King Saud University
College of Applied Medical Sciences
Department of Biomedical Technology
BMT333 Electric Machines in Medical Instrumentation 2 (2-0-0)

Current Instructor: Dr. seddik Khemaissia
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Textbook(s) and/or Other Required Materials:
Primary: Electric Machines and Drives, Gordon R. Slemon, Addison Wesley, 1992.

Course Description (catalog):
This course examines the operating theory, construction, testing, application, protection and control of electric machines. Building upon the principles of electric circuit theory and magnetic circuit theory, the following topics are studied: magnetic circuits, transformers, induction machines, synchronous machines, DC machines, stepper motors, single phase motors, motor control, polyphase rectification.
Prerequisites: BMT211
Co-requisite: None

Course Type: Mandatory

Course Learning Outcomes:
Upon completing BMT333, students should have the following capabilities:

1. Students are knowledgeable of the concept of the electromagnetic circuits and their importance in the electric machines design.
2. Students are knowledgeable of using electric transformers and their applications in medical equipment.
3. Students demonstrate of using the electromagnetic circuit formula to calculate the parameters of different DC machines and their applications in medical equipment.
4. Students demonstrate of using the electromagnetic circuit formula to calculate the parameters of a single phase induction motors and their applications in medical equipment.
5. Students demonstrate of using the electromagnetic circuit formula to calculate the parameters of some special motors and their applications in medical equipment.
6. Students are knowledgeable of construction, operating concepts, starting methods of Synchronous Motors and their applications in medical equipment.

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.
Students select and apply the knowledge, techniques, and skills of electric and magnetic circuits related activities

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.
Students select and apply knowledge of mathematics, science, engineering, and technology to electric machines in medical equipment.

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

d. an ability to analyze, design, and implement biomedical systems, components or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

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.
Students are able to solve equations for different electric machines to choose the appropriate machines for a specific application.
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.

Major Topics covered and schedule in weeks:

1. Electromagnetic Circuits
2. The Governing Equations
3. Transformers: Description - The Ideal Transformer
4. Equivalent Circuit - Losses and Ratings
5. Transformer tests: Open Circuit Test - Short Circuit Test - Autotransformers
6. DC motors: Geometry, Fields, Voltages, and Currents
7. DC motor: shunt – series - compound
8. Induction Machines: Description - Concept of Operation - Torque Development
9. Induction Motors: Operating characteristics - Starting of Induction Motors
10. Special Motors –
11. stepper motors
12. Line Controlled Rectifiers
13. choppers.