Syllabus for Chem 365-01/465-01
Introduction to Proteomics
Fall Semester 2021

Instructor: Dr. Paul Chiarelli, office FH 102 (email: mchiare@luc.edu, phone 773-508-3106) Office Hours Monday/Wednesday 9:30-11:30 AM by zoom meeting. If your wish to have an in person meeting please make an appointment.

Book: "Introducing Proteomics" by Josip Lovric, Wiley-Blackwell, LTD, ISBN 978-0-470-03523-8.

Objectives: The principle objective of this course is to acquaint students with different analytical methods (mass spectrometry, chromatography, x-ray crystallography, and optical spectroscopy techniques) that are used to answer questions about protein structure and carry out protein quantification. Particular emphasis will be placed on mass spectrometric methods of analysis because such methods are most frequently used to determine protein primary structure, post-translational modifications, and the atoms or amino acids involved in hydrogen-bonding interactions. Students will learn how different mass analyzers and ion sources function.

COVID Pandemic Policies relating to class:

Every class that meets on campus must have a seating chart for the purpose of contact tracing. Therefore students are being asked to stay in the seat in each class for the duration of the semester. We will make the chart the first day of class.

As a Departmental policy, even in the event the University relaxes its universal requirement for indoor mask-wearing during the Fall 2021 semester, it will remain a principle of this class-section that, out of respect for the health of housemates and others in regular contact with members of our community, in this class we properly wear masks at all times (e.g. over nose and mouth). You are allowed to remove your mask only to drink in class. You are not allowed to eat in class.

Office hours will be held by zoom. If you wish to see me in person, please make an appointment.

Please be familiar with and adhere to all the other guidelines posted on the *On-Campus Guidelines in Classroom Scenarios of the Return to Campus Guidelines* site: (https://www.luc.edu/returntocampus/classroomscenarios/)

Class Procedures: The class will meet on Tuesdays and Thursdays days from 5:30 to 6:45 PM in Dumbach Hall 227. This is a 3 hr. credit course. Lectures will be recorded and made available on Sakai.

Tentative List of Lectures

Aug 31	Tuesday	Introduction, Syllabus, What is Proteomics?
Sept 2	Thursday	Review of Protein Structure
Sept 7	Tuesday	Protein Isolation Methods, Planar Chromatography
Sept 9	Thursday	Electrophresis/Gel Chromatography Methods
Sept 14	Tuesday	Column Chromatography methods, Ion exchange Chromatography, HPLC
Sept 16	Thursday	Size Exclusion and Capillary Electrophoresis Chromatography
Sept 21	Tuesday	**Exam 1** Protein Structure and Chromatography
Sept 23	Thursday	Protein Molecular Weight Determinations by Mass Spectrometry, Electrospray Ionization
Sept 28	Tuesday	Mass Analyzers; Time-of-Flight Mass Analyzers
Sept 30	Thursday	Trapped ion mass analyzers: Ion Traps, Orbitraps, and FT-ICR
Oct 5	Tuesday	Tandem Mass Spectrometry and primary sequence Determination of peptides
Oct 7	Thursday	Electron Capture Dissociation of peptides and proteins
Oct 12	Tuesday	Midterm Break
Oct 14	Thursday	**Exam 2**: Instrumentation and tandem MS sequencing
Oct 19	Tuesday	Top-Down tandem mass spectrometry analysis
Oct 21	Thursday	Using Databases to identify Proteins
Oct 26	Tuesdays	MS Strategies for determining post-translational modifications
Oct 28	Thursday	Glycoprotein analysis strategies
Nov 2	Tuesday	X-ray crystallography (Dr. Ken Olsen)
Nov 4	Thursday	X-ray crystallography (Dr. Ken Olsen)

Nov 9	Tuesday	**Exam 3** Protein MS and X-ray crystallography
Nov 11	Thursday	Instrumentation and strategies for determining hydrogen bonding interactions: HDX analysis
Nov 16	Tuesday	Fast photochemical oxidation of proteins
Nov 18	Thursday	Protein Quantification Methods
Nov 23	Tuesday	Protein Quantification Methods, ICAT
Nov 25	Thursday	Thanksgiving
Nov 30	Tuesday	Tissue Imaging, MALDI
Dec 2	Thursday	Tissue Imaging, DESI
Dec 7	Tuesday	Optical Methods for Protein Analysis
Dec 9	Thursday	Optical Methods continued, Circular Dichroism

Final Exam

The University sets the schedule for all final exams. The final will be held on:

Tuesday December 14 5:30 to 7:30 PM

You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you start late. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either.

Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams. Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. If a student reports having four final examinations scheduled for the same date, students should be directed to e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (apatricoski@luc.edu).

A link to the LUC academic calendar may be found here: www.luc.edu/academics/schedules

Grading: For students enrolled in Chem 365, your course grade will be based on three exams, two problem sets and a final. Each exam and the final are worth 20% of your grade (80% total). Each problem set is worth 10% of your grade (20% total). Students in Chem 465 will have one additional requirement. They will write a five-page paper describing how they will answer a particular structural question using chromatography and mass spectrometry. The topic must be agreed on **by the student and the**

instructor. It may be a problem related to your own research. Students in Chem 465 will complete the same problem sets, take the same exams and final as the students enrolled in Chem 365. For Chem 465, each exam will be 15% (45% of your total grade), problem sets will be 10% each (20% total), the paper will be 15%, and the final 20% of your final grade. The grading scale is as follows:

A 100-91; **A-** 90-87; **B+** 86-83; **B** 82-79; **B-** 77-74; **C+** 73-70; **C** 69-66; **C-** 65-62; **D** 61-58; **F** <58.

I may adjust this scale (in your favor) over the course of the semester.

Recording of Zoom class meetings

In this class software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. All recordings will become unavailable to students in the class when the course has concluded. The use of all video recordings will be in keeping with the University Privacy Statement shown below.

Privacy Statement

Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use.

Course Repeat Rule

Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: http://www.luc.edu/chemistry/forms/ and personally meet and obtain a signature from

either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

Student Accommodations

If you have any special needs, please let me know in the first week of classes. The university provides services for students with disabilities. Any student who would like to use any of these university services should contact the Student Accessibility Center (SAC), Sullivan Center, (773) 508-3700. Further information is available at http://www.luc.edu/sac/.

Academic Integrity

All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at:
http://www.luc.edu/cas/advising/academicintegritystatement/

A basic mission of a university is to search for and to communicate the truth as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty. Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents. Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to the Chair of Chemistry and Biochemistry who will decide what the next steps may be. Cheating on an exam or plagiarizing an assignment will result in a grade of zero for the course.

Loyola University Absence Policy for Students in Co-Curricular Activities (including ROTC)

Students missing classes while representing Loyola University Chicago in an official capacity (e.g. intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes. Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation (develop standard form on web) describing the reason for and date of the absence. An appropriate faculty or staff member, and it must sign this documentation must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time.

https://www.luc.edu/athleteadvising/attendance.shtml

Accommodations for Religious Reasons
If you have observances of religious holidays that will cause you to miss class or otherwise effect your performance in the class you must alert the instructor ***within 10 calendar days of the first class meeting of the semester*** to request special accommodations, which will be handled on a case-by-case basis.