

**Syllabus for CHEM 404/504 Advanced Analytical Chemistry
Spring 2019**

MWF 9:00-9:50 am, Room 2280

<http://blackboard.wm.edu>

Professor Rachel O'Brien

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Office hours TBD or by appointment

Course Overview:

- This course will present analytical chemistry techniques with motivation from environmental studies.
- We will be going through a detailed overview of sampling and instrumentation fundamentals followed by an investigation of techniques used in analysis of air, particle, and water samples
- Emphasis will be placed on topics of current scientific/societal interest related to the impacts of human activities on the environment
- The goal of this class is to introduce you to several of the tools you need to be an analytical chemist, and then to provide you with the opportunity to practice using those tools with case studies.

Textbook: Select chapters from Analytical Chemistry 2.1- a free online text book are recommended. For review of the fundamentals of specific techniques, you may also find Quantitative Chemical Analysis by Harris and Principles of Instrumental Analysis by Skoog helpful. Copies of both will be placed in the library.

Link to Analytical Chemistry 2.1:

http://dpuadweb.depauw.edu/harvey_web/eTextProject/version_2.1.html

Grading:	Problem sets + discussion sheets	30%
	Midterm	20%
	Final	25%
	Presentation	10%
	Paper	10%
	Participation	5%

-Problem sets: Four graded problem sets will be assigned (30 pts each). You may work together, but you must turn in your own work. Problem sets turned in after the corresponding exam (midterm) or the last day of class will not be graded. Late problem sets (without extenuating circumstances/approval from instructor) will lose 5 points.

The last 30 points will be split between 5 worksheets that you will complete after you read papers/watch videos and prepare for in-class discussion. These are graded for completion, if you have to miss that class- turn in the work sheet via e-mail.

-Exams: There will be one midterm and one final, worth 20% and 25% respectively. The exams will be in class and they will be open note. The final will be cumulative.

-Attendance & Participation: Students are expected to be present and contribute to the class. These are discretionary points for the instructor.

-Presentation: At the end of the semester, groups of 2-3 students will give an approximately 10 min presentation on a research question they jointly decide to pursue with a critique of one analytical method *each* (sample preparation + instrumentation) that can be used to study that question. The presentation will have a joint introduction and then each student will present their individual analysis/critique.

Masters students will work alone on this project and will present a solo comparison of two different techniques that are used to study the same question.

-Paper: An original paper based on current literature research will be due the last day of class. This will be an in-depth review of the technique you are presenting on with background and motivation related to the question you are answering. You may share an *outline for the introduction* (scientific question + motivation/background) with your partner but you must *each write your own text for the paper*. Additional details will be provided in class.

Topics are due February 22nd. An outline is due April 1st. This paper will be approximately 1,000 words in length (double spaced, Times New Roman, 12 point font). If you are enrolled in 404W or 504, the length is doubled. I will want to see at least 6-8 citations and you are welcome to use figures from the references, as long as you cite them properly.

-Grading policy: Standard ranges for grades will used to start. These thresholds may be lowered if needed but they will not be raised.

Percentage Score	Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
60-66	D
<60	F

Honor Code:

The College of William & Mary has had an honor code since at least 1779. Academic integrity is at the heart of the university, and we all are responsible for upholding the ideals of honor and integrity. The student-led honor system is responsible for resolving any suspected violations of the Honor Code, and I will report all suspected instances of academic dishonesty to the honor system. The *Student Handbook* (www.wm.edu/studenthandbook) includes your responsibilities as a student and the full Code. Your full participation and observance of the Honor Code is expected. To read the Honor Code, see www.wm.edu/honor

Tentative Class Outline:

1. Evaluating analytical data
2. Sample collection
3. Sample preservation
4. Sample preparation
5. Quality Control
6. Urban air pollution
7. Ozone, NO_x, CO₂, measurements
8. Chromatography + GC/MS
9. Chemical ionization mass spectrometry
10. Aerosols + GC/MS
11. Two dimensional GC and LC