Physics 321: Signal Processing
Fall 2019

Instructor: Paul Voytas
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My Webpage: http://userpages.wittenberg.edu/pvoytas/index.html
Class Web site: http://userpages.wittenberg.edu/pvoytas/courses/p321_f19/index.html, where homework and reading assignments and other material for the course will be available.

Text: Various online and handouts

Course description: Study of Fourier methods, with emphasis on digital signal processing, digital data acquisition and digital analysis systems. Prerequisites: Physics 218 and Mathematics 202..

Office hours:
MWF: 2:15-3:20
M: 3:30-4:35
R: 4:30-5:30

Monday		Tuesday		Wednesday		Thursday		Friday	
8:00		**8:00**	Dept. Mtg 9-10	**8:00**		**8:00**		**8:00**	
9:15		**9:45**	Conference Call (10-11 – every other week)	**9:15**		**9:45**	Conference Call (10-11 – every week)	**9:15**	
10:30		**11:30**		**10:30**		**11:30**		**10:30**	
11:45	Lunch	**12:00**	Lunch	**11:45**	Lunch	**12:00**	Lunch	**11:45**	Lunch
1:00	Physics 107 Astronomy Sci 319	**1:00**	Physics 321 Signal Processing Sci304	**1:00**	Physics 107 Astronomy Sci 319	**1:00**	Physics 321 Signal Processing Sci304	**1:00**	Physics 107 Astronomy Sci 319
2:15	Office Hours	**2:45**		**2:15**	Office Hours	**2:45**		**2:15**	Office Hours
3:30	| | | V	**4:30**	Faculty meeting (some weeks)	**3:30**	Jr/Sr Seminar (Physics 360/460) Sci 319	**4:30**	Office Hours | | V	**3:30**	
4:45				**4:45**				**4:45**	

Grading policy:
assignments..... 30%
midterm…..... 30%
final……..... 40%
TOTAL 100%

Letter grades will be assigned according to the percentage of possible points you have accumulated at the end of the semester. You are guaranteed that the divisions between grades will be no higher than the following: 90%≤ A^-,A ≤100%, 80%≤ B^-,B, B^+<90%, 70%≤ C^-,C, C^+<80%, 60%≤ D^-,D, D^+<70%, F<60%. In borderline cases, attendance, class participation, and trend in exam scores will be used to decide whether to award the higher grade.

Accommodations:
"Wittenberg University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, learning, chronic health, physical, hearing, vision and neurological, or temporary medical conditions, etc.) Please, let me know immediately so that we can privately discuss options. To establish reasonable accommodations, you must register with Accessibility Services by contacting Jamie Rippey, the

Director of Accessibility Services at 937-327-7870 or by email at rippeyj@wittenberg.edu . Please note that services are confidential and may take time to put into place, and are not retroactive. The Accessibility Services Office is located in the Office of Academic Services COMPASS Sweet Success Center, Thomas Library on the first floor. Walk-in appointments are welcome 8 AM to 5 PM, Monday through Friday."

Readings and homework: Reading, problems, and questions will generally be assigned for each class period and will be due at the beginning of the next class. Some will be over material covered the previous class period (review questions), and some will be over the material for the upcoming class period (preparation questions). Late homework will be accepted for half credit until the beginning of the next class after the assignment was due.

Exams: There will be a midterm exam after the first half of the course as well as a comprehensive final exam.

Attendance: Unless something physically prevents you from doing so, contact me *before* class if you are going to be absent. Makeup exams will be available only in cases of excused absences.

Tentative course schedule:

Here are some more-or-less fixed dates

11/7: Exam 1
11/27: Thanksgiving break
12/12: Final Exam

I'm not going to fix a rigid schedule. Below are the main topics/themes we will be looking at, vaguely in the order we will address them. We may not get to all of them, we will play it by ear.

Signals
Noise(s)
- Johnson
- Shot
- "Pink"/Flicker
- "White"

Signal to noise ratio
Bandwidth
Analysis/Processing
Averaging
Smoothing
Fourier Series
Orthogonality
Even/Odd
Complex
Synthesis
Decomposition
Details: Periodic?
- Faking periodic—padding/windows
- Bandwidth
- Sampling/Aliasing
- Signals revisited

DFT
Fourier Transform (continuous)
Convolution/Deconvolution
Filtering
Other kernels
Lock-in technique
Gated Integrator