

West Virginia University  
College of Engineering and Mineral Resources  
Lane Department of Computer Science and Electrical Engineering

**EE 329: Signals and Systems II**  
**Spring 2015**  
**3 credit hours**

*Distributed on January 12, 2015*

**Class Info:** Meeting times: MWF 11:00-11:50 AM  
Location: AGS-E 2001

**Instructor:** Dr. Natalia A. Schmid  
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Office: ESB 737  
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**Office Hours:** M and W noon – 1 pm (tentatively) or by appointment

**Objectives:** To provide students with the *mathematical tools* necessary to successfully complete further studies in the topics of signal processing, communications, and controls. This includes relevant topics in the areas of signal analysis, random processes, and systems theory.

**Prerequisites:** EE 327 (Input/output relationship of linear time invariant systems and familiarity with transform methods) and STAT 215 (Basic principles of probability). Co-requisite: EE 328.

**Text:** **Main Text (required):**

- M. C. Valenti, *The Signals & Systems Workbook*, an online textbook downloadable from the course homepage, 2005. **BRING TO CLASS!**

**Secondary (recommended):**

- M. J. Roberts, *Signals and Systems: Analysis Using Transform Methods and MATLAB*, Mc Graw Hill, New York, 2011.
- L. F. Chaparro, *Signals and Systems Using Matlab*, Academic Press, Elsevier, 2011.
- H. P. Hsu, *Analog and Digital Communications (Schaum's Outlines)*, McGraw-Hill; Second Edition, 2002.
- R. D. Strum, D. E. Kirk, *Contemporary Linear Systems Using MATLAB*, Brooks Cole, 2000.
- M. P. Fitz, *Analog Communication Theory*, another online textbook downloadable from the course homepage.
- H. P. Hsu, *Schaum's Outline of Probability, Random Variables, and Random Processes*, McGraw-Hill, 1996.
- M. B. Pursley, *Random Processes in Linear Systems*, Prentice Hall, 2002.
- G. R. Cooper and C. D. McGillem, *Probabilistic Methods of Signal and System Analysis*, 3<sup>rd</sup> edition, Oxford University Press, 1998.

**Outcomes:** At the end of the semester you should:

- Be able to compute the following signal-analysis operations:
  - Add, multiply, scale, delay and reflect signals.
  - Perform a convolution of two signals.
  - Express a periodic signal as a Fourier series.
  - Calculate the Fourier Transform of a continuous-time signal.
  - For a given bandlimited signal, determine the minimum sampling rate required to assure that the signal can be represented in discrete-time without any distortion.
  - Determine the output of an ideal lowpass, highpass, or bandpass filter.
- Be able to perform the following communications-related functions:
  - Describe, compare, and contrast various classical forms of analog communication, including both amplitude and frequency modulation.
- Show knowledge of the following aspects of probability theory:
  - Define and apply random variables and explain how they relate to the real world.
  - Describe and utilize cumulative distribution (CDF) and probability density functions (pdf).
  - Calculate and apply expectation of a random variable or process.
  - Interpret the theory and apply autocorrelation and power spectral density (as the time permits).
  - Calculate the signal-to-noise ratio at the output of a LTI system (as the time permits).

**Web-page:**

A course homepage will contain announcements and materials, including the workbook and few links. Time critical material may be sent to your MIX e-mail accounts so you should check this regularly too.

[www.csee.wvu.edu/~natalias/EE329](http://www.csee.wvu.edu/~natalias/EE329)

<b>Assessment:</b> Quizzes (tentatively at the end of each chapter)	30% (6 @ 5% each)
Tests	40% (2 @ 20% each)
Final exam	30%

**Grade**

<b>Boundaries:</b> A	90%	You are guaranteed at least the letter grade shown here if you obtain the corresponding score. However, at my discretion, the decision boundaries may be adjusted in <i>your</i> favor.
B	80%	
C	70%	
D	60%	

**Quizzes:** There will be 6 quizzes given throughout the semester. They will be based on the material covered in a workbook chapter and the problems at the end of the chapter. Solutions to all problems at the end of chapters will be supplied. Quizzes will be given at the end of each chapter.

**Exams:** There will be two in-class tests during the semester and a final exam. The tests will be given near the end of February and beginning of April. All tests will be closed book and closed notes. However one equation sheet and a calculator will be allowed for the two tests and two sheets and a calculator will be allowed for the final.

**Missed Test Policy:** You are expected to attend the tests and the final exam at the scheduled times and dates. If you have a legitimate unavoidable conflict, please let me know as soon as possible, but no later than one week before the test/exam. If you miss a test or exam without first having your absence approved, then your eligibility to make up the exam will be at the discretion of the Associate Dean for Student Affairs.

**Honor Code:** All work submitted for quizzes, tests and the final exam must be your own unaided work.

**Re-grading:** If you believe that the instructor or grader made a mistake or was unfair in grading, you may request a re-grade. However, the request must be made in writing and within one week that the quiz or exam was returned.

**Attendance:** Attendance is strongly encouraged. In any case, you will be responsible for all material covered in class, even if it is not in the textbook/workbook. You are also responsible for material posted on the course webpage. It is your responsibility to make sure that you are aware of all announcements made in class. ***Please arrive to class on time and silence your I-phones before entering the class room.***

**Days of Special Concern:**

WVU recognizes the diversity of its students and the needs of those who wish to be absent from class to participate in Days of Special Concern, which are listed in the Schedule of Courses. Students should notify their instructors by the end of the second week of classes or prior to the first Day of Special Concern, whichever is earlier, regarding Day of Special Concern observances that will affect their attendance. Further, students must abide by the attendance policy of their instructors as stated on their syllabi. Faculty will make reasonable accommodation for tests or field trips that a student misses as a result of observing a Day of Special Concern.

**Social Justice Statement:**

*West Virginia University is committed to social justice. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (293-6700). If you feel that you are being treated inappropriately or unfairly in any way, please feel free to bring your concerns to my attention. Please be assured that doing so will not prejudice the grading process. In return, I expect you to behave professionally and ethically.*

## Tentative Schedule

<b>Duration</b>	<b>Topic</b>	<b>Reference</b>
One lecture	Course policies and overview	Syllabus, handouts
2 weeks	Review of signals and systems	Workbook chapter 1
4 weeks	Fourier Series and Transform	Workbook chapters 2 and 3
	<i>Exam #1</i>	
1 week	Filtering	Workbook chapter 4
1 week	Sampling	Workbook chapter 5
2-3 weeks	Communications	Workbook chapter 6
	<i>Exam #2</i>	
3 weeks	Probability from an engineering perspective	Workbook chapter 7
as the time permits	Random Processes	Workbook chapter 8