MOREHOUSE COLLEGE
CHEM 211 – ANALYTICAL CHEMISTRY
[CHEMISTRY IN 3D VR/INTELLECTUAL PROPERTY IN STEM]
LECTURE
COURSE REQUIREMENTS
FALL 2021

CLASS TIME: MWF 11:00 – 11:50 am
LECTURE ROOM: Zoom Classroom
PROFESSOR: Dr. Muhsinah L. Morris
OFFICE: Merrill Hall 104
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OFFICE HOURS: WF 12-1 pm
Otherwise, by appointment only.

OBJECTIVE: To familiarize students with fundamental principles and topics of analytical chemistry and its applications.

DESCRIPTION: This is an instructional, lecture-based course in analytical chemistry for those whose majors or areas of interest are in forensic chemistry, environmental science, sustainable energy techniques and methods.

REQUIREMENTS: You must have successfully passed CHEM 111/112 and the accompanying recitation and laboratory with a grade of C or better. The Department will confirm the prerequisites and co-requisites for each student in this class. If a student is found to not have the proper prerequisites and co-requisites, they will be immediately and involuntarily withdrawal from the course, regardless of time spent in the course or performance in the course. If you believe that you do not have the proper prerequisites and co-requisites, or you have questions regarding the prerequisites and co-requisites, you should notify your instructor immediately.

REQUIRED TEXT & MATERIALS:
Quantitative Chemical Analysis. 9th ed,
by Daniel C. Harris.
Publisher W.H. Freeman and Co.

ISBN: 9781464135385. The instructor, when appropriate, will provide supporting materials and handouts**. The study guide for the textbook will include end of chapter problems in the text and classroom problems.**

SUPPLEMENTAL MATERIALS:
COURSE PRESENTATION: Course presentation will be in the form of lectures, demonstrations, and presentations.
IP Textbook: The Intangible Advantage: Understanding Intellectual Property in the New Economy, by David Kline, The Michelson 20MM Foundation, Inc. 2016.

HOMEWORK (PROBLEM SETS): Homework is assigned for each chapter at the beginning of the chapter. It's highly recommended that you come to office hours to make sure that you understand all homework problems. All homework assignments are due on the date posted. All outstanding problem sets/homework for the chapter will be due before the exam for each student to receive full credit. Late homework will **NOT** be accepted. **Achieve (Sapling) will be used to turn in problem sets and quizzes.** Information will be uploaded to BlackBoard.

ATTENDANCE: Morehouse college attendance rules will be enforced. The student is REQUIRED to be on time for the class when the session is live. Students are expected to attend all class meetings or access the content from the week's material on Blackboard. In the event of an absence, it is the student's responsibility to obtain assignments and information covered by contacting the instructor. It is also the student's responsibility to complete withdrawal through the Office of the Registrar in the event that this becomes necessary. Withdrawal from lecture automatically requires withdrawal from the lab and vice versa. Attendance will be taken via Starfish and many tardies will be reported to your advisor, instructors, and administration.

PARTICIPATION
Respectful discussion is encouraged. Dr. Morris may also ask questions of individual students during the lecture period. Chemistry can be a complex subject to understand and will require you to read the textbook and ask for help. The goal of participating in lecture is to make sure that learning chemistry is simple, fun, and exciting! Participation will be recorded weekly based on the course access recorded from Blackboard.

COURSE DESCRIPTION AND GRADING: Students must earn a grade of C or better to pass the course. If a student receives a grade of C- or less, they will not be allowed to register in the next course in the chemistry

sequence. All grades are final! No adjustments to grades will be made after the close of semester, except for the grade of incomplete, I (see below). There will be four-hour *long* exams and the final exam. The final exam is required. **No make-up exams will be given in this course**. One exam will be dropped at the end of the semester.

The grading scale is as follows:

100-93	**A+**
92-89	**A**
88-85	**A-**
84-80	**B+**
79-75	**B**
74-70	**B-**
69-65	**C+**
64-60	**C**
59-55	**C-**
54-50	**D**
49-below	**F**

Category	**Percent**
Quizzes	15%
Exams	30%
Problem Sets/Homework	15%
Makerspace Project	15%
Final Exam	25%

COURSE PROJECT: Throughout the course, you will be working towards a culminating project using the principles used in each chapter. Typically, you would be required to use the **Makerspace at Morehouse College** to complete your final project; however, this semester is virtual and thus we will focus on design. You will work on this project individually and in pairs. Each individual will be graded. Details of the final project will be given in class.

INCOMPLETE: A grade of incomplete will be given only when a student has completed the majority of the course requirements, as specified by the instructor and provide a written excuse, signed by the appropriate university official excuse (e.g., Dean of Students, Division Dean, etc.) indicating a legitimate reason for not completing the course by the close of semester, is provided by the Vice President of student affairs. The student must complete the required course work in the next semester on or before the date indicated by the Registrar's Office or the grade will be converted into an "F".

ACADEMIC HONESTY: The College's policy on academic honesty will be strictly enforced. Cheating on homework, quizzes, and examinations will not be tolerated and will result in a grade of zero on the assignment for the first offense, and in immediate involuntary withdrawal from the course with a failing grade, for a second offense. Plagiarism is a violation of the Honor Code and will be punished with a grade of zero on the assignment for the first offense and a grade of "F" on the course for the second offense. Cheating and plagiarism will not be tolerated. Cheating or plagiarism will result in a zero for the exam or paper. A second offense will result in an F grade and be reported to the student court.

DISRUPTIVE ACTIONS: Students are expected to act with respect for the professor and fellow students. Talking to others in the class during lecture/discussion prevents others from hearing the proceedings. Leaving class during session may be disruptive and should occur only in an emergency. Disruptive persons will be warned.

TIME REQUIREMENTS: The amount of time outside of class needed to be successful in this class varies with background, study skills, interest, motivation, and intellectual ability. To be successful, expect 8 or more hours per week outside of class to study and do homework. Students must develop skill in solving problems and this can only be obtained by doing the homework. The laboratory component is separate and requires additional time. Expect approximately 3 hours at home to prepare for lab sessions, calculate results, and prepare reports. Careful attention and good use of class time can reduce the time required outside of class.

PROBLEM SETS AND QUIZZES: Problem sets and other homework will be collected at the appropriate hour exam on the day of the exam unless told otherwise. Quizzes will be given regularly and are generally announced. There may be unannounced "pop" quizzes in class. It is recommended that you form a study group with classmates that will meet regularly.

DISABILITIES AND IMPAIRMENTS: Morehouse College is an equal opportunity employer and educational institution. The College makes reasonable accommodations for all qualified individuals with disabilities. Any student requesting academic accommodations based on his disability is required to register with our Student Counseling & Student Accessibility Services Center (the "Center") by emailing SAS@morehouse.edu every semester. A disability accommodation letter can be obtained from the Center.

DISCLAIMER: The syllabus is not a contract between the instructor and the student, but rather a guide to course procedures. The instructor reserves the right to amend the syllabus when conflicts, emergencies or circumstances so dictate. In such cases, students will be duly notified. Similarly, the instructor reserves the right to alter the course content and assignments based on new materials, class discussions, or other legitimate pedagogical objectives.

EDUCATIONAL OUTCOMES: At the end of this lecture course, students should be able to:

- Define & differentiate analytical chemistry, analytical techniques, and instruments.
- Describe the statistical calculations that are used in analytical chemistry.
- Define and distinguish between a hypothesis, theory, and scientific law as it applies to analytical chemistry and techniques.
- State and describe the use of analytical chemistry in environmental science, forensic science, and chemistry.
- List, define, and explain four different types of instruments used in analytical analysis.
- Read, interpret, and present a current research article produced in the Journal of Analytical Chemistry, Environmental Chemistry, or Forensic Science.
- Define mixture, pure substance, element, and compound, heterogeneous, homogeneous.
- Develop of method of testing the precision of differently sized containers for liquid and solid ingredients.
- Define and understand the difference between physical and chemical changes.
- Provide examples of and classify physical and chemical changes.
- Define and distinguish the difference between physical and chemical properties.
- Define energy, work, kinetic energy, potential energy, thermal energy.
- State and interpret the law of conservation of energy.
- Define system of measurement, English system, metric system, International System (SI).

- Calculate mean, standard deviations, and distribution factors for a set of data.
- Perform student T-tests, ANOVA, and Tukey statistical test given a set of data.
- Use Excel to carry out various analytical calculations and generate graphs.
- Create graphs using Excel (or other graphing software) from a given set of data that depict values on X-axis, Y-axis, and legends.

TENTATIVE SCHEDULE FOR FALL 2021

Dates	Read Chapters	Topic	Notes
18-Aug		1st Day of Class Syllabus Review and Expectations	
	Chapter 0 The Analytical Process	The Analytical Chemist's Job	
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	Chapter 0 The Analytical Process	General Steps in a Chemical Analysis	
	Chapter 1 Chemical Measurements	SI Units; Chemical Concentrations	
	Chapter 1 Chemical Foundations	Preparing Solutions; Stoichiometry Calculations for Gravimetric Analysis	
	Chapter 7 Let the Titrations Begin	Titrations; Titration Calculations, End Point Detection	
	Chapter 0, 1, and 7 Problem Set	Problem Set #1	Work Problems in Class
6-Sept		***NO CLASS Labor Day***	

	Chapters 0, 1, and 7	Problem Set #1	Work Problems in Class
	Chapters 0, 1, and 7		Quiz #1
	Chapters 0, 1, and 7	Problem Set #1	Work Problems in Class
10-Sept	***Chapters 0, 1, and 7***	***Exam #1***	
	Chapter 2 Tools of the Trade	Safe, Ethical Handling of Chemicals and Waste; The Lab Notebook; Analytical Balance; Burets; Volumetric Flasks; Pipets and Syringes; Filtration; Drying; Calibration of Volumetric Glassware	
	Chapter 2 Tools of the Trade	Introduction to Microsoft Excel; Graphing with Microsoft Excel	Bring Laptop to class
	Makerspace Project Module 1	Learning the Software for 3D Design	Intellectual Property Overview
	Makerspace Project Module 2	What is the Makerspace?; Learning how Analytical Calibrations are done on Measuring Equipment	Intellectual Property Module I: Patents Discussion Board
	Chapter 3 Experimental Error	Significant Figures; Significant Figures in Arithmetic; Types of Errors	Quiz #2 Chapter 2 Tools of the Trade

	Chapter 3 Experimental Error	Types of Error; Propagation of Uncertainty from Random Error	
	Chapter 3 Experimental Error	Propagation of Uncertainty from Systematic Error	
	Chapter 2 and 3	Problem Set #2	Work Problems in Class
	Chapter 2 and 3	Problem Set #2	Work Problems in Class
1-Oct	***Chapters 2 and 3***	***Exam #2***	
	Chapter 4 Statistics	Gaussian Distribution; Comparison of Standard Deviations using the F Test	
	Chapter 4 Statistics	Confidence Intervals; Comparison of Means using Student's t-test	
	Chapter 4 Statistics	Grubb's Test for an Outlier; The Method of Least Squares; Calibration Curves	
	Chapter 4 Statistics	Problem Set #3 Intellectual Property: Module 2: Trademarks, Copyrights	Work Problems in Class; IP Discussion Board
	Chapter 4 Statistics	Problem Set #3	Work Problems in Class
	Chapter 5 Quality Assurance and Calibration Methods	Basics of Quality Assurance; Method Validation	Quiz #3 Chapter 4

	Chapter 5 Quality Assurance and	Standard Addition; Internal Standards	

	Calibration Methods		
	Chapter 5 Quality Assurance and Calibration Methods	Problem Set #4	Work Problems In Class
	Chapter 4 and 5 Review Problems	Work Problems in Class	
5-Nov	***Chapters 4 and 5***	***Exam #3***	
	Chapter 6 Chemical Equilibrium	The Equilibrium Constant; Equilibrium and Thermodynamics	
	Chapter 6 Chemical Equilibrium	Solubility Product; Complex Formation	
	Chapter 6 Chemical Equilibrium	Protic Acids and Bases; pH; Strengths of Acids and Bases	
	Chapter 6 Chemical Equilibrium	Intellectual Property Module 3: Trade Secrets Problem Set #5	Work Problems in Class; Discussion Board
1-Dec	***Exam #4***	***Chapter 6***	***due by 11:59pm***
	Chapters 0-7	Exam Review; Final Exam Study Review	Turn in Makerspace Papers
Week of Dec 6	***Makerspace Project Presentations Hour 1 Final Exam Hour 2***	***Final Project Presentations*** **Chapters 0-7**	

Add/Drop Ends August 24, 2021
Midterm Week September 27-October 1, 2021
Last Day to Withdraw with a W October 25, 2021