Course Syllabus

CH 430L Instrumental Analysis

Spring 2020

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Office Hours: Monday 9:30 – 11:30 AM, Thursday 1:30 – 3:30 PM

Department Name: Natural Sciences and Mathematics

College/School/Division Name: Chaminade University of Honolulu

Course Credits: 2

Class Meeting: Tuesday, Thursday 8:30 – 11:20 AM, Henry 223/Lab 8

University Course Catalog Description

This is a lab course during which students are expected to get hands-on experience with modern instrumentation, including but not limited to UV/VIS, FT IR, LC-MS, GC-MS. Following a discussion on the basic principles of each instrument, students will perform specific experiments and gather data from each instrument. Experiments during part of the course designated for topics in NMR spectroscopy will mostly be simulated. *Prerequisites: BC 324/BC 324L, BC 334/BC 334L. Materials intensive fee applies. Cross-listed with CH 430L.*

Course Overview

Instrumental analysis laboratory (BC/CH 430L) is a one-semester course targeting students with an interest in the field of biomedical research and/or education, as well we those intending to obtain a graduate level of science degree. The laboratory course will cover topics from the theoretical background of electrical theory, spectrometer devices, to hands-on application utilizing advanced instrumentation such as Liquid Chromatography – Mass Spectrometry (LC-MS), Fourier Transform Infrared (FTIR) Spectroscopy, Gas Chromatography – Mass Spectrometry (GC-MS), and Comprehensive Two-dimensional Gas Chromatography (GC×GC). Advanced structural elucidation utilizing spectral data from 1- and 2-dimensional Nuclear Magnetic Resonance (NMR) Spectroscopy and state-of-the-art molecular modeling docking studies will be performed with x-ray crystallographic structure of proteins and their interaction with drugs.

Program Learning Outcomes

Upon completion of the undergraduate program in Chemistry, students will have demonstrated the ability to:

1. Apply the scientific method as it is used in organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry, and molecular sciences
2. Recognize and explain chemical theory as it applies to the physical world
3. Visualize, evaluate, validate and interpret results of chemical analyses
4. Solve problems using analytical reasoning, professional resources, professional conduct, and ethical behavior
5. Communicate chemical information effectively in oral and written formats

Course Learning Outcomes and Linkage to Program Learning Outcomes

Students completing this course will demonstrate an understanding of:

Course Learning Outcomes	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
1. electronic components of a spectrometer	X	X	X		
2. basic concepts of electrical theory		X			
3. polarity with respect to chromatographic separation technologies	X	X	X	X	
4. advanced spectroscopic methods for the elucidation and purity assessment of molecules				X	
5. docking small molecules to specific protein targets in molecular modeling	X	X	X	X	

This course also fulfills Program Learning Outcomes for the Biochemistry and Forensic Sciences programs.

Required Learning Materials

There is no required textbook for this course. Students should bring a laboratory coat, safety glasses and scientific calculator or computer to each class meeting. This is considered part of your professional development as a scientist and will be taken into consideration as part of your Attendance and Professional Practice grades.

Course Website:

Course materials will be made available through Canvas. Students are required to use the canvas course for this class.

Technical Assistance for Canvas Users:

Search for help on specific topics at help.instructure.com. Chat live with Canvas Support 24/7/365. Watch this video to get you started with online guides and tutorials. Contact the Chaminade IT Helpdesk for technical issues: helpdesk@chaminade.edu, or call (808) 735-4855

Assessment

The course grades will be based on the following total points and scale:

Instructor	Item	Score (Points)
Dr. Kawakami	5 In-Class Worksheets	100
Dr. Kawakami	5 Quizzes	100
Dr. Kawakami	Mid-Term Exam I	100
Dr. Kawakami	LCMS Project Report	200
Dr. Perrault	Mid-Term Exam II	100
Dr. Perrault	GC-MS Certification	100
Dr. Perrault	Final Project Poster Presentation	200
Dr. Perrault	Attendance & Professional Practice	100
	Total	1000

Grading Scale

The grading scale is:

100% - 90%	A
89% - 80%	B
79% - 70%	C
69% - 60%	D
≤ 59%	F

Course Schedule

Part I, Instructor: Dr. Kawakami

Week of	Topic
1/13	Course Introduction and Part I Pre-test. Basic electrical theory (Split-Phase or Three-Phase), Site Preparation and Site Acceptance Plan. NMR, The Instrument, and
1/20	^{1}H-NMR in 1 Dimension & Worksheet 1. 1D-NMR (Cont) & Homonuclear 2D-NMR. Quiz No. 1 (^{1}H-NMR)
1/27	Heteronuclear 2D-NMR. Worksheet 2. Quiz 2 (1D- & 2D-NMR).
2/3	Review for Exam I (NMR). Exam I (NMR)
2/10	Quiz 3 (WS #3). Homonuclear and Heteronuclear 2D-NMR. Worksheet 4
2/17	Quiz 4 (WS #4). Midterm Examination I.
2/24	Quiz 4 (TBD) HP-TLC, Rotary Evaporator and Medium Pressure Flash Columns HPLC and Mass Spec (LCMS), the Theory. Hands-On LCMS. Worksheet 5 (Additional Hours will be assigned for small groups of 2 to 3 for LCMS projects in Flow Injection Analysis mode). Part 1 Post-test.

Part II, Instructor: Dr. Perrault

Week of	Topic
3/2	Part II Pre-test, Introduction to GC-MS GC-MS Training
3/9	GC×GC-MS GC×GC-MS Training
3/16	Chemometrics Demonstration Review
3/23	**SPRING RECESS, NO CLASSES**
3/30	Exam, Poster Instructions Projects
4/6	Projects
4/13	Projects
4/20	Projects
4/27	Poster Presentations Part II Post-test, Survey and Course Evaluations

Alignment of Natural Sciences Courses with Marianist and Hawaiian values of the University

The Natural Sciences Division provides an *integral, quality education:* sophisticated integrative course content taught by experienced, dedicated, and well-educated instructors.

- We *educate in family spirit* – every classroom is an *Ohana* and you can expect to be respected yet challenged in an environment that is supportive, inclusively by instructors who take the time to personally get to know and care for you.

- We *educate for service, justice and peace*, since many of the most pressing global issues (climate change, health inequity, poverty, justice) are those which science and technology investigate, establish ethical parameters for, and offer solutions to.
- We *educate for adaptation and change*. In science and technology, the only constant is change. Data, techniques, technologies, questions, interpretations and ethical landscapes are constantly evolving, and we teach students to thrive on this dynamic uncertainty.

The study of science and technology can be formative, exploring human creativity and potential in the development of technologies and scientific solutions, the opportunity to engage in the stewardship of the natural world, and the opportunity to promote social justice. We provide opportunities to engage with the problems that face Hawai‘i and the Pacific region through the Natural Sciences curriculum, in particular, those centered around severe challenges in health, poverty, environmental resilience, and erosion of traditional culture. The Marianist Educational Values relate to Native Hawaiian ideas of *mana, na'auao, ohana, aloha* and *aina*. We intend for our Natural Sciences programs to be culturally-sustaining, rooted in our Hawaiian place, and centered on core values of *Maiau,* be neat, prepared, careful in all we do; *Makawalu,* demonstrate foresight and planning; *`Ai,* sustain mind and body; *Pa`a Na`au,* learn deeply.

Late Work and Absence Policy

Attendance is very important. You will have attendance points deducted for every unexcused absence or late arrival. In addition, you will have in-class work problems and discussion directly associated with homework and quizzes.

Unexcused absences for two consecutive weeks may result in being withdrawn from the course by the instructor.

A planned, excused absence must be communicated to the instructor at least one week prior to the class. Necessary arrangements will be made to meet student learning objectives.

An unplanned, excused absence must be communicated to the instructor within one week of the missed class. Necessary arrangements will be made to meet student learning objectives.

Determination of valid excuses for missed classes is at the sole discretion of the instructor.

Student athletes must communicate absences at the earliest possible notice to their instructor. Students are not allowed to miss class for practices.

Grades of "Incomplete"

Students and instructors may negotiate an incomplete grade when there are specific justifying circumstances. An Incomplete Contract (available from the Divisional Secretary and the Portal) must be completed. When submitting a grade the "I" will be accompanied by the alternative grade that will automatically be assigned after 90 days. These include IB, IC, ID, and IF. If only an "I" is submitted, the default grade is F. The completion of the work, evaluation, and reporting of the final grade is due within 90 days after the end of the semester or term. This limit may not be extended.

Writing Policy

All written products should follow instructions as noted in the assignments tab on Canvas.

Instructor and Student Communication

Questions for this course can be emailed to the instructor, sent in Canvas, or addressed during office hours as noted on the first page of this syllabus. Online, in-person and phone conferences can be arranged. It is the responsibility of the student to check their email frequently. Report email-related problems to the Helpdesk at 808-735-4855 or helpdesk@chaminade.edu.

The instructors may post images or products from this class to social media. A photo release form will be provided if you have not already signed one in another course. Please inform the instructor in the first week of the class if you do not want to appear in these communications.

Cell phones, tablets, and laptops
Music Devices and Cellular Phones: Unless specifically permitted by your instructor, use of music devices and

cell phones is prohibited during all Natural Science and Mathematics classes, as it is discourteous and may lead to suspicion of academic misconduct. Students unable to comply will be asked to leave class. Out of consideration for your classmates, please set your cell phone to silent mode during class. Students are encouraged to bring laptops or tablets to class as the instructor will assign online activities and readings that will require the use of a laptop or tablet. Laptops and tablets should not be misused, such as checking distracting websites. Use your best judgment and respect your classmates and instructor.

Disability Access

If you need individual accommodations to meet course outcomes because of a documented disability, please speak with me to discuss your needs as soon as possible so that we can ensure your full participation in class and fair assessment of your work. Students with special needs who meet criteria for the Americans with Disabilities Act (ADA) provisions must provide written documentation of the need for accommodations from the Counseling Center by the end of week three of the class, in order for instructors to plan accordingly. If a student would like to determine if they meet the criteria for accommodations, they should contact the Counseling Center at (808) 735-4845 for further information (counselingcenter@chaminade.edu).

Title IX Compliance

Chaminade University of Honolulu recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct, physical and/or psychological abuse will NOT be tolerated at CUH. If you have been the victim of sexual misconduct, physical and/or psychological abuse, we encourage you to report this matter promptly. As a faculty member, I am interested in promoting a safe and healthy environment, and should I learn of any sexual misconduct, physical and/or psychological abuse, I must report the matter to the Title IX Coordinator. If you or someone you know has been harassed or assaulted, you can find the appropriate resources by visiting Campus Ministry, the Dean of Students Office, the Counseling Center, or the Office for Compliance and Personnel Services.

Attendance Policy

The following attendance policy is from the 2018-2019 Academic Catalog (p. 57-58): Students are expected to attend regularly all courses for which they are registered. Student should notify their instructors when illness or other extenuating circumstances prevents them from attending class and make arrangements to complete missed assignments. Notification may be done by emailing the instructor's Chaminade email address, calling the instructor's campus extension, or by leaving a message with the instructor's division office. It is the instructor's prerogative to modify deadlines of course requirements accordingly. Any student who stops attending a course without officially withdrawing may receive a failing grade. Unexcused absences equivalent to more than a week of classes may lead to a grade reduction for the course. Any unexcused absence of two consecutive weeks or more may result in being withdrawn from the course by the instructor, although the instructor is not required to withdraw students in that scenario. Repeated absences put students at risk of failing grades. Students with disabilities who have obtained accommodations from the Chaminade University of Honolulu ADA Coordinator may be considered for an exception when the accommodation does not materially alter the attainment of the learning outcomes. Federal regulations require continued attendance for continuing payment of financial aid. When illness or personal reasons necessitate continued absence, the student should communicate first with the instructor to review the options. Anyone who stops attending a course without official withdrawal may receive a failing grade or be withdrawn by the instructor at the instructor's discretion.

Academic Conduct Policy

See the current Undergraduate Academic Catalog and the Student Handbook available from Student Affairs.

The instructor may modify elements of this syllabus according to the operational needs of the class.