SYSC3501 Syllabus

Calendar Description

Term Winter 2012

SYSC 3501 [0.5 credit] (formerly 94.351*)

Communication Theory

Review of signals, linear systems and Fourier theory; signal bandwidth and spectra; digital waveform coding. Introduction to analog and digital modulation systems; synchronization; characterization and effects of noise; link budgets; communications media and circuits; applications to current communications systems.

Precludes additional credit for SYSC 3503.

Prerequisites: MATH 3705 and SYSC 3600 and STAT 3502 (STAT 3502 may be taken concurrently).

Lectures three hours a week and laboratory three hours alternate weeks.

Students who have not satisfied the prerequisites for this course must either:

a) withdraw from the course immediately; or

b) submit a prerequisite waiver online at www.sce.carleton.ca/ughelp and have it approved;

otherwise they will be deregistered from the course after the last day to register for courses in the Winter 2011 term..

Course Website

http://www.sce.carleton.ca/moodle/course/

Professors

Section	Name	E-Mail	Telephone	Office	Office Hours
A	Dr. Xiaoping P. Liu	xpliu@sce.carleton.ca	520-2600 ext 1774	4252 ME	MW13:00 - 14:00
B	Ms. Shermeen Nizami	shermeen@sce.carleton.ca			Appointment by email

Lecture Schedule

Section	Room	Lecture Time
A	TB 340	MW 16:05 - 17:25
B	ME 4499	TR 8:35 - 9:55

Laboratory Schedule

Section	**L1O**	**L2E**	**L3O**
Time	F (odd) 14:35 - 17:25	F (even) 11:35 - 14:25	W (odd) 11:35 - 14:25
Section	**L4E**	**L5O**	**L6E**
Time	T (even) 11:35 - 14:25	M (odd) 8:35 - 11:25	F (even) 14:35 - 17:25

Odd and even weeks are determined by the course outline (the first week is week 0 and is even). Note that winter break is not counted as a week. Refer to the course outline to avoid confusion. **It is your responsibility not to miss a laboratory!**

Textbook

L.W. Couch II, *Digital and Analog Communication Systems*, 7th Edition, Prentice-Hall, 2007.

Other References

H.P.E. Stern and S.A. Mahmoud, *Communication Systems - Analysis and Design*, Pearson Prentice Hall, 2004.

S. Haykin, *Communication Systems*, Fourth Edition, Wiley, 2001. TK5101.H37 2000

B.P. Lathi and Ding, *Modern Digital and Analog Communication Systems*, Oxford Higher Education, 2009

B.P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 1998. TK5101.L333

Marking Scheme

Maximum of {Scheme #1, Scheme #2, Scheme #3}

	Scheme #1	**Scheme #2**	**Scheme #3**
Midterm 1	15%	10%	20%
Midterm 2	15%	20%	10%
Assignments	10%	10%	10%
Laboratories	15%	15%	15%
Final Exam	45%	45%	45%

Whichever marking scheme is used, a student will receive an **F** (or **FND**) if they:

1. Failed to achieve a passing grade (50%) in the laboratories **OR**

2. Missed more than one lab **OR**

3. Failed to achieve a passing grade (50%) in the final exam

Examinations

Students who miss a midterm test must contact their professor within a week after the test date and provide a valid medical report in a timely fashion; **otherwise, a zero mark will be assigned for that test**. Students that miss the test with an excuse that is deemed valid may have the portion of the mark allocated to the test reallocated towards the final exam. There is no make-up midterm test.

The final exam is for evaluation purposes only and will not be returned to the student. Students who miss the final exam may be granted permission to write a deferred examination (see the Undergraduate Calendar for regulations on deferred exams). These students have additional months to study and a less crowded examination schedule compared to their colleagues who write the final exam in April. As such, it is only fair to expect substantially better performance from these students on the deferred examination than on the final exam.

Students must write their tests in their assigned section. Students must arrive for their tests on time and may not leave the test early. A student arriving late for a test may not be allowed to write the test and receive a grade of zero.

Assignments

There will be 4 assignments which will be given at regular intervals. All these assignments will be marked. The deadlines of submission will be 4:00 pm one week after the posting date. Assignments will be returned to students after marking and solutions of assignment questions will be posted on the course website.

Laboratories

There will be 5 labs: 2 hardware experiments and three computer simulation projects using Matlab/Simulink. Each student will be required to perform all the six labs. The three hardware labs will be conducted in **ME4485** and all the three software experiments in **MC6045**.

Note that **students who missed attendance for more than one lab without a valid excuse will automatically receive an F (or FND) in the course**. A valid excuse is equivalent to reasons for missing a final examination. **Students who miss a lab must contact their professor and the head TA in a timely fashion and provide a valid medical report within a week after their scheduled lab date; otherwise a mark of zero will be assigned for that lab**.

Lab Groups

Lab groups will be formed during the first two weeks of the term. More information on the nature of the lab groups will be posted on the Laboratory Section of the website.

Reports

Students are required to do their labs in their assigned group and during their scheduled lab sessions. Each group must complete one joint report for each lab, which must include answers to all the questions (theoretical and experimental) in the lab manual. Students must demonstrate their experiment (software simulations or hardware experiments) to the TAs during their lab session. Notes, data, sketches etc. must be initialed by one of the TAs responsible for the lab and included in the report. **The ones not initialed will be given a zero mark**.

Each student individually, (not as a group) must prepare the prelab prior to coming to the lab session. The TAs will initial her/his prelab, but will not collect them. **If the quality of the prelab is not satisfactory, or if the student has not done the prelab, 20% will be deducted from the total marks for this lab. If the student has done the prelab as a group, and the quality of the prelab is satisfactory, 10% will be deducted for each student. The prelab, sketches, plots, etc. should all be included in the final lab report.**

Deadlines

Lab reports are due one week after the completion of your lab session at 4:00 pm. For example, if you performed your lab on a Monday, it would be due the following Monday at 4:00 pm. **Any lab report or assignment work submitted after the deadline will be given a mark of zero. No exceptions**. Do not leave things to the last minute to avoid unforeseen circumstances (e.g. printer problems and transportation problems). A good way to avoid these problems is to finish the lab at least a day earlier.

Assignment and lab reports shall be dropped off by the due date in the departmental drop boxes.

Exemptions

Students can apply for a lab exemption if they have taken the course during the Winter Term of 2011, or the Summer Term of 2011, have done all labs, and have an average lab mark of at least 80%. Lab exemptions can be applied for by sending an e-mail to the professor of your section. **Lab exemptions must be arranged by 4:00 pm on Monday January 09, 2012**.

Manuals

Laboratory manuals will be posted on the course web site in the Laboratories page.

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and

email your instructor with any requests for academic accommodation during the first two weeks of class or as soon as possible after the need for accommodation is known to exist.

It takes time to review and consider each request individually and to arrange for accommodations where appropriate. Please make sure you respect these timelines particularly for in-class tests, mid-terms and final exams, as well as any change in due dates for papers.

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://carleton.ca/equity/accommodation.

Students with disabilities requiring academic accommodations in this course are encouraged to contact a coordinator at the Paul Menton Centre for Students with Disabilities 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.

Others

Plagiarism (copying and handing in someone else's work for credit) is a serious instructional offence that will not be tolerated. Note that the person providing solutions to be copied is also committing an offence as they are an active participant in the plagiarism. The person copying and the person copied from will be reprimanded according to the regulations set by Carleton University. Please refer to the section on instructional offences in the Undergraduate Calendar for additional information

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

Course Outline

Week 0 (Jan 4-6)

Introduction and overview of communication theory and systems (Chapter 1)

Review of complex arithmetic (notes)

Week 1 (Jan 9-13)

Properties of signals and noise (Section 2.1)

Fourier Transform and Spectra (Section 2.2)

Week 2 (Jan 16-20)

Power Spectrum (Section 2.3)

Fourier Series and periodic signals (Section 2.5)

Review of linear systems (Section 2.6)

Week 3 (Jan 23 – 27)

Bandwidth (Section 2.9)

Limiter, mixers, up- and down-converters (notes, Sections 4-10-12)

AM-DSB-C and noncoherent detection (Sections5-1, 4-13)

Week 4 (Jan 30 - Feb 3)

AM-DSB-SC and coherent detection (Sections 5.3, 4-13)

SSB and VSB (brief, Section 5.5)

Phase and frequency modulation and demodulation (Sections 5.6, 4-13)

Week 5 (Feb 6-10)

Superheterodyne receiver and image frequencies (4-16)

Sampling, quantization, and PCM systems (Sections 3.1 - 3.3)

Week 6 (Feb 13-17)

Pulse shaping (Section 3.6)

Midterm 1

Winter break (Feb 20-24)

Week 7 (Feb27- Mar 2)

Digital baseband modulation, binary and multilevel signaling (Section3-4)

Week 8 (Mar 5- 9)

Digital bandpass modulation: BASK, BPSK, BFSK, QPSK, M-ary PSK, QAM (Sections 5.9 and 10)

Week 9 (Mar 12-16)

Random processes (Sections 6.1-6.5, brief)

Thermal noise (Section 6.6)

Week 10 (Mar 19-23)

Error probabilities for binary signals (Sections 7.1-7.2)

Matched filter (Section 6.8)

Midterm 2

Week 11 (Mar 26 – 30)

Coherent demodulation of digital bandpass modulation (Section 7.3)

Noncoherent demodulation of digital bandpass modulation (brief Section 7.4)

Comparison of digital signaling systems (Section 7.6)

Week 12 (Apr 2 – 5)

Free space radio propagation, antennas, and link budgets (Section 8.6)

TDM, FDM, CDM and Spread Spectrum (Sections 3.9, 5.7 and notes) if time permits

Review

Last updated 26 January 2012