

## Virginia Western Community College MDL 260 - Laboratory Instrumentation

**Faculty Name:**

**Program Head: Jeffrey S. Gillette, Ph.D.** ([jgillette@viriniawestern.edu](mailto:jgillette@viriniawestern.edu))

### COURSE OUTLINE

**Prerequisites:**

Bio 101 and Bio 141 or equivalent.

**Course Description:**

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

**Lecture:**

**Semester Credits: 2 Lecture Hours: 1 Lab/Recitation Hours: NA**

**Course Outcomes:**

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

- Have an understanding of the clinical laboratory instrumentation basic theory and application.
- Apply knowledge from theories and methodologies to understand the principles of operation of currently and routinely used analyzers in clinical laboratories.
- Understand safety relating to laboratory instrumentation.
- Understand specimen requirements and processing.
- Understand equipment preventative maintenance, quality control and requirements for quality assurance.
- 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.
- Understand and discuss error detection and troubleshooting for common clinical laboratory analyzers.

**Required Materials:**

Textbook: TBD

*Possibly a combination of*

- *Chapters from textbooks utilized in prior courses along with current literature*
- *Applicable sections from Henry's Clinical Diagnosis and Management by ...*
- *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)*

## **Topics**

### **PART 1. Background and History**

1. Safety
2. General Laboratory Equipment and Reagents: Considerations, Cautions, Calibration and Quality
  - Glassware/ Plasticware, Balance, pH meter, thermometers, heat blocks ,water baths, incubators and ovens, refrigerators and freezers, mixing, centrifuge
  - Water, reagents
3. Specimen Requirements and Processing
4. Overview of Laboratory Instruments
5. Overview of Instrumentation Methodologies

### **PART 2. Testing Methodologies**

6. Spectrophotometry
7. Reflectometry
8. Molecular Luminescence Spectrophotometry - Fluorometry
9. Nephelometry and Turbidimetry
10. Refractometry
11. Osmometry
12. Flow Cytometry
13. Electrochemistry
14. Conductance
15. Electrophoresis and Densitometry
16. Impedance
17. Isoelectric Focusing
18. Chromatography
19. Mass spectrometry
20. Scintillation Counter
21. Capillary Electrophoresis
22. Nuclear Magnetic Resonance

### **PART 3. Automation**

23. 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

### **PART 4. Additional Topics**

22. Error Detection and Troubleshooting Instrumentation
23. Instrumentation Efficiency and Cost

## 23. Emerging Technologies: New Developments in Technologies and Automation Platforms