Introduction to Mass Spectrometry
Syllabus for Chem 395/455, sections 1/2
Spring Semester 2010

Instructor: Dr. M. Paul Chiarelli, office FH 102 (email: mchiare@luc.edu, phone 508-3106) Office Hours Tuesday 9:30-11:30 AM and Wednesday 3:30 to 5:30 PM.

Book: "Interpretation of Mass Spectra" by Fred W. McLafferty and Frantisek Turecek.

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. The textbook will be used primarily to teach spectra interpretation, particularly electron ionization. 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. The material for the second half of the course will come from journal articles and other handouts that I will make available to you.

Class Procedures: The class will meet on Mondays and Wednesdays from 5:30 PM to 6:50 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:

Item	**% grade**	**% total**
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.

Wednesday	Jan 19	Discussion of Course Goals; Introductory Lecture "What is Mass Spectrometry ?"
Monday	Jan 24	Appearance of a Mass Spectrum
Wednesday	Jan 26	GC/MS and Quadrupole Mass Analyzers
Monday	Jan 31	Molecule Ions; Calculating elemental compositions
Wednesday	Feb 2	Electron Impact Ion Generation and Mechanisms of Ion Generation
Monday	Feb 7	Alpha-cleavage and Charge-Site Initiated Fragmentation
Wednesday	Feb 9	Radical Site (McLafferty) Rearrangement Reactions
Monday	Feb 14	Low Mass Ion series
Wednesday	Feb 16	Fragmentation of Cyclic Structures
Monday	Feb 21	Interpretation of EI spectra continued
Wednesday	Feb 23	**Exam I**
Monday	Mar 2	Electrospray Ionization: Generation of Molecule Ions
Wednesday	Mar 4	Protein and Peptide Analyses based on MS and Enzymatic digestions
Monday Mar 7-Friday Mar 11		Spring Break
Monday	Mar 14	Protein and Peptide Analyses based on Tandem MS
Wednesday	Mar 16	Protein and Peptide Analyses based on Tandem MS
Monday	Mar 21	Top-Down Sequencing of Proteins by MS
Wednesday	Mar 23	Database searching strategies for Protein Identification

using MS data

Monday	Mar	28	MS of Oligonucleotides and Complex Carbohydrates
Wednesday	Mar	30	**Exam II**
Monday	Apr	4	Target analyte analysis based on LC and tandem MS
Wednesday	Apr	6	Tandem quadrupole Mass Spectrometry
Monday	Apr	11	Ion Trap Mass spectrometry
Wednesday	Apr	13	Linear Ion Traps and Orbitraps
Monday	Apr	18	Fourier Transform Mass Spectrometry
Wednesday	Apr	20	Time-of-Flight Mass Spectrometry
Monday	Apr	25	Matrix-Assisted Laser Desorption Ionization
Wednesday	Apr	27	Secondary Ion Mass Spectrometry
Monday	May	2	Final Exam