

Syllabus for CHEM 655/460  
Mass Spectrometry and Gas-Phase Ion Chemistry, Spring 2016  
MWF, Morton 238

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Office Hours: TBA

**Text:** *Mass Spectrometry. Principles and Applications*, 3<sup>rd</sup> ed. de Hoffmann and Stroobant. We will also be reading papers from the primary literature and I will put several general mass spectrometry books on reserve in the chemistry library

**Grading:**

Paper Assignments	20%
Problem Sets	20%
Class Participation	10%
Mid-term assignment	25%
Final assignment	25%

**Paper Assignments (20%):**

During the course of the semester, I will post papers from the current literature on topics that we are covering in the course. You should provide a one-page summary of the papers in paragraph format that should include the following:

title of paper and authors with affiliations

statement of the chemical problem that they were addressing

summary of analytical technique used to address the problem

summary of **important** results

summary of conclusions of the paper (did they answer the question or address the problem that they were investigating)

summary of future work motivated

opinion of the paper in terms of style, organization, clarity, significance of the work.

**Homework: (20%)** There will be several problem sets given out over the semester. These will generally be numerical in nature and will cover topics from the course.

**Mid-Term and Final (25% each)** You will be given two opportunities to show that you can integrate the material that we have been studying to solve new problems. These will be in the form of an exam, a presentation, or a paper. We will decide, more or less, as a class, when and what the format of the mid-term and final will be.

**Extra Assignment for 655** Graduate students will be expected to give a 15 minute presentation during the last week of the course on some MS-related topic.

## Tentative Course Outline

- I Introduction and History of Mass Spectrometry
- II. Instrumentation
  - A. Mass Analyzers
    - 1. sectors and multi sector instruments
    - 2. time of flight and related instruments
    - 3. quadrupole mass filters
    - 4. Paul and linear ion traps
    - 5. Orbitrap
    - 6. FT-ICR
    - 7. ion mobility instruments
    - 8. hybrid instruments
  - B. Sources
  - C. Detectors
  - D. Tandem Mass Spectrometry
  - E. QET/RRKM
- III. Interpretation of Mass Spectra
- IV. Gas-Phase Ion Chemistry
  - A. Ion-Molecule reactions
    - 1. reactivity
    - 2. thermochemistry
    - 3. kinetics
  - B. Ion-Ion reactions
  - C. Metal Ion Chemistry and catalysis
  - D. Ion Spectroscopy
- V. Applications
  - A. Proteomics
  - B. Metabolomics
  - C. Forensic Applications
  - D. Stable Isotope chemistry and ICP-MS
  - E. Polymer chemistry.