

# Practical Nuclear Magnetic Resonance Spectroscopy

## 1. Course information:

Course number: F419

2 credits Offered Spring semesters

Prerequisites: CHEM 321 or instructor permission

Location:

Lectures will be in REIC 138

Labs will be in REIC 136 for NMR time and REIC 132 will be available for some reactions and sample preparation.

Meeting time:

Lecture: Wednesdays: 11:45 am - 12:45 pm

Lab: Scheduled by the students as needed. Should average 3 hours per week, and not exceed 42 hours for the semester.

## 2. Instructor Information:

Dr. Carl Murphy, office: REIC 136; Phone: 474-5545;

e-mail: [cjmurphy4@alaska.edu](mailto:cjmurphy4@alaska.edu)

Office Hours: Mondays: 11:45 am-12:45 pm or by appointment.

## 3. Textbook:

**Required:** Organic Structures from 2D NMR Spectra, L.D. Field, Wiley, 2015 first edition ISBN: 1118868943 (\$56.91 on amazon).

## 4. Course description:

Students will be trained in the basic operation of multiple NMR instruments. The class will begin with a few lectures on theory and operation of the NMR instruments. Homework assignments will reinforce lecture material and provide practice in spectral interpretation. Students will spend much of the class time getting hands-on experience on the NMR. The second half of the class will be student-driven NMR-based research projects. At the end of the class, students will present their projects to the rest of the class.

## 5. Course Goals:

To provide students with a working background on Nuclear Magnetic Resonance, train them to be independent users of the NMR, and allow them to explore aspects of the NMR with a research project.

## 6. Student Learning Outcomes:

Students should leave this course with a basic understanding of NMR. They should also be able to safely operate the NMR instruments for standard NMR experiments in any future research in which they are involved.

## 7. Instructional Methods:

Lectures on the basics of NMR and its safe use will meet during the beginning of the semester. The laboratory meetings will focus on training students to operate the instruments. As students complete training they will be given user accounts on the NMR to start pursuing their own research project. The class will meet again at the end of the semester for students to present their research results.

## 8. Course calendar (tentative):

| Lecture Day | Lecture                            | Lab                             |
|-------------|------------------------------------|---------------------------------|
| 1/17/2018   | NMR Basics, Safety, and Review     | NMR Tour and Check-in           |
| 1/24/2018   | Intramolecular Interactions        | Lab 1, Learning the 300 MHz NMR |
| 1/31/2018   | Liquid Nitrogen Safety Meet in 136 | Lab 1, Learning the 300 MHz NMR |
| 2/7/2018    | Spectral Interpretation            | Lab 2, Learning the 600 MHz NMR |
| 2/14/2018   | Unknown Practice                   | Lab 2, Learning the 600 MHz NMR |
| 2/21/2018   | Project Expectations               | Lab 3, Solving an Unknown       |
| 2/28/2018   | Through space Coupling             | Lab 3, Solving an Unknown       |
| 3/7/2018    | Magic Angle Spinning and SSNMR     | Projects                        |
| 3/14/2018   | Spring Break                       |                                 |
| 3/21/2018   | Dynamics processes in the NMR      | Projects                        |
| 3/28/2018   | Advanced Theory                    | Projects                        |
| 4/4/2018    | Variable Temperature experiments   | Projects                        |

## **9. Course policies:**

Attendance at all lectures and scheduled lab times is expected and required. For the research projects, NMR usage will be scheduled based on need and availability of the instruments. When students sign up for an NMR time slot they are expected to use that time.

For all instrument use, students are expected to schedule time to come in on their own to use the NMR for the lab activities or projects. The three lab activities are each scheduled for two weeks to allow students ample time to get familiar with the instrument and complete the expectations of the activity. Time for the labs and project is expected to average 3 hours per week, but will be scheduled based on student and instrument availability. Total lab time for the semester should not exceed 42 hours.

## **10. Evaluation:**

8 homework assignments (10 points each): 80 points total

Final Project Presentation: 100 points

**12. 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 the instructor during the first two weeks of class. The instructor 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.