

Virginia Western Community College

MDL 260

Laboratory Instrumentation

Prerequisites

N/A

Course Description

Teaches the theory, principles of operation, methodologies, maintenance, and troubleshooting of the more common instrumentation used in the clinical laboratory.

Semester Credits: 2

Lecture Hours: 1

Lab/Clinical/ Internship Hours: 0

Required Materials

Textbook:

There is no required text for this course. The course instructor will provide handouts, information included would be from the following references:

- Chapters from textbooks utilized in prior courses
- Henry's Clinical Diagnosis and Management by Laboratory Methods, 23 Edition by Richard A. McPherson, MD, MSc; Matthew R. Pinus, MD, PhD; Elsevier
- Clinical Laboratory Instrumentation and Automation: Principles, Applications, and Selection, 1st Edition by Kory M. Ward PhD MT(ASCP) (Author), Craig A. Lehmann PhD CC(NRCC) (Author), Alan m. Leiken PhD (Author)
- copies of select journal articles

Course Outcomes

At the completion of this course, the student should be able to:

- Describe the theory behind common instruments and their principles of operation.
- Apply knowledge from theories and methodologies to understand the principles of operation of currently and routinely used analyzers in clinical laboratories.
- Apply safety regulations relating to laboratory instrumentation.
- Properly prepare specimens for instrumentation analysis.
- Properly troubleshoot equipment, perform preventative maintenance, quality control and follow quality assurance guidelines.
- Apply knowledge and be able to perform basic maintenance on clinical laboratory analyzers.
- Apply knowledge and be able to understand requirements for procurement, installation, qualification/ validation and equipment upgrades.
- Recognize when and how pre-analytical, analytical, and post-analytical errors can affect instrument generated results.

Topics

Part 1

- Safety
- Specimen Requirements and Processing
- General Laboratory Supplies and Reagents: Considerations, Cautions, and Quality
- Review of QC, Accuracy, Precision, Levey-Jennings Charts, Westgard Rules, etc.
- Overview of Laboratory Instruments / Overview of Instrumentation Methodologies

Part 2

- Spectrophotometry
- Reflectometry - Reflectance Photometry
- Molecular Luminescence Spectrophotometry – Fluorometry
- Nephelometry and Turbidimetry
- Refractometry
- Osmometry
- Flow Cytometry
- Electrochemistry

Part 3

- Conductance and Impedance
- Electrophoresis and Densitometry / Capillary Electrophoresis / Isoelectric Focusing
- Biotechnology Techniques

Part 4

- Chromatography
- Mass spectrometry
- Scintillation Counter
- Error Detection and Troubleshooting Equipment

Part 5

Additional Topics (time permitting)

- Instrumentation Efficiency and Cost
- Principles and Components of Automation:
 - Evolution of Automation
 - Preanalytical and Postanalytical Automation
 - Automated Chemistry Analyzers: Core Components
 - Laboratory Automation in Other Sections of the Laboratory: Hematology, Microbiology
- Emerging Technologies: New Developments in Technologies and Automation Platforms