CARLETON UNIVERSITY

Department of Systems and Computer Engineering

SYSC 4700 Telecommunications Engineering Winter 2018

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.

This course is broader than almost all the other courses you have had. The course aims to give you the big picture. The course helps in job interviews.

Instructor:	Professor Halim Yanikomeroglu 7032 MC (Minto Centre), 613-520-2600, ext. 5734 <u>halim@sce.carleton.ca</u> <u>http://www.sce.carleton.ca/faculty/yanikomeroglu.html</u>					
TAs:	Hossein Khoshnevis Mohamed Alzenad	7035 MC (Minto) 4038 MC (Minto)	khoshnevis@sce.carleton.ca mohamed.alzenad@sce.carleton.ca			
Schedule:	Lectures: Tuesday Laboratory: Fridays,	ys & Thursdays, 10:05 – [.] 8:35 – 11:25 am, 4324 N	11:25 am, 240 TB (Tory) /IE (Mackenzie)			
	Instructor (Yanikomeroglu) office hours: After the SYSC 4700 lectures The best way to contact the instructor: After the SYSC 4700 lectures and through e-ma Always use your Carleton email.					
Labs:	Laboratories consist of a number of components:					
	a) Bell Central Office (CO) and Global Network Management Centre (GNMC) tour (mandatory). Sign-up sheets will be posted next to my office door (7032 MC).					
	b) Bell Mobility Switching Centre tour (mandatory).					
	c) TA Office Hours: Fridays, 8:35 – 11:25 am, 4324 ME (lab time).					
	d) Group project meetings among students.					
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 slides will be available at the course website. Refer to the attached lecture schedule. Some lecture slides may not be available until just before the scheduled lecture.					
Text:	No textbook (refer to course notes).					
References:	Recent issues of IEEE Communications Magazine, IEEE Wireless Communications, IEEE Networks, and IEEE Spectrum.					

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 2018 term.

Marking:Bell Central Office and Global Network Management Centre tour: +5% or -5%
Bell Mobility Switching Centre tour: +5% or -5%
Term exam: 15% (Thursday, Feb 15)
Assignments: 5%
Project: 20%
Final Exam: 50% (for the evaluation purposes only and will not be returned to the student)

Term Exam: Closed book (bring a calculator), scheduled on **Thursday, February 15**, during 10:05 – 11:25 pm; location: in-class (240 TB).

Accommodations:

Medical certificates for absences from tests, assignments, Bell tours, as well as for the missed classes in order to get the attendance mark, must be presented within one week after the test or assignment due date or tour date or the missed class. Otherwise, the student will get zero from that component of the course.

Students with Disabilities:

Students with documented disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Registered PMC students are required to contact the PMC early each term to ensure that your Instructor receives your Letter of Accommodation no later than two weeks before the first in-class test/midterm requiring accommodations. If you require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC.

Laboratory and Assignments

This portion of the course consists of three major components:

- 1. (worth a total of 5%) About 3-4 assignments based on the lecture material. All assignments and reports will be handed in to designated assignment boxes in Mackenzie.
- 2. (worth 15%) A group project, in which you will work in groups of 3-4 to recommend solutions to an engineering problem in the form of a report. Project topic and further related information will be provided during the term. The best project will get an award (the best project award certificate).
- **3.** (worth +5% or -5%) A tour of the Bell Central Office and Global Network Management Centre at 78 O'Connor St. A student not attending the tour gets -5%.
- **4.** (worth +5% or -5%) A tour of the Bell Mobility Switching Centre at 1155 Lola Street, Unit 5. A student not attending the tour gets -5%.
- 5. 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: <u>http://www.sce.carleton.ca/courses/health-and-safety.pdf</u>

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 <u>one</u> of the possible central office visit times (the signup sheets will be posted on the door of Room 7032 MC starting on **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.

Osama Aboul-Magd, PhD	Principal Engineer, Huawei Canada Research Centre		
	Chair, IEEE 802.11ax Technical Group		
Nikhil Adnani, PhD	CTO, ThinkRF		
Furkan Alaca	Instructor and PhD candidate, School of Computer Science, Carleton U		
Andre Brandao, PhD	Project Leader, CRC (Communications Research Centre of Canada)		
Matthias Falkner, PhD	Distinguished Technical Marketing Engineer, Cisco Systems Canada		
Tony Hutchinson	Cloud Architect, Mitel Networks		
Paul Kloppenburg	Senior Strategic Architect, Avaya Networks		
Jim MacFie	National Standards Officer, Microsoft Canada		
Gerald Methe	Radio Access Networks Specialist, Bell Mobility		
Steve Rayment	Vice President, Technology Solutions, Ericsson		
Ted Reinhardt	Senior Director, Information Management Services, Government of Canada		
Tony Rybczynski	Director, Enterprise Networks, Nortel (retired)		
Henry Starzynski	Manager, Global Network Management Centre, Bell Canada (retired)		
Chuck Storry	Director, DSL Architecture, Nokia Canada		
Sherif Toulan	Technical Leader, Cisco Systems Canada		
Halim Yanikomeroglu, PhD	Professor, Carleton University		

SYSC 4700 Course Instruction Personnel

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 2018 – Lecture Schedule [last update: 08 January 2018]

All lectures are in 240 TB (Tory Building) and held during 10:05 – 11:25 am

Lecture	ecture Date		Торіс	Lecturer
1	Tue	Jan 09	Introduction, Objectives ICT & 5G Wireless	H. Yanikomeroglu
2	Thu	Jan 11	History of Telecommunications Transmission of Information – I	H. Starzynski H. Yanikomeroglu
3	Tue	Jan 16	Transmission of Information – II	H. Yanikomeroglu
4	Thu	Jan 18	Transmission of Information – III	H. Yanikomeroglu
5	Tue	Jan 23	Packet Switching	T. Rybczynski
6	Thu	Jan 25	Network Management of Wireless Networks Transmission of Information Media – I	G. Methe H. Yanikomeroglu
7	Tue	Jan 30	Transmission Media – II	H. Yanikomeroglu
8	Thu	Feb 01	Transmission Media – III	H. Yanikomeroglu
9	Tue	Feb 06	Broadband Access Technologies – xDSL & FTTx	C. Storry
10	Thu	Feb 08	Introduction to Machine Learning and Data Analytics (Big Data) in Communications Networks	A. Brandao
11	Tue	Feb 13	Global Telecommunications Standards	J. MacFie
12	Thu	Feb 15	Term Exam	
			Winter Break (Feb 19–23)	
13	Tue	Feb 27	Wireless LAN / WiFi – I	S. Rayment
14	Thu	Mar 01	Wireless LAN / WiFi – II	O. Aboul-Magd
15	Tue	Mar 06	Fundamentals of Cellular Communications & Networks – I	H. Yanikomeroglu
16	Thu	Mar 08	Fundamentals of Cellular Communications & Networks – II	H. Yanikomeroglu
17	Tue	Mar 13	Evolution and Future of Wireless Cellular	H. Yanikomeroglu
18	Thu	Mar 15	Voice over IP	T. Hutchinson
19	Tue	Mar 20	Starting a Technology Company	N. Adnani
20	Thu	Mar 22	Network Security and Cryptography – I	T. Reinhardt
21	Tue	Mar 27	Network Security and Cryptography – II	F. Alaca
22	Thu	Mar 29	Network Security and Cryptography – III	F. Alaca
23	Tue	Apr 03	Internet Technology & Cloud Computing Overviews	P. Kloppenburg
24	Thu	Apr 05	Multiprotocol Label Switching (MPLS) Services	S. Toulan
25	Tue	Apr 10	Network Function Virtualization (NFV) Software Defined Networks (SDN)	M. Falkner