

CHEM 4415-110, Instrumental Analysis

Spring 2018 rev. 12.08.2017

Texas A&M University-Central Texas

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Dr. Linh Pham

Office: 406 Warrior Hall

Phone: 254-519-8012

Email: linhpham@tamuct.edu

Time/Day: Lecture: TR 8:30 am – 9:45 am

Lab: T 10:00 am – 1:00 pm

Where: Lecture: Warrior Hall 313

Lab: Warrior Hall 413

Office Hours:

Monday: 1:30 pm – 4:30 pm

Thursday: 10:00 am – 1:00 pm or by appointment

Mode of instruction and course access:

This course meets face-to-face, with some supplemental readings made available online using the A&M-Central Texas Canvas Learning Management System [<https://tamuct.instructure.com>].

Student-instructor interaction:

In this course, 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 at 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 911 Cellular 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:

CHEM 4415 is the survey of the broad range of instruments available to the chemist, including function, application, calibration and limitation. Three hours of lecture and three hours of laboratory per week.

Prerequisite: CHEM 3415 or equivalent.

Course Objective:

The course examines chemical analysis utilizing spectroscopy techniques such as UV/VIS, molecular fluorescence, infrared, atomic emission, atomic absorption, atomic fluorescence, and mass spectrometry. The course also explores chromatographic and electrochemical techniques, such as gas and liquid chromatography, ion selective electrodes, coulometry, and cyclic voltammetry.

Student Learning Outcomes:

Students will:

1. demonstrate knowledge of calibration and standardization methodology as well as assess sources of error in chemical and instrumental analysis
2. integrate a fundamental understanding of the underlying principles as they relate to specific instrumentation used in chemical analysis
3. demonstrate acquisition of instrumentation laboratory skills
4. demonstrate ability to write scientific lab reports.

Required Reading and Textbook(s):

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

COURSE REQUIREMENTS

Requirements	Percentage	Points
Assignments	10%	100
Lab Reports	30%	300
Exam 1	16%	160
Exam 2	16%	160
Final Exam	26%	260
Attendance and Participation	2%	20
Total	100%	1000

- Assignments: There will be ten assignments 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 three lab reports. Detailed rubric of the lab reports is attached to the end of this syllabus
- 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. Students may not miss more than **three** labs. 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 Achievement that is outstanding relative to the level necessary to meet course requirements.

B 3.00 Achievement that is significantly above the level necessary to meet course requirements.

C 2.00 Achievement that meets the course requirements in every respect.

D 1.00 Achievement that is worthy of credit even though it fails to meet fully course requirements.

F 0.00 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, paper critiques and homework: 5-7 days.
 - For exams, technical and term papers: 7-10 days.

COURSE OUTLINE AND CALENDAR

Complete Course Calendar

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

Week	Lecture Topics	Laboratory Topics
Week 1 (Jan 15-21)	Chapter 5: Calibration Methods	Lab check-in and safety
Week 2 (Jan 22-28)	Chapter 3: Error and noise	<u>Lab 1:</u> Direct Calibration, Method of Standard Additions, And Internal Standard Method
Week 3 (Jan 29 – Feb 4)	Chapter 19&20: Spectrophotometers and application of Spectrophotometry	<u>Lab 2:</u> Spectrophotometric Determination of Equilibrium Constants of pH Indicator
Week 4 (Feb 5-11)	Molecular Luminescence Spectrometry (Reading provided by instructor)	<u>Lab 3:</u> Determination of Chloride in Drinking Water by Fluorescence Quenching
Week 5 (Feb 12-18)	Infrared Spectroscopy (Reading provided by instructor)	<u>Lab 4:</u> Quantitative IR Analysis of Xylene Mixture
Week 6 (Feb 19-25)	Raman Spectroscopy (Reading provided by instructor) Exam 1 (covers weeks 1-5)	<u>Lab 5:</u> Determination of sodium and potassium in water with Atomic Absorption Spectroscopy
Week 7 (Feb 26-Mar 4)	Chapter 21: Atomic Spectroscopy	<u>Lab 6:</u> Cyclic voltammetry of $\text{Fe(III)(CN)}_6^{3-}$ / Fe(II)(CN)_6^{4-} Due: Formal Lab Report 5

Week 8 (Mar 5-11)	Chapter 17: Electroanalytical Technique	<u>Lab 7-Part 1:</u> The Kinetics And Mechanism Of The Bromination Of Disubstituted Arenes By Gas Chromatography/Mass Spectrometry
Week 9 (Mar 12-18)	Spring Break – No class	
Week 10 (Mar 19-25)	Chapter 22: Mass Spectrometry	<u>Lab 7-Part 2:</u> The Kinetics And Mechanism Of The Bromination Of Disubstituted Arenes By Gas Chromatography/Mass Spectrometry
Week 11 (Mar 26 – Apr 1)	Chapter 24: Gas Chromatography	<u>Lab 8-Part 1:</u> Gas Chromatography Analysis of Isomeric Butyl Alcohol Mixture
Week 12 (Apr 2-8)	Chapter 25: High-Performance Liquid Chromatography Exam 2 (covers weeks 6-11)	<u>Lab 8-Part 2:</u> Gas Chromatography Analysis of Isomeric Butyl Alcohol Mixture Due: Formal Lab Report 7
Week 13 (Apr 9-15)	Chapter 26: Chromatographic Methods and Capillary Electrophoresis	<u>Lab 9-Part 1:</u> Determination of Caffeine in Beverage with High Performance Liquid Chromatography
Week 14 (Apr 16-22)	Chapter 27: Gravimetric and Combustion Analysis	<u>Lab 9-Part 2:</u> Determination of Caffeine in Beverage with High Performance Liquid Chromatography
Week 15 (Apr 23-29)	Chapter 28: Sample Preparation	Lab review Due: Formal Lab Report 9
Week 16 (Apr 30- May 6)	Reviews and Final Exam (Cumulative)	

Important University Dates:

January 2018

January 2, (Tuesday) Winter Break Ends

January 2, (Tuesday) Priority Deadline for Admissions applications

January 5, (Friday) VA Certification Request Priority Deadline

January 11, (Thursday) Convocation

January 12, (Friday) Tuition and Fee payment deadline (16 week & 1st 8 week)

January 15, (Monday) Martin L. King Jr. Day
January 16, (Tuesday) ADD/DROP/LATE REGISTRATION BEGINS (\$25 fee assessed for late registrants) (16 week & 1st 8 week)
January 16, (Tuesday) Classes Begins
January 18, (Thursday) ADD/DROP/LATE REGISTRATION ENDS (16 week & 1st 8 week)
January 23, (Tuesday) Last day to drop 1st 8-week classes with no record
January 31, (Wednesday) Last day to drop 16 week classes with no record

February 2018

February 2, (Friday) Priority Deadline to Submit Graduation Application
February 9, (Friday) Last day to drop a 1st 8-week class with a Q or withdraw with a W
February 15, (Thursday) Last day to apply for Clinical Teaching
February 23, (Friday) Student End of Course Survey Opens (1st 8-Week Classes)

March 2018

March 1, (Thursday) Deadline to submit application to Teacher Education Program
March 2, (Thursday) Deadline to Submit Graduation Application for Ceremony Participation
March 9, (Friday) 1st 8 week classes end
March 9, (Friday) Deadline for Admissions applications
March 11, (Sunday) Student End of Course Survey Closes (1st 8-Week Classes)
March 12, (Monday) Spring Break Begins
March 12, (Monday) 1st 8-week grades from faculty due by 3pm
March 15, (Thursday) Tuition and Fee Payment Deadline (2nd 8-week classes)
March 16, (Friday) Spring Break Ends
March 19, (Monday) 2nd 8 week begins
March 19, (Monday) Summer Advising Starts
March 19, (Monday) Class Schedule Published
March 19, (Monday) ADD/DROP/LATE REGISTRATION BEGINS (\$25 fee assessed for late registrants) (2nd 8-week classes)
March 21, (Wednesday) ADD/DROP/LATE REGISTRATION ENDS (2nd 8-week classes)
March 27, (Tuesday) Last day to drop 2nd 8-week classes with no record
March 30, (Friday) Last day to drop a 16-week course with a Q or withdraw with a W

April 2018

April 1, (Sunday) GRE/GMAT scores due to Office of Graduate Studies
April 2, (Monday) Scholarship Deadline
April 2, (Monday) Registration begins
April 5, (Thursday) Priority Deadline for International Student Admission Applications
April 13, (Friday) Last day to drop a 2nd 8-week class with a Q or withdraw with a W*
April 13, (Friday) Deadline for submission of final committee-edited theses with committee approval signatures to Office of Graduate Studies
April 27, (Friday) Student End of Course Survey Opens (16 Week and 2nd 8-Week Classes)

May 2018

May 7-11, Finals Week
May 11, (Friday) Last day to file for Degree Conferral (Registrar's Office)(\$20 Late Application Fee applies)
May 11, (Friday) Spring Term Ends

May 11, (Friday) Last day to withdraw from the university (16 week and 2nd 8 week classes)
May 11, (Friday) Last day to apply for \$1000 Tuition Rebate for Spring graduation (5pm)
May 12, (Saturday) Commencement Ceremony Bell County Expo Center 7:00 p.m.
May 13, (Sunday) Student End of Course Survey Closes (16 Week and 2nd 8-Week Classes)
May 14, (Monday) Minimester begins
May 15, (Tuesday) Last Day to clear Thesis Office
May 5, (Tuesday) Final grades due from faculty by 3pm (16 week & 2nd 8 week)
May 21, (Monday) Priority Deadline for Admissions applications
May 25, (Friday) VA Certification Request Priority Deadline
May 28, (Monday) Memorial Day

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

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 Department 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 Department 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) webpage [https://www.tamuct.edu/student-affairs/access-inclusion.html].

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and 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. For more information, please visit <https://www.tamuct.departments/index.php>. 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 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. On-campus subjects tutored 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 any other question, contact Academic Support Programs at 254-519-5796, or by emailing Dr. DeEadra Albert-Green at deeadra.albertgreen@tamuct.edu.

Chat live with a tutor 24/7 for almost any subject 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 forty subject areas. Access Tutor.com through Canvas.

University Writing Center: Located in 416 Warrior Hall, the University Writing Center (UWC) at Texas A&M University-Central Texas is a free workspace open to all TAMUCT students from 10am-5pm Monday-Thursday with satellite hours in the University Library Monday-Thursday from 6:00-9:00pm. 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 to schedule an online tutoring session. 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 University Writing Center is here to help!

If you have any questions about the University Writing Center, please do not hesitate to contact Dr. Bruce Bowles Jr. at 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 72,000 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 twenty-four 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](https://tamuct.libguides.com/) [https://tamuct.libguides.com/].

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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Laboratory Report Rubric

Category	Exceeds expectations	Meets expectations	Below expectations	Does not meet expectations	Score
Introduction	Thoroughly addresses the topic. Engages reader. Logical progression from broad to narrow topic. Clearly states main topic and previews structure of paper.	The introduction states the main topic and previews the structure of the paper.	The introduction states the main topic but does not adequately preview the structure of the paper.	There is no clear introduction or main topic and the structure of the paper is missing.	10.0%
Thesis Statement	Clearly and concisely states the paper's purpose in single sentence. Engaging and thought provoking.	Clearly and concisely states the paper's purpose in single sentence.	States the paper's purpose in a single sentence.	Incomplete statement or confusing.	5.0%
Body	Each paragraph has thoughtful supporting detail sentences that develop the main idea.	Each paragraph has sufficient supporting detail sentences that develop the main idea.	Each paragraph lacks supporting detail sentences.	Each paragraph fails to develop the main idea.	35.0%
Organization/Structural Development of Topic	Writer demonstrates logical and subtle sequencing of ideas through well-developed paragraphs; transitions are used to enhance organization.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	5.0%
Depth of discussion	In-depth discussion & elaboration in all sections of the paper.	In-depth discussion & elaboration in most sections of the paper.	Omission of pertinent content or content runs-on excessively. Quotations from others outweigh the writer's own ideas.	Cursory discussion in all the sections of the paper or brief discussion in only a few sections.	10.0%
Conclusion	The conclusion is engaging and restates the thesis. Relates topic back to 'real world' applications.	The conclusion restates the thesis.	The conclusion does not adequately restate the thesis.	Incomplete statement or confusing.	10.0%
Spelling/Punctuation	No errors in punctuation, capitalization and spelling.	Almost no errors in punctuation, capitalization and spelling.	Many errors in punctuation, capitalization and spelling.	Numerous and distracting errors in punctuation, capitalization and spelling.	2.5%
Grammar	No errors sentence structure and word usage.	Almost no errors in sentence structure and word usage.	Many errors in sentence structure and word usage.	Numerous and distracting errors in sentence structure and word usage.	2.5%
In-text citations	All facts are cited using primary literature or peer sources. Correct format with no errors	Some facts are cited. Correct format, very few errors.	Few facts are cited. Correct format, few errors	No in-text citations.	5.0%
Literature cited	Done in the correct format with no errors. Includes more than 10 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Done in the correct format with few errors. Includes more than 5 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Done in the correct format with some errors. Includes more than 3 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Done in the correct format with many errors. Includes more than 0-3 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	5.0%
Figures and tables	Tables/figures numbered consecutively in separate series. Title is complete enough to be understood without referring to text. Legend, headings, and units of measure are included. Footnotes used as necessary to provide clarity with respect to:Units of measure that do not fit in the heading, explanations of abbreviations and symbols, statistical significance of entries.	Tables/figures numbered consecutively in separate series Title is complete. Legend, headings, and units of measure are included. Footnotes used to provide clarity.	Tables/figures numbered, but not sequentially. Title is incomplete. Legend, headings, and units of measure are not fully included. Footnotes used but do not provide enough clarity	Tables/figures not numbered. No title. Legend, headings, and units of measure are not included. Footnotes are not used but are needed.	10.0%
Total					100.0%

CHEM 4415– Instrumental Analysis

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 _____