



The University of Texas at El Paso
College of Health Sciences
Clinical Laboratory Science Program



CLSC 3354: Clinical Chemistry I
Syllabus
Fall 2020

I. Course Information

Online Course via: Blackboard and Blackboard Collaborate Ultra

Textbook: Bishop, Michael L., Fody, Edward P., Schoeff, Larry E. 2018. *Clinical Chemistry. Principles, Techniques and Correlations. 8th Edition.* Wolters Kluwer.

II. Instructor Information

Instructor: Nancy D. Cruz-Sanchez, MS, MLS (ASCP)^{CM}

Email: ndcruzsanch@utep.edu

Office: College of Health Sciences (CHS) Room 419

Office Hours: via Blackboard Collaborate Ultra:

Mondays: 8:30am-10:00am

Tuesdays: 1:30pm-4:00pm

Wednesdays: 8:30am-10:00am

Thursdays: 1:30pm-4:00pm

- **In order to better assist you, please make sure you schedule an appointment. If you can't schedule during these times, please contact me (after class/lab or via email) to schedule another time.**
- **Multiple students may be scheduled for the same office hour session. If it's a private matter or you wish to discuss material or have questions and prefer to have a private online office hour session, please make sure to notify the instructor when appointment is being made.**
- **Students must use their UTEP email when communicating, for appointments, questions, etc.**

III. Course Description

This course is designed for students in the clinical laboratory science program. It intends to provide clinical chemistry theory, principles and foundations, and focusses in the discussion of clinical chemistry topics like analytical techniques, instrumentation and physiological-biochemical theory and principles of analytes tested in the clinical chemistry laboratory department for appropriate application in the clinical laboratory setting. It also intends to discuss the relationship of such analytes, to distinguish between normal and abnormal results and aid in the evaluation and analysis of the results using patient's clinical history and evidence. Topics to be discussed include but

are not limited to: plasma proteins, enzymes, carbohydrates, lipids, lipoproteins and non-nitrogen compounds.

Course co-requisite: CLSC 3155 – Clinical Chemistry I Laboratory

Course pre-requisite: CHEM 1305, CHEM 1105, CHEM 1306, CHEM 1106, CHEM 2324 and CHEM 2124 (Each with a grade of “C” or higher and department approval.)

IV. Course Goal

This course intends to provide the student with clinical chemistry foundations, principles and theory regarding analytes tested in the clinical chemistry laboratory, their physiological-biochemical purpose, pathways and an understanding of the analytical techniques used to determine analyte presence and/or concentration in a specimen. Likewise, the student will learn to accurately distinguish between abnormal and normal results and, will evaluate and analyze such results using patient clinical history and evidence.

V. Course Objectives

A. Cognitive

Upon completion of this course the student will be able to do the following accordingly to each chapter:

1. Chapter 5: Analytical Techniques

- a. Explain the general principles of each analytic method.
- b. Discuss the limitations of each analytic technique.
- c. Compare and contrast the various analytic techniques.
- d. Discuss existing clinical applications for each analytical technique.
- e. Describe the operation and component parts of the following instruments:
 - Spectrophotometer
 - Atomic absorption spectrometer
 - Fluorometer
 - Osmometer
 - Ion-selective electrode
 - pH electrode
- f. Outline the quality assurance and preventive maintenance procedures involved with the following instruments:
 - Spectrophotometer
 - Fluorometer
 - Osmometer
 - Ion-selective electrode
 - pH electrode

2. Chapter 6: Chromatography and Mass Spectrometry
 - a. Explain the general principles of each analytic method.
 - b. Discuss the limitations of each analytic technique.
 - c. Compare and contrast the various analytic techniques.
 - d. Discuss existing clinical applications for each analytic technique.
 - e. Describe the operation and component parts of the following instruments:
 - Mass spectrometer
 - Gas chromatograph
 - f. Outline the quality assurance and preventive maintenance procedures involved with the following instruments:
 - Mass spectrometer
 - Gas chromatograph

3. Chapter 7: Principles of Clinical Chemistry Automation
 - a. Define the following terms:
 - Automation
 - Channel
 - Continuous flow
 - Discrete analysis
 - Dwell time
 - Flag
 - Random access
 - Throughput
 - b. Discuss the history of the development of automated analyzers in the clinical chemistry laboratory.
 - c. List four driving forces behind the development of new automated analyzers.
 - d. Name three basic approaches to sample analysis used by automated analyzers.
 - e. Explain the major steps in automated analysis.
 - f. Provide examples of commercially available discrete chemistry analyzers and modular systems.
 - g. Compare the different approaches to automated analysis used by instrument manufacturers.
 - h. Discriminate between an open versus a closed reagent system.
 - i. Relate three considerations in the selection of an automated analyzer.
 - j. Explain the concept of total laboratory automation.
 - k. Differentiate the three phases of the laboratory testing process.
 - l. Discuss future trends in automated analyzer development.

4. Chapter 10: Point-of-Care Testing
 - a. Define point-of-care testing (POCT).
 - b. Explain what basic structure is required to manage a POCT program.
 - c. Explain the nuts and bolts process on implementing a POC test.
 - d. State the basic principles behind common POC applications.

5. Chapter 11: Amino Acids and Proteins
 - a. Identify essential and non-essential amino acids required for protein synthesis.
 - b. Describe the basic structure and general properties of amino acids.
 - c. Discuss the general characteristics of the following aminoacidopathies, including the metabolic defect in each and procedures commonly used for detection:
 - Phenylketonuria
 - Tyrosinemia
 - Alkaptonuria
 - Maple syrup urine disease
 - Isovaleric acidemia
 - Homocystinuria
 - Citrullinemia
 - Argininosuccinic aciduria
 - Cystinuria
 - d. Describe the basic structure and general properties of amino acids and proteins, including both conjugated and simple proteins.
 - e. Outline basic protein synthesis and catabolism.
 - f. Discuss the function and clinical significance of the following proteins:
 - Prealbumin
 - Albumin
 - Myoglobin
 - Cardiac troponin
 - Brain Natriuretic Peptide
 - Fibronectin
 - Adiponectin
 - β -Trace protein
 - Cross-linked C-telopeptides
 - Cystain C
 - Amyloid
 - g. Discuss the function and clinical significance of the following globulins:
 - α_1 -Antitrypsin

- α_1 -Fetoprotein
- α_1 -Acid glycoprotein
- α_1 -Antichymotrypsin
- Inter- α -trypsin inhibitor
- Gc-globulin
- Haptoglobin
- Ceruloplasmin
- α_2 -Macroglobulin
- Transferrin
- Hemopexin
- Lipoproteins
- β_2 -Microglobulin
- Complement
- Fibrinogen
- C-reactive protein
- High-sensitivity C-reactive protein
- Immunoglobulin

- h. Discuss at least five general causes of abnormal serum or plasma protein concentrations.
- i. List the reference intervals for serum or plasma total protein and albumin and discuss non-pathologic factors that influence their concentrations.
- j. Describe common methodologies used in the analysis of total protein, albumin, and protein fractionation including structural characteristics or chemical properties that are relevant to each measurement and the clinical usage of each.
- k. Identify the five fractions (zones) of a serum protein electrophoresis using the routine method and identify the proteins that migrate to each zone.
- l. Given a densitometric scan of a patient's serum electrophoresis, correlate the pattern with associated disease states.
- m. Describe the principle of the methods used for both qualitative and quantitative determination and identification of urine proteins.
- n. Discuss the use of cerebrospinal fluid (CSF) protein measurements in evaluation of diseases affecting the central nervous system (CNS).

6. Chapter 12: Non-Protein Nitrogen Compounds

- a. List the non-protein nitrogen components of the blood and recognize their chemical structures and relative physiologic concentrations.
- b. Describe the biosynthesis and excretion of urea, uric acid, creatinine, creatine, and ammonia.

- c. State the specimen collection, transport, and storage requirements necessary for determinations of urea, uric acid, creatinine, creatine, and ammonia.
- d. Discuss commonly used methods for the determination of urea, uric acid, creatinine, creatine, and ammonia in plasma and urine. Identify the source of error and variability in these methods and describe the effects on the clinical utility of the laboratory measurements.
- e. Recognize the reference intervals for urea, uric acid, creatinine, and ammonia in plasma and urine. State the effect of age and gender in these values.
- f. Perform calculations to convert laboratory results between systems of measurement.
- g. Describe the major pathological conditions associated with increased and decreased plasma concentration of urea, uric acid, creatinine, creatine, and ammonia.
- h. Describe the use of the urea nitrogen/creatinine ratio to distinguish prerenal, renal, and postrenal causes of uremia.
- i. Relate the solubility of uric acid to the pathologic consequences of increased plasma uric acid.
- j. Explain the use and limitations of serum creatinine for calculations of estimated glomerular filtration rate.
- k. Describe the toxic effects related to an increased plasma ammonia concentration.
- l. Suggest possible clinical conditions associated with test results, given patient values for urea, uric acid, creatinine, and ammonia and supporting clinical history.

7. Chapter 13: Enzymes

- a. Define the term enzyme, including physical composition and structure.
- b. Classify enzymes according to the International Union of Biochemistry.
- c. Discuss the different factors affecting the rate of an enzymatic reaction.
- d. Explain enzyme kinetics including zero-order and first-order kinetics.
- e. Explain why the measurement of serum enzyme concentrations is clinically useful.
- f. Discuss which enzymes are useful in the diagnosis of various disorders, including cardiac, hepatic, bone, and muscle malignancies and acute pancreatitis.
- g. Discuss the tissue sources, diagnostic significance, clinical assays, and the sources of error for the following enzymes: creatine kinase, lactate dehydrogenase, aspartate aminotransferase, alanine aminotransferase, alkaline

phosphatase, acid phosphatase, γ -glutamyltransferase, amylase, lipase, cholinesterase, and glucose-6-phosphate dehydrogenase.

- h. Evaluate patient serum enzyme concentrations in relation to disease states.
- i. Discuss the clinical importance for detecting macroenzymes.
- j. Discuss the role of enzymes in drug metabolism.

8. Chapter 14: Carbohydrates

- a. Classify carbohydrates into their respective groups.
- b. Discuss the metabolism of carbohydrates in the body and the mode of action of hormones in carbohydrate metabolism.
- c. Differentiate the types of diabetes by clinical symptoms and laboratory findings according to the American Diabetes Association.
- d. Explain the clinical significance of the three ketone bodies.
- e. Relate expected laboratory results and clinical symptoms to the following metabolic complications of diabetes:
 - Ketoacidosis
 - Hyperosmolar coma
- f. Distinguish between reactive and spontaneous hypoglycemia.
- g. Describe the principle, specimen of choice, and the advantages and disadvantages of the glucose analysis methods.
- h. Describe the three commonly encountered methods of glycosylated hemoglobin, specimen of choice, and source of error.
- i. Describe the use of glycosylated hemoglobin in the long-term monitoring of diabetes.
- j. Discuss the methods of analysis and the advantages and disadvantages of ketone bodies.

9. Chapter 15: Lipids and Lipoproteins

- a. Explain lipoprotein physiology and metabolism.
- b. Describe the structure of fatty acids, phospholipids, triglycerides, cholesterol, and the various types of lipoprotein particles.
- c. Describe the laboratory tests used to assess lipids and lipoproteins, including principles and procedures.
- d. Identify common lipid disorders from clinical and laboratory data.
- e. Discuss the incidence and types of lipid and lipoprotein abnormalities.
- f. Identify the reference ranges for the major serum lipids.
- g. Relate the clinical significance of lipid and lipoprotein values in the assessment of coronary heart disease.

- h. Describe the role of standardization in the measurement of lipids and lipoproteins.

10. Chapter 16: Electrolytes

- a. Define electrolyte, osmolality, anion gap, anion, and cation.
- b. Discuss the physiology of each electrolyte described in the chapter.
- c. State the clinical significance of each of the electrolytes mentioned in the chapter.
- d. Calculate osmolality, osmolal gap, and anion gap and discuss the clinical usefulness of each.
- e. Discuss the analytic techniques used to assess electrolyte concentrations.
- f. Correlate the information with disease state, given patient data.
- g. Identify the reference ranges for sodium, potassium, chloride, bicarbonate, magnesium, and calcium.
- h. State the specimen of choice for the major electrolytes.
- i. Discuss the role of the kidney in electrolyte excretion and conservation in a healthy individual.
- j. Discuss the usefulness of urine electrolyte results: sodium, potassium, calcium, and osmolality.

11. Chapter 17: Blood Gases, pH and Buffer Systems

- a. Describe the principles involved in the measurement of pH, $p\text{CO}_2$, $p\text{O}_2$, and the various hemoglobin species.
- b. Outline the interrelationship of the buffering mechanisms of bicarbonate, carbonic acid, and hemoglobin.
- c. Explain the clinical significance of the following pH and blood gas parameters:
 - pH
 - $p\text{CO}_2$
 - $p\text{O}_2$
 - Actual bicarbonate
 - Carbonic acid
 - Base excess
 - Oxygen saturation
 - Fractional oxyhemoglobin
 - Hemoglobin oxygen (binding) capacity
 - Oxygen content
 - Total CO_2
- d. Determine whether data are normal or represent metabolic or respiratory acidosis, or metabolic or respiratory alkalosis using the Henderson-Hasselbalch equation and blood gas data.

- Identify whether the data represents uncompensated or compensated conditions.
- e. Identify some common causes of non-respiratory acidosis and alkalosis, respiratory acidosis and alkalosis, and mixed abnormalities. State how the body attempts to compensate (kidney and lungs) for the various conditions.
 - f. Describe the significance of the hemoglobin-oxygen dissociation curve and the impact of pH, 2,3-diphosphoglycerate (2,3-DPG), temperature, and $p\text{CO}_2$ on its shape and release of O_2 to the tissues.
 - g. Discuss problems and precautions in collecting and handling samples for pH and blood gas analysis. Include syringes, anticoagulants, mixing, icing, and capillary and venous samples as well as arterial samples in the discussion.
 - h. Describe instrumental approaches to measuring various hemoglobin species and pH and blood gas parameters.
 - i. Describe approaches to quality assurance including quality control, proficiency testing, and delta checks to assess analytic quality.
 - j. Discuss the reasons for possible discrepancies, given oxygen saturation data calculated by the blood gas analyzer and measured by the CO-oximeter.
 - k. Calculate partial pressures of $p\text{CO}_2$, and $p\text{O}_2$, for various percentages of carbon dioxide and oxygen. In doing these calculations, account for the barometric pressure and vapor pressure of the water.

12. Chapter 18: Trace and Toxic Elements

- a. Define metalloprotein, metalloenzyme, cofactor, trace element, ultra-trace element, essential trace element, and non-essential trace element.
- b. State the biological functions of trace and toxic elements included in the chapter.
- c. Discuss the absorption, transport, and excretion of trace and toxic elements included in the chapter.
- d. Distinguish between essential and non-essential trace elements.
- e. Discuss the clinical significance of deficiency and toxicity of trace elements included in the chapter.
- f. Discuss specimen collection considerations and common laboratory methods for measuring trace and toxic elements.
- g. Determine the optimal specimen type for the assessment of trace and toxic elements.

13. Chapter 19: Porphyrins and Hemoglobin

- a. Describe the chemical structure and biological function of porphyrins and hemoglobin.
- b. Outline the biochemical pathway for the synthesis of heme.
- c. Define the role of porphyrins as intermediates in the heme biosynthetic pathway.
- d. Identify the properties of porphyrins and porphyrin precursor compounds that produce disease symptoms, facilitate detection, and differentiate the acute and cutaneous porphyrias.
- e. Describe the major pathological conditions associated with increased concentration and excretion of porphyrins and porphyrin precursors.
- f. State the specimen collection, transport, and storage requirements necessary for determination of porphyrins and porphyrin precursors in the clinical laboratory.
- g. Discuss commonly used methods for the measurement of porphyrins and precursor compounds in blood, plasma, urine, and feces.
- h. Suggest possible clinical conditions associated with test results, given patient values for porphyrins and precursor compounds, and supporting clinical information.
- i. Describe the degradation of hemoglobin.
- j. Discuss the clinical significance and laboratory data associated with the hemoglobinopathies and thalassemias.
- k. Identify the laboratory tests used in the diagnosis of hemoglobinopathies and thalassemias.
- l. Discuss the structure and clinical significance of myoglobin in the body.

B. Affective

Upon completion of this course, the student will be able to exhibit the appropriate responsible behaviors by demonstrating:

1. A positive attitude by being prepared for each session, completing assigned tasks on time and displaying self-motivation.
2. Organization by utilizing time effectively, sequencing and prioritizing tasks for completion with time constraints and maintaining a neat clean work.
3. Attention to detail by diligently pursuing accuracy and documenting data/notes accurately and legibly.
4. Problem solving ability by explaining purpose of each step in: diagnosis, interpretation, procedure, recognizing discrepancies in techniques or procedures and repeating necessary lab tests when necessary.
5. Dependability by following directions, working independently after being given directions.

6. Stability and self-confidence by approaching and performing routine tasks confidently without assistance and maintaining composure.
7. Appropriate interpersonal skills by cooperating and communicating effectively with classmates and instructors and displaying courteous, considerate behavior and appropriate appearance.
8. Ethical behavior and integrity by respecting confidentiality of patient information, complying with professional standards and code of ethics, adhering to safety policies and abiding by all rules and regulations of the institution.

C. Psychomotor

1. Psychomotor skills will be evaluated in the laboratory: CLSC 3155: Clinical Chemistry I Laboratory.
2. Psychomotor objectives available in the CLSC 3155: Clinical Chemistry I Laboratory Syllabus.

VI. Course Policies

- A. Textbook: Bishop, Michael L., Fody, Edward P., Schoeff, Larry E. 2018. *Clinical Chemistry. Principles, Techniques and Correlations. 8th Edition.* Wolters Kluwer.

B. Instructional Policies

1. Material and resources for the class will provided using the following:
 - a. Blackboard
 - b. Blackboard Collaborate Ultra
 - c. Yuja Media Library
 - d. You Tube

2. The student must have available or have access to the following technological resources:
 - a. Computer/laptop with camera (webcam), audio and microphone.
 - b. USB flash drive
 - c. Good internet connection
 - d. Microsoft Office (Word, Power Point, Excel)
 - e. Adode (PDF) Flashplayer
 - f. Windows Media Player
 - g. Internet browser (i.e. Google Chrome, Mozilla Firefox)
 - h. Blackboard's Respondus LockDown Browser

3. LockDown Browser + Webcam Requirement
 - a. This course requires the use of LockDown Browser and a webcam for online quizzes and exams. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. Watch this brief video to get a basic understanding of LockDown Browser and the webcam feature.

- <https://www.respondus.com/products/lockdown-browser/student-movie.shtml>

b. Download Instructions

- Download and install LockDown Browser from this link:<https://download.respondus.com/lockdown/download.php?id=586140509>
- Once Installed:
 - ◊ Start LockDown Browser
 - ◊ Log into Blackboard Learn
 - ◊ Navigate to the test
 - ◊ Note: You won't be able to access tests with a standard web browser. If this is tried, an error message will indicate that the test requires the use of LockDown Browser. Simply start LockDown Browser and navigate back to the exam to continue.

c. Guidelines

- When taking an online test, follow these guidelines:
 - ◊ Ensure you're in a location where you won't be interrupted
 - ◊ Turn off all other devices (e.g. tablets, phones, second computers) and place them outside of your reach
 - ◊ Before starting the test, know how much time is available for it, and also that you've allotted sufficient time to complete it
 - ◊ Clear your desk or workspace of all external materials not permitted - books, papers, other devices
 - ◊ Remain at your computer for the duration of the test
 - ◊ If the computer, Wi-Fi, or location is different than what was used previously with the "Webcam Check" and "System & Network Check" in LockDown Browser, run the checks again prior to the exam
 - ◊ To produce a good webcam video, do the following:
 - i. Avoid wearing baseball caps or hats with brims
 - ii. Ensure your computer or device is on a firm surface (a desk or table). Do NOT have the computer on your lap, a

- bed, or other surface where the device (or you) are likely to move
 - iii. If using a built-in webcam, avoid readjusting the tilt of the screen after the webcam setup is complete
 - iv. Take the exam in a well-lit room, but avoid backlighting (such as sitting with your back to a window).
 - d. Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted.
 - e. Getting Help
 - Several resources are available if you encounter problems with LockDown Browser:
 - The Windows and Mac versions of LockDown Browser have a "Help Center" button located on the toolbar. Use the "System & Network Check" to troubleshoot issues. If an exam requires you to use a webcam, also run the "Webcam Check" from this area
 - As applicable, insert information about your institution's help desk, including details about how to contact them. Some help desks want students to run the "System & Network Check" and the "Webcam Check" before they are contacted - and even, to forward the results of these checks at the time of opening a ticket.
 - Respondus has a Knowledge Base available from support.respondus.com. Select the "Knowledge Base" link and then select "Respondus LockDown Browser" as the product. If your problem is with a webcam, select "Respondus Monitor" as your product.
 - If you're still unable to resolve a technical issue with LockDown Browser, go to support.respondus.com and select "Submit a Ticket". Provide detailed information about your problem and what steps you took to resolve it.

C. Quiz and Exam Policy

1. Quizzes and Exams will be offered online using Blackboard Respondus LockDown Browser.
2. No make-up exams or quizzes will be administered.

3. If an exam or quiz is missed the grade will be 0. All grades will be used for calculating the final grade, no grades will be dropped.
4. If a student cannot attend a test, quiz or final exam for a **university-acceptable excuse**, inform the instructor as soon as possible and a time will be arranged accordingly with the instructor's schedule. It is responsibility of the student to notify the instructor of any absence and to provide legitimate documentation of absence as per University regulations.

D. Attendance and Participation Policies

1. The student is expected to access Blackboard regularly (at least twice a week) for material availability, announcements, quizzes, etc.
2. The student should spend 4-6 hours a week studying the material and resources provided by the instructor (and book).
3. The student is expected to actively participate in office hours sessions.
 - a. Multiple students may be scheduled for the same office hour session.
 - b. If it's a private matter or you wish to discuss material or have questions and prefer to have a private online office hour session, please make sure to notify the instructor when appointment is being made.

E. Etiquette guidelines

1. Treat instructor and classmates with respect.
2. Address instructor and classmates properly and accordingly.
3. Use clear and appropriate language.
4. Vulgar/obscene language, discrimination for race, color, ethnicity, gender, political or religious views, and inappropriate conduct is ***prohibited*** in class.
5. The instructor reserves the right to ban the student from the online session if vulgar language is being used, if student is being disrespectful toward the instructor or classmates, or exhibiting inappropriate conduct. This will be considered an absence. The student will be reported to the CLS program director.
6. Other etiquette guidelines (Netiquette) will be available through Blackboard.

F. Academic Integrity

There is a **zero-tolerance level** for academic dishonesty. Honesty and integrity are a critical aspect of your chosen profession, as well as patient confidentiality. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but it's not limited to:

1. Cheating

This means:

- a. Copying from the homework, in-class work or exam paper of another student.

- b. Engaging in written, oral, or any other means of communication with another student during an exam or homework assignment or giving aid to or seeking aid from another student during a test.
- c. Possession and/or use of test material (class notes, books, reviews, outlines, or any other material) not authorized by the instructor or exam proctor during an exam or quiz.
- d. Using, obtaining, or attempting to obtain, by any means, a part of the whole test, test key, homework solution, computer program, and tests administered during past semesters.
- e. Substituting for another person or another person substituting one's self to take a test/quiz.
- f. Falsifying data, laboratory reports and/or other records or academic work offered for credit.

2. Plagiarism

This means:

- a. The appropriation, buying, receiving as a gift, or obtaining by any means another's work, ideas, processes, results, or words without giving appropriate credit. This includes intentionally, knowingly or carelessly, presenting the work of another as one's own; failing to credit sources used in a work product; attempting to receive credit for work performed by another; failing to cite the World Wide Web, databases and other electronic resources.
- b. The submission for credit of any work or material that is attributable (whole or in part) to another person (i.e. copying from another student).

3. Collusion

This means the unauthorized (secret or illegal) collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on scholastic dishonesty.

Proven violations of the detailed regulations, as printed in the *Handbook of Operating Procedures (HOP)* (available in the Office of the Dean of Students), may result in sanctions ranging from disciplinary probation, failing grades on the work in question, failing grade in the course, suspension or dismissal, among others.

G. Student Support

In case of needed assistance:

- 1. Helpdesk
 - a. <https://www.utep.edu/irp/technologysupport/>

2. Miner Learning Center
 - a. <https://www.utep.edu/mlc/>
3. University Library
 - a. <https://www.utep.edu/library/>

H. Accommodations

If you have a disability and need special accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

VII. Grading Policy

Evaluation Technique	%
Quizzes	15%
4 Partial Exams	15% each (60% total)
Final	25%
Total	100%

Grading Scale	Grade
90-100	A
80-89	B
75-79	C
70-74.9*	D*
69 or below*	F*
* A grade of 75 or above is required to continue in the CLS program 100%	

VIII. Additional Course Work for Graduate Students Enrolled in Undergraduate Courses

Graduate students enrolled will have to prepare an essay on a research paper provided by the instructor or selected by the student. If the research paper is selected by the student, the paper must be approved by the instructor. The research paper will have to correlate with one of the chapters discussed during the semester (i.e., carbohydrates, lipids and lipoproteins, enzymes, hemoglobin).

This additional work is a requisite for graduate students taking the course. The student must obtain a 90% or above for the course to be accredited.

- A. Essay Specifications:
1. Length: 4-5 pages (excluding references and cover page)
 2. Format:
 - a. Times New Roman
 - b. Size 12
 - c. Margin 1"
 - d. 1.5 spaced
 3. Content:
 - a. General introduction.
 - b. Describe the role(s)/importance of the analyte of interest discussed in the research paper.
 - c. State the hypothesis.
 - d. Describe the experiments (methodology), from at least three figures, that were done to support the hypothesis.
 - e. Proposed mechanisms/functions of the analyte of interest.
 - f. General conclusion.
 - g. Include at least 7 additional references
 4. Due date: TBA