

## INSTRUMENTAL ANALYSIS - CHEM 4312

The University of Texas at Tyler

Spring, 2023

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### Office Hours:

M, T, W, R, F: 11:00am to 12:00 pm.

Open door policies.

**DESCRIPTION:** A scientist has at her or his disposal a variety of sophisticated instrumentation that better enable him or her to answer questions and solve problems. Solutions to problems require the scientist to understand the question and the nature of the answer sought, be able to determine the type and amount of samples needed to answer the question, and to select an appropriate instrumental technique to help solve the problem. This course is designed to help you learn to solve problems using modern instrumentation by solving challenging, "real" problems. You will explore the principles on which major instrumental techniques are based so that you have a full arsenal of ways to solve problems.

### **STUDENT LEARNING OUTCOMES:**

By the end of the course students will be able to:

1. Assess and address the germane challenges associated with a particular analysis;
2. Select an appropriate method or methods to solve a chemical problem;
3. Demonstrate the understanding of modern chemical instrumentation theory

**TEXTS:** *Principles of Instrumental Analysis*, 6th ed., by Skoog, Holler and Nieman (req.)

### **OTHER REQUIRED MATERIALS:**

1. High-speed Internet connection
2. Webcam (internal or external)
3. Windows, Mac, or Chrome Operating System
4. Up-to-date Chrome or Firefox browser

**EVALUATION:** Your grade in this course is determined by your performance on several exams that assess what you have learned in the lecture as well as your ability to evaluate and solve chemical problems. Each graded assignment is listed below along with its weight.

- Total: 400 points**
1. Three exams worth 100 points each;
  2. A standardized ACS exam worth 100 points;

The total number of points you attained on all graded work determines your final grade.

Grade	%
A	90 - 100
B	80 - 89
C	70 - 79
D	60 - 69
F	below 59

The standardized ACS final exam will encompass ideas that you should have learned in both the lecture and laboratory segments of the course.

### **IMPORTANT DATES:**

January 16–Martin Luther King, Jr. Holiday, all offices closed, no classes

January 23– Last day to withdraw without penalty (census date)

March 13 –18 Spring break, no classes

March 23 (Thursday) – Last day to withdraw from the course with a “W”

April 24 \* (Monday) – Final exam from 6:00 pm –8:00 pm

**POLICIES:** My expectation is that you will attend all classes unless directed otherwise. There will be regularly assigned readings and occasional problem sets. None of these assignments are graded; they are for your benefit only. The assigned readings from the text are listed on the syllabus. These assignments are the minimum I believe is necessary for an average student to understand the subject material. **If you are unable to attend a class, it is your responsibility to determine all material discussed and assignments given.**

You will be allowed to make up a missed exam with an excused absence. Normally, these reasons would include medical emergencies, a death in your family or required travel for an UT at Tyler’s event (e.g., athletic team travel). If possible, please let me know ahead of time if you are not able to take an exam at its scheduled time so that another time for you to take it can be arranged. If the absence is not excused, you will receive zero points for the exam.

**SMART DEVICES POLICIES:** Cell phones, smart watches, and any similar electronic devices must **be turned off and put away** during exams. If they are observed out in a visually accessible place (*i.e.* between legs, on the floor, *etc.*), it will be assumed that they are being used to cheat; your exam will be taken away, you will receive a zero score (0 points) for the test, and you will be referred to the Office of Judicial Affairs.

### **STUDENT ACADEMIC CONDUCT:**

While students are encouraged to study and prepare for examinations with other students, each student must work alone and neither give nor receive help from any sources when taking exams. ***Under NO circumstances will cheating be tolerated!*** University regulations are very explicit about academic dishonesty and these regulations will be strictly enforced. **The minimum penalty for cheating is a zero for the exam;** the maximum penalties, up to expulsion from the university, will be pursued in extreme or repeat cases. Students are expected to help enforce this policy and are encouraged to obtain a copy of *A Student’s Guide to Conduct and Discipline at UT Tyler*, available in the Office of Student Affairs.

### **UNIVERSITY POLICIES**

**UT Tyler Honor Code:** Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

#### **Students Rights and Responsibilities**

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: <http://www.uttyler.edu/wellness/rightsresponsibilities.php>.

#### **Campus Carry**

We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at <http://www.uttyler.edu/about/campus-carry/index.php>

### **UT Tyler a Tobacco-Free University**

All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling and group support. For more information on cessation programs please visit [www.uttyler.edu/tobacco-free](http://www.uttyler.edu/tobacco-free).

### **Grade Replacement**

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at <http://www.uttyler.edu/registrar>. Census Date can be found on the Syllabus, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar. Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract. The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a “W” grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid.

### **State-Mandated Course Drop Policy**

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

### **Disability/Accessibility Services**

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler> and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <http://www.uttyler.edu/disabilityservices>, the SAR office located in the University Center, # 3150 or call 903.566.7079.

### **Student Absence due to Religious Observance**

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

### **Student Absence for University-Sponsored Events and Activities**

Revised 01/18 If you intend to be absent for a university-sponsored event or activity, you (or the event ponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

### **Social Security and FERPA Statement**

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

### **Emergency Exits and Evacuation**

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

### **Student Standards of Academic Conduct**

Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

I. "Cheating" includes, but is not limited to:

- copying from another student's test paper;
- using, during a test, materials not authorized by the person giving the test;
- failure to comply with instructions given by the person administering the test;
- possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
- using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
- collaborating with or seeking aid from another student during a test or other assignment without authority;
- discussing the contents of an examination with another student who will take the examination; • divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
- substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
- paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
- falsifying research data, laboratory reports, and/or other academic work offered for credit;
- taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
- misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

II. "Plagiarism" includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another's work and the submission of it as one's own academic work offered for credit.

III. "Collusion" includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

IV. All written work that is submitted will be subject to review by plagiarism software.

### **UT Tyler Resources for Students**

- UT Tyler Writing Center (903.565.5995), [writingcenter@uttyler.edu](mailto:writingcenter@uttyler.edu)
- UT Tyler Tutoring Center (903.565.5964), [tutoring@uttyler.edu](mailto:tutoring@uttyler.edu)
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254)

**CHEMISTRY 4312\***  
Spring 2023

<u>Topic</u>	<u>Chapters</u>
Sampling, experimental design	1
Electrical Components and Circuits	2
Operational Amplifiers in Chemical Instruments	3
Digital Electronics and Microcomputers	4
Measurements and noise	5
<b>Exam I (100 points)</b>	
Properties of light, optics	6
Lasers, wavelength selectors	7
Atomic absorption spectrophotometry	8, 9
Atomic emission spectrophotometry	10
Molecular absorption spectrophotometry	13, 14
<b>Exam II (100 points)</b>	
Molecular fluorescence	15,
IR	16, 17
Raman	18
Mass Spectrometry	11
Mass Spectrometry	20
<b>Exam III (100 points)</b>	
Electrochemical principles, cyclic voltammetry	22, 25, other
Chromatographic principles	26
GC & LC Instrumentation	27, 28
Capillary Electrophoresis	30
<b>Final Exam (100 points)</b>	

\* Subject to changes