Course Description

MLS4193 | Clinical Molecular Diagnostics | 3.00 credits

Clinical molecular diagnostics course provides an introduction to molecular analysis of biological markers in clinical samples to aid in the diagnosis, monitoring, and treatment of diseases.

Course Competencies:

Competency 1: The student will demonstrate knowledge of the basic concepts of molecular testing in human disease by:

1. Evaluating the basic concepts of genetics and molecular biology
2. Explaining the terms associated with genetics such as genome, DNA, RNA, reverse transcriptase, DNA ligase
3. Evaluating the nucleic acid structure and function
4. Evaluating RNA transcription and translation

Competency 2: The student will demonstrate knowledge of amplification techniques as a tool for laboratory analysis by:

1. Comparing the evolution of Polymerase Chain Reaction (PCR) techniques from manual to automation since its inception
2. Explaining the technique of nucleic acid extraction by automation or by using manual extraction methods
3. Differentiating between traditional PCR and real-time PCR Evaluating procedural steps for PCR and other amplification techniques
4. Explain the uses and benefits of PCR in the laboratory

Competency 3: The student will demonstrate knowledge of DNA sequencing as another molecular method for identification by:

1. Explaining the steps in sequencing DNA
2. Comparing the characteristics and uses of Southern and Northern blot techniques
3. Explaining Western Blot procedure and uses in the laboratory
4. Evaluating emerging sequencing technologies in molecular biology

Competency 4: The student will demonstrate knowledge of molecular testing in the identification of genetic abnormalities in oncology, hematology, and clinical chemistry by:

1. Analyzing the human genome
2. Explaining some variations in the human genome and the correlation to human disease
3. Illustrating some examples of autosomal recessive and autosomal dominant disorders as they relate to molecular assay
4. Explaining the role of molecular assays used in identifying some conditions such as tumors, diabetes, and multiple myeloma

Competency 5: The student will describe molecular testing for the identification of commonly encountered viruses and bacterial infections associated with infectious diseases by:

1. Explaining the use of some molecular tools used for screening, confirmation, Viral load, and POC testing of HIV
2. Explaining the use of some molecular tools for Hepatitis related disease: HAV, HBV, HCB, HDV and HDE viruses
3. Explaining the techniques of some molecular testing associated with sexually transmitted diseases such as chlamydia and gonorrhea
4. Explaining the techniques of some molecular testing associated with molecular for viral rickettsia and mycoplasma disease
5. Explaining the use of some molecular testing procedures associated with nosocomial infections for organisms such as Clostridium and Methicillin-Resistant Staphylococcus aureus (MRSA)

Competency 6: The student will demonstrate knowledge of molecular testing for acute and chronic leukemias and coagulopathies by:

1. Distinguishing the four types of hypersensitivity relations and giving examples of each type I, II, III, and IV, as well as the laboratory identification methods
2. Evaluating the laboratory identification and diagnostic tools for immunoproliferative disorders such as multiple myeloma
3. Explaining the difference between organ-specific and organ-nonspecific autoimmune disorders with an emphasis on some of the commonly encountered diseases
4. Analyze organ transplantation and the laboratory procedure to screen potential donors and recipients
5. Explain the types of graft vs host disease

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Demonstrate knowledge of ethical thinking and its application to issues in society
- Use computer and emerging technologies effectively