

COURSE OUTLINE
BMET-112
Electro-Mechanical-Fluidic Devices I
3 Credits

HOWARD COMMUNITY COLLEGE

Description

The student, upon successful completion of this course, will be able to utilize the basic concepts to investigate the physics of and the interrelation between electrical, mechanical, fluidic and optical systems. The student will know the basic components of each system, where in the overall system they occur and what their function is toward the correct operation of the system. Prerequisite: ELEC-107 and PHYS-101. (2 hours lecture, 3 hours lab)

Overall Course Objectives

Upon completion of this course, the student will be able to:

1. Analyze a simple fluidic system (pneumatic and hydraulic) composed of pumps, control valves, cylinders, and pressure switches.
2. Construct various pneumatic circuits in the lab, verify the correct operation and modify the circuits to accomplish stated requirements.
3. Utilizing the basic principles and relations of individual pneumatic components, analyze several biomedical apparatus (anesthesia machine, respirators, suction and pressure pumps and dental apparatus).
4. Discuss the safe use of various gases with respect to application in patient settings.
5. Using the gas laws, calculate pressure, temperature and volume based upon a given situation.
6. Demonstrate the proper use of a basic respirator and identify the various parts of the respirator and describe how each part affects the operation.
7. Utilize basic drive mechanisms (gears, shafts, bearing, couplings, motors, dials, etc.) to demonstrate the understanding of the basic physics principles of mechanical systems.
8. For a given type of gear system; calculate displacement ratios, velocity ratios, torque ratios and horsepower.
9. Describe the basic principles of refrigeration and heating devices and how they are utilized in clinical lab equipment like centrifuges, sterilizers, incubators, etc.
10. Define and describe preventive maintenance procedures with respect to biomedical apparatus.
11. State the purpose of regulations imposed upon medical apparatus and identify the major organizations that write and enforce the regulations.

Major Topics

I. Hydraulics and Pneumatics

- A. Theory
- B. Components
- C. Symbols
- D. Troubleshooting

II. Pneumatic Applications

- A. Anesthesia
- B. Respirator
- C. Ventilator
- D. Suction and infusion pump

III. Mechanical Mechanisms

- A. Theory
- B. Components
- C. Systems
- D. Applications

Course Requirements

Grading/exams: Final grades will be calculated on the basis of quizzes, tests, exams, homework, and lab reports.

Writing: Each lab report will require written answers to questions and written summary of results.

Math: Algebra and trigonometry are utilized to calculate pneumatic and mechanical system variables.

Other Course Information

This course is a course in the Biomedical Technology program.