A. COURSE INFORMATION

Course number/section: BIMS_4326_001
Class meeting time: TR-3:30-4:45 PM
Class location: CI 128
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: 361-825-2473
e-mail: felix.omoruyi@tamucc.edu
Appointments: N/A

C. COURSE DESCRIPTION

Catalog Course Description
Continuation of BIMS 4325 – Clinical Chemistry 1. Emphasis is on advanced clinical clinical chemistry topics and procedures.

Extended 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.

D. PREREQUISITES AND COREQUISITES

Prerequisites
BIMS 4325: Clinical Chemistry 1

Corequisites
None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Optional Textbook(s) or Other References
OR
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, problem portfolio, and a final exam according to the following percentages:

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>15</td>
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<td>Exam 2</td>
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<tr>
<td>Exam 3</td>
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<td>Exam 4</td>
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<tr>
<td>Problem Portfolio</td>
<td>20</td>
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<tr>
<td>Final</td>
<td>20</td>
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</table>
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.

Unannounced quizzes may be given throughout the course of the semester and grades for this will be assigned to Problem portfolio.

There is no provision for making up late work and/or missed exams or quizzes. A grade of zero will be entered for any late or missed exam, lab, quiz or practical due to an unexcused absence. The only excused absences are personal illness, immediate family medical emergency or immediate family funeral.

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.

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
The following schedule is subject to change. It is the student’s responsibility to stay abreast of any changes announced in class.

<table>
<thead>
<tr>
<th>Month</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>January</td>
<td>16</td>
<td>Pre-analytical Variation</td>
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<tr>
<td></td>
<td>18</td>
<td>Reference Intervals</td>
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<td></td>
<td>23</td>
<td>Quality Control in Clinical Chemistry Laboratory</td>
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<td></td>
<td>25</td>
<td>Body Fluids</td>
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<td></td>
<td>30</td>
<td>Cardiac Function</td>
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<td>February</td>
<td>01</td>
<td>EXAM 1</td>
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<td>Isoenzymes</td>
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<td>08</td>
<td>Lipid Disorders</td>
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<td>13</td>
<td>Lipid Disorders</td>
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<td>Pancreatic Function</td>
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<td>20</td>
<td>GI Function &amp; Disorders</td>
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<td>22</td>
<td>Porphyrin Metabolism &amp; Disorders</td>
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<td>27</td>
<td>Iron status</td>
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<tr>
<td>March 01</td>
<td>EXAM 2</td>
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<tr>
<td>06</td>
<td>Endocrinology (Hormones)</td>
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<td>08</td>
<td>Steroid Hormones</td>
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<td>12–16</td>
<td>Spring Break</td>
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<td>20</td>
<td>Adrenal Function</td>
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<td>22</td>
<td>Reproductive Hormones</td>
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<td>27</td>
<td>Thyroid Function</td>
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<td>29</td>
<td>Thyroid Function</td>
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<tr>
<td>April 03</td>
<td>EXAM 3</td>
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<td>05</td>
<td>TDM (Therapeutic Drug Monitoring)</td>
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<td>10</td>
<td>Toxicology</td>
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<tr>
<td>12</td>
<td>Toxicology</td>
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<td>17</td>
<td>Chemistry of Pregnancy</td>
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<td>19</td>
<td>Tumor Markers</td>
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<tr>
<td>24</td>
<td>EXAM 4</td>
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<tr>
<td>26</td>
<td>Nutritional Assessment</td>
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<tr>
<td>May 01</td>
<td>Review</td>
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<tr>
<td>10</td>
<td>FINAL: 1:45 - 4:15 PM</td>
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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 during lectures/exams

**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)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **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.

**Statement of Civility**
Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

**Deadline for Dropping a Course with a Grade of W (University)**
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day 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**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**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.