

## **CHEM 3415-110, ANALYTICAL CHEMISTRY**

Fall 2018 rev. 08.01.2018

Texas A&M University-Central Texas

### **INSTRUCTOR AND CONTACT INFORMATION**

**Instructor: Dr. Linh Pham, Assistant Professor of Chemistry**

**Office: TAMUCT WH 406**

**Phone: 254-519-8012 (office)**

**Email: [linhpham@tamuct.edu](mailto:linhpham@tamuct.edu)**

**Time/Day:** Lecture: MW 10:00 am – 11:45 am

Laboratory: M 12:00 pm – 3:00 pm

**Where:** Lecture: Warrior Hall 312

Laboratory: Warrior Hall 413

### **Office Hours:**

MW 3:00 pm – 4:30 pm

T 10:00 am – 1:00 pm

By appointment: Please e-mail me at [linhpham@tamuct.edu](mailto:linhpham@tamuct.edu) to set up a time in advance.

### **Mode of instruction and course access:**

This course meets face-to-face, (with supplemental materials made available online).

This course uses the A&M-Central Texas Canvas Learning Management System

[<https://tamuct.instructure.com>].

### **Student-instructor interaction:**

*In this class, face to face interaction with the instructor is one of the most effective ways to learn. Therefore; I encourage my students to go to my office hours whenever you have questions. If students cannot make it to my office hours, don't hesitate to contact me by email*

***linhpham@tamuct.edu** for an appointment. I will reply within 24 hours, usually within couples of hours on weekdays. Response time may vary in weekends and holidays.*

### **911 Cellular:**

Emergency Warning System for Texas A&M University-Central Texas

911Cellular is an emergency notification service that gives Texas A&M University-Central Texas the ability to communicate health and safety emergency information quickly via email, text message, and social media. All students are automatically enrolled in 911Cellular through their myCT email account.

Connect at [911Cellular](https://portal.publicsafetycloud.net/Texas-AM-Central/alert-management) [<https://portal.publicsafetycloud.net/Texas-AM-Central/alert-management>] to change where you receive your alerts or to opt out. By staying enrolled in 911Cellular, university officials can quickly pass on safety-related information, regardless of your location.

## COURSE INFORMATION

### Course Overview and description:

In this course, you will learn the tools and master the techniques for chemical analysis. You will develop skills in chemical qualitative and quantitative procedure by conducting experiments and analyze data. Three hours of lecture and three hours of laboratory per week.

Prerequisite: CHEM 2425 or equivalent.

### Course Objective:

The principles and applications of gravimetric and volumetric analysis are addressed. Topics include the theory for selecting analytical methods, separation techniques such as gravimetric, volumetric, spectrophotometric, electroanalytical, and chromatographic methods and mass spectrometry. Methods for sources of error, data handling, and error analysis are also presented.

### Student Learning Outcomes:

*Students will:*

1. be able to treat chemistry as a quantitative science and seek to develop a keen observational and analytical insight
2. understand the classical and instrumental methods of chemical analysis
3. demonstrate knowledge of gravimetric, volumetric, spectrophotometric, electroanalytical, and chromatographic methods
4. demonstrate acquisition of basic laboratory skills and ability to write scientific lab reports.
5. evaluate the reliability of data, using both statistical and non-statistical methods

### Required Reading and Textbook(s):

- Harris, D.C. 2011. Quantitative Chemical Analysis, 9th ed. Macmillan Publishing. ISBN-10: 1-4641-3538-X; ISBN-13: 978-1-4641-3538-5
- *I expect you to read the corresponding chapters in your textbook before coming to class.*

## COURSE REQUIREMENTS

Course Requirements: (include point values for each- not just a percentage)

Requirements	Percentage	Points
Assignments	8%	80
Lab Reports	24%	240
Exam 1	18%	180
Exam 2	18%	180
Final Exam	30%	300
Attendance and Participation	2%	20
Total	100%	1000

### Mandatory Laboratory Safety Training:

- All students are **required** to take the mandatory Laboratory Safety Training Module - found on in your [Modules tab](#) in CANVAS.

- You must take the training and **bring the signed "Safety Agreement Form"** to your instructor **before you are allowed in lab!!!**

This is **YOUR RESPONSIBILITY** - any lab absences because you have not taken the training will be considered **unexcused!**

- Assignments:** There will be eight assignments of equal ten points to be turned in in class. The assignments are due at the beginning of the next class.
- Exams:** Exams may be take-home or in-class, as determined by the instructor. Exams 1 & 2 are non-cumulative. Final exam is cumulative. No make-up exams will be given without prior notification and approval.
- Lab Reports:** There will be five formal lab reports and one lab notebook report. Your grade will be determined primarily by the contents of the report and the accuracy of the results. However, the neatness and overall presentation of the report are also important.  
More details regarding the lab reports will be provided later.
- Lecture attendance is important for student's success in this course. If students miss more than **three** classes they will lose 20 points for attendance. No make-up of missed class is available.
- Lab attendance is mandatory. A maximum of **three absences** will be allowed; additional absences in lab will result in an **"F"** for the entire course, regardless of excuse. No make-up of missed labs is available. Absence from lab includes arriving late (more than 30 minutes) or leaving before lab is dismissed.

### Grading Criteria Rubric and Conversion

Percentage	Course Grades
90% or higher	A
80-80.99%	B
70-79.99%	C
60-69.99%	D
59.99% or lower	F

**A 4.00 (90 +)** Achievement that is outstanding relative to the level necessary to meet course requirements.

**B 3.00 (80-89%)** Achievement that is significantly above the level necessary to meet course requirements.

**C 2.00 (70-79%)** Achievement that meets the course requirements in every respect.

**D 1.00 (60-69%)** Achievement that is worthy of credit even though it fails to meet fully course requirements.

**F 0.00 (<60%)** Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an "I" (incomplete).

**I (Incomplete)** The "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances, the student was prevented from completing the work of the course

on time. The assignment of an “I” requires a written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements. In no event may any such written agreement allow a period of longer than one year to complete the course requirements. For graduate and professional students, an “I” is to remain on the transcript until changed by the instructor or department. For all other students, work to make up an I must be submitted within one year of the last day of final examinations of the term in which the “I” was given; if not submitted by that time, then the “I” will automatically change to an F. *To obtain an incomplete you must have been doing passing work in the course*

### Posting of Grades

- Student grades will be posted on the Canvas Grade book.
- The turn-around time for grades is as follows:  
For short assignments such as discussions, lab notebook reports and homework: 5-7 days.  
For exams and formal lab reports: 7-10 days.

### COURSE OUTLINE AND CALENDAR

The following schedule gives the chapters and problems covered. Modification and corrections may be made during the course of the semester.

#### Complete Course Calendar

Week	Lecture Topics	Lab
1 (August 27)	Chapter 1: Introduction, Chemical Measurements and Units	No Lab
2 (September 3)	Chapter 2: Safety and Tools	Lab 1: Practice of Analytical Technique
3 (September 10)	Chapter 3: Experimental Errors	Lab 2: Neutralization Titration: The Determination of Soda Ash (Part 1)
4 (September 17)	Chapter 4: Statistics	Lab 2: Neutralization Titration: The Determination of Soda Ash (Part 2) <b>Formal Lab Report 2</b>
5 (September 24)	Chapter 5: Calibration Methods	Lab 3: Oxidation-Reduction Titration: The Indirect Iodometric Analysis of Ascorbic Acid (Part 1)
6 (October 1)	Chapter 7: Introduction to Titration <b>Exam 1 (Chapters 1, 2, 3, 4, and 5)</b>	Lab 3: Oxidation-Reduction Titration: The Indirect Iodometric Analysis of Ascorbic Acid (Part 2) <b>Formal Lab Report 3</b>
7 (October 8)	Chapter 11: Acid-Base Titration	Lab 4: Spectrophotometric Methods: The Determination of Iron (Part 1)
8 (October 15)	Chapter 14: Fundamental of Electrochemistry	Lab 4: Spectrophotometric Methods: The Determination of Iron (Part 2)

		<b>Formal Lab Report 4</b>
9 (October 22)	Chapter 15: Electrodes and Potentiometry	Lab 5: Ion Selective Electrodes: The Determination of Chloride (Part 1)
10 (October 29)	Chapter 16: Redox Titration	Lab 5: Ion Selective Electrodes: The Determination of Chloride (Part 2) <b>Formal Lab Report 5</b>
11 (November 5)	Chapter 18: Fundamental of Spectrophotometry <b>Exam 2 (Chapters 7, 11, 14, 15 and 16)</b>	Lab 6: Gas Chromatography: The Analysis of Orange Oil (Part 1)
12 (November 12)	Chapter 19: Application of Spectrophotometry	Lab 6: Gas Chromatography: The Analysis of Orange Oil (Part 2) <b>Formal Lab Report 6</b>
13 (November 19)	Chapter 21: Atomic Spectroscopy	Lab 12: Review
14 (November 26)	Chapter 23: Introduction to Analytical Separation	No Lab_Thanksgiving
15 (December 3)	Chapter 14: Mass Spectrometry	Check out
16 (December 10)	<b>Review and Final Exam</b>	

## TECHNOLOGY REQUIREMENTS AND SUPPORT

### Technology Requirements

This course will use the A&M-Central Texas Instructure Canvas learning management system. Logon to A&M-Central Texas Canvas [<https://tamuct.instructure.com>].

Username: Your MyCT username (xx123 or everything before the "@" in your MyCT e-mail address)

Password: Your MyCT password

### Canvas Support

Use the Canvas Help link, located at the bottom of the left-hand menu, for issues with Canvas. You can select "Chat with Canvas Support," submit a support request through "Report a Problem," or call the Canvas support line: 1-844-757-0953.

For issues related to course content and requirements, contact your instructor.

### Other Technology Support

For log-in problems, students should contact Help Desk Central.

24 hours a day, 7 days a week:

Email: [helpdesk@tamu.edu](mailto:helpdesk@tamu.edu)

Phone: (254) 519-5466

[Web Chat](http://hdc.tamu.edu): [<http://hdc.tamu.edu>]

*Please let the support technician know you are an A&M-Central Texas student.*

## **UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES**

### **Drop Policy.**

If you discover that you need to drop this class, you must complete a [Drop Request Form](https://www.tamuct.edu/registrar/docs/Drop_Request_Form.pdf) [https://www.tamuct.edu/registrar/docs/Drop\_Request\_Form.pdf].

Professors cannot drop students; this is always the responsibility of the student. The Registrar's Office will provide a deadline on the Academic Calendar for which the form must be completed, signed and returned. Once you return the signed form to the Registrar's Office, you must go into Warrior Web and confirm that you are no longer enrolled. If you still show as enrolled, FOLLOW-UP with the Registrar's Office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the drop deadline or fail to follow the procedure, you will receive an F in the course, which may affect your financial aid and/or VA educational benefits.

### **Academic Integrity.**

Texas A&M University -Central Texas values the integrity of the academic enterprise and strives for the highest standards of academic conduct. A&M-Central Texas expects its students, faculty, and staff to support the adherence to high standards of personal and scholarly conduct to preserve the honor and integrity of the creative community. Academic integrity is defined as a commitment to honesty, trust, fairness, respect, and responsibility. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. Academic misconduct is any act that improperly affects a true and honest evaluation of a student's academic performance and includes, but is not limited to, cheating on an examination or other academic work, plagiarism and improper citation of sources, using another student's work, collusion, and the abuse of resource materials. All academic misconduct concerns will be reported to the university's Office of Student Conduct. Ignorance of the university's standards and expectations is never an excuse to act with a lack of integrity. When in doubt on collaboration, citation, or any issue, please contact your instructor before taking a course of action.

### **Academic Accommodations.**

At Texas A&M University-Central Texas, we value an inclusive learning environment where every student has an equal chance to succeed and has the right to a barrier-free education. The Office of Access and Inclusion is responsible for ensuring that students with a disability receive equal access to the university's programs, services and activities. If you believe you have a disability requiring reasonable accommodations please contact the Office of Access and Inclusion at (254) 501-5831. Any information you provide is private and confidential and will be treated as such.

For more information please visit our [Access & Inclusion](https://www.tamuct.edu/student-affairs/access-inclusion.html) web page [https://www.tamuct.edu/student-affairs/access-inclusion.html].

### **Important information for Pregnant and/or Parenting Students.**

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and related guidance from US Department of Education's Office of Civil Rights, the Dean of Student Affairs' Office can assist students who are pregnant and/or parenting in seeking accommodations related to pregnancy and/or parenting. Students should seek out assistance as early in the pregnancy as possible. For more information, please visit the [Student Affairs](https://www.tamuct.edu/student-affairs/index.html) web page [https://www.tamuct.edu/student-affairs/index.html]. Students may also contact the institution's Title IX Coordinator. If you would like to read more about these [requirements and guidelines online](http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf), please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

Title IX of the Education Amendments Act of 1972 prohibits discrimination on the basis of sex and gender—including pregnancy, parenting, and all related conditions. A&M-Central Texas is able to provide flexible and individualized reasonable accommodation to pregnant and parenting students. All pregnant and parenting students should contact the Associate Dean in the Division of Student Affairs at (254) 501-5909 to seek out assistance. Students may also contact the University's Title IX Coordinator.

### **Tutoring.**

Tutoring is available to all A&M-Central Texas students, both on-campus and online. Subjects tutored on campus include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Tutors are available at the Tutoring Center in Warrior Hall, Suite 111.

If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, or have any other question, contact Academic Support Programs at (254) 519-5796, or by emailing Dr. DeEadra Albert-Green at [deeadra.albertgreen@tamuct.edu](mailto:deeadra.albertgreen@tamuct.edu).

Chat live with a tutor 24/7 for almost any subject from on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log in and receive FREE online tutoring and writing support. This tool provides tutoring in over 40 subject areas. Access Tutor.com through Canvas.

### **University Writing Center.**

Located in Warrior Hall 416, the University Writing Center (UWC) at Texas A&M University–Central Texas (TAMUCT) is a free workspace open to all TAMUCT students from 10:00 a.m.-5:00 p.m. Monday thru Thursday with satellite hours in the University Library Monday thru Thursday from 6:00-9:00 p.m. This semester, the UWC is also offering online only hours from 12:00-3:00 p.m. on Saturdays.

Students may arrange a one-on-one session with a trained and experienced writing tutor by visiting the UWC during normal operating hours (both half-hour and hour sessions are

available) or by making an appointment via [WOnline](https://tamuct.mywconline.com/) at [https://tamuct.mywconline.com/]. In addition, you can email Dr. Bruce Bowles Jr. at [bruce.bowles@tamuct.edu](mailto:bruce.bowles@tamuct.edu) for any assistance needed with scheduling.

Tutors are prepared to help writers of all levels and abilities at any stage of the writing process. While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. By providing a practice audience for students' ideas and writing, our tutors highlight the ways in which they read and interpret students' texts, offering guidance and support throughout the various stages of the writing process. In addition, students may work independently in the UWC by checking out a laptop that runs the Microsoft Office suite and connects to WIFI, or by consulting our resources on writing, including all of the relevant style guides. Whether you need help brainstorming ideas, organizing an essay, proofreading, understanding proper citation practices, or just want a quiet place to work, the UWC is here to help!

If you have any questions about the UWC, please do not hesitate to contact Dr. Bruce Bowles Jr. at [bruce.bowles@tamuct.edu](mailto:bruce.bowles@tamuct.edu).

### **University Library.**

The University Library provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 250,000 eBooks and 82,000 journals, in addition to the 85,000 items in our print collection, which can be mailed to students who live more than 50 miles from campus. Research guides for each subject taught at A&M-Central Texas are available through our website to help students navigate these resources. On campus, the library offers technology including cameras, laptops, microphones, webcams, and digital sound recorders.

Research assistance from a librarian is also available 24 hours a day through our online chat service, and at the reference desk when the library is open. Research sessions can be scheduled for more comprehensive assistance, and may take place on Skype or in-person at the library. Assistance may cover many topics, including how to find articles in peer-reviewed journals, how to cite resources, and how to piece together research for written assignments.

Our 27,000-square-foot facility on the A&M-Central Texas main campus includes student lounges, private study rooms, group work spaces, computer labs, family areas suitable for all ages, and many other features. Services such as interlibrary loan, TexShare, binding, and laminating are available. The library frequently offers workshops, tours, readings, and other events. For more information, please visit our [Library website](http://tamuct.libguides.com/index) [http://tamuct.libguides.com/index].

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### **OPTIONAL POLICY STATEMENTS:**

#### **A Note about Sexual Violence at A&M-Central Texas**

Sexual violence is a serious safety, social justice, and public health issue. The university offers



support for anyone struggling with these issues. University faculty are mandated reporters, so if someone discloses that they were sexually assaulted (or a victim of Domestic/Dating Violence or Stalking) while a student at TAMUCT, faculty members are required to inform the Title IX Office. If you want to discuss any of these issues confidentially, you can do so through Student Counseling (254-501-5955) located on the second floor of Warrior Hall (207L).

Sexual violence can occur on our campus because predators often feel emboldened, and victims often feel silenced or shamed. It is incumbent on ALL of us to find ways to actively create environments that tell predators we don't agree with their behaviors and tell survivors we will support them. Your actions matter. Don't be a bystander; be an agent of change. For additional information on campus policy and resources visit the [Title IX webpage](https://www.tamuct.edu/departments/compliance/titleix.php) [https://www.tamuct.edu/departments/compliance/titleix.php].

### **INSTRUCTOR POLICIES.**

**Read these carefully as I am strict with my policies.**

**Grading Policy and Point Breakdown.** Grades in this course will be criteria-based on a number of activities including exams, assignments, lab reports, and attendance. This means that grades will not be curved and anyone achieving a 90% or above will receive an A in this course.

**Grade Dispute Policy.** Grading disputes must be put in writing (with justification such as supporting statements from the text or another credible source) and given to me no earlier than 24 hours after the assignment has been returned. I will consider your request carefully, but reserve the right to adjust your grade up or down.

**Late Assignments.** I expect all assignments to be turned in on time. Late assignments interfere with my ability to provide timely, detailed feedback, as well as with your ability to learn and process new material. Accordingly, any unauthorized late assignment will receive a 5% reduction in grade for each day it is late. No assignments will be accepted after it has been graded and returned.

**Exams.** The exams will be a mixture of multiple choices and short answers, designed to provoke reflection, critical thought, and application of knowledge. You will receive a list of several samples or real exam questions ahead of time. You are encouraged to prepare for the exam by reviewing reading materials, outlining a draft of a response, and discussing these thoughts with your peers. You will then demonstrate your individual, integrated thoughts on the topic in a closed-book exam during the class period.

**Missed exams.** If you know you will miss an exam, please contact me BEFORE the exam. I will gladly give make-up exams if the student has an unavoidable reason for missing the exam (i.e. death in the family, severe illness). Keep in mind that I will expect documentation of your reason for missing the exam (e.g. doctor's note, obituary notice). Exams must be made up within a week of the original scheduled date, no exceptions regardless of excuse.

**What I expect of you.** To get the most out of this class, you are expected to conduct yourself in a professional manner, which includes contributing to class discussions, being punctual, and notifying me of absences in advance.

**Class Attendance.** I expect that you attend each class session and arrive on time. If an unavoidable situation arises that prevents you from attending class, I expect that you also promptly contact me to discuss the missed material and get the notes from a classmate. I will not distribute my notes to students as they are often abbreviated and do not contain the detail needed

to sufficiently understand the material.

**What you can expect of me.** You can expect me to start and end class on time, be available through office hours, e-mail, and by appointment, be responsive to student suggestions for course improvement, answer questions to the fullest extent possible and/or direct you to appropriate resources, return graded assignments and exams within a reasonable time frame, and treat you with respect as future colleagues.

**Discussion.** The topics in this class encompass a diversity of issues that merit in-depth thought and discussion. Since individuals will be expressing their opinions, I expect that you will respect others' contributions, as you would want them to do for you.

**Credits and Workload expectations.** For undergraduate courses, one credit is defined as equivalent to an average of two hours of learning effort per week (over a full semester) necessary for an average student to receive an average grade for the course. A student taking a four-credit class that meets for four hours a week should expect to spend an additional eight hours a week outside the classroom in order to earn an average grade.

**Class Structure.** Classes will involve a balance of active lecture and engaging learning activities. I believe that students learn the theories and concepts much better when they have an active role. I know that this may be new to some of you, but please keep an open mind and I know that you will get more out of this class because of it.

#### **Copyright Notice.**

Students should assume that all course material is copyrighted by the respective author(s). Reproduction of course material is prohibited without consent by the author and/or course instructor. Violation of copyright is against the law and Texas A&M University-Central Texas' Code of Academic Honesty. All alleged violations will be reported to the Office of Student Conduct.

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# CHEM 3415– Analytical Chemistry

## Syllabus Contract

### Directions:

- First, read the syllabus.
- Second, read the statement below to confirm your personal reading and understanding of the contents of the syllabus.
- Third, provide confirmation by printing the document and providing your signature and date of completion in the space provided below.
- Last, submit this contract to me. Note that your grade for the first assignment will not be calculated until this contract is received.

I have received a copy of the syllabus. I have read and understand the policies of this course as stated in the syllabus.

**Print Name** \_\_\_\_\_

**Signature** \_\_\_\_\_

**Date** \_\_\_\_\_