Chemistry 351 **Organic Qualitative Analysis Syllabus** Fall 2015

Instructor
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Office Hours: TBA

Course Meeting Times
MWF 12:15 - 1:20 pm
Rohr Science 13

Textbook
Required: Pavia, Lampman, Kriz and Vyvyan, *Introduction to Spectroscopy*, 5th Edition.

Recommended: Doucleff, Hatcher-Skeers, and Crane, *Pocket Guide to Biomolecular NMR*.

Course Website
https://canvas.pointloma.edu/ Course:

Additional readings, assignments, exam keys, laboratory materials, and extra copies of class handouts will be available *only* on the course website.

Introduction Problems
A few short Introduction Problems will be assigned daily and will often be used to begin class discussion. The questions will be based on that day's reading assignment and will cover new material. You will work on these problems outside of class. Answers to Intro Problems will be collected to verify *participation* and *effort*.

Assignments
Problems requiring greater thought and reflection will be completed outside of class and will be due periodically throughout the course. (See the course schedule for due dates). In the interest of providing rapid feedback despite the large class size, only one or two of the assigned problems will be graded. *(Note that you won't be told which problem will be graded, so you would be wise to do your best on each!)* You are strongly encouraged to compare *all* your answers to the answer key, which will be posted on eclass after the due date.

Exams
There will be one midterm exam (one hour, in class) and one cumulative final exam (two and a half hours). See the course schedule for the dates of the exams.

Makeup examinations will be given only for excused absences. In such cases, appropriate documentation must be provided within two working days of the end of the excused absence.

Laboratory
In the laboratory component of this course, you will apply what you are learning in class to the structure elucidation of two organic unknowns. Since you will be acquiring your own data on each instrument (of which there is typically only one), you'll need to sign-up online for times during the week to perform the lab. For lab each week, you and a partner will *(1)* acquire data using PLNU instrumentation, *(2)* perform an in-depth analysis of the data, and *(3)* answer analysis questions regarding your results. Two formal reports (one for each unknown) will also be due during the semester. Additional details regarding each aspect of the laboratory can be found in the lab manual, which will be distributed in the second week of class.

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Attendance
Regular attendance is absolutely essential to success in Chem 351. Students who miss class for any reason are ultimately responsible for anything covered in that class (including announcements). Students who miss 20% of the total class meetings (4 meetings) may be dropped from the course.

Grades
Your final grade will be determined as follows:

Assignments	20%
Intro Problems	15%
Laboratory	30%
Midterm Exam	15%
Final Exam	20%
Total	**100%**

Academic Integrity
All students enrolled in this course are expected to adhere to the highest standards of academic integrity. If you are uncertain of the legitimacy of a particular action, you should contact the course instructor and request clarification.

- Collaboration with other students on problem sets is encouraged, but it is in your interest to ensure that you fully understand the underlying material.
- Intro Problems should be completed before class. Taking notes on the Intro Problems during class is encouraged, but you should clearly indicate which parts were added in class, for example, using a different color pen.
- You must adhere to proper use of sources in laboratory reports. If you restate an *original idea* from a source in your own words, you must cite that source. If you use *wording* from a source, you must cite the source ***and*** put the borrowed wording in quotation marks. Failure to do so is plagiarism; it is both illegal and unethical, and is grounds for a failing grade.
- Use of any unauthorized aids on exams is prohibited. Any cases of cheating will be prosecuted to the full extent of university policy.
- Assignments and exams from this course may not be committed to dorm repositories or otherwise be used to help future students.

Academic Accommodations
While all students are expected to meet the minimum academic standards for completion of this course as established by the instructor, students with disabilities may require academic accommodations. At Point Loma Nazarene University, students requesting academic accommodations must file documentation with the Disability Resource Center (DRC), located in the Bond Academic Center. Once the student files documentation, the Disability Resource Center will contact the student's instructors and provide written recommendations for reasonable and appropriate accommodations to meet the individual needs of the student. This policy assists the university in its commitment to full compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities (ADA) Act of 1990, and ADA Amendments Act of 2008, all of which prohibit discrimination against students with disabilities and guarantees all qualified students equal access to and benefits of PLNU programs and activities.

Program Learning Outcomes: CHEM PLO 2 (NMR) will be assessed directly by faculty laboratory instructors' observation of students' use of instruments.

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***Tentative* Schedule**

		Date	Topic	Reading*	Special Events†	Lab‡
1	W	Oct 21	Intro to organic structure analysis			*No Lab*
	F	*Oct 23*	*Fall Break – no class*			
2	M	Oct 26	Mass spectrometry, part I: the molecular ion	δ 3.6, 3.7, 1.4, 1.5		
3	W	Oct 28	Mass spectrometry, part II: fragmentation	δ 4.1, 4.2, 4.11, 4.12		*In lab: GCMS*
4	F	Oct 30	Intro to infrared spectroscopy	δ 2-2.6		
5	M	Nov 2	Interpreting IR spectra	δ 2.7-2.9		GCMS Qs Due
6	W	Nov 4	Intro to ^{1}H NMR spectroscopy	***§ Chapter 1***, δ 5-5.7	Assignment 1 Due	*In lab: IR*
7	F	Nov 6	Chemical shift and equivalence	δ 5.8-5.12		
8	M	Nov9	Intro to spin-spin coupling	***§ 2.1, 2.2***, δ 5.13-5.18		IR Qs Due
9	W	Nov 11	Intro to ^{13}C NMR spectroscopy	δ 6-6.8, 6.11-6.13, 6.17		*In lab: ^{1}H NMR*
10	F	Nov 13	^{13}C chemical shifts and DEPT	δ 6.10, 9.4, 9.5	Assignment 2 Due	
11	M	Nov 16	Reading and writing about structure elucidation	Journal articles tba	*Lab rubric development*	^{1}H NMR Qs Due
12	W	Nov 18	Midterm Exam *(MS, IR, ^{1}H NMR)*	δ Chapters 1-3		*In lab: Start Unknown 2*
13	F	Nov 20	Spin-spin coupling	Chapter 7		*GCMS, IR*
14	M	Nov 23	Exchange, NOE difference and other topics	Chapter 8		Report 1 Due
	Nov 25-29		*Thanksgiving Break – no class*			
15	M	Nov 30	Intro to 2D NMR	***§ 2.3, 2.5***, δ 9.6	Assignment 3 Due	*In lab:*
16	W	Dec 2	^{1}H-^{1}H COrrelation SpectroscopY (COSY)	δ 9.7		*Unknown 2*
17	F	Dec 4	Heteronuclear experiments: HETCOR, HMQC, and HMBC	δ 9.8, 9.9		*1D & 2D NMR*
18	M	Dec 7	NOESY	***§ 3.1, 3.2***, δ 8.11, 9.10		
19	W	Dec 9	Solving structure elucidation problems	δ 9.12, Chapter 11	Assignment 4 Due	
20	F	Dec 11	Catch up day			Report 2 Due
	W	Dec 18	Final Exam 10:30 am – 1:00 pm			

* The assigned readings shown here are tentative. A more up-to-date reading assignment can be found at the top of each day's Intro Problems. ***§* denotes readings from Doucleff *et al.*** δ denotes readings from Pavia *et al.*

† Assignments are due at the start of lecture.

‡ Lab questions are due Wednesday at 5pm. Reports are due by 5pm on the day indicated above.