

CHEM/BCMB 4190/6190/8189 - Introductory NMR

Nuclear Magnetic Resonance (NMR) is a form of spectroscopy that uses the magnetic properties of nuclei to probe molecular structure. It has found applications in analysis of organic and inorganic compounds, in structure determination of biological macromolecules, and even in medical imaging. These introductory courses are intended to serve a broad audience seeking background in principles behind NMR methodology as well as a practical introduction to how data are acquired and analyzed. Material is presented partly in lecture and partly in laboratory formats. It is an ideal stepping-stone to more advanced courses offered in biomolecular NMR (CHEM/BCMB 8190) as well as other application-oriented courses.

The three courses share lecture and laboratory presentations. Grading is based on a midterm, a final, and an evaluation of laboratory participation, with approximately equal weights given to each. For 6190 and 8189 completion of an additional independent study project is required.

Instructor: Jeffrey Urbauer

Class time: Tu,Th, 3:30-4:45

Recommended text: Friebolin "Basic One and 2D NMR Spectroscopy" - VCH paperback

Syllabus:

Date	Topic	Text Readings
Aug. Tu 19	Introduction and Basic Principles I	1.1, 1.2
Th 21	Basic Principles I	1.2, 1.3
Tu 26	Basic Principles II	1.4, 1.5, 1.6
Th 28	¹ H and ¹³ C Chemical Shifts	2.1-2.4
Sep. Tu 2	¹ H/ ¹ H, ¹³ C/ ¹ H, ¹³ C/ ¹³ C Couplings	3.1-3.5
Th 4	Lab Demo Handout	
Tu 9	1D ¹ H NMR Lab #1	
Th 11	1D ¹ H NMR Lab #1	
Tu 16	Double Resonance Expts	5.1-5.3
Th 18	Spin Relaxation	7.1-7.3
Tu 23	1D Double Resonance NMR Lab #2	
Th 25	1D Double Resonance NMR Lab #2	
Tu 30	Analysis of 1D ¹ H spectra	
Oct. Th 2	Intro to Complex Pulse Sequences	8.1-8.2
Tu 7	Midterm	
Th 9	Spin-Echo Experiment	8.3-8.4
Tu 14	INEPT Experiment	8.5
Th 16	DEPT Experiment	8.6
Tu 21	1D ¹³ C and DEPT Lab #3	
Th 23	1D ¹³ C and DEPT Lab #3	
Tu 28	Analysis of 1D ¹³ C spectra	
Th 30	Fall Break No Class	
Nov. Tu 4	Introduction to 2D NMR / COSY	9.1-9.2
Th 6	2D COSY / HETCOR	9.4

Tu 11	2D TOCSY / HSQC	9.4
Th 13	2D HETCOR / COSY Lab #4	
Tu 18	2D HETCOR / COSY Lab #4	
Th 20	The Nuclear Overhauser Effect	10.1-10.2
Tu 25	2D NOESY	10.2-10.4
Th 17	Thanksgiving Holiday - No Class	
Dec. Tu 2	HSQC Lab #5	
Th 4	HSQC Lab #5	
Tu 9	Analysis of 2D spectra	
Tu 16	Final Exam (3:30-6:30)	