FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department Chemistry and Biochemistry

College Science

*(To obtain a course number, contact **erudolph@fau.edu**)*

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

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

Effective Date *(TERM & YEAR)*
Spring 2023

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*

The diversity, complexity and variability of biomolecules demand highly sophisticated instruments to measure. Moreover, their fragility and heterogeneity impose tremendous difficulty for isolation and purification. This course aims to introduce the most recent developments and applications of innovative methodologies and technologies for analyzing biomolecules in various biological samples. In addition, multidisciplinary strategies and solutions for sample isolation, characterization and quantification will be discussed. Students will also learn and practice research design, data

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		***Date***
Department Chair	Andrew C. Terentis — 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: 2022.10.24 13:31:45 -04'00'	
College Curriculum Chair	Louis Merlin	10/26/2022
College Dean	William D Kalies — Digitally signed by William D Kalies Date: 2022.10.26 14:20:17 -04'00'	
UGPC Chair		
UGC Chair		
Graduate College Dean		
UFS President		
Provost		

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) 297-8575
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:

Analytical chemistry deals with methods and instruments that can determine the quality and the quantity of matters of interest. For biological samples, special cares are necessary to deal with their fragility, heterogeneity and complexity. This course covers the operating principles and practical application of modern methodologies and technologies used for chemical analysis for biological samples. In addition, multidisciplinary approaches for sample isolation, characterization and quantification will be discussed. All students will learn about the principles of research design, data analysis, and result interpretation. In addition, students will have reading assignments for in-depth learning.

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 Universityapproved 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:

COVID-19 Statement

Due to the surge in COVID19 cases and the delta variant, all students regardless of vaccination status are expected to wear masks while indoors in any FAU facilities, including classrooms and laboratories. Students experiencing flu-like symptoms (fever, cough, shortness of breath), or students who have come in contact with confirmed positive cases of COVID-19, should immediately contact FAU Student Health Services (561-297-3512). Symptomatic students will be asked to leave the classroom to support the safety and protection of the university community. For additional information visit https://www.fau.edu/coronavirus/. In classes with face-to-face components, quarantined or isolated students should notify me immediately as you will not be able to attend class. I will not be able to offer an online version of the class but will make reasonable efforts to assist students in making up the work. Vaccinated students have much lower chances of needing to quarantine and a much lower chance of missing class time.

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 1day (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 9th	Introduction to course, analytical instruments, and research design
Jan 11th	Basic spectral properties and spectrometric measurements
Jan 16th	**M.L. King Jr. day (no class)**
Jan 18th	Structural and spectral properties of biomolecules
Jan 23rd	UV-Vis spectrometry and fluorospectrometer
Jan 25th	Fundamentals of optical microscopy and label-free optical imaging
Jan 30th	Fluorescent probes and epi-fluorescence microscopy
Feb 1st	Confocal, multiphoton, and light-sheet microscopies*
Feb 6th	Fluorescence lifetime imaging*
Feb 8th	Super-resolution microscopy*
Feb 13th	Infrared, Raman, and vibrational spectroscopy
Feb 15th	Optical Tweezers
Feb 20th	Atom force microscopy
Feb 22nd	Electron microscopy
Feb 27th	X-Ray spectrometry and cryoEM
Mar 1st	Nuclear magnetic resonance spectroscopy; Take-home open-book exam given
Mar 6th – 10th	**Spring break (no class)**
Mar 13th	Review; Take-home open-book exam due
Mar 15th	**Exam 1**
Mar 20th	Thermal analysis: DSC ant TGA
Mar 22nd	Isothermal titration calorimetry (ITC) principles and application
Mar 27th	Light scattering and its application in characterization of nanoparticles, macromolecules, and assemblies
Mar 29th	Chromatography and high-performance liquid chromatography
April 3rd	Electrophoresis
April 5th	Nucleotide-based assays

April 10th	Mass spectroscopy**
April 12th	High-throughput assay principles and application**
April 17th	Multi-omics**
April 19th	Development and application of bioassay technologies**
April 21st	Statistical analysis, signal-to-noise, and control experiments
April 24th	Review
April 26th	**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.