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Course: CHEM.5140 Advanced Analytical Chemistry

Instructor: Dr. David K. Ryan
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Course Description: Designed to provide graduate students and senior undergraduate students with an understanding of the principles and the theory of analytical measurements and instrumentation. The course is divided into three sections consisting of a) analytical measurements including potentiometry and voltammetry, b) spectrophotometric instrumentation (i.e. for molecular spectrometry), and c) theory and practice of spectrophotometry. This course is required for graduate programs in Analytical Chemistry and Environmental Studies (Ph.D.) and is recommended for students in other graduate programs such as Biology, Biochemistry, Environmental Studies (MS) and other areas of chemistry.

Website: http://faculty.uml.edu/David_Ryan/84.514 is the URL for the course website. Every effort will be made to post current PowerPoint slides, class recordings and handouts on the Course Materials page. These are provided as a courtesy and for your enhanced learning experience and are not a guaranteed part of the course. Technical problems may occur at times and students should plan to take notes.

Book: Principles of Instrumental Analysis, 7th Edition, 2018
(not required) by Skoog, Holler and Crouch (the 6th or 5th Editions are also good)

Topics: Electrochemistry (Potentiometry, Voltammetry)
Molecular Spectroscopy (UV-vis, Fluorescence, Luminescence)

Exams: Three exams to be given outside of class time, no cumulative final exam.
Last hour exam will be given the week after last class at 8:00 AM in Olney 518.
No excuse for missing exam. Cellphones cannot be used as calculators or for any other purpose during class or exams.

Quizzes: Occasional unannounced quizzes at the end of class.

Grading: Exams makeup 75% of total grade (25% each)
Quizzes 5% (discretionary)
Student Projects makeup the remaining 20%

Projects: Each student must complete a project consisting of either a 10 minute class presentation or a research paper.
Projects should build on fundamentals presented in class, but, should give additional information on advanced techniques or important applications.

Project topics must be approved in advance.
A minimum of 10 literature sources must be used (e.g. journals such as Analytical Chemistry, Applied Spectroscopy, Analytica Chimica Acta, and others; books and book chapters).
A reference list must be submitted for either type of project.
All projects must be completed by the last class (The earlier the better!)
Sample Topics: Cryogenic Fourier Transform Spectroscopy
(don't use these) Non-Dispersive Infrared Analyzers
Coherent Anti Stokes Raman Spectroscopy
Optical Multichannel Analyzers

Additional Material: Handouts are posted on the website for extra reading and to enhance the discussion of certain topics.

Class Recordings: Audio and video recordings of classes are available for your use (see Course Materials page of website) in case you miss a class or wish to review the material. These recordings are not a good substitute for attending class. Students in the past who have attempted to learn the course material solely by watching the videos have always done poorly compared to those who attend the lectures. Videos will be assigned in the event of university closures and if the professor is traveling.

Cell Phones & Calculators Cell phone use is not permitted in the classroom during the class period. This includes voice calls, texting, internet use or using cell phones as calculators. Calculators are allowed for exams.

Disability Accommodations: The University of Massachusetts Lowell is committed to serving all students including those with disabilities as defined by federal regulations. If you have a disability and are not yet being accommodated please contact the Office of Student Disability Services at disability@uml.edu to register for accommodations. They are located in The Wellness Center at University Crossing Suite #300 and may be called directly at 978-934-4574.

Academic Integrity: All students are advised that there is a University policy regarding academic integrity. It is the students' responsibility to familiarize themselves with these policies. [Undergraduate academic integrity policy & Graduate academic integrity policy](#) can be found at these links.

Mental Health & Wellbeing: We are a campus that cares about the mental health and well-being of all individuals in our campus community. Your personal health and well-being can impact your success in this course. Students sometimes experience mental health concerns or stressful experiences that interfere with academics and have a negative impact on everyday life. If you or someone you know are experiencing mental health challenges at UMass Lowell, please contact Counseling (information below). [Counseling Services](#) provides crisis intervention, assessment, referrals, short-term individual counseling, group therapy, and on-call clinicians outside of business hours. They are located at University Crossing Suite 300 and their 24/7 phone number is 978-934-6800.
[UMatter2](#) is a university-wide initiative to support students and promote mental health. The office may be reached at 978-934-6671.
Consider also reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.