Course Subject, Number and Title
BIOCHEM 800, “Practical Nuclear Magnetic Resonance Theory”

Credits
2

Canvas Course URL
N/A. Course website is located at
http://extranet.nmrfam.wisc.edu/nmrfam_documents/bchm800/bchm800.html

Course Designations and Attributes
General education; graduate-level course

Meeting Time and Location
TTh, 11:00am – 11:50am, 2221 HF DeLuca Biochemical Sciences Building

Instructional Mode
Face-to-face

Specify how Credit Hours are met by the Course
Traditional Carnegie Definition – One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks.

Instructor Title and Name
Dr. W. Milo Westler, Senior Scientist, Dept. of Biochemistry

Instructor Availability
By appointment

Instructor Email/Preferred Contact
milo@nmrfam.wisc.edu

Course Description
Study of multipulsed, multinuclear, and multidimensional NMR spectroscopy; emphasis on the vector and product operator formalisms for the analysis of modern pulse sequences. Topics to be covered: The Vector Paradigm; Coherence and Magnetization; Radio Frequency (Rf) Excitation; Chemical Shifts; Signal Detection; Fourier Transformation; Coherence Transfer Pathways and Phase Cycling; Pulsed Field Gradients; Scalar Coupling; Product Operator Formalism; Coherence Transfer; Isotope Directed Editing; Two-Dimensional NMR; Multi (>2)-Dimensional NMR; 1H, 13C, and 15N Triple Resonance 3d and 4d; NMR Pulse Concatenation; Sequence Optimization; Relaxation.

Requisites
Introductory NMR *(*e.g. organic chemistry), basic trigonometry, elementary physics, and physical chemistry; consent of instructor.

Course Learning Outcomes

- Understand the basics of NMR pulse sequences
- Proficient in vector rotations as applied to the NMR vector paradigm
- Understand the use of the product operator formalism in the analysis of NMR ~~pulse~~ sequences
- Understand chemical shifts, coupling constants, radiofrequency pulses, and pulse field gradients in the analysis of NMR pulse sequences
- Understand scalar coupling constants and their role in coherence transfer
- Understand and compute two and multi-dimensional NMR spectra
- Obtain knowledge and significance of the Fourier transform of trigonometric functions used in the product operator formalism

Grading

A non-curved scale of A-F. Class attendance and participation are crucial factors.

Required Textbook, Software & Other Course Materials

http://extranet.nmrfam.wisc.edu/nmrfam_documents/bchm800/notes/index.html
http://extranet.nmrfam.wisc.edu/nmrfam_documents/bchm800/notes/ref.html

Exams, Quizzes, Papers & Other Major Graded Work

- List the summary period and the expectations associated with it
- List relevant details about the exams (dates, in-class or take home, cumulative or not, open-book or open-note, access to electronic devices, policies for make-up dates)

Homework & Other Assignments

- Provide rules and expectations concerning homework
- How are assignments to be submitted (online, Dropbox, hand in during class, instructor mailbox, other)

Rules, Rights & Responsibilities

- See the Guide's Rules, Rights and Responsibilities

Academic Integrity

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and

helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

Accommodations for Students with Disabilities

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

Diversity and Inclusion

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/