



CHEM 527 CHEMICAL and BIOCHEMICAL CHARACTERIZATION METHODS

Instructor Information

Dr. Stephen Starnes

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Office Hours: M-R 8 – 9 am

Office: Science 339

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Course Materials

Lecture textbook: Spectrometric Identification of Organic Compounds, 6th Edition, Robert M. Silverstein and Francis X. Webster. ISBN: 0-471-13457-0. The 7th edition is the newest edition, but the 6th edition is acceptable.

Classroom: Lecture online

Course Description: The purpose of this course is to introduce the student to the subject of Spectroscopy as it relates to the identification and characterization of organic and biological compounds. This semester we will cover ¹H-, ¹³C-, and variable temperature NMR spectroscopy. We will also cover several advanced NMR techniques like NOE, COSY, HETCOR, and HMQC. We will cover the basic principles of IR, Uv/Vis, mass spectroscopy, CD spectroscopy, fluorescence spectroscopy, and polarimetry.

Lecture Learning Outcomes / Course Objectives

By the end of the semester I intend for my students to have realized a number of objectives.

1. Know how to determine the structure of an organic molecule using spectroscopic techniques such as NMR, IR, UV/vis and MS.
2. Know how to interpret NMR, IR, Uv/Vis and MS data.
3. Understand the theory behind several spectroscopic techniques such as NMR, IR, UV/vis and MS.
4. Be able to read the experimental section of literature related to organic synthesis with regards to spectroscopic analysis of organic compounds and demonstrate proof of synthesis and purification of organic compounds.
5. You will be trained on how to use the Chemistry departments 400 MHz NMR and will learn the process for control of NMR instruments remotely.

Grading

There will be several problem sets assigned throughout the semester that will constitute 20% of the grade. You are encouraged to form discussion groups and to work together on these problems. There will be two exams (22.5% each), literature projects related to learning outcome #4 above (10%), and a final exam (25%). The final letter grade will be based on a standard scale 90-100% A, 80-89% B, 70-79% C, 60-69% D, and below 60% F. The grades may be curved, if warranted.

For the literature projects, you will be required to read articles from the *Journal of Organic Chemistry*, *The Journal of the American Chemical Society* and *Organic Letters* and will be required to use the *Scifinder Scholar* database to find spectroscopic information for organic molecules of synthetic interest and interpret the spectroscopic data to explain how it supports the proposed structure of organic molecules.

There will be absolutely no make-ups for exams. If you miss an examination, you will be assigned a zero for that assignment or the points will be placed on the final exam making your final exam a greater portion of your grade. Problem sets not submitted on time may receive a grade of zero.

COURSE OUTLINE / CALENDAR

June 1 – June 5: Introduction to spectroscopy, Mass Spectrometry, Mass Spectrometry

June 8 – June 12: IR Spectroscopy

June 15 – June 19: UV/Vis Spectroscopy, Theory of ^1H -NMR spectroscopy – nuclear spin flip, chemical shift

June 22 – June 26: Theory of ^1H -NMR spectroscopy – correlation tables, integration, spin-spin splitting, coupling constants

Exam 1, IR and UV/vis Spectroscopy and Mass Spectrometry

June 29 – July 3: Theory of ^1H -NMR spectroscopy – alcohols and related, Theory of ^{13}C -NMR Spectroscopy, DEPT

July 6 – July 10: Correlation NMR, 2D-NMR (COSY, HETCOR, HMQC)

July 13 – July 17: NMR of ^{19}F , ^{31}P , ^{15}N

July 20 – July 24: Chirality, NMR of chiral compounds

July 27 – July 31: Polarimetry, Fluorescence spectroscopy

Exam 2, NMR spectroscopy

August 3 – August 6: Fluorescence spectroscopy, Circular Dichroism spectroscopy

August 6: Final examination

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Technical requirements are:

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

YouSeeU Virtual Classroom Requirements:

<https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements>

ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

Interaction with Instructor Statement

The best way to communicate with the instructor is via e-mail: stephen.starnes@tamuc.edu or stop by the instructor's office (Science 339) for clarification of course material and expectations.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](#).

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: <https://www.britannica.com/topic/netiquette>

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedure 13.99.99.R0.01](#).

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty 13.99.99.R0.03](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

[Graduate Student Academic Dishonesty 13.99.99.R0.10](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf>

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library- Room 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

Website: [Office of Student Disability Resources and Services](#)

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.