

City University of Hong Kong

**Information on a Course
offered by Department of Electronic Engineering
with effect from Semester A 2012/13**

Part I

Course Title:	Signaling, Switching and Routing in Telecommunication Networks
Course Code:	EE6412
Course Duration:	One Semester (13 weeks)
No. of credits:	3
Level:	6
Medium of Instruction:	English
Prerequisites:	Nil
Precursors:	EE5412, Telecommunication Networks; or equivalent
Equivalent Course:	
Exclusive Courses:	

Part II**Course Aims:**

This course aims to provide students with an understanding of important concepts and techniques on signaling, switching and routing in telecommunication networks.

Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No.	CILOs
1.	Identify the fundamental concepts and components about voice over IP, especially the signaling protocol (SIP) and its calling procedure.
2.	Identify various types of switches and their roles in the telephone network and compute the cost and blocking probability of various switches.
3.	Identify various routing schemes and their applications to the real world circuit-switched networks and compute the blocking probability of various routing schemes.
4.	Identify the fundamental techniques/concepts of Multi-Protocol Label Switching (MPLS).

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO 1	Lecture, laboratory
CILO 2, 3, 4	Lecture, in-class exercise, case study

A mini-project is designed to encourage students to apply the knowledge learn from the course to build a real-world application.

Timetabling Information

Pattern	Hours
Lecture:	27
Tutorials:	12*
Laboratory:	
Other activities:	

* Some tutorials will be conducted in the laboratory

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

	Type of assessment tasks	Weighting (if applicable)
Continuous Assessment	Assignments, Tests, Laboratory	40%
Examination	Written exam	60% 2 hours

Remarks: To pass the course, students are required to achieve at least 35% in course work and 35% in the examination. Also, 75% laboratory attendance rate must be obtained.

Grading of Student Achievement:

Refer to Grading of Courses in the Academic Regulations for Taught Postgraduate Degrees.

Letter Grade	Grade Point	Grade Definitions
A+	4.3	Excellent
A	4.0	
A-	3.7	
B+	3.3	Good
B	3.0	
B-	2.7	
C+	2.3	Adequate
C	2.0	
C-	1.7	
D	1.0	Marginal
F	0.0	Failure

Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1, 2, 3, 4	This course aims to provide students with skills and knowledge in three major areas of telecommunication networks. Upon completion of this course, students will be able to apply analytical skills to access and evaluate network performance in those areas.

Part III**Keyword Syllabus:**The Telephone Network

- The big picture
- Routing: routing algorithms, essence of problem, features of telephone network routing
- Transmission: multiplexing, link technologies, analogue to digital conversion, voice coding
- Switching: motivation, space division switching, time division switching
- Signaling: signaling network, switch controller, Signalling System 7 (SS7), state transition diagram

Voice over Internet Protocol

- Enabling technologies?
- Real Time Transport protocol (RTP)
- RTP Control Protocol (RTCP)
- Signaling protocol: Session Initiation Protocol (SIP), SIP's call establishment procedure

Circuit Switching

- Link systems: concentrator, route switch, expander, multi-stage switching network
- Grades of service of link systems
- Time-division switching, grades of service of time-division switching networks

Routing in the telephone network

- Telephone network topology
- Features of telephone network routing
- Alternate/dynamic routing, Trunk reservation
- Random routing, Least loaded routing, Real world examples: DNHR, RTNR
- Erlang fixed point approximation

IP routing and label switching in Multi-Protocol Label Switching (MPLS)

- Motivation
- Label switching routers, label switched path
- IP packet forwarding, IP routing, label switching
- Label assignment, label allocation, label distribution

Recommended Reading:Essential Reading

1. John E. Flood, *Telecommunications Switching, Traffic and Networks*, Prentice Hall, 1995.
2. Keshav S: *An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network*, Addison Wesley, 1997.
(<http://www.awl.com/cseng/titles/0-201-63442-2>)
3. Cisco web site: <http://www.cisco.com>

Supplementary Reading

1. D. E. Comer, *Computer Networks and Internets, with Internet Applications*, 3rd ed., Prentice Hall, 2001. (<http://www.netbook.cs.purdue.edu>)
2. G. R. Ash, *Dynamic Routing in Telecommunications Networks*, McGraw-Hill, 1997.
3. K.W. Ross, *Multiservice Loss Models for Broadband Telecommunication Networks*, Springer, 1995.
4. Bruce Davie and Yakov Rekhter, *MPLS: Technology and Applications*, Morgan Kaufmann, 2000.
5. Zheng Wang, *Internet QoS: Architectures and Mechanisms for Quality of Service*, Morgan Kaufmann, 2001.
6. Uyles Black, *MPLS and Label Switching Networks*, Prentice Hall, 2001.

Online Resources (if any)