Fall 2018 EE 313 Linear Systems and Signals Prof. Evans

Homework #9

# Continuous-Time Frequency Response and Fourier Transforms

Assigned on Sunday, November 25, 2018

Due on Friday, November 30, 2018, by 10:59 pm via Canvas submission

*Late homework is subject to a penalty of two points per minute late*.

***Reading***: McClellan, Schafer & Yoder, *Signal Processing First*, 2003, Chapters 10-11.

Companion Web site with demos and other supplemental information: <http://dspfirst.gatech.edu/>

Web site contains solutions to selected homework problems from *DSP First*.

The e-mail address for Mr. Houshang Salimian (TA) is [salimian.houshang@gmail.com](mailto:salimian.houshang@gmail.com).

Office hours for Mr. Salimian and Prof. Evans follow. Prof. is holding additional office hours on WF 9:00-10:00am. His Wednesday afternoon office hours have changed to 1:00-2:00pm.

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| ***Time Slot*** | ***Monday*** | ***Tuesday*** | ***Wednesday*** | ***Thursday*** | ***Friday*** |
| 9:00 am |  |  | Evans (EER 6.882) |  | Evans (EER 6.882) |
| 10:00 am |  |  |  |  |  |
| 11:00 am |  | Salimian (EER 0.814 Table #4) |  | Salimian (EER 0.814A) | Salimian (EER 0.814D) |
| **12:00 pm** |  | **Salimian (EER 0.814 Table #4)** |  | **Salimian (EER 0.814A)** | **Salimian (EER 0.814D)** |
| **12:30 pm** |  | **Evans (EER 1.516)** |  | **Evans (EER 1.516)** | **Salimian (EER 0.814D)** |
| 1:00 pm |  | Evans (EER 1.516) | Evans (EER 6.882) | Evans (EER 1.516) |  |
| 2:00 pm |  | Evans (EER 6.882) |  | Evans (EER 6.882) |  |
| **3:00 pm** |  | **Evans (EER 6.882)** | **Salimian (EER 1.810)** | **Evans (EER 6.882)** |  |
| **3:30 pm** |  |  | **Salimian (EER 1.810)** |  |  |
| **4:00 pm** |  |  | **Salimian (EER 1.810)** |  |  |
| **4:30 pm** |  |  |  |  |  |

***Prof. Evans’ coffee hours this week will be 12:00-2:00pm on Friday in the EERC café.***

EE 313 tutoring is available on Sundays through Thursdays from 7:00pm to 10:00pm in EER 0.814:

[http://www.ece.utexas.edu/undergraduate/tutoring](http://www.ece.utexas.edu/undergraduate/tutoring" \t "_blank)

**1. Continuous-Time Frequency Response. *25 points*.**

*Signal Processing First*, problem P-10.9, page 305. In addition, for each of the seven filters given, describe their frequency selectivity as lowpass, highpass, bandpass, bandstop, allpass, or notch.

**2. Continuous-Time Fourier Transforms. 25 points.**

*Signal Processing First*, problem P-11.4, page 342. In addition, for parts (a), (b) and (d), describe the magnitude response shape of the signal as lowpass, highpass, bandpass, bandstop, allpass, or notch.

**3. Continuous-Time Filtering. 25 points.**

*Signal Processing First*, problem P-11.7, page 343.

*Note: In part (c), the periodic impulse train can be used to model an idealized view of sampling. When sampling the continuous-time signal x(t) every Ts seconds, we ideally select the amplitude at each sampling time. This can be modeled mathematically in continuous time by multiplying x(t) by a series of continuous-time impulses (i.e. Dirac delta functionals) that are spaced apart by Ts seconds and occur at nTs seconds where n is the sample index. This series of impulses is also known as a periodic “impulse train”. Please the solution to homework problem 8.4 from fall 2017 at*

<http://users.ece.utexas.edu/~bevans/courses/signals/homework/fall2017/solution8.pdf>

**4. Continuous-Time Frequency Domain Symmetry. 25 points.**

*Signal Processing First*, problem P-11.16, page 345. Note that problem P-11.9 is similar.

Although not graded, please review the solution to problem 8.3 from fall 2017 at

<http://users.ece.utexas.edu/~bevans/courses/signals/homework/fall2017/solution8.pdf>

As stated on the course descriptor, “Discussion of homework questions is encouraged. Please be sure to submit your own independent homework solution.”

NOTE: In your solutions, please put all work for problem 1 together, then all work for problem 2 together, etc. Please see additional homework guidelines on the homework page.

Please read the homework guidelines at <http://users.ece.utexas.edu/~bevans/courses/signals/homework/index.html>