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Course Description: In this course you will be given a survey of classes of instruments that are used in analysis of chemical systems. In particular, spectroscopy, chromatography, and electrochemistry will be studied along with basic electronics and signal-to-noise enhancement.

Lecture: MWF 10:00 – 10:50 am in MCK 345

Laboratory: M 1:00 – 5:00 pm in MCK 326

Required Materials :

- textbook - *Principles of Instrumental Analysis* by Skoog, Holler, Nieman 6th ed., Harcourt
- from Organic Spec. – *Organic Structures from Spectra* by Field, Sternhell, Kalman
- a scientific calculator of some sort capable of scientific notation, logarithms, and exponents
 - **NOTE: CELL PHONE USAGE WILL NOT BE ALLOWED DURING EXAMS**
 - **The use of such devices will result in an F for that assignment.**
- the laboratory manual will be provided
- a lab notebook

Course Objectives: My goal for the course is to 1) provide you with the all the necessary resources to allow you to learn and 2) learn something new about chemistry. My job is not to read the book to you, but to answer your questions and help you to learn the material. You will be able to use me most effectively if you attend class, stop into my office for help, and ask a lot of questions.

I hope your goal for the course is to begin to understand the components and complexities that are involved in instrument design and function.

Office Hours: If I am in my office and the door is open, you are welcome to come in and ask questions. Making an appointment with me via email will be your best method of getting help outside of class, but you are always welcome to stop by my office and see if I am available.

Grading: The grading break-down is as follows:

For the lecture portion of the course:

Item	% of Total
homework	20 %
quizzes	20 %
exams	35 %
final exam	25 %

For the lab portion of the course:

Item	% of Total
attendance	20 %
pre-lab assignments	20 %
lab notebooks	15 %
lab reports	45 %

% Earned	Letter Grade	% Earned	Letter Grade
≤ 95.0 %	A	≤ 73.3 %	C
≤ 90.0 %	A-	≤ 70.0 %	C-
≤ 86.7 %	B+	≤ 66.7 %	D+
≤ 83.3 %	B	≤ 63.3 %	D
≤ 80.0 %	B-	≤ 60.0 %	D-
≤ 76.7 %	C+	< 60.0 %	F



Honor Code: As a college student, you are expected to act in all endeavors with academic integrity. This means there will be a policy of zero tolerance for cheating and plagiarism in all college courses. Your homework, quizzes, and exams are to be your own work. All data submitted in the laboratory must be measured (and not fabricated) by you (and your partner) during the semester. Any written reports or answers which contain text that has been copied word-for-word from another source must be cited appropriately. If you are caught cheating or plagiarizing on an assignment or if you aid another student in doing so you will be brought before the Honor Council. It is not my responsibility to be your judge, jury, and executioner. All incidences where there is evidence of an honor code violation will be reported, giving you the opportunity to defend yourself in front of your peers. Read about the Honor System and Codes of Ethics in the Bridgewater College Catalog.

COMMENTS ON THE LECTURE PORTION OF THE COURSE

Homework: Homework is a very important way to learn anything. Unless you practice something over and over, you will not learn it well. Students who conscientiously complete all homework assignments generally do the well in the class. Homework will assigned and completed using online Computer Assisted Personalized Approach (CAPA). Each week CAPA assignments will be distributed in the lecture room. Each assignment has a set number and a CAPA ID number.

See the "CAPA Homework Instructions" handout for more information.

IMPORTANT: Because the answers to each CAPA assignment will be different from person to person, you are strongly encouraged to work together on your homework. It is acceptable to work with friends to figure out the formula or answer to each question as long as each person understands the answer to the problem BEFORE it is answered. Suffice it to say that while I may not be able to tell immediately if someone has done your homework for you (this is cheating, by the way, and will not be tolerate if it is detected), I will be able to tell if you have done your own homework by your quiz and exam scores.

Course Home Page: There will be a course home page which you can locate from my home page located at the following URL: www.bridgewater.edu/~koverway/ This web site will be the depository for my class lecture notes, a homework discussion board, practice exams, and links to extra reading material.

Note: Most of your homework is going to be tough (this is an advanced course after all)! Make sure you read the text carefully, attend class regularly, find some classmates with whom to study, and see me if you need help.

Quizzes: Quizzes are meant to prepare you for the exams. Quizzes will be timed and taken from homework problems, information from class discussions, or examples from worksheets. The questions may require numerical answers or explanations. The exact number of quizzes cannot be determined ahead of time, but there will at least five (some announce and some unannounced). I will drop the lowest score and include the remainder of the quizzes in your final grade. No make-up quizzes will be given for any reason, so one of the quizzes you miss will be the quiz that gets dropped.



Exams: There will be 3 exams given during the semester (see schedule for dates) and one comprehensive final at the end of the semester. Pertinent mathematical formulas and/or physical constants will be provided for you on the cover page of each exam.

NOTE: If you fail to show up for an exam without notifying me **in advance**, you will receive a zero for that exam unless you have documented proof that a personal or familial medical emergency occurred the evening or morning before the exam.

Rescheduling Exams: If you need to reschedule an exam or the final exam, you must get written notice from the Academic Dean. When I have received the written notice, I will arrange for a mutually convenient time for you to take the exam.

Attendance: Regular class attendance is expected of all students and attendance records are kept via missed quizzes and homework assignments that are not received in class. A student who persists in being absent from class will be reported to the Vice President and Dean for Academic Affairs. At the discretion of the instructor and the Dean, the student may be withdrawn from the course with a Withdraw Failing (WF) grade and may possibly be withdrawn from the College. Missing class too often will directly affect your grade in the course through missed quizzes, for which there are no opportunities for make-ups.

COMMENTS ON THE LABORATORY PORTION OF THE COURSE

Attendance: Attendance is mandatory in the laboratory portion of the course. You will not pass this course unless you complete every laboratory. If you have a valid conflict with a scheduled laboratory, it is your responsibility to notify me at least 1 week in advance so that I may arrange for a period when you can make up the absence. If you do not show up for a lab without making prior arrangements, you will automatically lose 10% of the points allotted to the lab report for the experiment you missed - **WITHOUT EXCEPTION! If this happens a second time or more, you will get a zero for the lab.** It is rude and thoughtless for you to leave your partner to fend for herself/himself and I will consider this behavior to be indicative of your performance in the course.

Pre-lab Assignments: Pre-lab assignments will be printed in each laboratory handout and/or will incorporate CAPA problems. They are to be completed in your lab notebook after the initial preparations (purpose, chemicals, etc.). I'll be checking for them in your notebook **at the beginning** of each lab. You are to answer the questions thoroughly and completely. When a numerical answer is required, you must provide a derivation or example calculation (whichever is appropriate) to get full credit. Pre-lab assignments will be accepted late only if it is determined that the assignment was completed before the beginning of lab.

Lab Reports: Lab reports will be written for each experiment performed. Most reports will be data and some post-lab questions, and one will be a full report. Reports will be graded on several facets:

- demonstration of an understanding of the experiment and its results (intro, results, post-lab questions)
- correct analysis of experimental data (spreadsheet formulas and presentation of results)
- accuracy and precision of measurements
- proper formatting of text, graphs, tables, charts

Refer to your lab manual for more information concerning lab reports.



Your calculations and analysis of experimental data will make extensive use of spreadsheets. You are required to turn in the printout of your spreadsheet that contains the data analysis (along with a printout of the formulas used - see the Lab Report Expectations handout). EACH PERSON IS REQUIRED TO USE THEIR OWN SPREADSHEET, INDEPENDENT OF HIS/HER PARTNER'S. A spreadsheet template is provided for most of the experiments. These spreadsheets can be downloaded from the course home page. The template organizes your data but does not provide formulas. If a spreadsheet template is provided for the experiment, it **MUST** be used.

Due Date: All lab reports will be due according to the schedule provided below. Late lab reports will be penalized 10% per solar day it is late. After 10 days, don't even bother turning in the lab report. Each student gets one late lab penalty waiver (for reports late less than 1 week).

Lab Notebooks: You can use any lab notebook for this course as long as it is not a spiral-bound notebook. You must have your lab notebook with you when you are in the laboratory. You will not be permitted to start any lab without your notebook.

You must come to each lab period with an updated table of contents and an objective for the experiment that you will do that day. Your instructor will be spot checking lab notebooks and giving you points for coming to lab prepared.

The information contained in your notebook will likely vary from experiment to experiment. Refer to your lab manual for the specifics needed for each lab experiment.

USE CORRECT DATES: If you add information to a lab experiment, date the page with the current date, not the date that the experiment was conducted. In general, whenever you write something in your lab notebook you should record the date of the writing, not when it should have been written or when the lab was conducted. Lab notebooks can be invalidated in patent disputes when dates are fraudulent.

Dress Code: Due to the hazardous nature of the chemicals and equipment used in the laboratory, a safe dress code will be enforced. Absolutely no open-toed shoes, shorts, or skirts will be permitted in the laboratory and safety glass will be worn at all times while you are in the laboratory. You are strongly encouraged to wear a lab coat.

Disabled Students: If you require any special equipment or consideration due to a learning or physical disability, please let the instructor know at your discretion so the proper arrangements can be made.

Tentative Lab Schedule

Day	Date	Experiment	Report #	Notebooks Due	Reports
Mon	9/6/2010	Spreadsheet Lab		your spreadsheets	
Mon	9/13/2010	Analysis of Mixtures lab	#1		results only; due by 9/20
Mon	9/20/2010	Noise Lab	#2	check	results only; due by 9/27
Mon	9/27/2010	Percent Alcohol in Beer	#3	check	results only; due by 10/4
Mon	10/4/2010	Survey of Instruments	#4	check	results only; due by 10/11
Mon	10/11/2010	Atomic Absorption Spectroscopy	#5		draft of AA due by 10/25
Mon	10/18/2010	<i>Fall Holiday</i>		<i>is cancelled</i>	
Mon	10/25/2010	Slit Width Effects and ...	#5	check	draft of AA & Slit Width due by 11/1
Mon	11/1/2010	Fluorescence Spectroscopy	#5	check	
Mon	11/8/2010	help session for report #5			full report for #5 due on 11/15
Mon	11/15/2010	GC, HPLC	#6		results only due on 11/22
Mon	11/22/2010	ISE Analysis of Calcium	#7		results only due on 11/29
Mon	11/29/2010	lab cleanup, turn in your report			

Tentative Lecture Schedule

Day	Date	Topic	Reading	Notes
Wed	9/1/2010	Introduction; Figures of Merit		
Fri	9/3/2010	Statistics and Significant Figures	967-973, 982 (Rounding)	skip Normal Error, Conf. Limits
Mon	9/6/2010	Statistics and Significant Figures		
Wed	9/8/2010	Hypothesis Testing	983-985	
Fri	9/10/2010	Methods of Quantitation	Chapt. 1: all & 985-988	
Mon	9/13/2010	Signals and Noise	Chapt. 5: 5A thru 5C-1	
Wed	9/15/2010	Signals and Noise		
Fri	9/17/2010	Signals and Noise	Chapt. 5: 5C-1 thru end	FT filter take-home quiz
Mon	9/20/2010	Signals and Noise		
Wed	9/22/2010	Signals and Noise; review		
Fri	9/24/2010	Exam I - Chapters 1, 2, 5		
Mon	9/27/2010	Introduction to Spectroscopic Methods	Chapt. 6 - all	
Wed	9/29/2010	Optical Components: Design & Sources	Chapt. 7: 7A, 7B	Components handout
Fri	10/1/2010	Optical Components: Wavelength Selectors	7C thru 7E-2; skim 7E-3	Citations Exercise
Mon	10/4/2010	Optical Components: Detectors	7E-4 thru 7G	
Wed	10/6/2010	Fourier Transform Spectrometers	7H thru end	
Fri	10/8/2010	Atomic Absorption Spectroscopy	Chapt. 8: all	
Mon	10/11/2010	Atomic Absorption Spectroscopy	Chapt. 9: 9A thru 9D	
Wed	10/13/2010	Absorbance Spectroscopy	Chapt. 13: all	Beer's Law handout
Fri	10/15/2010	Absorbance Spectroscopy	Chapt. 14: all	
Mon	10/18/2010	<i>Fall Holiday</i>	<i>no scheduled class</i>	
Wed	10/20/2010	Luminescence Spectroscopy	Chapt. 15: all	
Fri	10/22/2010	<i>Wacky Thursday (aka PDP day 2)</i>	<i>no scheduled class</i>	
Mon	10/25/2010	review		
Wed	10/27/2010	Exam II - Chapters 6-9, 13-15		
Fri	10/29/2010	Chromatography	Chapt. 26: 26A thru 26C	
Mon	11/1/2010	Chromatography	Chapt. 26: 26D thru end	
Wed	11/3/2010	Chromatography		
Fri	11/5/2010	GC and HPLC	Chapt. 27: all	
Mon	11/8/2010	GC and HPLC	Chapt. 28: all	
Wed	11/10/2010	Electrophoresis	Chapt. 30: 30A thru 30C	
Fri	11/12/2010	Electrophoresis		
Mon	11/15/2010	Electrochemistry	Chapt. 22: all	
Wed	11/17/2010	review		
Fri	11/19/2010	Exam III - Chapters 22-30		
Mon	11/22/2010	Mass Spectrometry	Chapt. 11: 11A, 11B	<i>skim readings</i>
Wed	11/24/2010	<i>Thanksgiving Holiday</i>	<i>no scheduled class</i>	
Fri	11/26/2010	<i>Thanksgiving Holiday</i>	<i>no scheduled class</i>	
Mon	11/29/2010	Mass Spectrometry	Chapt. 20: 20A, 20B, 20D	
Wed	12/1/2010	Mass Spectrometry	read chapt 4 from Field, Sternhell, Kalman	
Fri	12/3/2010	Mass Spectrometry		
Final Exam Schedule				
Wed	12/8/2010	8-10 AM in MCK 345		