics:

Topics	Lecture Hours	
UNIT - I 1. **FUNDAMENTALS OF TRANSMISSION, SWITCHING AND SIGNALLING**	**6**	
1.1 Network configurations; Transmission, switching and signalling	1	
1.2 Circuit and packet switching; Analog, digital and integrated digital networks.	1	
1.3 Transmission media and impairments; 4-wire transmission: Hybrid, echo, stability and crosstalk;	1	
1.4 Digital transmission and multiplexing, line coding, framing and bit stuffing, plesiochronous digital hierarchies (PDH)	2	
1.5 SONET and SDH: Hierarchical model, frames and justification, virtual tributaries.	1	
UNIT - II	**7**	

2.	**SPACE AND TIME DIVISION SWITCHING**		
	2.1 Switching elements and switching matrices; Time division time- and space-switching;	1	
	2.2 Multi-stage switching in Link Systems: General, Two stage networks, three stage networks, four stage networks.	2	
	2.3 Grades of service of link systems: General, Two stage networks, three stage networks, four stage networks Call packing	1	
	2.4 Strict sense non blocking networks, internal blocking, distribution and mixing; Evaluation of probability of blocking of switching networks	2	
	2.5 Lee graph; Call packing, Benes networks and CLOS networks.	1	
UNIT - III		**10**	
3.	**TRAFFIC MODELLING**		
	3.1 Traffic characteristics, Erlang, random process and Markov chain modelling of traffic.	1	
	3.2 Birth-Death models, differential equations and steady-state solutions,	2	
	3.3 Poisson process; Modelling of arrivals, inter arrival times and service times; Grade of service, time and call congestion	3	
	3.4 Little's theorem, M/M/1 queue, Erlang-B and Erlang-C formulations, M/G/1 queue,	3	
	3.5 prioritized queues; Sequential hunting; Loss system with limited sources.	12	
UNIT - IV		**11**	
4.	**SIGNALLING SYSTEM STANDARDS**		
	4.1 Subscriber loop signalling; PCM signalling	1	
	4.2 Channel-associated and common channel signalling	2	
	4.3 Signalling System No. 7 (SS7): Protocol architecture, signalling units' format, signalling link and network level	2	
	4.4 Numbering plan and routing; Concept of intelligent networks.	1	
	4.5 Overview of ISDN, transmission structure, protocol architecture, physical layer, LAPD, basic call control	2	
	4.6 Overview of ATM, ATM cells, reference model, adaptation layer, cell switching.	3	
UNIT-V		**6**	
5.	**MECHANISM IN HIGH-PERFORMANCE TELECOMMUNICATIONS NETWORKS**		
	5.1 Introduction to DSL	1	
	5.2 Transmission and reception in ADSL	1	
	5.3 Overview of xDSL.	1	
	5.4 Overview of VoIP and MPLS	2	
	5.5 IP Telephony packet based Multimedia Communication	1	

Textbook/ references (IEEE format):
TEXT BOOKS:

1. Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks*"; PHI Publications*

2.Flood, J.E., "Telecommunication Switching, Traffic and Networks", *Pearson Education*. 2001
3. Bertsekas, D. and Gallager, R., "Data Networks", 2nd Ed., *Prentice-Hall of India*.1992
4. Bellamy, J.C., "Digital Telephony", 3rd Ed., *John Wiley & Sons*, 2002
5. Bear, D., "Principles of Telecommunication Traffic Engineering", 3rd Ed., *Peter Peregrinus*. 1988
6. Stallings, W., "ISDN and Broadband ISDN with Frame Relay and ATM", 4th Ed., *Pearson Education*. 2000
7. Black, U., "MPLS and Label Switching Networks", *Pearson Education*.

REFERENCES:
1. Olivier, H., Gurle, D. and Petit, J.P, "IP Telephony: Packet Based Multimedia Communications Systems", *Addison-Wesley Longman*. 2000

Additional Resources:
 Will be notified in due course of time

Evaluation Methods:

Item	Weightage
Quiz	10
Assignment	20
Class Test	10
Midterm	20
Final Examination	40

Prepared By:
Last Update: 28/04/2016