



King Saud University
College of Applied Medical Sciences
Department of Biomedical Technology

BMT437 Control Systems in Biomedical Instrumentation 2 (2-0-0)

Current Instructor: Prof. Mohamad Rizon Juhari

Course Coordinator: Prof. Mohamad Rizon Juhari

Coordinator's email: mjuhari@ksu.edu.sa

Textbook(s) and/or Other Required Materials: Primary: Nise N.S. Control System Engineering (4th Ed), John Wiley & Sons, 2004.

Course Description (catalog): This course continues the coverage of the basic components of a control system, the concept of feedback, closed-loop control versus open-loop control, using the Laplace transform to solve linear differential equations, finding transfer function for linear time-invariant electrical and mechanical, understanding the concept of poles and zeros and how to find the time response from a transfer function and determining the stability of a system
<http://faculty.ksu.edu.sa/75455> then choose BMT437 web page includes PowerPoint presentations and some other related materials

Prerequisites: None

Co-requisite: None

Course Type: Mandatory

Course Learning Outcomes:

Upon completing BMT437, students should have the following capabilities:

1. Students are knowledgeable of the control system, the concept of feedback, closed-loop control versus open-loop control.
2. Students are knowledgeable of using the Laplace transform to solve linear differential equations, finding transfer function for linear time-invariant electrical and mechanical,
3. Students demonstrate an ability to understand the concept of poles and zeros
4. Students demonstrate an ability to find the time response from a transfer function.
5. Students demonstrate an ability to analyze stability of the system.

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 the fundamental basic control system, the concept of feedback, closed-loop control versus open-loop control, examples of control systems, transfer function, types of feedback control system characteristics – noise rejection, gain, sensitivity, stability.](#)

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 Laplace transform to solve linear differential equations, finding transfer function for linear time-invariant electrical and mechanical.

c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

Students demonstrate an ability to understand the concept of poles and zeros, to find the time response from a transfer function, to analyze stability of the system.

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

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

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

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.

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

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.

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

Covered

Major Topics covered and schedule in weeks:

1. Introduction to control engineering
2. Models of physical systems.
3. State variable models, system response
4. Control system characteristics
5. Stability analysis, root-locus analysis and design
6. Frequency response design
7. Biological control systems