

Chemistry 625

Spring 2020

Chemical Applications of Magnetic Resonance Spectroscopy

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Days and Time: Tue. & Th., 9.30 a.m. to 10.50 a.m.

Class Location: SGM 226

Course website: chemmac1.usc.edu/625

This course will not have any formal prescribed texts. Material from the following suggested books will be used from time to time.

- “Basic One- and Two-Dimensional NMR Spectroscopy”, H. Friebolin, 5th Edition, Wiley-VCH, A Paperback, 2016.
- “Organic Structure Analysis”, P. Crews, J. Rodriguez and M. Jaspars, Oxford University Press, Oxford, 2010, Second Edition.
- “NMR Spectroscopy, Basic Principles, Concepts and Applications in Chemistry”, H. Günther, Wiley-VCH, 3rd Edition, A Paperback, 2013.
- “Understanding NMR Spectroscopy”, J. Keeler, 2nd Edition, Wiley, A Paperback, 2010.
- “Modern NMR Techniques for Chemistry Research”, A. E. Derome, Pergamon Press Inc., (flexi cover), 1991.

Exams: Tuesday, Feb 25 and Thursday, April 16

Grade: 2 Midterm Tests (40%), Final Term Paper on selected topics (40%), Occasional problem sets (20 %).

Syllabus: Outline of the material that will be covered.

Introduction to Nuclear Magnetic Resonance (NMR) Spectroscopy
Physical Aspects of NMR and Basic Theory- Single Pulse Experiment
FT NMR
Experimental Aspects
¹H NMR spectra of Organic Molecules
¹H NMR Chemical Shifts and Spin-Spin Coupling Constants
Origin of Chemical Shifts and Coupling Constants
¹³C and ¹⁹F NMR Spectroscopy
Spin Decoupling
NMR of Other Nuclei
Dynamic NMR
CIDNP
Multiple Pulse Experiments
Polarization Transfer
Spectral Editing
Connectivity through Bonds, Space and Chemical Exchange
Two Dimensional NMR
NMR of Solids
Imaging
Theoretical Methods (IGLO, GIAO)

NMR Bibliography

- “Carbon-13 Nuclear Magnetic Resonance Spectroscopy”, G.C. Levy, R.L. Lichter and G. Nelson, John Wiley and Sons, New York, 1980.
- “Nuclear Magnetic Resonance Spectroscopy”, R.K. Harris, Longman Scientific.
- “Proton and Carbon-13 NMR Spectroscopy- An Integrated Approach”, R.J. Abraham and P. Loftus, Heyden, London, 1978.
- “Practical NMR Spectroscopy”, M.L. Martin, J.-J. Delpuech and G.J. Martin, Heyden, London, 1980.
- “Experimental Pulse NMR- A Nuts and Bolts Approach”, E. Fukushima and S.B. Roder, Addison-Wesley, New York, 1981.
- “Hand Book of High Resolution Multinuclear NMR”, C. Brevard and P. Granger, John Wiley and Sons, New York.
- “Dynamic NMR Spectroscopy”, J. Sandstrom, Academic Press, 1982.
- “Solid State NMR for Chemists”, C. Fyfe, C.F.C. Press, Guelph, Ontario, Canada 1983.
- “Nuclear Magnetic Resonance Imaging in Medicine and Biology”, P.G. Morris, Calrendon Press, Oxford 1985.
- "NMR Basic Principles and Progress", Springer Verlag, Volumes 1-33. Each volume is dedicated to a particular nucleus or technique.
- "NMR Spectroscopy Techniques", C. Dyboski and R. L. Lichter, eds., Marcel Dekker, Inc., New York, 1987.
- “A Complete Introduction to Modern NMR Spectroscopy”, Roger S. Macomber, Wiley, New York, 1998.
- “200 and More NMR Experiments, A Practical Course”, S. Berger and S. Braun, Wiley-VCH, Weinheim, 2004.
- “Applied NMR Spectroscopy for Chemists and Life Scientists”, O. Zerbe, S. Jurt, Wiley-VCH, Weinheim, 2014.
- “High-Resolution NMR Techniques in Organic Chemistry”, 3rd ed., T. Claridge, Elsevier, 2016.
- “Organic Structures from 2D NMR Spectra”, L. Field, H. Li, A. Magill, Wiley, 2015.