

Dordt College Engineering Department

EGR 363, Introduction to Communication Systems

Fall, 2017

2017-18 Catalog Data	A study of analog and digital communication systems performance and theory with applications in radio, satellite, telephone, computer networking, and radar systems. Topics include linear modulation (AM, SSB, etc.) exponential modulation (FM and PM), sampling theory, the discrete-time and discrete-frequency domains, and basic digital modulation methods such as m -ary PSK, DPSK, OFDM, etc. The topic of noise is considered at the most elementary level sufficient to distinguish the performance of various modulation methods in the presence of noise. Prerequisite: Engineering 220. (4 credit hours, offered in fall of odd-numbered calendar years.)
Textbook	Proakis and Salehi, <i>Fundamentals of Communication Systems</i> , 2 nd ed., Pearson Prentice-Hall, 2014. ISBN 978-0-13-335485-0.
Instructor	Douglas F. De Boer, Professor of Engineering, http://homepages.dordt.edu/ddeboer Office Phone: 722-6245; Office location: SB1638 (Office hours posted on homepage, or just call.) E-mail Douglas.DeBoer@Dordt.edu, Home Phone: seven-two-two-fourteen-fourteen, please call before 10 PM.
Course Objectives and Outcomes	<i>Creational Structure:</i> Students will be able to predict the performance of basic analog and digital communication systems in terms of bandwidth and signal-to-noise ratios using deterministic signal models. <i>Creational Development:</i> Students will understand the tradeoffs made when selecting a modulation method. Students will understand some of the standards used in broadcasting, and will study the historical development of one of these standards.
Prerequisites by topic	Calculus including techniques of integration, sequences, and series. Differential equations. Sinusoidal steady state analysis of RLC circuits.
Computer use	Matlab and Octave will be the supported development environments for writing algorithms. Students are encouraged (but not required) to use other programs such as Mathcad or Sage for homework solutions when appropriate. Course management will be via Dordt College's subscription to the cloud service "Canvas" by Instructure.
Academic Integrity	Students must do their own work. Students may discuss homework but may not show papers or files to each other outside of class. Detail on this policy can be found on the web at http://homepages.dordt.edu/ddeboer/integrity.htm This policy applies to the whole course, not just homework.
Accommodations	Students who require assistance or accommodations based on the impact of a documented disability must contact Marliss Van Der Zwaag, the Coordinator of Services for Students with Disabilities, to access accommodations. Telephone 722-6490, or e-mail Marliss.VanDerZwaag@Dordt.edu
Means of Evaluation	Homework (5%), Weekly quizzes (15%), Two Tests (25% each), Final Exam (30%) For details, follow the link titled "grading policy" at http://homepages.dordt.edu/ddeboer

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This class meets for two 75 minute periods and one 50-minute period each week,
Tuesday and Thursday at 11 AM and Wednesday at 3:00 PM in SB2803.

Dates	Class
8/29 8/30 8/31	Introduction—Basic Concepts <i>Text: Chapter 1, Chapter 2</i>
9/05 9/06 9/07	Signals and Systems—Fourier Series <i>Text: Chapter 2</i>
9/12 9/13 9/14	Signals and Systems—Fourier Transform <i>Text: Chapter 2</i>
9/19 9/20 9/21	Signals and Systems—Filters <i>Text: Chapter 2</i>
9/26 9/27 9/28	Signals and Systems—Power, Energy, Hilbert Transform <i>Text: Chapter 2</i>
10/03 10/04 No class 10/05	Linear Modulation—Types (DSB-SC, AM, SSB, VSB) and Properties <i>Text: Chapter 3</i>
10/10 10/11 10/12 Th, 10/12 Test	Linear Modulation—Modulators and Demodulators, Multiplexing, FDM, Quadrature <i>Text: Chapter 3, Test on Thursday</i>
10/17 10/18 10/19	Superheterodyne Receiver <i>Text Chapter 3 and supplement</i>
10/24 10/25 10/26	Exponential Modulation—FM, PM and Properties thereof <i>Text Chapter 4,</i>
10/31 11/01 11/02	Exponential Modulation—Modulators and Demodulators. <i>Text Chapter 4</i>
11/07 11/08 11/09	Exponential Modulation—FM-Radio, Television Standards, AMPS cellular <i>Text Chapter 4</i>
11/14 11/15 11/16 Wed, 11/16 Test	Probability and Random Processes—Definitions and Basics <i>Text Chapter 5, Test on Thursday</i>
11/21 No Class 11/22-23	Probability and Random Variables—Gaussian and White Processes <i>Text Chapter 5</i>
11/28 11/29 11/30	Effect of Noise on Analog Communication Systems <i>Text Chapter 6</i>
12/05 12/06 12/07	Analog-to-Digital Conversion and the sampling theorem <i>Text Chapter 7</i>
12/12 12/13 12/14	Analog-to-Digital Conversion and the sampling theorem <i>Text Chapter 7</i>
Tuesday, 12/19	Final exam, 3:30 p.m. – 5:30 p.m.

Note: Schedule may vary by up to two weeks in order to accommodate the dynamics of this particular offering of the class.

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A large amount of information from this point onward in this document is copied from the Student Handbook as per policy in Dordt College's "Syllabus Checklist." *Copied information is rendered in italic text (except this sentence is not copied)!* There is some additional information specific to this course as well. Additional information is in the normal type-face.

Note on the course content	The actual course content may vary from the content shown on the previous page to accommodate student interests and abilities. The content shown is a reasonable projection based on past offerings of this course.
Audience and Role of this Course	This course is intended for junior and senior engineering majors. It is required for engineering majors who select the electrical concentration. It is a chestnut that, "telecommunications has become the lifeblood of modern civilization." (Do you use the Internet?) This course will bring amazing depth to your understanding of signals, systems, information, and how we store and transmit information from place to place. The richness of God's creation is on display here! Besides that, there are high-paying jobs in this field.
Missed Tests or Exams	Professor De Boer announces his test schedule in the first week of classes. During the first two or three weeks of classes, and possibly at other times if there is good cause, students may negotiate to change the test date(s) for the entire class to avoid a conflict for any one student. However in the week before a test Prof. De Boer is very reluctant to negotiate the date because this can cause hardship for those who have been carefully planning. If you realize that you have a schedule conflict with a test date that cannot be resolved by the means above, discuss this with Prof. De Boer as soon as possible. If your reasons are sound, Prof. De Boer may schedule a special test time just for you. This special test time will usually be in advance of the regular test date. In this case Prof. De Boer reserves the right to give you a different test than he gives to the rest of the class.

If you arrive late to a test you must still finish at the scheduled time.

If you miss a test entirely the test will go in the grade book as a blank score which will count as an "F." At the end of the semester after all your course work is complete Prof. De Boer will reassess the situation and might choose to estimate what he thinks you might have earned on the test based on any evidence he can find relevant to the situation. If an estimated grade is granted, it probably will still be discounted to a lower grade than the other tests and exams you completed if negligence is a partial cause for missing the exam. A dead cell phone battery that causes you to miss an alarm is an example of negligence. If a test is missed due to illness (fever, nausea, etc., not just a "bad cold") then be sure to report the illness to student services in a timely way relative to the type of illness and before the test. If student services can verify your illness to Prof. De Boer, an estimated grade that is non-punitive will be given at the end of the semester. If you become ill during a test Prof. De Boer will decide how to act on a case-by-case basis and may wait until the end of the semester to make a final decision on how to handle the case.

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Attendance

Students are expected to be present for every class and laboratory period. Penalties for absence from class are left to the instructor. No designated number of skips is permitted.

Student Responsibility: *Students shall notify each professor concerning the reason for absence prior to or immediately upon returning to class or in accordance with the instructor's method of accounting for absences. Students shall notify student services concerning all illnesses.*

Unexcused absences *are defined as failing to notify the instructor of the reason for the absence, or if the instructor deems the reason as illegitimate.*

Faculty initiatives: *The instructor may contact student services to check on the illness record of the students. They should also alert student services and contact the student directly concerning excessive absences, and must, if asked, report attendance patterns. Any instructor may, after due warning and according to guidelines established in the class syllabus, penalize the student by reducing the semester grade by a given percentage.*

Student Services Responsibility: *Normally, student services does not notify instructors concerning student illness. Student services may alert instructors to serious problems. Decisions to inform instructors about serious problems will be made balancing the need to respect confidentiality and the responsibility to keep instructors appropriately informed about their students. Any student with serious problems is strongly advised to work closely with student services and follow the process to insure adequate communication between all parties in as efficient a way as possible.*

Excused Absence for Activities: *Students have obligations in many realms, so special care shall be taken not to demand commitments for participation in extra-curricular events that cause neglect in other areas. Sponsors/coaches shall inform students from the beginning of the time and effort expected of them. Sponsors/coaches shall demand a minimum of absences from other classes, restrict student involvement to only those crucially involved, and make efforts to choose a time/date for the event that is least invasive of classroom or lab time. In the case of conflicts, resolution shall be the responsibility of the sponsor/coach and the instructor with no penalty to the student (The appeals process outlined in the section titled Complaints Regarding Instruction in the Student Handbook shall be used if needed). The sponsor shall email faculty and student services a list of names, dates, and activities in advance of the event. The student must contact the instructor and make arrangements for any missed work.*

Professor De Boer expects to be notified by e-mail at least a day in advance if you can reasonably be expected to have known that far in advance of a time when you will have to miss a class for a scheduled event of higher priority. In addition to the options listed above, missing classes without notification or for insubstantial reasons could be cause for being classified as an "uncooperative student" which could lead to dismissal from the course. Professor De Boer will give a warning before invoking the uncooperative student process.

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Late work

Anything handed in late will be accepted for possible grading, but usually no grade will be entered in the grade book, the work will not be returned to you, and the empty grade will function as a zero or an “F.” Usually the item will never be graded. If, in the judgment of Prof. De Boer, grading the late item might improve the course grade, and if the reasons for the late work seem acceptable and if there is no pattern of carelessness, then Prof. De Boer may choose to estimate a grade or actually grade the late work and replace the empty grade(s) in the grade book with the estimate(s) or actual grade(s). Prof. De Boer may make a decision to estimate or fully grade a late item at any time after the item is handed in, but usually will do so only at the end of the course after all student course activities are complete. Additionally, if a pattern of late work develops, the professor will warn the student. After that warning if the problem is not resolved, a reduced course grade might result and/or the student may be classified as “uncooperative” which could lead to dismissal from the course.

Class Participation

Professor De Boer does not grade class participation. It is expected of all students. If your participation is a problem Prof. De Boer will talk about it privately with you. Usually mere attendance is adequate participation, presuming you are not sleeping in class, distracted, or hung over. If you are sleeping in class or hung over you will be considered absent on those days and the attendance policy will apply.

Electronic Devices in Class

Cell phones and other devices should be placed in a silent mode before class. Some devices vibrate too loudly to be considered silent in that mode. They should be powered off or otherwise made actually silent. All chimes and other signals from your devices should be undetectable to anyone except yourself. During class time Professor De Boer expects that you will use electronic devices only to support the course. For example, you might use e-mail during class to retrieve an attached file that relates to the course, but then if you notice something such as “From Facebook: Vicki likes your comment” you must resist the temptation to check that until after class.

Do you think you are good at multitasking? Prof. De Boer is sure that you are not good enough at it. You will be amazed at how much time you will accidentally spend reading about Vicki or whatever if you succumb to it. Prof. De Boer expects that you know how to manage such temptation.

<http://www.npr.org/templates/story/story.php?storyId=95256794>

During tests and quizzes all electronic devices except NCEES-approved calculators need to be stowed out of sight and they must remain silent.

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Academic Integrity

Dordt College is committed to developing a community of Christian scholars where all members accept the responsibility of practicing personal and academic integrity in obedience to biblical teaching. For students, this means not lying, cheating, or stealing others' work to gain academic advantage; it also means opposing academic dishonesty.

Academic Dishonesty. Students found to be academically dishonest will receive academic sanctions from their professor (from a failing grade on the particular academic task to a failing grade in the course), who will report the incident and the sanction given to the Student Life Committee for possible institutional sanctions (from a warning to dismissal from the college).

Appeals in such matters will be handled by the student disciplinary process as outlined in the Student Handbook.

Definitions

***Academic dishonesty** at Dordt College includes, but is not limited to, the following behaviors:*

***Stealing/Plagiarizing:** copying another's work or ideas and creating the impression that they are one's own by failing to give proper credit or citation. This includes reading or hearing another's work or ideas and using them as one's own; quoting, paraphrasing, or condensing another's work without giving proper credit; purchasing or receiving another's work and using, handling, or submitting it as one's own work.*

***Cheating:** unauthorized use of any study aids, equipment, or another's work during an academic task. This includes using unauthorized aids or other equipment during an examination; copying or looking at another individual's examination; taking or passing information to another individual during or after an examination; taking an examination for another individual; allowing another individual to take one's examination; stealing examinations.*

All graded academic tasks are expected to be performed on an individual basis unless otherwise stated by the instructor.

An academic task may not be submitted by a student for course credit in more than one course without the permission of all instructors.

***Lying/Fabricating:** the intentional, unauthorized falsification or invention of any information or citation during an academic task. This includes changing or adding an answer on an examination and resubmitting it to change the grade; inventing data for a laboratory exercise or report.*

***Facilitating Academic Dishonesty:** knowingly allowing or helping another individual to plagiarize, cheat, or fabricate information.*

Students must do their own work. In Prof. De Boer's courses students may verbally discuss homework but may not show un-graded papers to each other. This policy applies to the whole course, not just homework. Detail on this policy and more can be found on the web at <http://homepages.dordt.edu/ddeboer/integrity/#DYOW>.