

CN8811: Multimedia Processing and Digital Communication

Calendar Description

The course covers the basic concepts in digital communication techniques. It subsequently introduces various aspects of multimedia processing. Topics include: sampling, quantization, PCM, DPCM, delta modulation, line coding, information theory on entropy, Huffman coding, Lempel Ziv coding, information theory on channel capacity, linear block codes, cyclic codes, convolutional codes, baseband transmission, multimedia data compression standards, and multimedia information retrieval. Theoretical concepts will be re-enforced through some experiments in the laboratory using Matlab.

Course Details

MAJOR TOPICS

- **Introduction:** *C1 and Appendix A* - Introduction to communication systems and digital information, review of Fourier analysis, Fourier series and Fourier transform, and linear time invariance system.
- **Sampling theory in digital communication:** *C2:* sampling, Nyquist rate, quantization, signal to quantization noise ratio, PCM, delta modulation.
- **Source coding and channel coding:** *C13, C6-7:* Information theory on entropy, Huffman coding, lempel-ziv coding. Cyclic codes, convolutional codes, transfer functions.
- **Probability, optimal detection of binary signals,** *C3-4* Review probability, autocorrelation function and power spectrum density, WSS processes, optimal detection of binary signals in AWGN channel, optimal transceiver, bit error rate analysis.
- **Multimedia data compression and information retrieval,** *C13:* Introduction to multimedia data compression standard (ADPCM, MPEG, JPEG); fundamental of voice compression, audio and image processing techniques.

TEXTBOOK

- Bernard Sklar, Digital communications: Fundamentals and applications, Prentice Hall, 2000.

OTHER REFERENCES:

- Simon Haykin, An Introduction to Analog and Digital Communications, Wiley, 1989.
- Simon Haykin, Communications Systems, 3rd edition, Wiley, 1994.
- B.P. Lathi, Modern Digital and Analog Communication System, Oxford Press, 1998.

Course Schedule (tentative)

	Tuesday	Friday
September	09 Introduction Into to matlab	12 Introduction Sampling Theorem Lab0 (no report)
	16 Sampling Theorem	19 Source coding Lab 1 due
	23 Source coding	26 Channel coding Lab 2 due
	30 Channel coding	
October		03 Channel coding Midterm
	07 Optimal detection	10 Optimal detection Lab 3 due
	14 Multimedia processing	17 Finish cours and review Lab 4 due
	21	24 Final Exam

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Lab Schedules

Laboratory: *Everyone must read the lab materials and do the preparation before each lab. In order to obtain a passing grade in this course, all students must attend the lab and hand in the lab report. Late submission will not be accepted.*

- **Lab0:** Familiar with matlab, no report ([exp0.pdf](#)).
- **Lab1:** Sampling Theorem, Quantization and PCM ([exp1.pdf](#));
- **Lab2:** Source Coding Techniques ([exp2.pdf](#));
- **Lab3:** Channel coding Techniques ([exp3.pdf](#));
- **Lab4:** Binary Transmission in the Presence of AWGN, Bit Error Rate Analysis ([exp4.pdf](#))

Evaluation

Laboratory	20 %
Midterm	30 %
Final exam	50%

All grades will be posted in Blackboard.
Students who miss the midterm, marks will be added to final exam

Missed Classes and/or Evaluations

Students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any considerations and accommodations according to the relevant policies and well in advance. Failure to do so will jeopardize any academic appeals.

- *Medical certificates* – If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component because of illness, he or she must submit a Ryerson Student Medical Certificate AND an Academic Consideration form within 3 working days of the missed date. Both documents are available at www.ryerson.ca/senate/forms/medical.pdf. **If you are a full-time or part-time degree student, then you submit your forms to your own program department or school. If you are a certificate or non-certificate student, then you submit your forms to the staff at the front desk of the Chang School.**
- *Religious observance* – If a student needs accommodation because of religious observance, he or she must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the required absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the required absence. Both documents are available at <http://www.ryerson.ca/senate/forms/reobservforminstr.pdf>. **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school. If you are a certificate or non-certificate student, then you submit the forms to the staff at the front desk of the Chang School.**
- *Students with disabilities* – In order to facilitate the academic success and access of students with disabilities, they should register with the Access Centre <http://www.ryerson.ca/studentervices/accesscentre/index.html>. Before the first graded work is due, students should also inform their instructor through an “Accommodation Form for Professors” that they are registered with the Access Centre and what accommodations are required.

Academic Integrity and Plagiarism

Ryerson’s Policy 60 (the *Student Code of Academic Conduct*) applies to all students at the University. The policy and its procedures are triggered in the event that there is a suspicion that a student has engaged in a form of academic misconduct.

Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism. Plagiarism is a serious academic offence and penalties can be severe. In any academic exercise,

plagiarism occurs when one offers as one's own work the words, data, ideas, arguments, calculations, designs or productions of another without appropriate attribution or when one allows one's work to be copied.

All academic work must be submitted using the citation style approved by the instructor. The most common citation style is APA. Students may refer to the Ryerson Library for APA style guide references: <http://library.ryerson.ca/guides/toolbox/style/>

It is assumed that all examinations and work submitted for evaluation and course credit will be the product of individual effort, except in the case of group projects arranged for and approved by the course instructor. Submitting the same work to more than one course, without instructor approval, is also considered a form of plagiarism.

Students are advised that suspicions of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are charged with academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will be assigned one or more of the following penalties:

- A grade reduction for the plagiarized work
- A zero for the plagiarized work
- An F in the course
- More serious penalties up to and including expulsion from the University

For more detailed information on these issues, please refer to the full online text for the *Student Code of Academic Conduct* at <http://www.ryerson.ca/senate/policies/pol60-F2014.pdf> and the Academic Integrity Website at www.ryerson.ca/ai.

Important Resources Available at Ryerson

Use the services of the University when you are having problems writing, editing or researching papers, or when you need help with course material:

- **The Library** (LIB 2nd floor) provides research workshops and individual assistance. Inquire at the Reference Desk or at www.ryerson.ca/library/info/workshops.html
- **The Writing Centre** (LIB 272- B) offers one-on-one tutorial help with writing and workshops www.ryerson.ca/writingcentre/workshops.htm
- **Learning Success** (VIC B-15) offers individual sessions and workshops covering various aspects of researching, writing, and studying. You must book these directly through their website <http://www.ryerson.ca/student-services/learningsuccess/>
- **English Language Support** (VIC B-17) offers workshops to improve overall communication skills www.ryerson.ca/student-services/els/

There is one general site where you may see and register for all of the workshops offered by all of these areas: <http://www.ryerson.ca/academicintegrity/workshops.html>