

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 207

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

Meeting time:

Lecture: Tuesday: 1:00 PM - 2:00 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

Office Hours: Monday mornings or by appointment.

3. Textbook:

Required: Organic Structures from 2D NMR Spectra, L.D. Field, Wiley, 2015 first edition ISBN: 1118868943 (\$70.24 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:

Weekly lectures will focus on safe use of the NMR instruments, the theory of how the instruments work, and analysis of NMR spectra. 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 instruments to start pursuing their own research project. For spectral analysis access to a personal laptop is recommended, but not required.

8. Course calendar (tentative):

Lecture Day	Lecture	Lab
1/17/2023	NMR Basics, Safety, and Review	
1/24/2023	Intramolecular Interactions	Lab 1, Learning the 300 MHz NMR
1/31/2023	Project Expectations	Lab 1, Learning the 300 MHz NMR Liquid Nitrogen Safety Meet in 136
2/7/2023	Magic Angle Spinning and SSNMR/ How NMR Works	Lab 2, Learning the 600 MHz NMR
2/14/2023	Spectral Interpretation	Lab 2, Learning the 600 MHz NMR
2/21/2023	Spectral Interpretation	Lab 3, Solving an Unknown
2/28/2023	Challenges to Interpretation	Lab 3, Solving an Unknown
3/7/2023	Spectral Interpretation	Projects
3/14/2023	Spring Break	
3/21/2023	Relaxation, Decoupling, and Solvent Suppression	Projects
3/28/2023	Advanced Theory	Projects
4/4/2023	Interpretation Practice	Projects
4/11/2023	Interpretation Practice	Projects
4/18/2023	Review and Project Presentation Overview	Projects
4/25/2023	Final Exam	Projects
5/2-5/5		Presentations (Time TBD)

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.

Late Work: All work is due by the end of the business day on the due date of the assignment. Any work turned after that will be penalized 10% per weekday until it is turned in. No matter how late, work may always be turned in and is worth up to one (1) point.

10. Evaluation:

- 8 homework assignments (20 points each): 160 points total
- Final Project Presentation: 100 points
- 3 Labs (60 points each): 180 Points total
- Final exam: 100 points
- Participation: 60 points (based on attendance and involvement with class discussions)
- Total Points: 600

Grades will be letter grades without +/- modifiers following the cutoff values listed below.

540 points = A

480 points = B

420 points = C

360 points = D

<360 points = F

The final project will be graded as follows:

Criterion	Points
Lab Performance	20
Effective Application of NMR to your project	20
Project Plan (Due March 7)	20
Presentation	
Layout	10
Quality of Figures	15
Does it tell a story	15
Total	100

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.

13. Student protections and services statement:

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/

14. Effective communication:

Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication's Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English's Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette st, 907-455- 2860).