WORKSHEET — Request for a New Course version 1.3

** Place your pointer on the underlined fields and start typing to fill in text, **
or use an X or a number to fill in "check-box" or numbered fields.

Provide information requested below that is not contained in the syllabus.
Please note the guidelines in the boxes.

Number (if known): EE 111   X Undergraduate   X Graduate   ____ Professional

Title/subtitle: Digital and Analog Signals and Systems

Effective: Fall 2015 (Quarter and Year)

Offered: ___ Fall   ___ Winter   X Spring   ___ Summer   ___ Once Only   ___ Other ___

Instructor(s): ___ Ertem Tuncel

Hours per week per unit of credit may not be less than but may exceed those listed below.

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop
- One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems
- One unit for each two to three hours per week (1:2-3) of studio

Units: 4

Activities and hours per week: Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

___ Activity
___ Internship
___ Seminar
___ Clinic
3 ___ Laboratory
___ Studio
___ Colloquium
3 ___ Lecture
___ Term Paper
___ Consultation
___ Practicum
___ Thesis
___ Discussion
___ Research (outside)
___ Tutorial
___ Extra Reading
___ Research (scheduled)
___ Workshop
___ Field
___ Screening (outside)
___ Written Work
___ Individual Study
___ Screening (scheduled)
___ Other: ___
Prerequisite(s): EE 1B, EE 20, and MATH 46, or permission of instructor

Read the guidelines in this box before writing the Catalog description.
Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:
Instead of "This course will introduce students to the history of . . .," use one of the following formats:
Introduces the history of . . .
An introduction to the history of . . .
Introduction to the history of . . .

Instead of "Functions, equations, and graphs," use a format similar to one of the following examples:
Explores functions, equations, and graphs . . .
Topics include functions, equations, and graphs . . .
A study of functions, equations, and graphs . . .

Catalog description: Covers continuous- and discrete-time signals and systems, linear time-invariant (LTI) systems, impulse response, Fourier analysis, frequency response, Laplace and Z-transforms, sampling theorem and Nyquist rates. Includes laboratory experiments with signals, transforms, linear digital filtering, and sampling/aliasing.

Grading:
X Letter Grade or petition for Satisfactory/No Credit (S/NC)
_ Letter Grade only
_ In Progress (IP)

_ Letter Grade or S/NC; no petition required
_ S/NC only

The statements selected below will be added to the Catalog description by the Catalog office:

Grading statement (if required):
X Satisfactory (S) or No Credit (NC) grading is not available.
_ Graded Satisfactory (S) or No Credit (NC).
  _ Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.
  _ May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.
  _ May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.
_ Students who submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
_ Students who present a seminar receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
  _ Students who present a seminar or submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
_ Other: ___

Repeatability statement (if required):
_ Course is repeatable.
_ Course is repeatable to a maximum of ___ units.
_ Course is repeatable as content changes.
_ Course is repeatable as content changes to a maximum of ___ units.
_ Course is repeatable as topics change.
_ Course is repeatable as topics change to a maximum of ___ units.
_ Other: ___

If the course is repeatable, may a student take more than one section of the course in a single quarter? ___ Yes ___ No
Cross-listing statement: Cross-listed with NA

Credit statement (to limit credit when course content overlaps):
Credit is awarded for only one of ___
Other ___

Breadth statement (for CPAC, ETST, FVC, HASS, or WMST courses only):
___ Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.
___ Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences.
___ Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ Other: ___

If the course content overlaps or duplicates the content of another course, describe the overlap or duplication: NA
If the course affects degrees, minors, and/or programs, list the affected degrees, etc. and explain how they are affected: 
If the course affects the prerequisites and/or descriptions of other courses, list the affected courses and explain how they are affected: NA

Justification for establishing the course (insert or attach):

This is a one-quarter course describing the essential theory and practice for processing analog continuous-time signals on computer platforms (i.e., discrete-time, digital signals).

At present, the ECE department offers a two-quarter sequence (Signals and Systems EE 110A and EE 110B) for EE students. The initial audience for the proposed course is Computer Engineering students.

Syllabus (insert or attach and include the information below): Attached
Course requirements Midterm Exam, Final Exam, Homework, Laboratory Reports

If an activity selected above under "Activities and Hours" does not involve faculty contact (e.g., extra reading, individual study, and outside research), describe the activity and explain how it will be evaluated.

If one of the activities selected above is consultation hours, explain how these hours will be implemented and monitored.

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at senate.ucr.edu/Committees/courses/guidelines.pdf
Course Description
Covers continuous- and discrete-time signals and systems. Topics are linear time-invariant (LTI) systems, convolution, Fourier analysis, frequency response, Laplace and Z-transforms, filtering, sampling and reconstruction. Includes laboratory experiments with signals, transforms, linear digital filtering, and sampling/aliasing.

Prerequisites
EE 1B, EE 20, and MATH 46

Text Book
Alan V. Oppenheim & Alan S. Willsky, Signal and Systems, 2nd Ed., Prentice Hall

Homework
Homework will be assigned weekly.

Grading
A letter grade (4 units) will be based on the following formula.
Homework  15%
Lab  25%
Midterm:  20%
Final:  40%

Lab Experiments
There will be a total of eight experiments, each of which will be carried out using MATLAB.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 1</td>
<td>Basics of signal acquisition. Plotting and manipulation of basic signals. Time shifts, time-reversals, and subsampling.</td>
</tr>
<tr>
<td>Lab 2</td>
<td>Input/output relations of linear time-invariant (LTI) systems. Convolution sums and difference equations.</td>
</tr>
<tr>
<td>Lab 3</td>
<td>Discrete-time Fourier transform (DTFT). Magnitude and phase components. Demonstration of time-shift, time-reversal, multiplication, and convolution effects in the Fourier domain.</td>
</tr>
<tr>
<td>Lab 5</td>
<td>Causal alternatives to ideal lowpass filtering. Truncated and modified sinc filters.</td>
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<tr>
<td>Lab 6</td>
<td>Sampling and reconstruction. Sub- and super-Nyquist sampling, and aliasing.</td>
</tr>
<tr>
<td>Lab 7</td>
<td>Discrete-time processing of continuous-time signals.</td>
</tr>
<tr>
<td>Lab 8</td>
<td>Effect of quantization on the quality of digital signals.</td>
</tr>
</tbody>
</table>
# Lecture Sequence

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter</th>
<th>Topic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Chapter</td>
<td>Basic characteristics of signals and systems</td>
<td>Important continuous- and discrete-time signals. Concepts of linearity, time-invariance, causality, memory, stability, invertibility.</td>
</tr>
<tr>
<td>Week 2&amp;3</td>
<td>Chapter 2</td>
<td>Linear time-invariant (LTI) systems</td>
<td>The impulse response, convolution sum and integrals.</td>
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</tbody>
</table>