

COURSE SYLLABUS

Course Number ELC 152 Title Signal Processing
Department/Program ECCE School SOSE
Semester First School Year 2008 - 2009 Instructor Luisito L. Agustin

A. Course Description

This course discusses various signal-processing techniques with emphasis on their application to speech and image processing. Topics include Z-transform, convolution, FIR filters, IIR filters, random signal analysis, correlation functions, discrete Fourier transform (DFT), fast Fourier transform (FFT), spectral analysis, signal encoding and compression, signal recovery and extraction, noise reduction, and image enhancements.

Prerequisite: ENGMA 101, ENGMA 102, ENGMA 103

B. Course Objectives

In this course, students must be able to:

- * discuss fundamental ideas in DSP
- * demonstrate mastery of DSP concepts thru a project on a selected area of DSP

C. Course Outline and Timeframe

Weeks 1 to 5:

- introduction to basic concepts (refer to course description)
- review of past projects
- formulation of project specifications

Weeks 6 to 14:

- special topics depending on projects
- five progress reports due
- five project consultation and review sessions

Week 15: prefinal project evaluation

Weeks 16 and 17: project presentations

Week 18 (Finals Week): final project evaluation

D. Required Readings

Steven W. Smith: *The Scientist and Engineer's Guide to Digital Signal Processing*, 1997. (may be downloaded at <http://www.dspguide.com/>)

Marven, C. & Ewers, G: *A Simple Approach to Digital Signal Processing*, Texas Instruments, 1994.

E. Suggested Readings

Mitra, S., *Digital Signal Processing—A Computer-Based Approach*, McGraw-Hill International Ed., 1998.

John Proakis and Dimitris Manolakis, *Digital Signal Processing*, 3rd ed, 1996.

documentation of past projects

F. Course Requirements

The main requirement will be a course project. Students are expected to submit homework whenever there is pending homework. Students are also expected to participate actively in class discussion and all class activities.

G. Grading System

The class standing is determined as

$$CS = 0.7 Proj + 0.3 Part$$

where

Proj is the project grade in the range [0,100], and
Part is the participation grade in the range [0,100].

The 100 points of the project grade are distributed as follows:

- * 5 pts for the formulation of project specifications and related activities
- * 5 pts for 5 progress reports (1 pt per progress report)
- * 10 pts for project review and consultation sessions (2 pts per session)
- * 10 pts for the prefinal project evaluation
- * 10 pts for the oral presentation of the project
- * 60 pts for the final project evaluation

The final project evaluation involves a comprehensive evaluation of various aspects related to the project. These include, but are not limited to: completeness and quality of the project and its documentation, quality of research in doing the project, efficiency and modularity of the project implementation, usefulness of the project and consistency of the project implementation and documentation with expectations and good practices.

The project is rated according to the following system (based on the official grading system of the university):

- * A Fulfillment of the requirements set for the project to a high degree of academic performance as shown by both an intelligent grasp and superior critical appreciation of the subject matter. Final project evaluation grade in the range [92, 100].
- * B Fulfillment of the requirements set for the project to a degree above satisfactory performance as shown by both an intelligent grasp and rudimentary critical appreciation of the subject matter. Final project evaluation grade in the range [77, 86).
- * C Satisfactory fulfillment of the requirements set for the project as shown by a fairly intelligent grasp of the the subject matter. Final project evaluation grade in the range [60, 69).
- * D Passing fulfillment of the minimum requirements set for the project. Final project evaluation grade in the range [50, 60).
- * F Failure: Non-fulfillment of the minimum project requirements. Final project evaluation grade in the range [0, 50).

The grades of C+ — final project evaluation grade in the range [69, 77)— and B+ — final project evaluation grade in the range [86, 92) — are given for those inevitable borderline cases which, in the professor's estimation, do not merit the higher grade and at the same time definitely deserve better than the lower grade or mark.

The participation grade covers class participation, homework, quizzes and other day-to-day class activities.

A student's participation grade shall be computed as

$$Part = \max \left(P_{min}, \min \left(P_{max}, P_{min} + (P_{max} - P_{min}) \left(\frac{P_{cred}}{M_P} \right)^{\frac{1}{C_P}} \right) \right)$$

where

P_{cred} is the sum of all participation credits earned by the student (P_{cred} is changed to 0 in the unfortunate case where it turns out to be negative at the end of the semester),

M_P is the maximum value of P_{cred} over all students in the class,

P_{min} is initially set to 0, but may be set to a higher value according to the instructor's evaluation of the class as a whole,

P_{max} is initially set to 100, but may be set to a lower value according to the instructor's evaluation of the class as a whole,

C_P is a curving parameter initially set to 1, but may be raised based on the instructor's evaluation of the class as a whole.

On a given class day, a student earns participation credits given by

$$P_{daily} = PF * RF * \left(\sum_{i=0}^{N-1} \left(\frac{1}{2} \right)^i S_i \right) + P_{raw} \right) + B_{raw} - D_{raw}$$

where:

PF is a punctuality factor set to 1.0 if student was in class at the start of the period and set to 0.8 otherwise;

RF is a recovery factor set to 1.5 if the value of M_P is 200 or more as of the previous class day and a student's participation class standing (as of the previous class day) is below 50 or below the class average, and set to 1.0 otherwise;

N is the number of homework submitted by a student, and the S_i are the homework scores sorted from largest to smallest, with each homework submitted being graded over 10 points.

P_{raw} are raw participation points given for recitation, class participation and various contributions to class discussion

B_{raw} are raw bonus points earned

D_{raw} are raw participation demerits given for offences such as, but not limited to, disturbing class discussion, refusal to participate in class activities and violation of the dress code.

The final grade (FG) will be determined from the class standing (CS) as follows: FG = F if $CS < 50$, D if $50 \leq CS < 60$, C if $60 \leq CS < 69$, C+ if $69 \leq CS < 77$, B if $77 \leq CS < 86$, B+ if $86 \leq CS < 92$, A if $92 \leq CS$.

H. Classroom Policies

H.1. Attendance

Students who arrive after the class period has started are considered late. Students who have not come in by the time attendance is checked will be marked absent. Students who arrive late and/or after attendance has been checked are responsible for ensuring that they are marked late, rather than absent, by informing the instructor by the end of the period that they came in late. They may be marked absent if they fail to do so. Lateness is not considered a cut.

Students who have exceeded the allowed number of cuts shall be given a grade of W, and shall be barred from class for the rest of the semester. Dean's Lists are NOT allowed unlimited cuts.

H.2. Attire

Students are expected to dress decently and appropriately. Short shorts and skirts and similar clothes are not appropriate attire. Slippers and similar footwear are not appropriate attire. Students wearing inappropriate attire may be barred from class, denied participation points and/or given participation demerits.

H.3. Homework

All homework should be typeset and printed on short bond paper. No handwritten homework will be accepted. Only those physically present in class may submit homework. Homework must be submitted when called for. Homework may have additional requirements in addition to the printed component. Students should be ready to present their homework in class when called upon to do so. Students who refuse to or cannot present their homework in class will not be given full credit for the homework in question. Homework should cite all relevant references used. Students may submit additional homework at the end of the class period.

Not all homework will be discussed in class. Some homework are assigned because they will not be discussed.

H.4. Projects

As a general rule, all software components of projects shall use Dev-C++. Fixed point representations will be used for all data to be processed. Algorithms will be implemented using fixed point techniques. All project-related documents shall be in OpenOffice/OpenDocument format.

H.5. Language

This is an English language course. All oral presentations shall be in English. All documents submitted shall be in English.

I. Consultation Hours

3 to 5 p.m., Thursdays and Fridays, F-312