

University of Western Ontario
Faculty of Engineering
Department of Electrical and Computer Engineering
ECE-9304 (MEng & PhD) /ECE-9034 (MEng) – Digital Modulation and Coding
(Graduate Course, Summer 2019)
May 1, 2017 to July 2, 2019
Course Outline

Objective

The primary aim of this course is to introduce graduate students, wishing to specialize in digital transmission theory, to topics of digital signal design, detection theory, error coding and decoding, modulation and demodulation techniques, and communication system design concepts.

Instructor

Dr. Raveendra Rao, P.Eng., SIEEE
ACEB 4457, Dept. of Electrical and Computer Engineering
Tel: (519) 661-2111 ext 88231
Email: rrao@uwo.ca

Contact Hours

3 lecture hours/week, Monday: 9.30 AM to 10.30 AM; Tuesday: 10.30 AM to 12.30 PM.
All lectures are held in Room SH 3307.

1 hour in-class discussion every alternate week; Alternate Mondays: 8.30 AM to 9.30 AM starting from May 13, 2019.

Prerequisite

ECE-4433 and ECE-4437 or Equivalent. Background in probability, random variables, and stochastic processes and MATLAB are essential.

Topics

1. Signal-Space Analysis
2. Detection of Signals in noise
3. Modulation and Demodulation Techniques
4. Performance Analysis of Communication Systems
5. Channel Coding and Decoding Techniques
6. Special Topics in Communication Systems

Books and Course Material

J.G.Proakis & M.Salehi: Digital Communications, McGraw-Hill, Fifth Edition

S.Haykin: Communication Systems, John Wiley, 4/e, ISBN: 0-471-17869-1

A. Papoulis, Probability, Random Variables, and Stochastic Processes, McGraw Hill, 1991, ISBN-0-07-0484775

H.L.Van Trees and K.L.Bell with Z. Tian: Detection, Estimation, and Modulation Theory, Wiley, 2nd Edition, 2013, ISBN 978-0-470-54296-5

R.K.Rao: "Course Notes" (will be posted on course website)

Assignments & Exercises

A total of TWO assignments will be administered during the course duration and you are required to submit solutions to these on due dates mentioned on them. Several exercises would be posted to website during the course. There is no need to submit solutions to these

exercises. You are encouraged to solve them to obtain firm grasp of concepts and topics taught in the course.

Project/Research Project

Research project for students of ECE-9304 and project for students of ECE-9034 would be posted to the course website. Students are expected to work on these and submit a report in the form of a technical paper. Submission is due on June 28, 2019.

Course Evaluation

ECE-9304 (MEng & PhD):

To obtain a passing grade in the course student must obtain minimum of 50% in each of the three components namely Research Project, Assignments, and Final Examination. Failure to obtain a mark of 50% in these two components will result in a course grade of 48% or less. The Table below indicates weights for each of the course components:

Component	Weight	Penalty (English)	Penalty (Presentation)
Research Project	20%	10 %	10 %
Assignments (2)	15%	10%	10%
Final Examination	65%	5 %	5 %

ECE-9034 (MEng):

To obtain a passing grade in the course student must obtain minimum of 50% in each of the three components namely Project, Assignments, and Final Examination. Failure to obtain a mark of 50% in these components will result in a course grade of 48% or less. The Table below indicates weights for each of the course components:

Component	Weight	Penalty (English)	Penalty (Presentation)
Project	20%	10 %	10 %
Assignments (2)	15%	10%	10%
Final Examination	65%	5 %	5 %

In accordance with the policy of the University, the grade assigned to all written and oral work presented in English shall take into account syntax, diction, grammar and spelling. In the professional life of an engineer, the manner in which oral and written communications are presented is extremely important. An engineering student must develop these skills as an integral part of the undergraduate program. To encourage the student to do so, the grades assigned to all written and oral work will take into account all aspects of presentation including conciseness, organization, neatness, use of headings, and the preparation and use of tables and figures.

All work will be marked first for content after which a penalty not to exceed the maximum percentages shown above may be applied for lack of proficiency in English and/or presentation.

Final Examination

Date and Time: Friday the June 28, 2019 and 10.30 AM to 1.30 PM

Duration: 3 Hours

Format: Closed Book Examination (only a calculator is permitted)

Location: To Be Announced

General Learning Objectives

Knowledge Base	2/3	Use of Engineering Tools	3/3	Impact on Society and the Environment	
Problem Analysis	2/3	Individual and Team Work		Ethics and Equity	
Investigation		Communication Skills		Economics and Project Management	
Design		Professionalism		Life-Long Learning	

Notation: x/y , where x is the cognitive level (1: Remember, 2: Understand, 3: Apply) at which the attribute is assessed and y is the academic level (1: Beginner, 2: Intermediate, 3: Advanced) at which the attribute is assessed.

Late Submission Policy

All submissions are due by 4.30 PM on specified due date. Late submissions will not be accepted.

Project/Assignment Submission

ACEB 4457 (slip under my office door)

E-mail Correspondence Policy

Use Subject as **ECE 9304/ECE 9034** in all e-mail correspondence regarding the course. Please note that all e-mails from non-UWO accounts will be ignored.

Use of English

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, project reports, and examinations for improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Attendance

All classes are mandatory unless otherwise stated. Any student who, in the opinion of the instructor, is absent too frequently from class will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Absence Due to Illness or Other Circumstances

Students should immediately consult with the instructor or department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached "Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled"). The student should seek advice from the instructor or department Chair regarding how best to deal with the problem. Failure to notify the instructor or department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Cheating and Plagiarism

Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Use of Electronic Devices

Students may use laptops, tablet computers, or smart phones *only* to access the course OWL site during lectures. Use of *nonprogrammable* calculators *only* is permitted during examinations. No other electronic devices may be used at any time during lectures or examinations.

Internet and Electronic Mail

Students are responsible for regularly checking their Western e-mail and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted to the website.

Accessibility

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services

Office of the Registrar, <http://www.registrar.uwo.ca/>

Student Development Centre, <http://www.sdc.uwo.ca/>

USC Student Support Services, <http://westernusc.ca/services/>

Students who are in emotional/mental distress should refer to Mental Health @ Western, http://www.health.uwo.ca/mental_health/, for a complete list of options about how to obtain help.