

SPRING 2021
CHEM 5319 / 6319
Contemporary Topics in Analytical Chemistry
(Analysis and Characterization of Nanomaterials)
Time 10:30 - 11:50 AM TR (Virtual Synchronous via Zoom)

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Brief Course Description:

Given the graduate nature of this course, I would like to share my expertise as an editor by providing an overview on *how to get published in scientific journals*, an important skill every graduate student must have. The course will then shift to our main topic, multidisciplinary techniques for the analysis and identification of engineered nanomaterials. Nanotechnology has grown exponentially in the last decades, and although common characterization techniques have been used in the development and production phases; such analytical techniques present limitations when analyzing complex samples. This course aims to present the adaptation of existing techniques and the development of new methods to identify and characterize nanomaterials. We will review the evolution of analytical techniques for nanomaterials, from the analysis of samples with simple matrices to matrices of higher complexity and at relevant analyte concentration.

Objectives:

- Summary on “how to get published in scientific journals, impact factors, *H-index*”.
- To learn state of the art techniques in analytical chemistry
- To apply the acquired knowledge to your research
- To develop interdisciplinary research abilities

Contents

1-Preface: Journal impact factors, h-index, summary on “How to get published in scientific journals.”

2-Background

- 1.1-Nanoparticles in nature
- 1.2-Nanotechnology
- 1.3-Physicochemical characterization
- 1.4-Characterization challenges

3-Sample Preparation

- 2.1-Digestion
- 2.2-Centrifugation
- 2.3-Filtration & Ultrafiltration
- 2.4-Liquid Solid Extraction

4-Electron Microscopy

- 3.1-TEM

- 3.2-Cryofixation
- 3.3-ESEM
- 5-Light Scattering
 - 4.1-DLS
 - 4.2-NTA
- 6-Spectroscopy Techniques
 - 5.1-GFAAS
 - 5.2-ICP OES
 - 5.3-ICP MS
 - 5.4-SP ICP MS
 - 5.5-XAS
 - 5.6-XRF-Hyperspectral Microscopy
- 7-Separation Techniques
 - 6.1-Field Flow Fractionation
 - 6.2-Electrophoresis
 - 6.3-Hydrodynamic Chromatography
- 8-Electroanalytical Techniques
- 9-Chemical Sensors
- 10-Carbon based nanomaterials

Students will be required to make a class presentation and to write a short paper (more details will be given the first class).

Evaluations:

Exams: 50% (in-class quizzes, midterm, and the final exam)

Presentation: 20 %

Research paper: 25 %

Attendance: 5%

Class Participation Bonus: 5 %

Grades:

A: 89% - 100%, B: 79% - 89%, C: 70%-79%, D: 60%-69%, F: <60%

Important Dates:

- Midterm: 03/11/2021
- Final Exam: 05/11/21

Absence:

Doctor note can be accepted for the absence of class to avoid absence penalty. But any missing exams, quizzes, and other in-class tests will not be arranged for the student to make up.

Academic honesty:

Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.

Students with Disabilities

If you have or believe you have a disability, you may wish to self-identify. You can do so by providing documentation to the Office of disabled Student Services located in Union E Room 203. Students who have been designated as disabled must reactivate their standing with the Office of Disabled Student Services on a yearly basis. Failure to report to this office will place a student on the inactive list and nullify benefits received. If you have a condition which may affect your ability to exit safely from the premises in an emergency or which may cause an emergency during class, you are encouraged to discuss this in confidence with the instructor and/or the director of Disabled Student Services. You may call 747-5148 for general information about the Americans with Disabilities Act (ADA).

All grades of Incomplete must be accompanied by an Incomplete Contract that has been signed by the instructor of record, student, departmental chair, and the dean. Although UTEP will allow a maximum of one year to complete this contract, the College of Science requests it be limited to one month based upon completion data. A grade of Incomplete is only used in extraordinary circumstances confined to a limited event such as a missed exam, project, or lab. If the student has missed a significant amount of work (e.g. multiple assignments or tasks), a grade of Incomplete is not appropriate or warranted.

Syllabus is subject to change. Any change will be announced in class, or by email, or posted on the Blackboard site during the semester. You are solely responsible for getting the most updated information.