NMR Spectroscopy of Natural Products
Syllabus
University of Alaska Fairbanks
Spring 2011

Course Information
Chemistry F420/F620, NMR Spectroscopy of Natural Products, 3.0 Credits.
Reichardt 136, MW 5:50 – 7:20 pm
Prerequisite: Chem 321, 322 Organic Chemistry with grade of C or better

Instructor
Thomas Green, Professor of Chemistry
Reichardt 174, Phone: 474-1559, Email: tkgreen@alaska.edu
Office Hours: Tues 1-5 pm, Thurs 1-5 pm.
Website: http://chem.uaf.edu/green/NMR.htm

Course Materials

Course Description
The first half of this course focuses on theory and practice of Nuclear Magnetic Resonance (NMR) Spectroscopy for the elucidation of organic structure. Both one- and two-dimensional techniques are covered. Examples of “unknown” structures will be offered as homework assignments. Students will receive “hands-on” training with the Chemistry Department’s Varian Mercury NMR instrument. Readings of the primary literature will also be assigned.

The second half of the course will be an introduction to capillary electrophoresis, liquid/gas chromatography, and mass spectrometry techniques. Handouts and literature articles will be used for this portion of the course.

Course Goals
1. Know the basic theory of nuclear magnetic resonance spectroscopy, especially Fourier transformation, resolution, processing, relaxation, through-bond/through-space effects, and 2D theory.
2. Know how to interpret 1D and 2D NMR spectra for complex unknowns.
3. Know the basic theory of capillary zone electrophoresis and micellar electrokinetic chromatography, including electroosmotic flow, electrophoretic mobility, and chiral selectivity.
4. Know the basic theory of high performance liquid chromatography with focus on the theory of separation and method development.
5. Know the basic mass spectrometry techniques, including coupling of gas and liquid chromatography to mass spectrometry.
6. Know how to interpret mass spectra, especially fragmentation pathways for small molecules.
Student Learning Outcomes

At the end of this course, students should be proficient in:
1. Interpretation of 1D and 2D NMR spectra of small molecules (less than 500 MW).
2. Knowing the essential instrumental components of CE, NMR, HPLC, and GC/MS.
3. Basic operation of the departmental NMR, HPLC, CE, and GC/MS instruments.
4. Designing experiments for the efficient separation of complex mixtures using CE, GC and HPLC.
5. Interpretation of mass spectra of small organic molecules.

Instructional Methods
1. The instructor will lecture on the theory, instrumental aspects, and interpretation of spectra using a combination of Power Point slides and Chalkboard, providing copies of notes to the students via the web and handouts.
2. Hands-on use of departmental instruments of capillary electrophoresis, liquid and gas chromatography, and mass spectrometry will be an integral part of the course.

Schedule and Coverage
January 21 – March 11; Theory and Practice of NMR spectroscopy
March 21- April 1; Theory and Practice of Capillary electrophoresis
April 4 – April 15; Theory and Practice of Gas/Liquid Chromatography
April 18 – May 6; Theory and Practice of Mass Spectrometry
May 9, Monday; 3:15 - 5:15 p.m. Final Exam

Evaluation
Exams (4) – 100 pts each x 4 = 400 pts
1. Theory and instrumental aspects of NMR.
2. Interpretation of simple and complex spectra using 1D and 2D NMR.
3. Theory and instrumental aspects of CE and LC/GC
4. MS – theory and interpretation of mass spectra.
Homework (8) – 25 pts each x 8 = 200 pts
Hands-on Project and Poster (Graduate Students only) - 100 pts.

Point Totals and Grade Assignment

4 exams @ 100 pts each = 400 points
Homework = 200 points
Project and Poster (Graduate students only) – 100 pts
Grading
90-100% A
80-89% B
70-79% C
60-69% D
<60% F

Notes and Policies:
1. Class attendance is expected and role will be taken.
2. Make-up exams are only allowed in the event of a legitimate excuse as determined by the instructor. Exams must be made up as soon as possible.
3. Cheating will result in a grade of F for the course.
4. The course will move quickly and it is important to keep up on a daily basis. The best way to do this is to read the text and to work the problems.

Disabilities Services

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. I will work with the Office of Disabilities Services (*208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities. You will need to provide documentation of your disability to Disability Services.