Instrumentation and Automation (Theory)

Total: 12 hours /week
Lecture: 6 hours/week
Tutorial: 0 hour/week
Practical: 6 hours/week
Lab: 0 hours/week

Course Description

This course is designed to provide basic knowledge and skills on instrumentation and automation in the clinical laboratory. It helps to develop basic but comprehensive knowledge of commonly used Instruments and techniques in clinical laboratory, their uses, working principle, procedure, Maintenance and precautions during performance of various laboratory tests.

Course Objectives

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

1. Explain the need of instrumentation and automation for the diagnosis of the diseases.
2. Classify the medically important instruments for the diagnosis of specific diseases.
3. Describe the care, handling and maintenance of instruments.
4. Discuss the load of samples and the need for automation.

Course Content

Unit 1: Instrumentation: **15hrs**

- Introduction, principle, types, importance, operation, applications, advantages, disadvantages and maintenance of following biomedical instruments:
    - Microscopes
    - Centrifuge
    - Micropipettes
    - Photometric system used in peripheral laboratory (Colorimeter, Spectrophotometer and Flame photometer)
    - pH meter
    - Ion selective electrode (ISE)
    - Analytical balance.
    - Bio-safety Cabinets
    - Vertical laminar flow
    - Autoclave
    - Fumigator
    - Vortex mixer
    - Automatic Blood culture system

Unit 2: Hi-Tech Instruments and Technology **10hrs**

- Introduction, Principle, applications of following biomedical instruments:
    - Chromatography

- Electrophoresis
- Polymerase Chain Reaction (PCR)
- Flow Cytometry
- High Performance Liquid Chromatography (HPLC)
- Fluorescent and Electron microscopy

Unit 3: Immunochemical Techniques: **15 hrs**

- Introduction, Principle and applications of following technologies:
    - Enzyme linked immunosorbent assay (ELISA)
    - Radioimmunoassay (RIA)
    - Chemiluminescence immunoassay (CLIA)
    - Electrochemiluminescent immunoassay (ECLIA)

Unit 4: Automation **26 hrs**

- Automatic analyzers: Introduction, working principle, components, applications, advantages and disadvantages of:
    - Continuous flow systems
    - Discrete analyzers (Semi and fully automated)
    - Centrifugal analyzers
    - Dry Chemistry analyzers
    - Robotic analyzers
- Blood cell analyzer: Introduction, working principle, components, applications.
- Arterial blood gas analyzer and its applications.
- Applications of computer in automation.

References Books

- Lynch's Medical Laboratory Technology by Raphael
- Gradwohl's Clinical laboratory methods and diagnosis; Volume I & II by Garett.

Unit	**1**	**2**	**3**	**4**	**Total**
Unit Hours	**15**	**10**	**15**	**26**	66
Marks	**19**	**12**	**19**	**30**	**80**

Instrumentation and Automation (Practical)

Practical: 66hrs

Instrumentation and Automation

- **Handle the following instruments with quality control assurance in diagnostic lab:**
    - Colorimeter and Spectrophotometer,
    - Centrifuge,
    - Water bath
    - Microscope
    - Micropipettes
    - Autoclave
    - Fumigator
    - Dispensor

- **Demonstrate:**
    - Chromatography set
    - Electrophoresis set

- **Demonstrate automated equipment:**
    - Fully automated analyzers
    - Semi automated analyzers
    - Automated electrolyte analyzers
    - Blood cell analyzers
    - ELISA
    - Blood gas analyzer