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Fall 2020

## EVSC 612-101: Environmental Analysis

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## EVSC 484/612 Environmental Analysis *Course Syllabus*

**NJIT Academic Integrity Code:** All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

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### **Course Description:**

Environmental Analysis (EVSC 484/612) is designed to acquaint students with identifying and quantitatively measuring pollutants at trace levels in environmental matrices including, waters, soils, sediments, and air. The course covers a wide range of topics such as the errors and statistics in microanalysis, instrumentations used to measure organic and inorganic pollutants, authentic identification of pollutants and their quantifications, as well as their extractions from sample matrices and purifications. Additional topics involve in-depth discussions on the concepts, chemistry, and techniques applied in such trace chemical analysis. There will be labs in which students are exposed to techniques and instrumentation used in environmental measurements.

**Prerequisites:** Students must have an in-depth understanding of general chemistry.

**Delivery Format:** This course consists of both lectures and laboratory components. During the first six weeks of the course, we will have only the lecture and group activities: 100% online. In week 7, we will have a mid-term exam, followed by safety, environmental compliance, and standards. The last six weeks of the semester will involve hands-on exposure to environmental sampling and analysis. These labs are designed to reinforce the lecture aspects. The lab sessions will accommodate only 1/3 of the class in compliance with the CDC Guidelines of social distancing.

**Number of Credits:** 3

**Prerequisites:** Students must have an in-depth understanding of general chemistry.

### **Learning Outcomes:**

- Recall fundamental concepts in general chemistry, laboratory procedures and practices
- Demonstrate why a particular substance is important and describe its behavior in the environment
- Apply the concepts of sampling, subsequent analysis, the choice of laboratory and field analysis and introduction of quality assurance and quality control
- Understand the principles of various instrumental techniques including spectroscopy, chromatography, electroanalytical methods, sensors, and field techniques
- Demonstrate the ability to identify and quantitatively measure pollutants at trace levels of concentrations in environmental matrices including, waters, soils, sediments, and air
- Apply classical and instrumental techniques to chemical analysis
- Understand why one specific technique is often preferable
- Demonstrate practical knowledge of analysis of real environmental samples

| Course-Section                 | Instructor               |
|--------------------------------|--------------------------|
| Environmental Analysis         | Professor Omowunmi Sadik |
| CRN 92799/92801 – EVSC 484/612 |                          |

## Recommended Textbooks:

|                  |                                 |
|------------------|---------------------------------|
| <b>Title</b>     | Intro to Environmental Analysis |
| <b>Author</b>    | Roger Reeve                     |
| <b>Edition</b>   | Wiley                           |
| <b>Publisher</b> | 2001                            |
| <b>ISBN #</b>    | 9780471492948                   |

|                  |   |
|------------------|---|
| <b>Title</b>     | Environmental Chemical Analysis                         |
| <b>Author</b>    | Somenath Mitra, Pradyot Patnaik and Barbara B. Keibekus |
| <b>Edition</b>   | CRC Press, 2nd Edition, 2018                            |
| <b>Publisher</b> | 2018  |
| <b>ISBN #</b>    | 978-0-8493-3838-0 (paperback)                           |

**University-wide Withdrawal Date:** The last day to withdraw with is Monday, November 9, 2020. It will be strictly enforced.

***Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.***

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)”*

## **POLICIES**

**All CES students must familiarize themselves with and adhere to all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.**

**Grading Policy:** The final grade in this course will be determined as follows:

|           |               |          |            |
|-----------|---------------|----------|------------|
| <b>A</b>  | 90% and above | <b>C</b> | 50 to 50%  |
| <b>B+</b> | 80 to 89 %    | <b>D</b> | 40 to 49 % |
| <b>B</b>  | 70 to 79 %    | <b>F</b> | Below 40 % |
| <b>C+</b> | 60 to 69 %    |          |            |

| <b>Grading Criteria</b>                         | <b>EVSC 484</b> | <b>EVCS 612</b> |
|---|-----------------|-----------------|
| Exam I  | 100 points      | 100 points      |
| Exam II   | 100 points      | 100 points      |
| Project Report/Research Proposal                | NA              | 100 points      |
| Group Discussion*                               | 50 points       | 50 points       |
| Lab Experiment Reports and Homework Assignments | 100 points      | 100 points      |

\*Students should submit their contributions to the group discussion for grading at the end of each group session.

### **Project Report/Research Proposal:**

You will select an environmental analysis research topic, research the instrumental/analytical issues involved and propose a specific analytical method for solving the selected problem. The project due date is **November 23, 2020**. The length of your report or proposal should be at least 25 pages. The report will include:

- Objective of the work (define the analytical questions or what type of analyte? What media? What motivates the analysis?)
- Background: Chemistry, occurrence, source, fate, and their control by regulations and standards
- Method: Sample collection, sample storage information, sample preparation, and step-by-step methodology with detailed quality control procedures, as well as the calculation for correct reporting units.
- Laboratory safety procedures, and method validation
- Possible problems that may be encountered during the analysis
- How to address the problems encountered

### **Group Discussion:**

The purpose of a **Group Literature Discussion** is to carefully examine and sometimes evaluate a research work or an aspect of a research work of **literature**. This provides a way for students to engage in critical thinking and reflection as they read, discuss, and respond to research literature. Collaboration is at the heart of this approach. Students reshape and add onto their understanding as they construct meaning with other readers. Instructor will assign a literature paper prior to the class meeting and this will be discussed in group setting in class. Students are also free to suggest any topic or paper that they would like to be used during the class group Discussion. Students should submit their contributions to the group discussion for grading at the end of each Group Session.

### **Class Participation**

Class participation includes, but is not limited to, class engagement; attendance and response to questions during class (up to 50 points). This is a discussion driven and student centered class, students are expected to be actively involved in discussions and other class activities that would generate the robust energy needed for a successful discussion. Active participation includes completing assignments on time, being present for impromptu class discussions and quizzes. Students who record four or more unexcused absences will receive no points for class participation. You are strongly advised to use all means available to contact me if you need to be excused from class in an emergency. When you miss a class, it will be your responsibility to find out what was discussed.

**Exams:** There will be two exams. In addition, students will have to write papers on any one of the assigned topics. The lab reports will be due after each lab. The exam periods are tentative and therefore, possibly subject to change:

|                                   |                          |
|-----------------------------------|--------------------------|
| Exam I                            | Mid-October 2020         |
| Exam II                           | December 2020            |
| Labs, Lab Reports and/or Lab Quiz | November – December 2020 |

**Makeup Exam Policy:** There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor that the exam will be missed so that appropriate steps can be taken to make up the grade.

## ADDITIONAL RESOURCES

**Accommodation of Disabilities:** Office of Accessibility Resources and Services (*formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability, please contact Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at [lyles@njit.edu](mailto:lyles@njit.edu). The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided, please visit the Accessibility Resources and Services (OARS) website at:

- <http://www5.njit.edu/studentssuccess/disability-support-services/>

**Important Dates** (See <https://www5.njit.edu/registrar/fall-2020-academic-calendar/>)

| Date        | Day | Event                         |
|-------------|-----|-------------------------------|
| September 1 | Tue | First Day of Classes          |
| September 5 | Sat | Saturday Classes Begin        |
| September 7 | Mon | Labor Day                     |
| September 8 | Tue | Monday Classes Meet           |
| September 8 | Tue | Last Day to Add or Drop Class |
| November 9  | Mon | Last Day to Withdraw          |
| November 25 | Wed | Friday Classes Meet           |
| November 26 | Th  | Thanksgiving Recess Begins    |
| November 29 | Sun | Thanksgiving Recess Ends      |
| December 10 | Th  | Last Day of Classes           |

## CourseOutline

| Lecture | Topic  | Assignment |
|---------|--|------------|
| 1       | The Environment: Biogeochemical Cycles, Environmental Pollution, Effects of Pollution, The Need for Chemical Analysis                |            |
| 2       | Sampling & Storage, Data Treatment (calibration, Figures of Merit, QA/QC) and Overview of Standard Methods (US EPA, WHO, APHA, etc.) |            |
| 3       | Wet methods: spectroscopic and titrimetric methods<br><b>(Group Discussion)</b>  |            |
| 4       | Chromatography concepts and applications: GC, HPLC, IC   |            |

|                       |   |                                 |
|-----------------------|---|---------------------------------|
| 5                     | Sample extraction techniques, removal of interference<br><b>(Group Discussion)</b>    | Project topics will be approved |
| 6                     | Atomic spectroscopy: flame and furnace atomic absorption<br><b>(Group Discussion)</b> |                                 |
| 7                     | Sensors, Electrochemical Methods, and Field Techniques<br><b>(Exam 1)</b>             |                                 |
| 8*                    | Safety, laboratory practice, environmental standards<br><b>(Converged online)</b>     |                                 |
| 8*                    | Lab: sulfate analysis by spectrometry<br><b>(Converged online)</b>                    |                                 |
| 10                    | Lab: pH, conductivity and titration<br><b>(Converged online)</b>                      |                                 |
| 12                    | Lab: chemical oxygen demand<br><b>(Converged online)</b>                              |                                 |
| 13                    | <b>Exam 2 and Submission of Project Report</b>  |                                 |
| 14                    | Lab: determination of lead by atomic spectroscopy                                     |                                 |
| 15                    | Lab: volatile organic compounds by GC; check out                                      |                                 |
| *Running concurrently |   |                                 |
|                       |   |                                 |

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*Updated by Genti Price – June 19, 2020  
Department of Chemistry & Environmental Sciences (CES)  
Course Syllabus, Fall 2020*