Course Name: Clinical Chemistry II
Course Number: MLT-243
Course Department: STEMM
Course Term: Spring 2020
Last Revised by Department: 9/2019
Total Semester Hour(s) Credit: 2.0
Total Contact Hours per Semester:

  Lecture: 2  Lab: N/A  Clinical: N/A  Internship/Practicum: N/A

Catalog Description: This is a study of the endocrine system, tumor markers, therapeutic drugs, toxicology and vitamins, and correlating test results with states of health and disease.

Pre-requisites and/or Co-requisites: CHM 110–Introduction to Chemistry, CHM 111-Introduction to Chemistry Lab; MLT 241 – Clinical Chemistry I.

Textbook(s) Required:

Access Code: N/A

Required Materials: Microsoft Surface Go (or similar device), Course Packet (provided by instructor prior to instruction), 3-ring binder (1.5 – 2 inch is ideal), Scantrons for quizzes/exams (available for purchase in the campus bookstore), and a Calculator.


Course Fees: N/A

Institutional Outcomes:

Critical Thinking: The ability to dissect a multitude of incoming information, sorting the pertinent from the irrelevant, in order to analyze, evaluate, synthesize, or apply the information to a defendable conclusion.

Effective Communication: Information, thoughts, feelings, attitudes, or beliefs transferred either verbally or nonverbally through a medium in which the intended
meaning is clearly and correctly understood by the recipient with the expectation of feedback.

Personal Responsibility: Initiative to consistently meet or exceed stated expectations over time.

**STEMM Department Outcomes:**

- Students will apply science, technology, engineering, and mathematics in contexts that make connections between school, community, and work, enabling them to compete in the current and future economy.
- Students will possess the skills needed to be gainfully employed in their chosen career path.
- Students will demonstrate competency in the skills needed to satisfy their educational goals.

**Program Outcomes:**

- Demonstrate entry level knowledge and skill in modern clinical laboratory science.
- Collect and process biological specimens and perform analytical tests on body fluids, cells, and products.
- Monitor quality control through understanding of basic laboratory statistics, recognize affected result, and take appropriate action.
- Perform preventive and corrective maintenance of equipment and instruments or refer to appropriate sources for repairs.
- Recognize the responsibilities of other laboratory and health care personnel and interact with them with respect for their position and patient care.
- Relate laboratory findings to common disease processes.

**Student Learning Outcomes:**

- Explain the location and determine the function of endocrine glands and the laboratory tests used to identify endocrine system disorders.
- Define pharmacokinetics and the laboratory’s role in therapeutic drug monitoring and toxicology testing in the evaluation of various drug therapies and potentially harmful substances.
- Explain the role and characteristics of tumor markers and how they are used to diagnose and monitor treatment of neoplasms.
- Differentiate and identify the properties of common laboratory instrumentation and testing methodologies used in the chemical analysis of laboratory specimens.
Define the role, function, and characteristics of vitamins, minerals, and trace elements and the disease states associated with abnormalities of each.

Explain the different types and functions of body fluids and the laboratory analysis and abnormalities associated with them.

**Unit Objectives:**

**Unit 1: The Endocrine System**
1. Define hormones and discuss their various functions.
2. Discuss the different structural classes of hormones.
3. Define the mechanism of control when dealing with hormones.
4. Differentiate primary, secondary, and tertiary disorders that are associated with hormones.
5. Differentiate components associated with the hormones and the laboratory findings.

**Unit 2: Thyroid Function**
1. Name the parts of the thyroid gland.
2. Describe the action and regulation of thyroid hormones.
3. Distinguish the various assays used to determine abnormal thyroid function.
4. Name the laboratory findings, signs, and symptoms associated with the major thyroid disorders.

**Unit 3: Therapeutic Drug Monitoring**
1. Define the mechanism used by the body to process a drug.
2. Define the Pharmacokinetics of therapeutic drugs and describe the concepts used to manage them.
3. Define key terms in therapeutic drug monitoring.
4. Explain proper sample collection of therapeutic drugs.
5. List specific classifications of drugs which are commonly prescribed and monitored giving examples of each.

**Unit 4: Tumor Markers**
1. Define tumor markers and identify where they are located.
2. Discuss the different tumor marker tests and give the characteristics of “ideal tumor markers.”
3. Name the tumor specific antigens and discuss the significance of them.
4. Discuss the placental proteins and identify how they are useful.
5. Discuss the different enzymes that are valued as tumor markers.
6. Describe the hormones that are used as tumor markers.
7. Discuss why steroid receptors are important and how they are used.

**Unit 5: Toxicology**
1. Define toxicology.
2. Discuss the pathologic mechanisms of the different toxicants.
3. Discuss the different areas of toxicants such as specific agents and therapeutic drugs and list the ranges and effects of these toxicants.

Unit 6: Instrumentation
1. Discuss the spectrophotometer in terms of its parts and relate it to Beer’s Law.
2. Identify an atomic absorption spectrophotometer and explain the principles and advantages to it.
3. Discuss the principles of fluorometry and describe its advantages.
4. Discuss Nephelometry and Turbidimetry and the disadvantages of each.
5. Define and discuss refractometry.
6. Compare the operation and components of the pH, PCO2, PO2 and ion selective electrodes.
7. Discuss the measurement of blood gases.
8. Define osmometry and the colligative properties associated with it.
9. Discuss electrophoresis in association with movement, pH, endosmosis, time and wick effect.
10. Compare and contrast the three basic approaches to instrument automation.
11. Discuss operation and function of centrifuges.

Unit 7: Vitamins, Minerals, and Trace Elements
1. Define vitamins and discuss the water soluble and fat soluble characteristics.
2. Identify the water soluble vitamins along with the functions and deficiencies.
3. List the fat soluble vitamins and their functions, sources, and deficiencies.
4. Explain and discuss the digestion, transport, and regulation of iron in the body.
5. Define minerals and differentiate trace minerals from major minerals.

Unit 8: Body Fluid Analysis
1. Define amniotic fluid and describe its role in pregnancy.
2. Describe the physiologic basis for tests of fetal maturity.
3. Describe the origin and physiologic role of alpha-fetoprotein in the fetus and explain how its measurement in maternal serum is of value in assessing the risk of neural tube defect.
4. Explain why confirmatory tests of alpha-fetoprotein are essential.
5. Define the different body fluids including CSF, peritoneal, and thoracic, and describe their role in the body.

College Procedures: All college-wide procedures are located in the Iowa Central Community College Student Handbook.

Assessments:

The Exam category of this course includes 4 unit exams (worth 45-70 points each) and one final exam worth 90 points. Students are required to take ALL unit exams and the final comprehensive exam. All unit and final exams must be completed to pass the course.
The Classwork category of this course includes 15 sets of discussion questions (2 points each), 15 weekly participation points (10 points each), 15 unit topic worksheets (5-10 points each), 11 online quizzes (5-10 points each), 7 article reviews (20 points each), 14 Online CLS Simulation Exams (10 points), 1 research paper (100 points), and other activities as assigned by the instructor.

Please note that assessments are subject to change.

Non-discrimination Statement:


If you have questions or complaints related to compliance with this policy, please contact Kim Whitmore, Director of Human Resources, phone number 515-574-1138, whitmore@iowacentral.edu; or the Director of the Office for Civil Rights, U.S. Department of Education, Citigroup Center, 500 W. Madison, Suite 1475, Chicago, IL 60661, phone number 312-730-1560, fax 312-730-1576.

Disability/Accommodation Services:

If you have a request for an accommodation based on the impact of a disability, it is Iowa Central’s policy that you contact the Academic Assistance & Accommodations Coordinator to discuss your specific needs and to provide supporting information and documentation, so we may determine appropriate accommodations. The office for accommodations is located in the Academic Resource Center, and it can be reached by calling 515-574-1045. For online information about accommodations, please go to www.iowacentral.edu/accommodations.

Bias-Free Classroom Statement:

MLT-243 Clinical Chemistry II maintains high standards of respect in regard to individual beliefs and values when selecting classroom materials including textbooks, project activities, power points, videos, presentations, and classroom discussions.

It is our belief that all people have the right to obtain an education within our department/program courses free of bias, with full respect demonstrated to all who enroll in the courses of this department/program.