

Syllabus: CHEM 396 Analytical Mass Spectrometry – Spring 2019

Course Description:

Material to be covered in CHEM 396:

The purpose of CHEM 396 is to look “under the hood’ of the mass spectrometer.

- The majority of the CHEM 396 course will address how various types of mass spectrometers work and what are the components that make up a mass spectrometer. The primary areas to be covered in detail are
 - Methods to “ionize” or add a charge to a molecule
 - Analyzer types that separate charged molecules
 - Fragmentation of charged molecules
 - Fundamentals of charged molecules (exact mass and isotopic distribution)
 - Tandem mass spectrometry (MS/MS)
 - Collisionally-induced dissociation and fragmentation of charged molecules
- Other areas that will be covered are
 - vacuum systems
 - detector systems
- Focus will be primarily on organic compounds and biologically relevant and important molecules
 - Proteomics and protein and peptide analysis by mass spectrometry will be discussed specifically

Lecture:

Class: MWF 10:50 am - 11:40 am in Waterman 423

Course Instructor:

Dwight E. Matthews

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Room: Discovery W322

Phone: 656-8114

<http://www.uvm.edu/~dmatthew/>

Office hours: Available by appointment via email or whenever you can find me.

Textbook:

No single text has been written that really covers mass spectrometry, but some texts are better than others. One problem is that published material becomes old within about 5 years of publication. Another problem is that most books are shallow in key areas. They are good surveys, but do not cover the details of the field in adequate depth for this course.

- One book that is a reasonable introductory source and is useful to have is **Edmond De Hoffmann & Vincent Stroobant, *Mass Spectrometry: Principles and Applications*, 3rd ed., John Wiley, 2007**
 - De Hoffmann is available on-line in paperback from a variety of sources including [Amazon](#)
 - De Hoffmann is in Bailey-Howe (QD96.M3 H6413 2007).
- Other sources are
 - Jürgen H Gross, *Mass Spectrometry: A Textbook*, 2nd ed., Springer-Verlag, 2011.
 - Not available in Bailey-Howe
 - Can be ordered on [Amazon](#)

- Kenzo Hiraoka, ed., *Fundamentals of Mass Spectrometry*, Springer-Verlag, 2013, ISBN-13: 978-1461472322
 - Not available in Bailey-Howe
 - Can be ordered on [Amazon](#)
- J. Throck Watson & O. David Sparkman, *Introduction to Mass Spectrometry: Instrumentation, Applications, and Strategies for Data Interpretation*, 4th ed., John Wiley, 2007. Not that exciting
 - Watson & Sparkman is in Bailey-Howe (QC454.M3 W38 2007).
- C. Dass, *Fundamentals of Contemporary Mass Spectrometry*, Wiley-Interscience, 2007. Somewhat shallow and expensive. Available from [Amazon.Com](#)

UVM Policy on Absences:

- **Religious Holidays:** Students have the right to practice the religion of their choice. Students should submit in writing by the end of the 2nd full week of classes their documented religious holiday schedule for the semester if there are any conflicts with the class or laboratory schedule.
- **Inter-collegiate Athletics:** Members of UVM varsity and junior varsity teams are responsible for documenting in writing any conflicts between their planned athletic schedule and the class (& laboratory) schedule by the end of the 2nd full week of classes.

UVM Policy on Academic Integrity:

Offenses against the Code of Academic Integrity are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code are taken very seriously and will be forwarded to the Center for Student Ethics & Standards for further investigation. Details: <http://www.uvm.edu/policies/student/acadintegrity.pdf>.

How the course grade is determined:

There will be three tests throughout the semester as indicated on the schedule. All tests are take-home tests over a weekend. The last test will be handed out by 5/2/19 and is due back on 5/6/19. Your grade will be based upon the cumulative test points.

Course Format:

- The course covers introductory basic material about different types of mass spectrometers and their components. There is no such thing as *a single mass spectrometer* in mass spectrometry. There is a wide range of different instruments with different methods of producing ions, separating ions, and measuring ions. The hope is that every student taking the course will have a good working knowledge of the fundamentals of mass spectrometry instrumentation when these lectures are complete. This portion of the course is directed towards satisfying analytical chemistry graduate student requirements.
- Lectures in the latter part of the course are directed towards proteomics and biological applications of mass spectrometry. This part of the course is directed towards graduate students in the biomedical sciences. However, because the biomedical applications of mass spectrometry are probably the most important applications, this information is also important to analytical chemistry students.
- Each day's lecture notes will be available on Black Board as a PDF file ahead of each lecture.