Term Information

Effective Term	Summer 2013

General Information

Course Bulletin Listing/Subject Area	Chemistry
Fiscal Unit/Academic Org	Chemistry - D0628
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5450
Course Title	Practical NMR Spectroscopy
Transcript Abbreviation	Practical NMR Spec
Course Description	This course focuses on the application of NMR Spectroscopy to the structure determination and dynamics of primarily synthetic organic and organometallic products. The practical aspects of acquiring optimized, high-quality data are still beneficial for analysis of these spectra will be presented as lectures and demonstrations.
Semester Credit Hours/Units	Fixed: 1

Offering Information

Length Of Course	4 Week (May Session)
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: Chem 5420 or Permission of instructor.
Exclusions	

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	40.0501
Subsidy Level	Doctoral Course
Intended Rank	Junior, Senior, Masters, Doctoral

Quarters to Semesters

Quarters to Semesters	New course
Give a rationale statement explaining the purpose of the new course	This represents a practical course to teach student how to use the NMR spectrometers in the department, focusing on the collection and analysis of data.
Sought concurrence from the following Fiscal Units or College	

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Practical knowledge of the use of the NMR spectrometers in the department, data collection and interpretation of spectra of organic and organometallic molecules.

Content Topic List

- NMR Theory
- The NMR spectrometer
- Experimental parameters
- 1D methods
- Multinuclear NMR
- Data Processing
- Multidimensional NMR

Attachments

- NMR_Syllabus_rev3.pdf: Syllabus

  (Syllabus. Owner: Turro,Claudia)

- NMR_petition.pdf: Appeal for OAA

  (Appeal. Owner: Turro,Claudia)

Comments

- The syllabus for Chem 5450 has been attached. Unlike Chem 5450, Chem 5420 is not focused on practical aspects of NMR data collection and interpretation. NMR is only a small portion of the material to be covered in Chem 5420. The purpose of Chem 5450 is to teach incoming graduate students and upper level undergrads to use the spectrometers in the NMR facility before the start doing research.

  The credit hours have been revised only 1 credit for May-mester (4 weeks) only

  The syllabus has been updated to reflect only lectures and demonstrations

  The pre-reqs are now consistent.

  Grading information has been added to the syllabus. The class will meet twice a week for 1 hour and 20 min. This has also been added to the syllabus.

  An appeal for OAA has been attached. *(by Turro,Claudia on 02/05/2013 12:28 PM)*

- -Please attach appeal for OAA if course will be taught this Summer. (see deadlines here: http://asccas.osu.edu/curriculum/important-deadlines)
  -Please inlude information about assignments & grading information (percentages for each assignment), and statement on academic misconduct (see p. 13 of handbook https://asccas.osu.edu/sites/asccas.osu.edu/files/ASC_CurrAssess_Operations_Manual_2012-13_.pdf)
  -Committees will likely wish to know how many times / week and for how long the class will meet. *(by Vankeerbergen,Bernadette Chantal on 02/01/2013 03:10 PM)*
- The syllabus should include additional items including disability statement, sample offering times (including lecture times), etc. The syllabus would need additional information for review by subsequent committees.

  Syllabus refers to lab components of the course, but the course request only mentions lecture. Please update and clarify.

  Pre-reqs are inconsistent (see syllabus).

  Different credits for the same course being offered under 2 time schemes is not acceptable. For example, consider what happens when a transcript has the course number and course description for completion. If Chemistry & Biochemistry want 2 different sets of learning outcomes for this course (when offered under 7 week vs 3.5 week formats), then 2 different courses should be created. Otherwise, if the same course will show up on 2 different students' transcripts, then the learning outcomes (including total contact time and overall learning goals) should be the same. If not, have 2 different courses. *(by Hadad,Christopher Martin on 01/29/2013 04:35 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Turro,Claudia	01/29/2013 02:47 PM	Submitted for Approval
Approved	Turro,Claudia	01/29/2013 02:49 PM	Unit Approval
Revision Requested	Hadad,Christopher Martin	01/29/2013 03:38 PM	College Approval
Submitted	Turro,Claudia	01/29/2013 03:51 PM	Submitted for Approval
Approved	Turro,Claudia	01/29/2013 03:51 PM	Unit Approval
Revision Requested	Hadad,Christopher Martin	01/29/2013 04:35 PM	College Approval
Submitted	Turro,Claudia	01/30/2013 09:31 AM	Submitted for Approval
Approved	Turro,Claudia	01/30/2013 09:32 AM	Unit Approval
Approved	Hadad,Christopher Martin	01/30/2013 12:56 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	02/01/2013 03:10 PM	ASCCAO Approval
Submitted	Turro,Claudia	02/05/2013 12:28 PM	Submitted for Approval
Approved	Turro,Claudia	02/05/2013 12:30 PM	Unit Approval
Approved	Hadad,Christopher Martin	02/05/2013 12:41 PM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Vankeerbergen,Bernadette Chantal Hogle,Danielle Nicole Hanlin,Deborah Kay	02/05/2013 12:41 PM	ASCCAO Approval

Practical NMR Spectroscopy

Course Description: Magnetic Resonance Spectroscopy is a powerful technique that has evolved with applications in virtually every scientific discipline. This course focuses on the application of NMR Spectroscopy to the structure determination and dynamics of primarily synthetic organic and organometallic products. Although automation of NMR data collection is becoming mainstream, the practical aspects of acquiring optimized, high-quality data are still beneficial for analysis of these spectra. Various aspects of optimization will be covered such as pulse calibrations, probe tuning, measuring relaxation parameters, sample preparation, and shimming. The applications of these techniques to a variety of routine NMR experiments will be demonstrated, as well as advanced sequences in an attempt to make seemingly complex experiments more accessible to the synthetic chemist to simplify structure determination. The course will be a combination of short lectures with demonstrations utilizing the department's NMR facility instrumentation. Previous use of the facility instruments is recommended.

Meeting times: The class will meet twice a week for one hour and 20 minues.

I. Week One

NMR Theory
Magnetic moment, NMR transition and spin states, vectors and RF pulses
Relaxation parameters, T_1 and T_2

The NMR
Probes and tuning, magnet and cryogens, RF routing, and the workstations
Safety and NMR

Experimental parameters
Sample handling, locking and shimming
Optimizing signal to noise, gain, pulse widths, line-widths
Acquisition of basic proton NMR spectrum

Demo
Sample handling, locking and shimming
Optimizing signal:noise, pulse calibrations
Acquiring your best NMR spectrum

II. Week Two

More 1D methods
Edited 1D spectra
Dipolar coupling, ie. The NOE
Quantitative NMR is possible

Multinuclear NMR
Relative sensitivity, quadruple nuclei
Acquisition of multinuclear NMR spectrum

Data Processing
Multiplet analysis
Phasing, baseline corrections, line broadening
Tips and Tricks

Demo
Quantitative NMR
Homonuclear decoupling
Acquisition of ^{31}P and ^{19}F NMR

III. Week Three

Multidimensional NMR
2D NMR pulse sequences
Optimization of 2D NMR acquisition

Demo
$^{1}H - {}^{1}H$ Correlation spectroscopy
$^{1}H - {}^{13}C$ Heteronuclear spectroscopy

IV. Week Four

Miscellaneous
Selective Pulses
Diffusion
Solid-state NMR

Demo
$T_1(H)$ measurement and processing
Selective NOE setup and measurement
Student choice

Prerequisites: Organic Spectroscopy (Chem 5420) or by consent of the Instructor.

Grading: Grading is based on two exams (70%) and participation (30%).

Recommended reading list:

Keeler, J.; Understanding NMR Spectrscopy, Wiley, **2010**.
Levitt, M.; Spin Dynamics; Basics of Nuclear Magnetic Resonance, Wiley, **2008**.
Silverstein, R. M.; Webster, F.X.; Kiemle, D.; Spectrometric Identification of Organic Compounds, Wiley, **2005**.
Berger, S.; Braun, S.; 200 and More NMR Experiments; A Practical Course, Wiley-VCH, **2004**.
Mason, J. E. Multinuclear NMR, Springer, **1987**.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

All students with documented disabilities, who need accommodations, should see the instructor privately to schedule an appointment as early in the quarter as possible. If your disability requires materials in alternative format, please contact the Office for Disability Services at 292-3307, Room 150 Pomerene Hall.

Claudia Turro
Professor and Vice Chair for Graduate Studies

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February 5, 2013

Dear representative of OAA,

Please consider this petition to offer the course titled "Practical NMR Spectroscopy", Chem 5450, during the May session this year, 2013.

This past year we had a very large incoming class of graduate students, 73, into the chemistry Ph.D. program. Nearly all of these students will need to learn to run and interpret NMR spectra as soon as they start research this summer. In the past this training was done informally, but this year it would be more efficient to train all the students at the same time as part of this course. This is an urgent situation because of the number of students who entered our program this past year.

I look forward to your response.

Sincerely,

Claudia Turro
Professor of Chemistry and Biochemistry and
Vice Chair for Graduate Studies