

CARLETON UNIVERSITY

Department of Systems and Computer Engineering

SYSC 4700

Telecommunications Engineering

Winter 2012

The modern telecommunications network is based on a broad spectrum of engineering principles for its design, evolution, operation and management. This course surveys these broad topics from a telecommunications industry perspective. We are fortunate in having a number of experts from the telecommunications industry, and the federal government, as well as from Carleton University to give the lectures.

Instructor: Akram Bin Sediq
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akram@sce.carleton.ca
<http://www.sce.carleton.ca/~akram/>
Instructor office hours: Wednesdays, 1:00 pm – 2:00 pm
Best way to contact the instructor: after SYSC4700 lectures and through e-mail

Schedule: Lectures: Wednesdays & Fridays, 2:35 pm – 3:55 pm, 416 SA (Southam Hall)
Laboratory: Thursdays, 2:35 pm – 5:25 pm, 507 AA (Architecture Building)

Laboratories consist of a number of components:

- a) Bell Central Office (CO) and Global Network Management Centre (GNMC) tour (**compulsory**). Sign-up sheets will be posted next to my office door (7035 MC)
- b) Bell Mobility Switching Centre tour (**compulsory**)
- c) TA Office Hours (Thursdays, 2:35 pm – 5:25 pm, 507 AA)
- d) Group project meetings

Labs are starting on Thursday, January 12

Web site: <http://www.sce.carleton.ca/courses/sysc-4700>
The website contains assignments, course notes, schedule information, marks postings, as well as updated course news. Please check the course website frequently.

Course Notes: Copies of lecture overheads will be available at the course website. Refer to the attached lecture schedule. Note that some lecture overheads may not be available until just before the scheduled lecture.

Text:
No textbook (refer to course notes).

References: R.N.E. Houghton, *The Telecommunications Mosaic*, a 3-volume draft textbook.
Recent issues of *IEEE Communications Magazine*, *IEEE Wireless Communications*, and *IEEE Networks*

Course prerequisites:

- 4th year status
- SYSC 3501 Communication Theory or SYSC 3503 Communication Theory II

Students who have not satisfied the prerequisites for this course must withdraw from the course; otherwise, these students will be deregistered from the course after the last day to register for courses in the Winter 2012 term.

- Marking:** Bell Central Office and Global Network Management Centre tour: **5%**
Bell Mobility Switching Centre tour: **5%**
Attendance (18 out of the 23 lectures): **10%**
Mid-term exam: **15%** (Friday, Feb 17)
Assignments: **10%**
Project: **15%**
Final Exam: **40%** (for the evaluation purposes only and will not be returned to the student)
- Term Exam:** Closed book (bring a calculator), scheduled on **Friday, February 17, 2010, during 02:35 pm – 03:55 pm, in lecture room (416 SA).**

Accommodations:

Medical certificates for absences from tests, assignments, or tours, must be presented within one week after the test or assignment due date or tour date. Otherwise, the student will get zero from that component of the course.

Students with Disabilities:

Students with disabilities requiring academic accommodations in this course are encouraged to contact a coordinator at the Paul Menton Centre for Students with Disabilities (PMC) to complete the necessary letters of accommodation. After registering with the PMC, make an appointment to meet and discuss your needs with me at least two weeks prior to the final exam. This is necessary in order to ensure sufficient time to make the necessary arrangements. Please note the following deadlines for submitting completed forms to the Paul Menton Centre: **March 7, 2012** for the Winter Term.

Laboratory and Assignments

This portion of the course consists of three major components:

1. (worth a total of 10%) Several regular assignments based on the lecture material. All assignments and reports will be deposited in the course assignment box (near ME 4436). **Late assignments and reports will be penalized 10% per day late. Hand in any late assignments directly to the teaching assistants.**
2. (worth 15%) A group project, in which you will work in groups of 3-4 to analyze and write a report. Report topic and further related information will be provided during the term.
3. (worth 5% + 5%) A visit to the Bell Central Office and Global Network Management Centre at 78 O'Connor St. Another visit to Bell Mobility Switching Centre at 1155 Lola Street, Unit 5. There may be questions related to them on the final exam.

TA Office Hours are part of the lab system as well.

Every student should have a copy of our Health and Safety Manual. An electronic version of the manual can be found at: <http://www.sce.carleton.ca/courses/health-and-safety.pdf>

Note on Plagiarism:

Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offence that will not be tolerated. Please refer to the section on instructional offences in the Undergraduate Calendar for additional information.

Central Office & GNMC and Bell Mobility Tours

Sign up for one of the possible central office visit times (the signup sheets will be posted on the door of Room 7035MC starting around **Jan. 18**): Note that signup is first come-first served, and that no more than 10 students will be allowed to sign up for each visit. The

Bell facilities must have a list of all visitors in advance of their visits. Therefore, no “last minute” visits will be allowed – you must sign up well in advance.

You are responsible for your own transportation to and from these facilities. The facilities have a high degree of security, and there are very strict rules and regulations regarding visits. **See the rules on the next page of this document.** If you arrive late or have to cancel, there is no guarantee that you can get on a later visit.

SYSC 4700 Course Instruction Personnel

Nikhil Adnani, PhD	CEO, ThinkRF
Andre Brandao, PhD	CRC (Communications Research Centre of Canada)
Andrew Brown	Manager, Development Test Engineering, Cisco Systems
Dave Dawson	Researcher
Bob Houghton, P.Eng	Bell Canada (retired)
Tony Hutchinson	Mitel Networks
Paul Kloppenburg, P.Eng	Avaya Networks
Jim MacFie	Microsoft
Steve Rayment	CTO, BelAir Networks
Ted Reinhardt	Director, Information Technology Security, Correctional Service of Canada
Tony Rybczynski, P.Eng	Director, Strategic Tech & Marketing, Enterprise Networks, Nortel (retired)
Henry Starzynski	Manager, Global Network Management Centre, Bell Canada
Chuck Storry	Director, DSL Architecture, CID, Alcatel-Lucent
Wen Tong, PhD, P.Eng	CTO Wireless and VP Wireless Research, Huawei Technologies
John Visser, P.Eng	Senior Manager, International Network Standards, Ericsson
John Wright, P.Eng	President, Softwright, Inc.
Akram Bin Sediq	Course Instructor, Carleton University

Teaching Assistants: Yaser Fouad <yfouad@sce.carleton.ca>
Furkan Alaca <falaca@sce.carleton.ca>

SECURITY REGULATIONS for BELL CANADA CENTRAL OFFICE (78 O'Connor Street) and BELL MOBILITY SWITCHING CENTER (1155 Lola Street, Unit 5) TOURS

ALL TOUR GROUPS MUST AGREE WITH THE FOLLOWING SECURITY BEFORE ENTERING THIS LOCATION

1. GROUP SIZE MUST NOT EXCEED 10 PEOPLE
2. ALL GROUPS MUST SUPPLY AN ATTENDEE LIST PRIOR TO ENTRY
3. ANYONE NOT ADHERING TO THE SCHEDULE WILL BE DENIED ACCESS
4. NO CAMERAS
5. NO FOOD OR BEVERAGES
6. NO BACKPACKS
7. IF YOU DO NOT HAVE A BELL ID, YOU MUST SIGN IN WITH SECURITY. CENTRAL OFFICE IS A VISABLE ID ZONE
8. THE ONLY TOURS SANCTIONED BY SECURITY ARE PREAUTHORISED BY THE DESIGNATED OPERATIONS TOUR TEAM
9. BELL IS REQUIRED BY LAW TO ADVISE YOU OF BUILDING EMERGENCY OPERATIONS PROCEDURES (EOP)
 - A) 'SLOW BELL' FIRE ALARM WILL TERMINATE YOUR TOUR
 - B) PROCEED IMMEDIATELY TO YOUR DESIGNATED EXIT AND EVACUATE AS DIRECTED BY YOUR TOUR LEADER OR BY THE BUILDING EMERGENCY CO-ORDINATOR
 - C) KEEP TO THE RIGHT OF THE STAIRS
 - D) WALK, DO NOT RUN
 - E) DO NOT ENTER ANY OTHER FLOOR UNLESS ORDERED TO DO SO OVER THE PUBLIC ADDRESS SYSTEM
 - F) DO NOT USE ELEVATOR

Typical Tour Components:

Power Room
Cable Vault
Main Distribution Frame
DMS
DSLAM
Transport Equipment
Fibre Management System
DS/DS1/DS3
X-connects
Fibre Multiplexers

SYSC 4700 Telecommunications Engineering

Winter 2012 – Lecture Schedule [last updated on 18 November 2011]

All lectures are in 416 SA (Southam Hall) and held during 2:35 pm – 3:55 pm

Lecture	Date		Topic	Lecturer
1	Wed	Jan 04	Introduction, Objectives Telecommunications Overview	A. Bin Sediq R. Haughton
2	Fri	Jan 06	Telecommunication Network Evolution	J. Wright
3	Wed	Jan 11	Information: Analog and Digital I	A. Bin Sediq
4	Fri	Jan 13	Information: Analog and Digital II	A. Bin Sediq
5	Wed	Jan 18	Signaling SS7 Engineering Finance	J. Wright J. Wright
6	Fri	Jan 20	Packet Switching	T. Rybczynski
7	Wed	Jan 25	Transmission Media	A. Bin Sediq
8	Fri	Jan 27	Problem Analysis and Solving Network Management of Telecommunication Networks	R. Haughton H. Starzynski
9	Wed	Feb 01	Global Telecommunications Standards	J. MacFie
10	Fri	Feb 03	Multiplexing	A. Bin Sediq
11	Wed	Feb 08	Digital Subscriber Loops and Fiber Access	C. Storry
12	Fri	Feb 10	Voice Over IP	T. Hutchinson
13	Wed	Feb 15	RF Spectrum Management Smart Grid	D. Dawson A. Brandao
14	Fri	Feb 17	Term Exam	
			Winter Break	
15	Wed	Feb 29	Fundamentals of Cellular Communications and Networks	A. Bin Sediq
16	Fri	Mar 02	Evolution of Cellular Networks	A. Brandao
17	Wed	Mar 07	4G Cellular LTE & LTE-Advanced Networks	W. Tong
18	Fri	Mar 09	Wireless Standards	J. Visser
19	Wed	Mar 14	Cognitive Radio Starting An IT Company	N. Adnani N. Adnani
20	Fri	Mar 16	Network Security and Public Key Cryptography	T. Reinhardt
21	Wed	Mar 21	Wireless LAN / WiFi	S. Rayment
22	Fri	Mar 23	Wireless Multihop Relay & Mesh Networks	A. Bin Sediq
23	Wed	Mar 28	Internet Technology Overview	P. Kloppenburg
24	Fri	Mar 30	Large Scale IP Network Design	A. Brown
25	Wed	April 04	Review	A. Bin Sediq