Carleton University

Department of Systems and Computer Engineering

SYSC 4600 Digital Communications Fall 2016

http://www.sce.carleton.ca/courses/sysc-4600/f16

Course Outline

Instructor: Professor Halim Yanikomeroglu
Office: MC 7032
Phone: 613-520-5734
Email: halim@sce.carleton.ca
URL: http://www.sce.carleton.ca/faculty/yanikomeroglu.html

Lectures: Tuesdays and Thursdays, 8:35 – 9:55 am, 2202 CB (Canal Building)

Office Hours: Tuesdays and Thursdays, after the lecture

TA: Hamza Umit Sokun, husokun@sce.carleton.ca, 4038 MC

Course Description and Objectives: The objective of this course is to introduce the student to advanced topics in modulation and coding. Topics covered includes signal space representation, probability of error and bounds for AWGN channel, applications to PSK, QPSK, FSK, QAM, multi-carrier modulation and OFDM, spread-spectrum communication and CDMA, information theory, source coding theorem, channel capacity, linear block codes and convolutional codes.

Prerequisites: SYSC 3501 Communication Theory
STAT 3502 Probability and Statistics

Students who have not satisfied the prerequisites for this course must either a) withdraw from the course, or b) obtain a prerequisite waiver from the Registrar's office, or c) will be deregistered from the course after the last day to register for courses in the Fall term."

Textbook: Simon Haykin and Michael Moher, *Communication Systems*, 5th edition, John Wiley and Sons, Inc., 2009 (4th edition, 2001).

References:

- Wikipedia.
- B. Sklar, *Digital Communication: Fundamentals and Applications*, 2nd edition, Prentice Hall, 2001.
- There are many other very good textbooks.

Laboratory Sessions: Even Fridays, 11:35 am – 2:25 pm, 6045 MC (Minto)

Grading Scheme: To pass the course, a student must obtain at least 50% in the final exam. Composition of final mark:

Assignments:	Will not be collected
Quizzes:	10% (3 in total; dates TBD, in-class, 20 mins each)
Term Exam:	20% (Wednesday, October 20, in-class, 80 mins)
Labs:	20% (4 or 5 in total)
Final Exam:	50% (will be scheduled by exam services, 3 hours)

Carleton University
Department of Systems and Computer Engineering

SYSC 4600 **Digital Communications** **Fall 2016**

http://www.sce.carleton.ca/courses/sysc-4600/f16

Course Outline

Important Dates:

	Tue	Thu	Week	Lab / PAS
Sep		08 (1)	0	
	13 (2)	15 (3)	1	
	20 (4)	22 (5)	2	Fri, Sep 23
	27 (6)	29 (7)	3	
Oct	(TA) 04 (8)	(TA) 06 (9)	4	Fri, Oct 07
	11 (10)	13 (11)	5	
	18 (12)	**Term Exam – 20 (13)**	6	Fri, Oct 21
	25	27	Fall Break	
Nov	01 (14)	03 (15)	7	
	08 (16)	10 (17)	8	Fri, Nov 11
	15 (18)	17 (19)	9	
	22 (20)	24 (21)	10	Fri, Nov 25
	29 (22)	01 (23)	11	
Dec	(TA) 06 (24)	(TA) 08 (25)	12**?**	Fri, Dec 09**?**

Please be advised that classes on Friday, December 9th will follow a Monday schedule:

1) There will be no Friday classes on Friday, December 9th.
2) Last Friday classes will take place on Friday, December 2nd.
3) Although the week of December 5th is an even week, December 9th will be the 6thodd Monday for engineering and science labs and other activities that are offered in odd weeks only.

- Final exam is for the evaluation purposes only and will not be returned to the student.
- A student who misses the term exam or a quiz must submit formal documentation (such as a physician's report) to prevent a penalty. If the documentation is accepted, the weight of the quiz and term exam will be moved to the final exam.
- The students must be present in the lab during the lab period.
- Students are expected to attend all lectures and lab periods as required. The Faculty of Engineering and Design requires students to have a conflict-free timetable, so requests to accommodate missed exams, assignment due dates, project milestones, etc., because of conflicts with other courses, jobs or vacation plans will not be considered.

Course Outline

Academic Accommodations for Students with Disabilities:

"The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your ***Letter of Accommodation*** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). **Requests made within two weeks will be reviewed on a case-by-case basis.** After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (*if applicable*). "

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

Week-By-Week Outline (maybe modified)

Weeks 1-2	Overview of digital communications systems. Review of probability concepts and stochastic processes. Review of linear system concepts including frequency analysis.
Weeks 3-6	Baseband transmission and matched filter. Signal space analysis and geometric representation of signals. Maximum likelihood detection. Probability of error.
Week 7	Bandpass transmission.
Weeks 8-9	Linear clock codes, syndrome decoding, Hamming distance. Error detecting and correcting capabilities of block codes. Examples of linear block codes.

Course Outline

Weeks 10-11	Convolutional codes, distance properties, systematic and nonsystematic codes. Decoding of convolutional codes and Viterbi algorithm.
Week 12	Introduction to information theory. Shannon's channel capacity theorem. Shannon limits. Introduction to source coding.