

**Syllabus for CHEM 404/504 Advanced Analytical Chemistry
Spring 2022**

TR 11:00-12:20 am, Room 3280

<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	30%
	Midterm	25%
	Outline	3%
	Abstract	2%
	Presentation	15%
	Paper	20%
	Participation	5%

-Problem sets: Five 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 last day of class will not be graded. Late problem sets (without extenuating circumstances/approval from instructor) will lose 5 points.

-Exams: There will be one midterm worth 25% and a final project worth a total of 40% (outline, abstract, presentation, and paper). The midterm will be in class.

-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, students will give an approximately 12-15 min presentation on a research question they decide to pursue with a critique of two analytical methods (sample preparation + instrumentation) that can be used to study that question.

Masters students will give a 20 min presentation.

-Paper: An original paper based on current literature research will be due by the end of the time of the final (May 10th 5 pm). This can be submitted via either e-mail or blackboard. This will be an in-depth review of the techniques you are presenting with background and motivation related to the question you are answering. Additional details will be provided in class.

Topics are due February 24th. An outline is due April 5th. This paper will be approximately 3,000 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 8-10 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

Accessibility:

William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see www.wm.edu/sas.

Absences:

You are not required to attend class, but there are some in class activities that will count towards participation. These will be available on Blackboard as will the recording of the class (unless there are technical issues). The notes from the lectures will also be made available on Blackboard. You don't need to inform me when you are unable to attend, but let me know if you need extensions for any of the work in this class. If I am unable to lecture, I will assign a paper to read and a summary sheet/questions to fill out. Assuming I am feeling better for the next class, we can have an in-class discussion on the paper when I return, or we can just have that be a participation activity.

CHEM 404/504- Advanced Analytical Chemistry, Spring 2022

Special note: This semester I am taking part in a field campaign looking at Indoor Chemistry, so a few of the classes will likely be online (zoom) so I can be at the NIST test house to collect samples. I'll let you know ahead of time when those will happen. I will be out of town on the 8th, so that lecture will be asynchronous and posted to Blackboard.

Tentative Class schedule

Date				Topic	Reading	Due (tentative)
Jan	27	R	1	Intro to the class		
Feb	1	T	2	Video-introductory material	AC 2&3	
	3	R	3	Overview of analytical chem	AC 1	
	8	T	4	Statistics review	AC 4	
	10	R	5	Details on quantification	AC 4	
	15	T	6	Quant + Sample collection	AC 7	
	17	R	7	Sample preparation	AC 7	
	22	T	8	Sample preservation, extractions	AC 7	Prob 1
	24	R	9	Buffer		Research topic
March	1	T	10	Atmospheric chemistry- structure + lifetime		
	3	R	11	Urban air pollution		
	8	T	12	Ozone + ozone monitors		
	10	R	13	Ozone disc. and NOx + chemiluminescence		Prob 2
	3/12-3/20			Spring break		
	22	T	14	Organic chemistry → CO2 + NDIR		
	24	R	15	Cavity ringdown		Prob 3
	29	T	16	Review / buffer – Igor training		
31	R		<i>MIDTERM -- proctored</i>			
April	5	T	17	Chromo review		Outline due
	7	R	18	GC/MS detail + Aqueous GC/MS		
	12	T	19	Real GC + HPLC		Prob 4
	14	R	20	2D GC and LC		
	19	T	21	2D + UHRMS		Abstract due
	21	R	22	In class presentations		
	26	T	23	In class presentations		
	28	R	24	In class presentations		Prob 5
	3	T	25	In class presentations		
	5	R	26	In class presentations		
				Final paper due May 10, 5 pm		