A. COURSE INFORMATION

Course number/section: BIMS_4326_001
Class meeting time: TR-1:00-2:15 PM
Class location: OCNR 255
Course Website: https://bb9.tamucc.edu/

B. INSTRUCTOR INFORMATION

Instructor: Dr. Felix Omoruyi
Office location: Center for Sciences 130B
Office hours: MW – 12:00 - 2:00 PM; R – 12:00 – 1:00 PM
Telephone: 825-2473
E-mail: felix.omoruyi@tamucc.edu
Appointments: N/A

C. COURSE DESCRIPTION

This course studies the theory and practice of analytical procedures in clinical chemistry and comparative methodology of diagnostic tests with normal and abnormal human physiology as applied to diagnosis of pathological conditions. Emphasis is on advanced procedures and clinical correlations.

D. PREREQUISITES AND COREQUISITES

BIMS 4325: Clinical Chemistry 1
Corequisites
None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES


Optional Textbook(s) or Other References

Supplies
You will need a scientific calculator.
F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

Preanalytical Variation
At the conclusion of the lecture, the student should be able to:
1. Describe the three major categories of preanalytical variation.
2. Discuss the appropriate uses of anticoagulants and their preservatives and their effects on common laboratory tests.
3. Define delta checks and summarize their utility in detection of preanalytical errors.

Reference Intervals
At the conclusion of the lecture, the student should be able to:
1. State the purpose of reference intervals.
2. Describe how reference intervals are obtained.
3. Define clinical decision limits, specificity, sensitivity, and predictive value.

Quality Control in Clinical Chemistry Laboratory
At the conclusion of the lecture, the student should be able to:
1. Describe a good quality control program.
2. Understand routine quality control rules.
3. Evaluate out of control problems and actions to resolve the problem.
4. Define calibrators
5. Understand external Quality Control programs and their importance in the lab.

Body Fluids
At the conclusion of the lecture, the student should be able to:
1. Define serous fluid, synovial fluid, and CSF.
2. Differentiate between transudate and exudates.
3. Describe routine tests and normal results for synovial, serous, and CSF.
4. Describe changes in synovial, serous, and CSF in pathological conditions.

Cardiac Function
At the conclusion of the lecture, the student should be able to:
1. Discuss the etiology of the following heart conditions: congenital, hypertensive, infectious, coronary, or congestive heart disease
2. List the factors for an ideal cardiac marker.
3. Discuss the enzymes useful in the diagnosis of cardiac disorders
4. Discuss the time course of enzyme activity in AMI
5. Assess the clinical utility of the various cardiac markers for AMI.
Isoenzymes
At the conclusion of the lecture, the student should be able to:
1. Define ‘isoenzyme’ and characterize the isoenzyme of CK, LD, ALP
2. Describe methods of assay for CD isoenzyme, LD isoenzyme, and the isoenzyme of ALP
3. Discuss interpretations of isoenzyme patterns in MI
4. Discuss interpretations of isoenzyme patterns in diseases of liver and bone
5. Discuss isoenzymes as tumor markers.

Lipid Disorders
At the conclusion of the lecture, the student should be able to:
1. Discuss the nature, clinical application, and assay methods of HDL cholesterol and apoproteins
2. Explain the lipoprotein physiology and metabolism
3. Describe the methodology for lipoprotein phenotyping and characterize each lipoprotein factor
4. Describe each of the hypolipoproteinemias and lab results in each
5. Classify each of the hyperlipoproteinemias by triglyceride and cholesterol values, serum appearance, and electrophoresis patterns.

Pancreatic Function
At the conclusion of the lecture, the student should be able to:
1. Describe the function of the pancreas including hormones and enzymes produced and stimulation of pancreatic secretion
2. Describe cystic fibrosis and diagnostic tests for CF
4. Describe laboratory diagnosis of acute pancreatitis.

GI Function and Disorders
At the conclusion of the lecture, the student should be able to:
1. Discuss the phases of digestion and actions of the hormones and enzymes involved
2. State the purpose of tests of gastric acidity and how gastric acid is the most suitably measured
3. Describe the protocol for gastric analysis and calculation of BAO and MAO
4. Describe gastric results in pernicious anemia, gastric vs peptic ulcer, Zollinger-Ellison syndrome.
5. Evaluate the assays for serum gastrin and its significance.
6. Define steatorrhea and celiac disease and evaluate the performance and significance of the test for fecal fat.
7. Describe the significance of the D-xylene test, Schilling test, and lactose tolerance test.

Porphyrin Metabolism and Disorders
At the conclusion of the lecture, the student should be able to:
1. Discuss the significance of heme.
2. Name the two classes of primary porphyria and explain the difference.
3. Describe the most distinctive lab findings in acute intermittent porphyria.
4. List the most common causes of secondary porphyrinuria and/or porphyrinemia.
5. Describe the following: Ehrlich’s aldehyde reaction, Watson-Schwartz test, porphyrin assay, assay of ALA and ALA dehydrase.
6. List the tests used in the detection and evaluation of lead overload and discuss relative usefulness.
Iron Status
At the conclusion of the lecture, the student should be able to:
1. Outline the metabolism of iron.
2. Outline the basic steps in the assays of serum iron, TIBC, UIBC, and explain what is being measured in each assay.
3. Recognize conditions associated with abnormalities of serum iron and TIBC.
4. Describe proper collection and handling of specimens for iron and TIBC and give the normal ranges for each.
5. Discuss the serum ferritin assay, the principle and clinical applications.

Endocrinology (Hormones)
At the conclusion of the lecture, the student should be able to:
1. Define ‘hormone’ and name and describe the three chemical types of hormones.
2. Describe the mechanism of action of each of the three chemical types of hormones.
3. List the components of the endocrine system and hormones produced by each and control mechanisms.
4. Discuss general methodology for a hormone assay.
5. Describe the clinical features of the excess and deficiency states for growth hormone, prolactin, and vasopressin.
6. Define the functions of the anterior and posterior pituitary hormones.
7. Discuss the regulation of prolactin secretion.

Steroid Hormones
At the conclusion of the lecture, the student should be able to:
1. Describe the general structure of steroid hormones.
2. Identify estrogens, androgens, progesterone, and adrenal cortical steroids by their structure.
3. Distinguish a glucocorticoid from a mineralocorticoid by structure.
4. Describe the Zimmerman reaction, the Porter-Silber reaction and the 17-Ketogenic steroid assay and identify compounds which would react in each assay.

Adrenal Function
At the conclusion of the lecture, the student should be able to:
1. Explain how the adrenal gland functions to maintain blood pressure, potassium, and glucose homeostasis.
2. Discuss the pathophysiology of adrenal cortex disorders, namely Cushing’s syndrome and Addison’s disease.
3. List the appropriate laboratory tests to differentiate between primary and secondary Cushing’s syndrome and Addison’s disease.
4. State the most useful measurements in supporting the diagnosis of pheochromocytoma.

Reproductive Hormones
At the conclusion of the lecture, the student should be able to:
1. Name the male and female sex hormones and biosynthetic pathways and the regulation of the hormones.
2. List the metabolites of the steroid hormones.
3. Describe the appropriate lab testing protocol to effectively evaluate or monitor patients with suspected gonadal disease.
4. Correlate laboratory information with regard to suspected gonadal disorders, given a patient’s clinical data.

**Thyroid Function**
At the conclusion of the lecture, the student should be able to:
1. Discuss the biosynthesis, secretion, transport, and action of the thyroid hormones.
2. Explain the principles of the thyroid function tests, T3, T4, TSH, T3 Uptake.
3. Correlate laboratory information with regard to suspected thyroid disorders, given a patient’s clinical data.

**Therapeutic Drug Monitoring (TDM)**
At the conclusion of the lecture, the student should be able to:
1. Discuss factors influencing serum drug levels.
2. Discuss pharmacokinetics: dose-response curve, drug half-life, steady state, dosing intervals, peak and trough drug levels.
3. Discuss the characteristics of a drug that make it TDM essential.
4. Describe the TDM of cardiac drugs, antiepileptic drugs, theophylline, aminoglycosides, and antidepressant drugs.

**Toxicology**
At the conclusion of the lecture, the student should be able to:
1. Define the term toxicology.
2. List the major toxicants.
3. Define the pathologic mechanisms of the major toxicants.
4. Discuss the laboratory methods used to evaluate toxicity.
5. Explain the difference between quantitative and qualitative tests in toxicology.

**Chemistry of Pregnancy**
At the conclusion of the lecture, the student should be able to:
1. Outline the formation of amniotic fluid throughout pregnancy and the reason for performing amniocentesis.
2. Describe serum and urine levels of HCG, HPL, and estriol throughout pregnancy.
3. Define toxemia.
4. Describe assay methods and applications for HCG, HPL, and estriol.
5. State the purpose of monitoring alpha-fetoprotein levels in amniotic fluid.
6. Describe specimen collection and handling for L/S ratio.

**Tumor Markers**
At the conclusion of the lecture, the student should be able to:
1. Describe the major properties, assays, and clinical usefulness of CEA, AFP, CA125, CA19-9, PSA, β-hCG, and PALP.
2. Explain the role of tumor markers in cancer management.
3. Identify the characteristics of properties of an ideal tumor marker.
4. Explain the use of enzymes and hormones as tumor markers.
Nutritional Assessment
At the conclusion of the lecture, the student should be able to:
1. List biochemical parameters used to monitor nutritional status.
2. Correlate alterations in vitamin status with circumstances of increased metabolic requirements, age-related physiologic changes, or pathologic conditions.
3. Delineate laboratory procedures used in the assessment of vitamin status.
4. Discuss the role of the laboratory in nutritional assessment and monitoring.
5. Describe some of the electrolyte and mineral abnormalities associated with TPN.

By the end of this course, students should be able to:
1. develop understanding of the body’s major organ systems and the role that each plays in the normal functioning of the body.
2. acquire knowledge of the principles of laboratory methods, their uses, specimen requirements, and sources of error.
3. identify selected pathological conditions and the analytes that would be altered in the event of such conditions.
4. evaluate laboratory test results and correlate them with other laboratory and clinical findings.

G. INSTRUCTIONAL METHODS AND ACTIVITIES
You will be provided with lecture notes. Instructional methods will include lecturing with discussion, problem solving and case studies.

H. MAJOR COURSE REQUIREMENTS AND GRADING
The final course grade will be based on four exams, attendance, problem portfolio, and a final exam according to the following percentages:

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<thead>
<tr>
<th>ACTIVITY</th>
<th>PERCENT OF FINAL GRADE</th>
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<tr>
<td>Exam I</td>
<td>15%</td>
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<td>Exam 2</td>
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<td>Exam 3</td>
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<td>Exam 4</td>
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<td>PROBLEM PORTFOLIO</td>
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<td>FINAL</td>
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It is assumed that you have mastered the material covered in Clinical Chemistry I; therefore, questions from the previous semester may be included in each exam. Attendance will be taken in class.
Grades
You are expected to read the material that corresponds to the objectives as they are covered. Mastering course objectives will require that you have read the material.

The following scale will be used to report grades:
A  90 - 100
B  80 - 89
C  70 - 79
D  60 - 69
F  below 60

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Month</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>January</td>
<td>22</td>
<td>Pre-analytical Variation</td>
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<tr>
<td></td>
<td>27</td>
<td>Reference Intervals</td>
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<td></td>
<td>29</td>
<td>Quality Control in Clinical Chemistry Laboratory</td>
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<tr>
<td>February</td>
<td>03</td>
<td>Body Fluids</td>
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<td></td>
<td>05</td>
<td>Cardiac Function</td>
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<td>10</td>
<td>EXAM 1</td>
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<td>12</td>
<td>Isoenzymes</td>
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<td>17</td>
<td>Lipid Disorders</td>
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<td>24</td>
<td>Pancreatic Function</td>
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<td>26</td>
<td>GI Function &amp; Disorders</td>
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<td>March</td>
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<td>Endocrinology (Hormones)</td>
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<td>31</td>
<td>Reproductive Hormones</td>
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April 02 Thyroid Function
07 Thyroid Function
09 EXAM 3
14 TDM (Therapeutic Drug Monitoring)
16 Toxicology
21 Chemistry of Pregnancy
23 Tumor Markers
28 EXAM 4
April 30 Nutritional Assessment
May 07 FINAL: 11:00-1:30 PM

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
Students are expected to attend all lectures. If you know in advance that you will miss an exam due to official University business, you must provide the Professor with official documentation of the absence at least fourteen days prior to missing. It is the student’s responsibility to obtain official documentation in timely fashion. Once the documentation has been verified, the Professor will decide how to handle the absence. In the overwhelming majority of cases, assignments and exams will be turned in or completed prior to the planned, official absence. Exams given outside regularly scheduled times may vary in format and content at the discretion of the faculty member. Absolutely nothing may be turned in late by anyone for any reason.

Late Work and Make-up Exams
There is no provision for making up late work and missed exams.

Extra Credit
There is no provision for extra credit

Cell Phone Use
No use of cell phone in class
Laptop Use
Only for assessing lecture notes posted on blackboard

Food in Class
No eating in class

Missed Exam
Unexcused absence during exams will result in a zero for that exam. It is the student's responsibility to contact me in cases of extreme emergency. The only excused absences are personal illness, immediate family medical emergency, or attending funeral of immediate family.

K. COLLEGE AND UNIVERSITY POLICIES

• Academic Integrity (University)
  It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior. See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

• Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

• Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course by Friday, April 10, 2015. No student is eligible to receive a W without completing the official drop process by this deadline. Visit the Office of the University Registrar for the Course Drop Form that must be submitted. After April 10, 2015 a student will not be allowed to drop a course.

• Grade Appeals (College of Science and Engineering)
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For
assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  Disability Services (DS) is the hub for coordinating services and accommodations to ensure accessibility and utilization of all programs for all Texas A&M University-Corpus Christi students with disabilities. Our services are designed to meet the unique educational needs of enrolled students with documented permanent or temporary disabilities. DS provides intake and consultation services to students seeking to register with our office. DS reviews an individual’s documentation of disability and assesses eligibility for services and the determination of reasonable accommodations. For more information visit the Disability Services Office at 116 Corpus Christi Hall or go to http://disabilityservices.tamucc.edu/

L. **OTHER INFORMATION**
You are expected to read the material that corresponds to the objectives as they are covered. Mastering course objectives will require that you have read the material.

**GENERAL DISCLAIMER**
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.