

 FLORIDA ATLANTIC UNIVERSITY	NEW COURSE PROPOSAL Graduate Programs		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____	
	Department Chemistry and Biochemistry College Science (To obtain a course number, contact erudolph@fau.edu)			
Prefix CHM Number 6177	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) Lab Code	Type of Course Lecture	Course Title Bioanalytical Methods and Applications	
Credits (Review Provost Memorandum) 2	Grading (Select One Option) Regular ☒ Sat/UnSat ☐	Course Description (Syllabus must be attached; see Guidelines) The diversity and complexity of biomolecules demand highly sophisticated instruments to study. Moreover, their fragility and heterogeneity impose difficulty for isolation and purification. This course aims to introduce the latest methodologies and technologies for analyzing biomolecules. In addition, multidiscipline strategies and solutions for preparation, characterization and quantification will be discussed. Students will learn and practice research design, data analysis, and result interpretation in their own fields of interests.		
Effective Date (TERM & YEAR) Spring 2023				
Prerequisites N/A		Corequisites N/A	Registration Controls (Major, College, Level) Graduate standing	
Prerequisites, Corequisites and Registration Controls are enforced for all sections of course				
Minimum qualifications needed to teach course: Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)		List textbook information in syllabus or here Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler, Stanley R. Crouch, Cengage Learning; 7th edition (January 1, 2017), ISBN-10: 9781305577213, ISBN-13: 978-1305577213		
Faculty Contact/Email/Phone Qi Zhang, Ph.D./zhangq@fau.edu/(561) 799-8575		List/Attach comments from departments affected by new course This will be included as a required course in the Chemistry and Biochemistry Ph.D. and M.S. degree programs; there is currently no equivalent course being taught.		

Approved by Department Chair <u>Andrew C. Terentis</u> College Curriculum Chair <u>Louis Merlin</u> College Dean _____ UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	Digitally signed by Andrew C. Terentis DN: cn=Andrew C. Terentis, o=Florida Atlantic University, ou=Department of Chemistry and Biochemistry, email=terentis@fau.edu, c=US Date: 2022.11.03 16:36:19 -0400	Date <u>11/03/2022</u> _____ _____ _____ _____ _____ _____
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Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

CHM 6177
Bioanalytical Methods and Applications

Spring 2023

Prof. Qi Zhang

Office: PS-216

Telephone: (561) 799-8575

Email: zhangq@fau.edu

Class Meeting Days: TBD

Class Meeting Hours: TBD

Class Location: TBD

Office Hours: M and W, online or in person by appointment, 2:30PM-3:30PM. Location: PS-216

Course Withdrawal: Jan 20, 2023. Last day to drop course with 25% tuition adjustment. Feb 29, 2023, Last day to drop course without a "W".

Number Credit Hours: 2

I. Course Description:

The diversity and complexity of biomolecules demand highly sophisticated instruments to study. Moreover, their fragility and heterogeneity impose difficulty for isolation and purification. This course aims to introduce the latest methodologies and technologies for analyzing biomolecules. In addition, multidiscipline strategies and solutions for preparation, characterization and quantification will be discussed. Students will learn and practice research design, data analysis, and result interpretation in their own fields of interests.

II. Course Objectives and Learning Outcomes:

This course is designed to provide all students with a solid understanding of the mechanisms, applications, and care of modern analytic approaches and instruments used for analyzing biological samples. Students who successfully complete this course will be proficient in understanding of operating principles of each type of instrument, its optimal area of application, sensitivity, precision, advantages and limitations. Homework assignments and additional take-home exams will help students to develop critical thinking skills in the areas of research design, instrument selection, method development and data interpretation.

III. Instructional methods:

This class is designated as "In-person." Traditional concept of in person instructional method where course content and learning material are taught in person to students. Attendance is mandatory.

IV. Recommended Texts and Materials:

- 1) Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler, Stanley R. Crouch, Cengage Learning; 7th edition (January 1, 2017), ISBN-10: 9781305577213, ISBN-13: 978-1305577213

V. Course Prerequisites:

VI. Attendance Policy:

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

VII. Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <https://www.fau.edu/counseling/>

VIII. Disability Policy Statement:

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

IX. Code of Academic Integrity Policy Statement:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high-quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](#).

X. Policy on the Recording of Lectures:

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity, see [University Regulation 4.001](#).

XI. Exams:

There will be two in-class exams (60 min each) and one take-home open-book exam. Exam rules will be clearly shown on the front page of every exam and it is the responsibility of every student to read and adhere to these rules.

There will be no make-up exams, except in the following cases:

1. Medical emergency or problem
2. Death in the immediate family
3. Participation in an FAU-sponsored academic or athletic activity/event
4. Required appearance in a civil or criminal court
5. Military obligations
6. Religious Holiday

A request for exemption from the exam policy for any of the above reasons will be considered only if the student *does not attempt* a given exam AND written documentation (e.g., medical certificate etc.) is submitted to the professor within 1 day (before or after) of the scheduled exam date. Also, please see the Attendance Policy.

XII. Assignments:

Monthly homework assignment for recent research papers and essay questions on related topics will be given at the beginning of every month. The assignment will compose of one or two review papers and one primary research paper, which are all related to a topic covered in the lectures. All students are expected to read through all assigned papers. For the course, he or she will write an introductory essay in the style of *Nature* "News & Views" about a primary research paper he/she choose. Particularly, the essay should start with an overview of the topic/field, an introduction of the attending problem, a comprehensive description of the primary research, an analysis of its discovery and significance, and end with a brief discussion of the prospect. The length of the essay should be around 1,000 words.

XIII. Course Grade:

The grading scale for the course will be A (95-100%), A- (90-94%), B+ (87-89%), B (83-86%), B- (79-82%), C+ (75-78%), C (71-74%), C- (68-70%), D+ (64-67%), D (60-63%), and F (<59%).

The course grade is made up of the following components:

Components		Points
Exam 1	=	30 points
Exam 2	=	30 points
Assignments	=	20 points (one take-home exam)
Attendance	=	20 points
Total	=	100 points (max)

Incomplete grade: Incompletes will not be given unless: a) a student is passing the course and b) a student encounters severe and unexpected problems and was not able to complete some portion of the work assigned to all students as a regular part of the course. Incompletes are given only by arrangement with the instructor. Students are expected to make up incompletes as soon as reasonably possible. Incompletes are not given because a student is doing poorly in the course.

XIV. Tentative Course Schedule:

Date	Information
Jan 9 th	Introduction to course, analytical instruments, and research design
Jan 11 th	Basic spectral properties and spectrometric measurements
Jan 16 th	M.L. King Jr. day (no class)

Jan 18 th	Structural and spectral properties of biomolecules
Jan 23 rd	UV-Vis spectrometry and fluorospectrometer
Jan 25 th	Fundamentals of optical microscopy and label-free optical imaging
Jan 30 th	Fluorescent probes and epi-fluorescence microscopy
Feb 1 st	Confocal, multiphoton, and light-sheet microscopies*
Feb 6 th	Fluorescence lifetime imaging*
Feb 8 th	Super-resolution microscopy*
Feb 13 th	Infrared, Raman, and vibrational spectroscopy
Feb 15 th	Optical Tweezers
Feb 20 th	Atom force microscopy
Feb 22 nd	Electron microscopy
Feb 27 th	X-Ray spectrometry and cryoEM
Mar 1 st	Nuclear magnetic resonance spectroscopy; Take-home open-book exam given
Mar 6 th – 10 th	Spring break (no class)
Mar 13 th	Review; Take-home open-book exam due
Mar 15 th	Exam 1
Mar 20 th	Thermal analysis: DSC ant TGA
Mar 22 nd	Isothermal titration calorimetry (ITC) principles and application
Mar 27 th	Light scattering and its application in characterization of nanoparticles, macromolecules, and assemblies
Mar 29 th	Chromatography and high-performance liquid chromatography
April 3 rd	Electrophoresis
April 5 th	Nucleotide-based assays
April 10 th	Mass spectroscopy**
April 12 th	High-throughput assay principles and application**
April 17 th	Multi-omics**
April 19 th	Development and application of bioassay technologies**
April 21 st	Statistical analysis, signal-to-noise, and control experiments
April 24 th	Review
April 26 th	Exam 2

* Potentially, a field trip to Cell Imaging, Advanced Bioimaging Centers at the FAU Stiles-Nicholson Brain Institute and the Max Planck Florida Institute for Neuroscience will be scheduled in one of those days. Participation is voluntary.

** Potentially, a field trip to X-Ray Crystallography, Nuclear Magnetic Resonance, Metabolic, High-Content Imaging, Mass Spectrometry and Proteomics Cores at the UF Scripps Biomedical Research Institute will be scheduled in one of those days. Participation is voluntary.