EE103: Signals and Systems

Course Instructor: Prof. Sung-Mo (Steve) Kang
Email: skang@ucsc.edu
Office hours: tbd, BE 239

Time: MWF 1:20 -2:25 pm
Location: Steven Acad 175

-eCopy 180 days Rental: VitalSource

Course website: ee103-fall17-01.courses.soe.ucsc.edu
  • All lectures/HW/solutions will be posted on our web site
  • The lecture is now posted at webcast.ucsc.edu

Midterm: Wednesday, November 1, 1:20 -2:25 pm (closed book, no calculators)
Final Exam: Tuesday, December 12, 4:00–7:00 p.m (closed book, no calculators)
Tentative Grading

<table>
<thead>
<tr>
<th>Homework</th>
<th>Quiz</th>
<th>20%</th>
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<tbody>
<tr>
<td></td>
<td>Midterm</td>
<td>30%</td>
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<tr>
<td></td>
<td>Final</td>
<td>50%</td>
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- Homework will be assigned for each week
- Homework is not collected
- Each student is responsible to solve them
- Solution will be posted on course website
- There will a 15 minutes Quiz on Mondays
- One problem chosen from the assigned HWs
  with modified parameters

- 2 TA office hours every week at BE 224
- TA office hour poll URL: goo.gl/wD5Tnq

EE103L: Signals and Systems Laboratory (not mandatory for all taking EE103)
Course website: canvas.ucsc.edu
#Labs starts today (September 29th) Ming Ong Comp lab/Merrill college

Disability Resources:
Contact the Disability Resource Center (DRC) to request an Accommodation Authorization
459-2089 (voice), 459-4806 (TTY), http://drc.ucsc.edu

- Bring your DRC form to course instructor, after class or during office hours or send via email
- For lab sections (EE103L) please let your TA know about your accommodation needs.
make sure to log in to access secured uploads/course materials
• **Signals** are functions of independent variables (e.g. time, space) that carry information

• A **system** is an entity that interacts with one or more signals, thereby yielding new signals
\[ \vec{v} = \sum \text{projections} \]
$\vec{v} = \sum_{\text{projections}}$
\[ a_2 x(t-t_2) \]

A\[ a_1 x(t-t_1) \]

\[ -a_2 x(t-t_2) \]

\{ differential amplifier \}
\{ suppress common mode noise \}

\[ \text{system} \]
\[ \text{decay/delay/gain} \]

\[ i/p \]
\[ \rightarrow \]
\[ o/p \]

\[ i/p \text{ signal may change if there is a heart disease.} \]

\[ o/p = \text{convolution of } i/p \text{ & impulse response.} \]

\[ \pm t_1 < t_2: \text{delay} \]
\[ \pm a_1 > a_2: \text{decay} \]
• signal time shift
• signal magnitude scaling
• signal superposition
• system model: impulse response
• o/p signal=convolution (i/p signal, impulse response)

Input signal \rightarrow \text{System} \rightarrow \text{Output signal}

differential equation $\rightarrow$ impulse response
actual o/p signal

expected o/p signal

\[
A \left[ a_1 x(t-t_1) - a_2 x(t-t_2) \right]
\]

\{ differential amplifier \\
suppress common mode noise \}
Fourier analysis

60 Hz power line noise

Noise filtering

clean ECG signal
Signals and Systems

- signal time shift
- signal magnitude scaling
- signal superposition
- system model: impulse response
- o/p signal=convolution (i/p signal, impulse response)

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Input signal  System  Output signal
```

- differential equation—>impulse response

- Fourier analysis:
  - Fourier series
  - Fourier transformation
  - Laplace transformation
  - Filter design