EEL 3135 Introduction to Signals and Systems (Spring 2017)

1. Catalog Description:
   Continuous-time and discrete-time signal analysis including Fourier series and
discrete-time and discrete Fourier transforms; sampling; discrete-time linear system
analysis with emphasis on FIR and IIR systems: impulse response, frequency
response, and system function; MATLAB-based programming for Signals and
Systems. (4 credit hours)

2. Pre-requisites and Co-requisites:
   Pre-requisites: MAC 2312 – Calculus 2

3. Course Objectives:
   To provide analytical skills and numerical tools necessary for further study in
communications, control, and signal processing. Upon completion of this course, the
student should be able to:
i. understand basic concepts of discrete-time, continuous-time, and linear time invariant
   (LTI) systems;
ii. provide time-domain and frequency-domain descriptions of these signals and systems;
iii. employ Fourier analysis to design and analyze simple LTI systems;
iv. proficiently use MATLAB as a programming and numerical analysis tool;
v. implement simple discrete-time systems, such as linear filters, in MATLAB; and
vi. program MATLAB to numerically perform Fourier analysis of signals and LTI systems.

4. Contribution of course to meeting the professional component (ABET only)
   ● 4 credits of Engineering Science

5. Relationship of course to program outcomes (ABET only)
   ● EE1 - knowledge of probability and statistics, including applications
   ● EE2 - knowledge of mathematics, basic and engineering sciences necessary to analyze
     and design complex systems
   ● a - an ability to apply knowledge of mathematics, science, and engineering
   ● e - an ability to identify, formulate, and solve engineering problems
   ● k - an ability to use the techniques, skills, and modern engineering tools necessary for
     engineering practice

6. Instructor: Sanjeev J. Koppal
   i. Office location: NEB437
   ii. Telephone:
   iii. E-mail address: sjkoppal@ece.ufl.edu
   iv. Office hours: F 1:00-2:00pm
7. Instructor: Barukh B. Rohde (Best to contact through email, or for small things Facebook Messenger)
   i. Office location: NEB486E
   ii. Telephone: 646-468-7336
   iii. E-mail address: barukh94-school@yahoo.com
   iv. Office hours: TR 11:45 – 12:35, 3:00-3:50

8. Teaching Assistants:
   a. Trey Staton (Best to contact through Facebook Messenger)
      ![Trey Staton](image1.png)
      E-mail address: kstaton6@ufl.edu
      Office hours and location: TBA
      Grades: Lab Part 2

   b. Quan Pham (Best to contact through email)
      ![Quan Pham](image2.png)
      E-mail address: quanpham@ufl.edu
      Office hours and location: TBA
      Grades: Lab Part 1

   c. Shiming Deng (Best to contact through email)
      ![Shiming Deng](image3.png)
      E-mail address: mingmingrr@ufl.edu
      Office hours and location: TBA
      Grades: HW/CW

   d. Daniel Suen (Best to contact through email)
      ![Daniel Suen](image4.png)
      E-mail address: dsuen1@ufl.edu
      Office hours and location: TBA
Grades: Lab Part 2

e.  Genesis Liang (Best to contact through Canvas)

E-mail address: gliang1219@ufl.edu
Office hours and location: TBA
Grades: Lab Part 1

f.  Ted Johnson (Best to contact via email)

E-mail address: teddyj@ufl.edu
Office hours and location: TBA

g.  Rosemond Fabien (Best to contact via email)

E-mail address: rosemondfabien@ufl.edu
Office hours and location: TBA
Grades: HW/CW

b.  Elena Shortman (Best to contact through email)

E-mail address: eshortman5892@ufl.edu
Office hours and location: TBA
Grades: Big Quiz

c.  Kari Simmons

E-mail address: ksimmons1@ufl.edu
Office hours and location: TBA
Grades: Lab Part 1

d.  Ryan Earl (Best to contact through email)
e. Jennifer Stone

E-mail address: jenngibson@ufl.edu
Office hours and location: TBA
Grades: Lab Part 2

f. Alek Weber

E-mail address: webera@ufl.edu
Office hours and location: TBA
Grades: Writes quizzes

h. Miles Mulet (best contacted via email – I will NOT respond to Facebook)

E-mail address: muletmiles@ufl.edu
Office hours and location: All Period 11-E1 Lab sessions, MAEA 0327
Grades: Helps write labs, run lab sessions, occasionally may grade.

i. Ana Covic (Best to contact through e-mail, and by tagging in Facebook comment)
9. Meeting Times:  
   Section 14 65: TR 3-4 (9:35am – 11:30am)  
   Section 03H6: TR 6-7 (12:50pm – 2:45pm)

10. Lecture videos, readings, and tutorials will be posted on Canvas before classes. It is MANDATORY that you watch them before the designated class period. You WILL be quizzed and tested on this material.

11. Class/Workshop schedule: 3 sessions of 55-min. lecture/problem/HW and 1 session of 55-min. MATLAB programming workshop (“lab”) each week. Lab will be split across the two days of the week.

12. Quizzes:  
   i. Little quiz: 5 minutes each week  
   ii. Big quiz: 20-25 minutes each week

13. Grading Breakdown:  
   i. Midterm Exam: 20%  
   ii. Final Exam: 20%  
   iii. Classwork/Homework: 10%  
   iv. Graded Labs: 25%  
   v. Little Quizzes: 5%  
   vi. Big Quizzes: 20%

14. If the final exam score is greater than the midterm score, then the midterm will be dropped and the final will count for 40% of the grade.

15. Meeting Location:  
   Section TR3-4: NEB101  
   Section TR6-7: FLG260

16. Material and Supply Fees: $99 for student edition of MATLAB with toolboxes or $50 without toolboxes. $$$ for coffee and snacks to sustain hours and hours of hard work.

17. Textbooks and Software Required:
a. Title: *DSP First*
   Authors: J. H. McClellan, R. W. Schafer, and M. A. Yoder
   Publication date and edition: 2016, 2nd edition
   ISBN number: 0-13-601925-0

b. MATLAB Student Version, MathWorks, Inc. You MUST bring a laptop to every class session.

18. Recommended Reading:

19. Course Outline:

<table>
<thead>
<tr>
<th>Class</th>
<th>Topic</th>
<th>Text</th>
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</thead>
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<tr>
<td>1</td>
<td>Overview &amp; Introduction</td>
<td>1</td>
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<tr>
<td>2</td>
<td>Sinusoids</td>
<td>2.1-2.4</td>
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<tr>
<td>3</td>
<td>Complex exponentials &amp; phasors</td>
<td>2.5-2.8</td>
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<tr>
<td>4</td>
<td>Sums and products of sinusoids &amp; frequency spectrum</td>
<td>3.1-3.3</td>
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<tr>
<td>5</td>
<td>Fourier series</td>
<td>3.4-3.5</td>
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<td>6</td>
<td>Time-frequency spectrum</td>
<td>3.6-3.7</td>
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<tr>
<td>7</td>
<td>Sampling</td>
<td>4.1-4.2, 4.4, 4.5</td>
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<tr>
<td>8</td>
<td>Reconstruction</td>
<td>4.3</td>
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<tr>
<td>9</td>
<td>Discrete-time systems</td>
<td>5.1-5.2</td>
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<tr>
<td>10</td>
<td>FIR filters</td>
<td>5.3-5.5, 5.9</td>
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<tr>
<td>11</td>
<td>FIR filters (cont.)</td>
<td>5.3-5.5, 5.9</td>
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<tr>
<td>12</td>
<td>Discrete-time LTI systems &amp; convolution</td>
<td>5.6-5.8</td>
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<tr>
<td>13</td>
<td>Discrete-time LTI systems &amp; convolution (cont.)</td>
<td>5.6-5.8</td>
</tr>
<tr>
<td>14</td>
<td>FIR frequency, transient, and steady-state responses</td>
<td>6.1-6.3</td>
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<tr>
<td>15</td>
<td>More about freq. response</td>
<td>6.4-6.6</td>
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<tr>
<td>16</td>
<td>FIR filtering examples</td>
<td>6.7-6.8</td>
</tr>
<tr>
<td>17</td>
<td>FIR filtering examples</td>
<td>6.7-6.8</td>
</tr>
<tr>
<td>18</td>
<td>Discrete-time Fourier transform</td>
<td>7.1-7.4</td>
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<tr>
<td>19</td>
<td>Discrete-time Fourier transform (cont.)</td>
<td>7.1-7.4</td>
</tr>
<tr>
<td>20</td>
<td>Time- vs. freq- domain analysis</td>
<td>-</td>
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<tr>
<td>21</td>
<td>z-Transform</td>
<td>9.1-9.3</td>
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<tr>
<td>22</td>
<td>More about z-Transform</td>
<td>9.4-9.5</td>
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<tr>
<td>23</td>
<td>Zeros &amp; poles</td>
<td>9.6</td>
</tr>
<tr>
<td>24</td>
<td>Elementary filter designs</td>
<td>9.7-9.9</td>
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<tr>
<td>25</td>
<td>Elementary filter designs (cont.)</td>
<td>9.7-9.9</td>
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<tr>
<td>26</td>
<td>Elementary filter designs (cont.)</td>
<td>9.7-9.7</td>
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<tr>
<td>27</td>
<td>IIR filters</td>
<td>10.1-10.2</td>
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<tr>
<td>28</td>
<td>IIR system (transfer) function</td>
<td>10.3-10.6</td>
</tr>
<tr>
<td>29</td>
<td>IIR freq. response</td>
<td>10.7-10.8</td>
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<tr>
<td>30</td>
<td>Inverse z-Transform</td>
<td>10.9-10.10</td>
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<tr>
<td>31</td>
<td>Inverse z-Transform (cont.)</td>
<td>10.9-10.10</td>
</tr>
<tr>
<td>32</td>
<td>Second-order and higher order IIR filters</td>
<td>10.11-10.13</td>
</tr>
<tr>
<td>33</td>
<td>Second-order and higher order filters (cont.)</td>
<td>10.11-10.13</td>
</tr>
<tr>
<td>34</td>
<td>Numerical analysis in time, frequency, and z domains</td>
<td>-</td>
</tr>
<tr>
<td>35</td>
<td>Discrete-time Fourier series</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Discrete-time Fourier series (cont.)  8.5
Discrete Fourier transform  8.1-8.4, 8.7
Discrete Fourier transform (cont.)  8.1-8.4, 8.7
Fast Fourier transform  8.8
Fast Fourier transform (cont.)  8.8

20. Attendance and Expectations:
   a. Class attendance is required.
   b. Attendance at each programming workshop session is mandatory: before each scheduled workshop period, you are expected to complete the “prelab” and “warm-up” sections and submit a short report via Canvas. Unexcused failure to attend a workshop session will result in a letter grade reduction from your final grade.
   c. Tentative list of workshop sessions:

<table>
<thead>
<tr>
<th>Lab</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Introduction to MATLAB in Signals and Systems</td>
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<tr>
<td>1</td>
<td>Introduction to Sinusoids, Complex Exponents &amp; Phasors</td>
</tr>
<tr>
<td>2</td>
<td>Multipath Interference</td>
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<tr>
<td>3</td>
<td>Synthesis of sinusoidal signals: Music synthesis</td>
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<tr>
<td>4</td>
<td>Echoes and Images: A/D and D/A, convolution and FIR filtering</td>
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<tr>
<td>5</td>
<td>Filters and Frequency response: bandpass and nulling filters</td>
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<tr>
<td>6</td>
<td>Octave band filtering</td>
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<tr>
<td>7</td>
<td>Filter design: Frequency shift keying</td>
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<tr>
<td>8</td>
<td>IIR filter design: Vowel synthesis</td>
</tr>
<tr>
<td>9</td>
<td>Fast Fourier Transform of Biological Signals (heart rate lab)</td>
</tr>
</tbody>
</table>

d. **Reports**: After each lab, you are required to finish “in-lab” portion and submit your solutions in a report. Your report should be self-sufficient i.e., the report should be self-explanatory.

e. **Pay attention to the workflow.** There will be one quiz every class day except midterm week; one weekly big quiz, one weekly little quiz. Homework, pre-lab and lab reports will generally be every week. DO NOT FALL BEHIND.

21. Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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<tbody>
<tr>
<td>A</td>
<td>92.5-100</td>
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<tr>
<td>A-</td>
<td>90.0-92.4</td>
</tr>
<tr>
<td>B+</td>
<td>87.5-89.9</td>
</tr>
<tr>
<td>B</td>
<td>82.5-87.4</td>
</tr>
<tr>
<td>B-</td>
<td>80.0-82.4</td>
</tr>
<tr>
<td>C+</td>
<td>77.5-79.9</td>
</tr>
<tr>
<td>C</td>
<td>72.5-77.4</td>
</tr>
<tr>
<td>C-</td>
<td>70.0-72.4</td>
</tr>
</tbody>
</table>

(may change to match class average)
Students near intergrade borders will be bumped upward or downward based on their participation in class.

22. Make-up Exam Policy: No make-up exam.

23. Zero tolerance plagiarism/cheating policy: A formal academic dishonesty process will be carried out if plagiarism/cheating is suspected. Once verified, students involved will automatically receive the failing grade (E). Further disciplinary actions may also result. Refer to items below about academic honesty.

Other important course information:

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

University Honesty Policy
UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or
criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

**Student Privacy**
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: [http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html](http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html)

**Campus Resources:**

**Health and Wellness**

**U Matter, We Care:**
If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

**Counseling and Wellness Center:** [http://www.counseling.ufl.edu/cwc](http://www.counseling.ufl.edu/cwc), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Assault Recovery Services (SARS)**
Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or [http://www.police.ufl.edu/](http://www.police.ufl.edu/).

**Academic Resources**

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu, [https://lss.at.ufl.edu/help.shtml](https://lss.at.ufl.edu/help.shtml).

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. [https://www.crc.ufl.edu/](https://www.crc.ufl.edu/).

**Library Support**, [http://cms.uflib.ufl.edu/ask](http://cms.uflib.ufl.edu/ask). Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. [https://teachingcenter.ufl.edu/](https://teachingcenter.ufl.edu/).

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. [https://writing.ufl.edu/writing-studio/](https://writing.ufl.edu/writing-studio/).

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).
