**Instructor:** Professor Yariv Ephraim

**Office:** Nguyen Engineering Building Room 3229

**Email:** yephraim@gmu.edu

**Phone:** (703) 993-1562

**Office Hours:** Monday 4:30-5:30 pm; Wednesday 1:45-2:45 pm.

**Course Credit:** 3 credit hours

**Time:** MW 3:00-4:15 pm

**Place:** Blue Ridge Hall Room 129

**Date Range:** January 23, 2017 - May 3, 2017.

**Spring Break:** 3/13 - 3/17

**Final Exam:** Comprehensive Exam, Monday 5/15, 1:30-4:15 pm.

**Mid-term exams:** 3/8, 4/19, 3:00-4:15 pm.

**Exams Policy:** You may only use the lecture notes during all exams. No other material is allowed. Electronic devices of any kind are not allowed.

**Grading:** 1st test 25%; 2nd test 30%; 3rd test 35%; homework 10%.

**Prerequisites:** Grade C or better in ECE 220 and STAT 346. Students who do not meet these two prerequisites will be automatically dropped.

**Required Text Book:**

Y. Ephraim, Class Notes in ECE 460: Communication and Information Theory, January 8 2017. Notes are sold (Mason Money only) by the department (at Tech Shop - ENGR 3916) for nominal fee of $9.50 to cover printing costs only.


**Help Desk:** Mr. Massieh Kordi Boroujeny, Tuesdays, 10:00 am - 12:00 pm and Thursdays, 1:00 pm - 3:00 pm, in Johnson Center Room 239A except that on 4/18 we will use Room 326 in Johnson Center; Email: mkordibo@gmu.edu.
Grading TA Information: Mr. Ashfaque Khan; Email: mkhan53@masonlive.gmu.edu

Course Description:

This course provides an introduction to analog and digital communications. The goal of communication systems is to reliably transmit information (random messages) produced at one location to another location. The random noise in the channel interferes with this goal. Transmission is performed by modulating deterministic signals. We shall first study important aspects of signals and systems theory, as well as of probability and random processes, that are relevant to communication theory. We shall proceed to study the principles of digital and analog communication systems and analyze their performance. Through this course, students will acquire the basic concepts of communication theory and engineering, and understand the tradeoffs (power, bandwidth, complexity, latency) and performance limitations in communication systems. Contemporary issues will also be discussed.

Course Outline:

- Introduction (Lecture 1)
- Some important signals (Lecture 2)
- Fourier series and signal representation (Lecture 3)
- Fourier transform (Lectures 4-5)
- Linear time-invariant systems (Lecture 6)
- Probability basics (Lectures 7-8)
- Random variables (Lectures 9, 10)
- Multiple random variables (Lecture 11)
- Jointly Gaussian random variables (Lecture 12)
- Random processes (Lecture 13)
- First mid-term exam: March 8 (Lecture 14)
- Transfer through LTI systems (Lecture 15)
- Gaussian random processes (Lecture 16)
- Hypothesis testing and probability of error (Lecture 17)
- Signal representation (Lecture 18)
- Digital communication-optimal receiver (Lectures 19, 20, 21)
- Orthogonal frequency division multiplexing-OFDM (Lecture 22)
• Introduction to information theory (Lecture 23)
• **Second mid-term exam: April 19** (Lecture 24)
• Analog signal communication (AM, SSB, FM, PM) (Lectures 25-26)
• Contemporary Issues in Communications (Lecture 27)
• Review (Lecture 28)

**Attendance and homework:**

1. Students are encouraged to attend all lectures and to submit all homework assignments.

2. Please be seated by 3:00 pm and refrain from going in and out the classroom during lectures.

3. Please refrain from using cellphones and other electronic devices during lectures.

4. Practicing the material taught in class, by working out the homework problems, is crucially important to your success in this class. Homework will be assigned weekly, and will be due in class the week following their assignment. Graded homework will be returned in class the week following their due date. Uncollected homework will be returned to the TA. Late homework submission will not be graded. No exceptions except for medical emergencies

5. You are encouraged to discuss the material and homework problems with other classmates, but you must submit your OWN solutions.

6. Weekly homework will be assigned on Wednesday and will be due the following Wednesday by 3:00pm on my desk. Late homework will not be accepted.

7. Copying solutions for homework assigned problems, from any source, constitutes a violation of the university honor code. See the paragraph on **Academic Integrity** below.

8. Electronic devices of any kind are not allowed (and will not be needed) during exams.

9. **Audio taping, video taping, or picture snapping, during lectures, are not allowed.**

10. Students must use their MasonLive email account to receive important University information, including messages related to this class. See [http://masonlive.gmu.edu](http://masonlive.gmu.edu) for more information. Homework assignments and other course material will be emailed to your
MasonLive email account. Please make sure that your mail box is not full at any time during the semester. Also, when you send me an email, please write ece460 on the subject line.

11. Students who cannot attend an exam due to religious holidays and observances should contact me as soon as possible to arrange for an alternative date.

Support Resources: A list of support resources on campus may be found in: http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/

University Policies: The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.

Academic Integrity: GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Office of disability services: If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

Other useful campus resources:

- Writing center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu
- University libraries: “Ask a Librarian” http://library.gmu.edu/mudge/IM/IMRef.html
- Counseling and psychological services (CAPS): (703) 993-2380; http://caps.gmu.edu