

Introduction to Mass Spectrometry
Syllabus for Chem 395/455, sections 1/2
Spring Semester 2014

Instructor: Dr. M. Paul Chiarelli, office FH 102 (email: mchiare@luc.edu, phone 508-3106) Office Hours Tuesday 9:30-11:30 AM and Friday 9:30 to 11:30 AM **or by appointment.**

Book: "Introduction to Mass Spectrometry" by J. Throck Watson and O. David Sparkman, 4th edition, John Wiley and Sons, LTD, ISBN 978-0-470-51634-8.

Objectives: The specific objectives of this course are to acquaint the student with basic aspects of mass spectrometry. The focus of the course will be twofold. One part will concentrate on the interpretation of mass spectra, particularly the type of spectra generated by electron ionization (i.e, the spectra you might acquire from a typical GC/MS determination) and the mass spectra would acquire from large biological molecules, such as proteins and oligonucleotides. The other part of the course will be a general survey of the different types of mass spectrometers, ionization techniques, and their applications in real world research problems. Students will be assigned reading in the appropriate sections of the textbook prior to lectures and exams. Other course material will be supplied by the instructor (journal articles, etc.) at the appropriate times.

Class Procedures: The class will meet on Mondays and Wednesdays from 4:00 to 5:15 PM. This is a 3 hr. credit course. There will be two exams and a final. There will two problem sets that will be collected and graded. The problem sets will be concerned with mass spectra interpretation primarily. You will be asked to write one 5-page paper on a particular application of mass spectrometry on **a topic agreed upon by you and the instructor**. The contribution of each exam/assignment to your final grade breaks down as follows:

<u>Item</u>	<u>% grade</u>	<u>% total</u>
Problem Sets (2)	10%	20%
In-class exams	15%	30%
Paper	25%	25%
Final exam	25%	25%
Total		100%

A tentative list of meeting dates and the lecture titles are given below. **If there is a topic of particular interest you would like to cover and don't see it below, come and talk to me. I will try to work it in.**

Monday	Jan 13	Discussion of Course Goals; Introductory Lecture "What is Mass Spectrometry ?"
Wednesday	Jan 15	Appearance of a Mass Spectrum
Monday	Jan 20	MLK day, no class
Wednesday	Jan 22	GC/MS and Quadrupole Mass Analyzers
Monday	Jan 27	Molecule Ions; Calculating elemental compositions
Wednesday	Jan 29	Electron Impact Ion Generation and Mechanisms of Ion Generation
Monday	Feb 3	Alpha-cleavage and Charge-Site Initiated Fragmentation
Wednesday	Feb 5	Radical Site (McLafferty) Rearrangement Reactions
Monday	Feb 10	Low Mass Ion series
Wednesday	Feb 12	Fragmentation of Cyclic Structures
Monday	Feb 17	Interpretation of EI spectra continued
Wednesday	Feb 19	Exam I
Monday	Feb 24	Electrospray Ionization: Generation of Molecule Ions
Wednesday	Feb 26	Protein and Peptide Analyses based on MS and Enzymatic digestions
Monday Mar 3-Friday Mar 8 Spring Break		
Monday	Mar 10	Protein and Peptide Analyses based on Tandem MS
Wednesday	Mar 12	Protein and Peptide Analyses based on Tandem MS
Monday	Mar 17	Top-Down Sequencing of Proteins by MS

Wednesday	Mar	19	Database searching strategies for Protein Identification using MS data
Monday	Mar	24	MS of Oligonucleotides and Complex Carbohydrates
Wednesday	Mar	26	Exam II
Monday	Mar	31	Target analyte analysis based on LC and tandem MS
Wednesday	Apr	2	Tandem quadrupole Mass Spectrometry
Monday	Apr	7	Ion Trap Mass Spectrometry
Wednesday	Apr	9	Linear Ion Traps and Orbitraps
Monday	Apr	14	Fourier Transform Mass Spectrometry
Wednesday	Apr	16	Time-of-Flight Mass Spectrometry
Monday	Apr	21	Matrix-Assisted Laser Desorption Ionization
Wednesday	Apr	23	Secondary Ion Mass Spectrometry
Monday	Apr	28	Final Exam