Chemistry 584

Advanced Integrated Laboratory II

Section 801

Spring 2018

COURSE SYLLABUS

Instructors:

Mark L. Dietz

E-Mail: *dietzm@uwm.edu*

Office Number: 643

Office Hours: T/R 2:00 - 3:00 PM
(or by appointment)

Teaching Assistant (Section 801)

Charles Smith

E-Mail: *smit2429@uwm.edu*

Office Number: 642

Office Hours: TBD

Class Meeting Times:

Section 801:	Tuesday and Thursday, 9:00 AM-11:50 AM
First Day of Classes:	Tuesday, January 23, 2018
Last Day of Classes:	Thursday, May 10 , 2018

General Information:

This course comprises four experiments and a "special research project" that are intended to supplement the material covered in the Intermediate Analytical Chemistry and Physical Chemistry II courses (CHEM 524 and CHEM 562, respectively). For a passing grade, the student must successfully complete the four experiments (data collection, data analysis, written report, and exam), ***and*** a research project that includes the presentation of a research poster.

The following experiments are offered:

- **Principles of Optical Detection**
  From Wave/Particle Duality to Optical Detection for Analytical Separations

- **Molecular Electronic Transitions**
  Principles of Absorption and Fluorescence Spectroscopy

- **Reaction Kinetics**
  Monitoring the Progress of Reactions and Determination of Reaction Rate Constants

- **Spectra of Atoms**
  Physical Origin and Application to Atomic Absorption Spectroscopy

For all experiments, 3-4 lab periods (*i.e.*, 9-12 laboratory hours) are allocated. Each experiment focuses on a concept, which is illustrated by physical and analytical experiments, with the physical chemistry experiment introducing a basic phenomenon and the subsequent analytical chemistry experiment demonstrating the application of the phenomenon for analytical measurements. The remaining course periods (6-7 weeks) are devoted to a special research project of your own design. The special research project phase concludes with the presentation of your results at a research poster session (Tuesday, May 15 at 12:30 PM). **On the last day of classes (Thursday, May 10) there will be a mandatory laboratory clean up.**

Course Prerequisites:

The prerequisites for the Chemistry 584 Laboratory course are a grade of ***C*** or better in the lecture courses Chemistry 524 and Chemistry 562, ***and*** in the laboratory course Chemistry 563. You are responsible for ensuring that you have the correct prerequisites. If you do not, your registration will be canceled unless you obtain the permission of the instructor to remain.

Location of the Experiments:

The class will take place in rooms (labs) 365-375 of the Chemistry Building. Several instruments in other laboratories may be used during the Special Project phase of the course, in consultation with your Instructors.

Required Course Materials:

- A scientific electronic calculator and a permanently-bound (*i.e.*, stitched) Laboratory Notebook will be required (available at local bookstores). The use of approved safety goggles in the laboratory is mandatory at all times.

Recommended Course Materials:

- Analytical Chemistry textbooks (*e.g.*, Skoog, Holler, & Crouch. *Principles of Instrumental Analysis*, 6th Edition, published by Brooks-Cole, 2007).
- Physical Chemistry textbooks (*e.g.*, Atkins, P. W., de Paula, J. *Physical Chemistry*, 7th Edition, Freeman, 2002).

Laboratory Assignments:

All experiments will be performed by groups of 2-4 students on a rotating basis, as described below. The lab times allocated for the experiments are designed to provide sufficient time to complete the experimental work.

Before embarking on each experiment, you should carefully read the relevant section in the (separate) *Laboratory Manual for Chemistry 584* and consult the references that are provided in each section. If you have any questions concerning the experiments, do not hesitate to ask the Teaching Assistant, the stockroom manager, or the Instructor. Please inform one of these people if the apparatus for any experiment appears to be non-functional. Before the start of each experiment, the TA or the Instructor will discuss the experiment with you to determine if you are adequately prepared to conduct it.

Laboratory Safety:

A number of hazards associated with the various experiments, among them high voltage, glass vacuum apparatus, and hazardous reagents, are noted in the *Laboratory Manual*. Accordingly, students must exercise vigilance at all times while working. **In addition, all students must wear approved safety goggles whenever present in the laboratory. Also, at all times the instructions of the Teaching Assistant must be followed!** Read the Laboratory Safety Rules provided later in this Syllabus **and sign and return** the copy found on page 12.

Policies:

Department of Chemistry & Biochemistry
You are expected to fully understand the policies posted on the bulletin boards across from Room 195 and adjacent to Room 164.

Academic Dishonesty
Cheating will result in a grade of zero as a minimum consequence. Failure in the course and referral to the University Judiciaries may also occur. In short, academic dishonesty *in any form* will not be tolerated.

Below is a statement on academic misconduct (from the Office of the Provost and Vice Chancellor):

"Academic misconduct is an act in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts."

"Prohibited conduct includes cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed."

Attendance
There is no provision in the schedule for "make-up" lab work. Unexcused absences from a laboratory session will result in zero points for that week's graded material. To request an excused absence (***e.g.***, sports, music, etc.), please contact Prof. Dietz (**not** the TA) at least 48 hours prior to lab for approval. For medical absences, a written letter from a physician is required. Late lab reports are penalized at **10%** per calendar day.

Performance Evaluation:

The course grade consists of the scores obtained for the four experiments, two exams, and a special project, as well as a 5% discretionary contribution (see below).

			Weight for Course Grade
(1) Experiments:	Lab Reports	400 points (max) (100 points per report)	40%
(2) Special Project:	Project Proposal	50 points (max)	35%
	Project + Poster	300 points (max)	
(3) Discretionary:	Professional conduct, notebook, etc. (50 pts)		5%
(4) Exams	200 points (100 points per exam)		20%

Each student will submit a lab report for each experiment (*i.e.*, four in total). A portion of each report grade will be based on the error analysis (error estimates, error propagation) presented and a discussion of these errors.

The Syllabus contains a sheet entitled "Experimental Record" (page 13). Enter the name of the experiment as well as the dates when the experiment was started and completed. After completing each experiment, ask the Teaching Assistant to sign the "Experimental Record" and also check to make sure that you have all of the required data. The Instructor will also sign the sheet. At the end of the term, return the "Experimental Record" sheet to the Teaching Assistant.

The second half of the course is devoted to the Special Research Project. You are required to select the topic of for your research project by **Thursday, February 22nd** and to submit by **Tuesday, March 6th** a written research proposal. The format for this proposal, which must include the background and goals of the project, the required resources, progress milestones, and so on, is specified in the Lab Manual. This proposal will contribute 50 points to the overall grade for the research project.

Your research project concludes with the presentation of your results in the form of a research poster. A poster session, during which the results of all projects will be presented, will be held during the final examination period for the course (**12:30 – 2:30 PM on Tuesday, May 15, 2018**).

As part of your preparation for an experiment, you are required to prepare **before** arriving at the laboratory your notebook according to the format stated in the laboratory manual. Your Instructor and TA will check notebooks during the semester to see that this simple "pre-lab" assignment is being done. Furthermore, your lab notebooks will be **graded** at the end of the semester. Proper maintenance of a laboratory notebook, as well as **professional conduct** in the laboratory (*e.g.*, adherence to safety regulations and procedures, care / professional use of instruments, punctuality), constitutes 5% of your course grade.

Recommended Reference Books:

(Available in the Golda Meir Library)

Author	Title	Publisher	Location - Year	Call Number
S.P. McGlynn	Introduction to Applied Quantum Chemistry	Holt, Rinehart, and Winston, Inc.	New York, 1972	QD462.I58
C.N.R. Rao	Ultraviolet and Visible Spectroscopy	Butterworth	London, 1975	QD95 R37 1975
A. G. Gaydon.	Dissociation Energies and Spectra of Diatomic Molecules	Chapman & Hall	London, 1968	QD517 G4 1968
W.J. Moore	Physical Chemistry, 4th ed.	Prentice-Hall	Englewood Cliffs, N.J. 1972	QD453.2 M65
P.W. Atkins	Physical Chemistry	W.H Freeman and Company	New York	QD453.2 .A88 1998
K.J. Laidler	Chemical Kinetics	McGraw Hill	New York 1965	QD501 L17 1965
Charlotte E. Moore	Atomic Energy Levels As Derived From the Analysis of Optical Spectra Vol. I-III National Bureau of Standards	U.S. Government Printing Office	Washing-ton, D.C. 1971	QC100.U573 No.35 Vol . I QC100.U573 No.35 Vol . II QC100.U573 No.35 Vol . III
G. Herzberg	Molecular Spectra and Molecular Structure I; Spectra of Diatomic Molecules	Krieger Publishing		QC454.M6 H4713 1989
John R. Taylor	An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements	University Science Books	Mill Valley, CA	QA275 T38 1982
P.R. Bevington	Data Reduction and Error Analysis for the Physical Sciences	McGraw-Hill	New York	QA278 B48
D. P. Shoemaker, C.W. Garland, J. W. Nibler	Experiments in Physical Chemistry	McGraw-Hill	New York	QD457 S56 1989

H. A. Strobel W. R. Heineman	Chemical Instrumentation: A Systematic Approach 3rd ed.	Wiley	New York 1989	QD79 I5 S76 1989
P. T. Kissinger, W. R. Heineman, Eds.	Laboratory Techniques in Electroanalytical Chemistry, 2nd ed.	Marcel Dekker	New York 1996	QD115 L23 1996
A. Braithwaite, F.J. Smith	Chromatographic Methods 4th ed.	Chapman and Hall	London, New York 1985	QD79 C4 B73 1985
C. F. Poole S. A. Schuette.	Contemporary Practice of Chromatography	Elsevier	New York, Amsterdam 1984	QD79 C4 P66 1984
J. D. Winefordner, S. G. Schulman, T. C. O'Haver	Luminescence Spectrometry in Analytical Chemistry	Wiley-Interscience	New York 1972	QD117 F5 W5
J. W. Robinson	Atomic Spectroscopy	M. Dekker	New York 1990	QD96 A8 R63 1990

Lab Schedule - Spring 2018

#	Student Name	TUE Jan 23	THU Jan 25 – THU Feb 1	TUE Feb 6 – TUE Feb 13	TUE Feb 13	THU Feb 15 – TUE Feb 27	THU Feb 15
1	Sec 801 **Students 1 and 2**	Introduction	**Experiment 1:** Principles of Optical Detection	**Experiment 2:** Molecular Electronic Transitions	**Lab Report 1 Due:** Principles of Optical Detection	**Experiment 3:** Reaction Kinetics	**Exam 1:** Principles of Optical Detection / Molecular Electronic Transitions
2	Sec 801 **Students 3 and 4**	Introduction	**Experiment 1:** Principles of Optical Detection	**Experiment 2:** Molecular Electronic Transitions	**Lab Report 1 Due:** Principles of Optical Detection	**Experiment 3:** Reaction Kinetics	**Exam 1:** Principles of Optical Detection / Molecular Electronic Transitions
3	Sec 801 **Students 5 and 6**	Introduction	**Experiment 1:** Principles of Optical Detection	**Experiment 2:** Molecular Electronic Transitions	**Lab Report 1 Due:** Principles of Optical Detection	**Experiment 3:** Reaction Kinetics	**Exam 1:** Principles of Optical Detection / Molecular Electronic Transitions
4	Sec 801 **Students 7 and 8**	Introduction	**Experiment 1:** Principles of Optical Detection	**Experiment 2:** Molecular Electronic Transitions	**Lab Report 1 Due:** Principles of Optical Detection	**Experiment 3:** Reaction Kinetics	**Exam 1:** Principles of Optical Detection / Molecular Electronic Transitions

Lab Schedule - Spring 2018

#	Student Name	THU Feb 22	TUE Feb 27	THU Mar 1 – TUE Mar 13	TUE Mar 6	TUE Mar 13
1	Sec 801 **Students 1 and 2**	**Deadline for Special Project Selection**	**Lab Report 2 Due:** Molecular Electronic Transitions	**Experiment 4:** Spectra of Atoms	Project Proposal (**TOPS**) due	**Lab Report 3 Due:** Reaction Kinetics
2	Sec 801 **Students 3 and 4**	**Deadline for Special Project Selection**	**Lab Report Due 2:** Molecular Electronic Transitions	**Experiment 4:** Spectra of Atoms	Project Proposal **(TOPS**) due	**Lab Report 3 Due:** Reaction Kinetics
3	Sec 801 **Students 5 and 6**	**Deadline for Special Project Selection**	**Lab Report Due 2:** Molecular Electronic Transitions	**Experiment 4:** Spectra of Atoms	Project Proposal (**TOPS**) due	**Lab Report 3 Due:** Reaction Kinetics
4	Sec 801 **Students 7 and 8**	**Deadline for Special Project Selection**	**Lab Report Due 2:** Molecular Electronic Transitions	**Experiment 4:** Spectra of Atoms	Project Proposal (**TOPS**) due	**Lab Report 3 Due:** Reaction Kinetics

Lab Schedule - Spring 2018

#	Student Name	THU Mar 15	THU Mar 15 to THU May 10	TUE Mar 20 & THU Mar 22	THU Mar 29	THU May 10	TUE May 15
1	Sec 801 **Students 1 and 2**	**Exam 2:** Reaction Kinetics / Spectra of Atoms	Special Project Phase	Spring Break	**Lab Report 4 Due:** Spectra of Atoms	Lab check-out	Poster Presentation
2	Sec 801 **Students 3 and 4**	**Exam 2:** Reaction Kinetics / Spectra of Atoms	Special Project Phase	Spring Break	**Lab Report 4 Due:** Spectra of Atoms	Lab check-out	Poster Presentation
3	Sec 801 **Students 5 and 6**	**Exam 2:** Reaction Kinetics / Spectra of Atoms	Special Project Phase	Spring Break	**Lab Report 4 Due:** Spectra of Atoms	Lab check-out	Poster Presentation
4	Sec 801 **Students 7 and 8**	**Exam 2:** Reaction Kinetics / Spectra of Atoms	Special Project Phase	Spring Break	**Lab Report 4 Due:** Spectra of Atoms	Lab check-out	Poster Presentation

Laboratory Safety Rules:

(Please sign and return the copy provided on page 12)

- Carefully follow all safety instructions given by the Instructor, Teaching Assistant, or Laboratory Technician/Stockroom Manager.
- Approved eye protection must be worn at all times in the laboratory. No exceptions.
- Know the location of fire extinguishers, eye wash fountains, and safety showers.
- Shoes must cover the entire foot — no sandals.
- No food, gum, beverages, or tobacco products are allowed in the laboratory.
- Dispose of all chemicals as directed by the Instructor, Teaching Assistant, or Laboratory Technician/Stockroom Manager.
- Do not attempt unauthorized experiments. Professional conduct in the laboratory is part of your laboratory grade.

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I have read and understood these laboratory safety regulations:

_____

Name (printed)

_____ _____

Signature Date

Experimental Record

Name: _____

Lab Section: **801**

Title of Experiment	Date Started	Date Completed	Signature of TA	Signature of Instructor