King Saud University
College of Applied Medical Sciences
Department of Biomedical Technology
BMT415 Biomedical Signal Processing 3 (2-1-0)

Current Instructor: Mr. Amr Rodwan and Prof. Mohamad Rizon Juhari
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Textbook(s) and/or Other Required Materials: Primary: Analog and Digital signal processing, second edition, Ashok Ambardar, Brooks/Cole publishing company, 1999.

Course Description (catalog): This course continues the coverage of the fundamental concepts of Discrete Signals, Sampling and Quantization, Discrete Convolution, the Z transform, application of Z transform, Fourier transform and application on system analysis, Digital filters-IIR, FIR. http://faculty.ksu.edu.sa/75455 then choose BMT415 includes PowerPoint presentations and some related materials

Prerequisites: BMT 314
Co-requisite: None
Course Type: Mandatory

Course Learning Outcomes:
Upon completing BMT415, students should have the following capabilities:

- Students are knowledgeable of convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform
- Students are knowledgeable of decimation in time and frequency FFT algorithms for efficient computation of the DFT.
- Students demonstrate an ability to design digital IIR filters by designing prototypical analog filters and then applying analog to digital conversion techniques such as the bilinear transformation.
- Students demonstrate an ability to design digital FIR filters using the window method.
- Students demonstrate an ability to analyze signals using the discrete Fourier transform (DFT).

Student Outcomes Covered by Course:
a. an ability to select and apply the knowledge, techniques, skills, and modern tools of biomedical technology to include the application of circuit analysis, analog and digital electronics, microcomputers, biomechanics, biomedical instrumentation systems, and safety in the building, testing, operation, and maintenance of biomedical equipment.
Understanding sampling and reconstruction in both the time and frequency domains, understanding linear time-invariant systems, system properties, the convolution sum, and properties of convolution.

b. an ability to select and apply a knowledge of mathematics, chemistry, physics, and biological sciences, engineering, and technology to building, testing, operation, and maintenance of

biomedical equipment and the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of biomedical systems.
The ability to understand the Z-transform and its application to identifying system properties, solving difference equations, and determining the frequency response of a system and to understand system analysis using Fourier Transform.

c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.
Understanding the system frequency response, magnitude response and phase response, understanding the Z-transform and its application to identifying system properties, solving difference equations, and determining the frequency response of a system and understanding MATLAB as a tool for signal processing.

d. an ability to analyze, design, and implement biomedical systems, components or processes for broadly-defined engineering technology problems appropriate to program educational objectives.
Students are requested to design small systems and implement and test their solutions in HW and Lab assignments.

e. an ability to function effectively as a member or leader on a technical team.

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f. an ability to identify, analyze, and solve broadly-defined biomedical technology problems.

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g. an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.

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h. an understanding of the need for and an ability to engage in self-directed continuing professional development.

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i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.

j. a knowledge of the impact of engineering technology solutions in a societal and global context and an understanding of the clinical application of biomedical equipment.

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k. a commitment to quality, timeliness, and continuous improvement.

Major Topics covered and schedule in weeks:

1. Discrete Signals
2. Sampling and Quantization
3. Discrete Convolution
4. the Z transform
5. application of Z transform
6. Fourier transform and application on system analysis
7. Digital filters-IIR
8. FIR.