

BLM2041 Signals and Systems

Syllabus

The Instructors:

Prof. Dr. Nizamettin Aydın

naydin@yildiz.edu.tr

Asist. Prof. Dr. Ferkan Yilmaz

ferkan@yildiz.edu.tr

1

Course Details

- Course Code : BLM 2041
- Course Name: Signals and Systems
(Sinyaller ve Sistemler)
- Instructor : Prof. Dr. Nizamettin Aydın
Asist. Prof. Dr. Ferkan Yilmaz

2

Assesment

Method	Quantity	(%)
Quiz	-	-
Homework	2	20
Midterm Exam(s)	2	35
Final Exam	1	40
Attendance & participation	-	05

By University Rule:

Your average < 40 → FF

3

Course Outline

- 1. Introduction.**
Mathematical Representation of Signals. Mathematical Representation of Systems.
- 2. Sinusoids.**
Review of Sine and Cosine Functions. Sinusoidal Signals. Sampling and Plotting Sinusoids. Complex Exponentials and Phasors. Phasor Addition. Time Signals.
- 3. Spectrum Representation.**
The Spectrum of a Sum of Sinusoids. Beat Notes. Periodic Waveforms. Fourier Series Analysis and Synthesis. Time-Frequency Spectrum. Frequency Modulation.
- 4. Sampling and Aliasing.**
Sampling. Spectrum View of Sampling and Reconstruction. Discrete-to-Continuous Conversion. The Sampling Theorem.
- 5. Continuous-Time LTI Systems and the Convolution Integral.**
Establishing a General Input-Output Relationship. Working with the Convolution Integral.
- 6. Discrete-Time LTI Systems and the Convolution Sum.**
Specializing the Input/Output Relationship. Working with the convolution Sum.
- 7. LTI System Differential and Difference Equations in the Time Domain.**
Obtaining the differential/difference equations for the input-output relations of systems. Solution of differential and discrete equations in the time domain.

4

Course Outline

- 8. The Fourier Transform for Continuous-Time Signals and Systems.**
Continuous-Time Aperiodic Signals. Continuous-Time Fourier Transform. Properties of Continuous-Time Fourier Transform.
- 9. The Discrete Time Fourier Transform for Discrete-Time Signals.**
Discrete-Time Aperiodic Signals. Discrete-Time Fourier Transform. Properties of Discrete-Time Fourier Transform
- 10. The Laplace Transform for Continuous Time.**
Laplace Transform. Common Laplace Transforms. Properties Of the Laplace Transform. Inverse Laplace Transform. Poles and Zeros in the s-plane.
- 11. The Z Transform for Discrete Time.**
Z Transform. Common Z Transforms. Properties Of the Z Transform. Inverse Z Transform. Poles and Zeros in the z-plane.

5

COURSE OBJECTIVES

- Students will be able to:
- Understand **mathematical** descriptions of Signals and Systems
- Express those descriptions as computer **implementations** (MATLAB, OCTAVE, SCILAB, R, PYTHON)
 - Yildiz Technical University provides MATLAB License.
 - OCTAVE, SCILAB, R and PYTHON are free

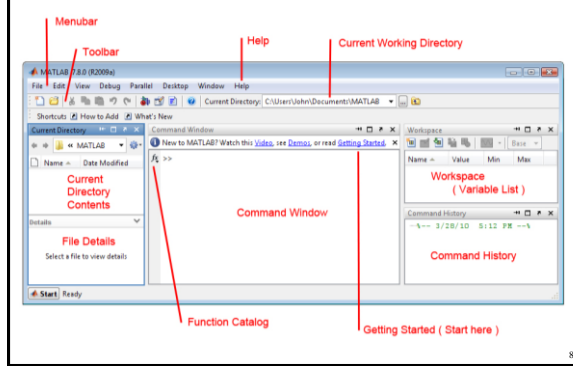
6

COURSE OBJECTIVES

- MATLAB
 - <https://www.mathworks.com/>
- SCILAB
 - <https://www.scilab.org/>
- OCTAVE
 - <https://www.gnu.org/software/octave/>
- R
 - <https://www.r-project.org/>
- PYTHON
 - <https://www.python.org/>

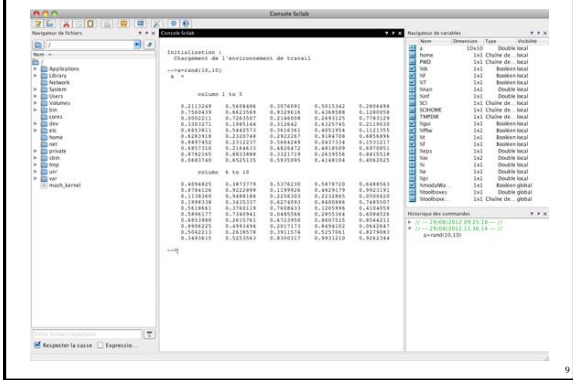
7

MATLAB environment



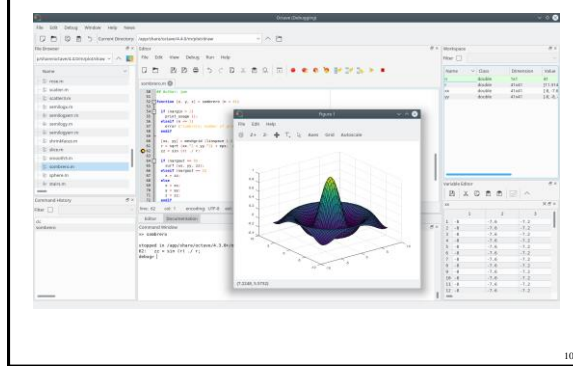
8

SCILAB environmet



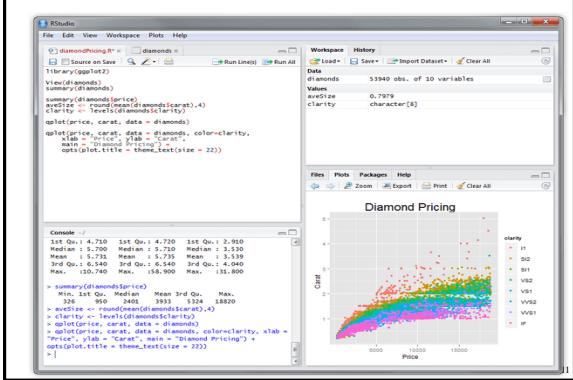
9

OCTAVE environment



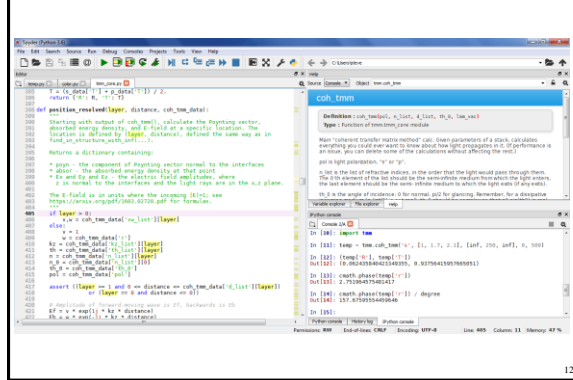
10

Rstudio (IDE for R)



11

Spyder (IDE for PYTHON)



12

Course Objectives (In details)

Academic knowledge

- Students will be able to:
 - Understand and develop simple mathematical models for representing signals and systems
 - Understand the relationship between time and frequency domain models of dynamic systems
 - Convert time to frequency-domain models and vice versa
 - Understand the relationship between continuous and discrete-time models

Intellectual skills

- Students will be able to:
 - Build a mathematical model from a real-life problem related to signals and systems
 - Interpret results achieved by mathematical solutions

Practical skills

- Students will be able to:
 - Express models and methods as computer implementations (MATLAB or OCTAVE)
 - Yildiz Technical University provides MATLAB License.
 - Apply Matlab/Octave for analysis and simulation of continuous and discrete time systems
 - Analyse mathematical solutions in the context of the original problem

Transferable skills

- Students will be able to:
 - Choose appropriate approach in problem solving situation
 - Present and communicate formalised results and conclusions

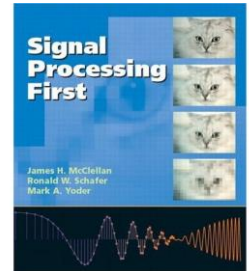
Main course book

Signal Processing First

by James H McClellan,
Ronald W. Schaffer
and Mark A. Yoder.

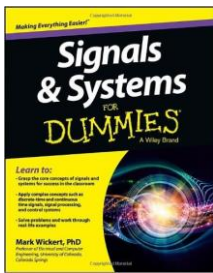
Published by Prentice
Hall.

Isbn: 0-13-120265-0



14

Some Other Books

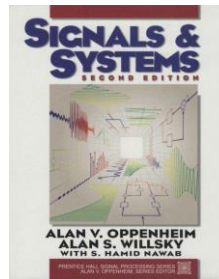


- by Mark Wickert

Wickert, Mark. *Signals and Systems for Dummies*. John Wiley & Sons, 2013.

15

Some Other Books

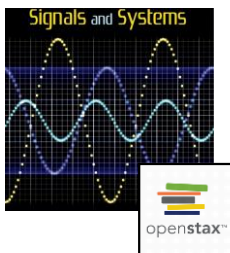


- by Alan V. Oppenheim and Alan S. Willsky

Oppenheim, Alan V., Alan S. Willsky, and Syed Hamid Nawab. "Signals and systems 2nd ed." *New Jersey: Prentice Hall*(1997).

16

Some Other Books



- Online e-book by Richard Baraniuk

<https://cnx.org/contents/d2CEAGW5>

17

Rules of the Conduct

- No eating /drinking in class
 - *except water*
- Cell phones must be kept outside of class or switched-off during class
 - *If your cell-phone rings during class or you use it in any way, you will be asked to leave and counted as unexcused absent.*
- No web surfing and/or unrelated use of computers,
 - *when computers are used in class or lab.*

18

Rules of the Conduct

- You are responsible for checking the class web page often for announcements.
- Academic dishonesty and cheating will not be tolerated and will be dealt with according to university rules and regulations
 - Presenting any work, or a portion thereof, that does not belong to you is considered academic dishonesty.*
- University rules and regulations:
 - <http://www.ogi.yildiz.edu.tr/category.php?id=17>
 - https://www.yok.gov.tr/content/view/544/230/lang.tr_TR/

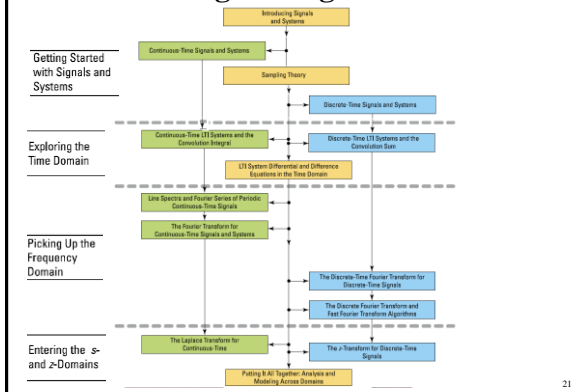
19

Attendance Policy

- The requirement for attendance is **70%**.
 - Hospital reports are not accepted to fulfill the requirement for attendance.*
 - The students, who fail to fulfill the attendance requirement, will be excluded from the final exams and the grade of **F0** will be given.*
- Absent more than 12 hours → F0**

20

Seeing the Big Picture



21