

### CHM3400 — Physical Chemistry for the Biosciences – Spring 2017

Instructor	Dr. Alexander Angerhofer (Dr. A.)
Phone	392-9489 (office, CLB 318A), or 392-4582 (office, LEI 214A).
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Class Times	MWF 2 <sup>nd</sup> period (8:30-9:20am) in Leigh 207
Office Hours	M-3 (9:35 – 10:25am), W-10 (5:10 – 6:00 pm), and R-10 (5:10 – 6:00 pm) in CLB 318A

TA	Anthony (Tony) Pastore
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Office Hours	T-7 (1:55 – 2:45pm), W-8 (3:00 – 3:50pm), and R-9 (4:05 – 4:55pm) in CLB 318

Holidays	01/16 (MLK Day), 3/6-3/10 (spring break), 4/20+21 (reading days).
Class Text	“Physical Chemistry for the Biosciences,” by Raymond Chang, University Science Books, Sausalito, CA, 2005, ISBN #1-891389-33-5.
Homework	Homework will be assigned weekly except for exam weeks.
Points Earnable	2 progress exams @ 200 pts. each, for 400 pts. total. 1 cumulative final exam @ 400 pts., for 400 pts total. 2 online quizzes @ 50 pts. each, for 100 pts. total. 10 homeworks @ 20 pts. each, for 200 pts. total. 1 participation grade @ 100 pts., for 100 pts. total. Total earnable points are 1,200 pts.
Grading Scheme	A: ≥ 85% (1020 pts) 85% (1020 pts) > A- ≥ 82.5% (990 pts) 82.5% (990 pts) > B+ ≥ 80% (960 pts) 80% (960 pts) > B ≥ 75% (900 pts) 75% (900 pts) > B- ≥ 72.5% (870 pts) 72.5% (870 pts) > C+ ≥ 70% (840 pts) 70% (840 pts) > C ≥ 65% (780 pts) 65% (780 pts) > C- ≥ 62.5% (750 pts) 62.5% (750 pts) > D+ ≥ 60% (720 pts) 60% (720 pts) > D ≥ 55% (660 pts) 55% (660 pts) > E.

**Course Schedule (tentative):**

Date	Day	Chapter	Topic	Reading
01/04/17	W	2	Gas Laws	pp. 7-21
01/06/17	F	2	Kinetic Theory of Gases	pp. 21-31
01/09/17	M	3	The First Law of Thermodynamics, State/Path Functions	pp. 39-49
01/11/17	W	3	Heat Capacities and Gas Expansions	pp. 49-59
01/13/17	F	3	Calorimetry and Thermochemistry	pp. 59-74
01/18/17	W	3	Entropy	pp. 81-86
01/20/17	F	4	Carnot Engine, 2 <sup>nd</sup> Law of Thermodynamics	pp. 87-95
01/23/17	M	4	3 <sup>rd</sup> Law of Thermodynamics, Gibbs Energy	pp. 95-100
01/25/17	W	4	Refrigeration/Gibbs and Helmholtz Energy	pp. 101-110
01/27/17	F		Field Trip – Microkelvin Lab	
01/30/17	M	4	Clapeyron Equation/Phase Diagrams	pp. 110-119
02/01/17	W	5	Ideal Solutions, Chemical Potential	pp. 127-134
02/03/17	F	5	Real Solutions, Raoult's Law, Henry's Law	pp. 134-142
02/06/17	M	5	Colligative Properties	pp. 142-154
02/08/17	W	5	Electrolyte Solutions, Ionic Activity	pp. 154-181
02/10/17	F	6	Chemical Equilibrium	pp. 193-203
02/13/17	M	6	Heterogeneous Equilibria, Ligand Binding	pp. 203-217
02/15/17	W	6	Bioenergetics	pp. 217-229
02/16/17	R		1 <sup>st</sup> Mid-Term Exam (chapters 2-6)	
02/17/17	F	7	Electrochemistry, Nernst Equation	pp. 235-246
02/20/17	M	7	Electrochemistry, Applications	pp. 246-261
02/22/17	W	9	Chemical Kinetics, Rxn Rates, Molecularity	pp. 311-332
02/24/17	F	9	Temperature Effects and Potential Energy Surfaces	pp. 332-336
02/27/17	M	9	Rxn Rate Theories, Rxns in Solution	pp. 336-354
03/01/17	W	10	Enzyme Catalysis	pp. 363-377
03/03/17	F	10	Enzyme Inhibition, Allosterism, pH Effects	pp. 377-396
03/13/17	M	11	Quantum Mechanics – The Foundations	pp. 401-410
03/15/17	W	11	De Broglie, Heisenberg, Schrödinger Eqn., Particle in a Box	pp. 410-426
03/17/17	F	11	Atomic Orbitals and the Periodic Table	pp. 426-439
03/20/17	M	12	The Chemical Bond, MO Theory	pp. 447-458
03/22/17	W	12	MO Theory	pp. 458-468
03/24/17	F	12	Coordination Compounds	pp. 469-483
03/27/17	M	13	IMF's	pp. 489-501
03/29/17	W	13	Hydrogen Bonding, Structure of Water/Ice	pp. 502-510

03/30/17	R		2 <sup>nd</sup> Mid-Term Exam (chapters 7,9-13)	
03/31/17	F	14	Spectroscopy Fundamentals	pp. 513-522
04/03/17	M	14	Spectroscopy, $\mu$ W, IR, and UVVIS	pp. 522-539
04/05/17	W	14	Magnetic Resonance	pp. 539-554
04/07/17	F	14	Luminescence, Lasers, Optical Activity	pp. 554-568
04/10/17	M	15	Photochemistry – Fundamentals and Photosynthesis	pp. 575-586
04/12/17	W		Field Trip to AMRIS NMR Facilities	
04/14/17	F	15	Photochemistry – Vision, Radiation Effects	pp. 586-594
04/17/17	M	16	Macromolecules – Analytical Methods	pp. 599-613
04/19/17	W	16	Macromolecules – Structure, X-Ray Crystallography	pp. 613-633
04/28/17	W		Final Exam (Leigh 207, 10:00am – 12:00pm, cumulative)	

### Further Important Information:

- Overview and Goals:** CHM 3400 is a one-semester overview of physical chemistry with emphasis on biological systems. It covers the whole range of physical chemistry, *i.e.*, thermodynamics, electrochemistry, chemical kinetics, molecular structure and bonding, and spectroscopy. The goal of this course is to familiarize students who major in biochemistry or other bio-related majors with the techniques and tools of physical chemistry.
- Prerequisites:** MAC 2312, CHM 2200 or CHM 2210, and two semesters of college physics.
- Exam Policies:** Two mid-term exams will be given on R-2/16 and R-3/30 evening, periods E2-E3 (approx. 8:15-10:15pm, see schedule above). Making up a missed exam is a serious and exceptionally burdensome problem and will only be granted if you have a legitimate excuse. Legitimate excuses include sickness or a conflict with another exam for a higher numbered class and need to be brought to the attention of the instructor ahead of time if at all possible. If you are not sure whether your excuse is valid, talk to the instructor well before missing an exam. If you have an emergency that prevents you from letting the instructor know ahead of time that you are missing an exam, an excused absence and rescheduled make-up exam will be granted after official documentation about your emergency (doctor's note, *etc.*) deemed appropriate by your instructor has been presented. Since the final exam is cumulative, the instructor reserves the right to consider assigning a letter grade above that which the student would receive based strictly on total points earned (as listed above). This will only take effect if the performance on the final exam is significantly above the student's overall performance for the semester, and if the student shows clear improvement in his/her grades over the course of the semester. A student contending that an exam or quiz has been mis-graded or mis-scored must report this to the TA responsible for grading within one week of receiving the original grade or score. Failure to follow this policy results in no reconsideration of the contended grade or score. For all questions on grades or grading, please consult with the TA first in person. If this does not resolve the issue you may talk to the instructor about it in person. Except for problems with on-line quizzes (see below), emailed questions on grades or grading will not be answered.
- On-line Quizzes:** There will be two on-line quizzes on elearning (1 quiz = 50 points max.). The on-line quizzes will be administered through the canvas interface to the class. Quiz durations will be between 30 and 60 minutes depending on the level of difficulty and the number of questions. For your convenience the web format will allow for an extended period of time (typically a 4-day period) during which you can take the quiz. Once a quiz has been started the

clock starts running and you have to finish it in the allotted time. Typically, students will get two chances at a quiz and the better of the two scores will count toward their grade.

5. **Textbook:** The listed textbook is only one of many reference and study tools you should use to learn physical chemistry. “Physical Chemistry for the Biosciences,” by Raymond Chang was chosen because of its combination of scientific rigor and accessibility. There is a copy on course reserve at the Marston Science Library. There is no need to bring the textbook to class. Occasionally, problems from the book will be used for homework, quiz, or exam problems. Posted reading assignments ought to be completed before coming to class to allow for better comprehension of the material during lecture.
6. **Elearning:** This course uses the canvas elearning site. Please log on at <https://lss.at.ufl.edu/> to get access to your course page.
7. **Homework:** Weekly homework will be assigned. The homework will come from both problems in the book as well as other problem sets that the instructor may assign. Homework will typically be assigned on a Friday and announced during the Friday lecture, and will be due a week later on Friday at the beginning of lecture (8:30am). Policies for late submission: Each work day that homework is late, 20% of the achievable points are subtracted. Homework is considered a day late if it is turned in after 8:30am on Fridays. The 8:30am deadline carries through for additional daily 20% loss of achievable points on subsequent work days if HW is late. If your HW is late, please submit directly to the TA in charge of grading, not the instructor.
8. **Calculators:** You must have your own scientific calculator. Calculators may be used on quizzes and exams but may not be shared. You may not use graphing calculators or any calculators that are capable of information storage or communication on any exam. Simple inexpensive scientific calculators such as the TI-30 series or the Casio fx-260 are acceptable and sufficient for any problem encountered on exams.
9. **Participation Grade:** The participation points (up to 100) will be earned through active participation in class. This is primarily done by using the learning catalytics app on your digital device (smartphone, tablet, notebook PC, *etc.*) to respond to questions asked by the instructor throughout the lectures (see further explanation below under #10).
10. **Learning Catalytics:** In this course, we will use LC on your digital device for you to respond to the instructor's questions and earn valuable points toward your grade. You will need to purchase access and create a student account on <https://learningcatalytics.com/>. Follow instructions on the web site, or in the registration document on your Canvas account (click on Files → LC → Get\_Started\_Flyer\_Learning\_Catalytics.pdf) to activate your account and link it to our course, CHM3400. The cost is \$12 for the term. You are required to bring at least one wifi-enabled digital device to class to use for this activity. If you don't have access to a digital device, please contact the instructor.
11. **Class Attendance:** Regular class attendance is essential for your success in this class. However, we will not do roll-calls. Repeated absence in class and discussion session will make it very difficult to earn full participation points. For further information on UF's attendance policies which are in effect for this course, see: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> .
12. **Study Habits:** This course demands on average 8 – 10 hours/week of work outside of class. Regular lecture attendance is essential. While the class will loosely follow the book it will not be taught “by the book.” It is expected that you read the assigned pages from the textbook or similar chapters in alternative textbooks in advance of coming to class. Please note that the course schedule printed above is tentative and may change depending on our pace of progress. Make sure to stay ahead of the material with your reading assignments. The instructor will build on this material and you are expected to be able to follow in-class discussion. The course demands a regular sustained effort throughout the term. Most importantly, do not allow yourself to fall behind! The material builds up and you need to stay on the game. If you find that you are

not grasping essential material by reading the textbook and following in-class discussion, seek help immediately! Visit your instructor's and/or TA's office hours (see above), talk to other students in your class, compare notes, form a study group, *etc.*

13. **Study Groups:** It is highly encouraged to form student study groups and meet with them on a weekly basis to discuss course material and to prepare for exams. In this course it is permissible that you work on HW assignments together with your study partners. However, you are responsible to fully understand your own worked-out HW submissions and may not just copy someone else's.
14. **Office Hours:** The instructor and TA have listed a total of six office hours (see above). However, we are also available by appointment (please request by email at least one day in advance), particularly if your schedule prevents you from coming to scheduled office hours.
15. **Email Policy:** For all course-related business, use your official @ufl.edu gatorlink email address or the e-learning messaging system. The instructors will not respond to emails from other sources (*e.g.*, your gmail or yahoo address).
16. **Cell Phone Etiquette:** Please put all cell phones or other electronic devices on “**silent mode**” during all class and discussion periods. Please do not leave the classroom during lecture to make a phone call. Use your cellphone only for ‘learning catalytics’ activities while class is in session. Thank you!
17. **Classroom Behavior:** Please conduct yourself professionally and responsibly during classroom times. If you want to contribute to the class discussion or ask a question, indicate so by lifting your hand and wait until you are called upon. Arriving late or leaving class early can be very disrupting to the lecture and other students and should be kept to a minimum. If you have to arrive late for a class period, please enter quietly. If you have to leave the class early you may do so quietly but you should not come back during the same class period. You are permitted to use your notebook computer for note-taking during lecture as long as it does not disturb your fellow students (*i.e.*, sound has to be off, very quiet keys or use of pen-enabled tablet).
18. **Online Course Evaluation:** Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester. Announcements will be made to students about the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.
19. **Students with Disabilities:** Students requiring special accommodations should register with the Dean of Students Office (<http://www.dso.ufl.edu/>, 352-392-1261) and the Disability Resource Center (DRC, <https://www.dso.ufl.edu/drc>, 352-392-8565), and present documentation from that office to the instructor.
20. **Counseling Services:** The University of Florida provides counseling services for students, staff, and faculty. See <http://www.counseling.ufl.edu/cwc/>. If you or a friend are in distress, call (352) 392-1575 (available 24/7), email [umatter@ufl.edu](mailto:umatter@ufl.edu), or walk in for an emergency consultation during regular service hours (8:00am – 5:00pm) at the Radio Road Site, 3190 Radio Rd., or the Peabody Hall Site, on the 4<sup>th</sup> floor of Peabody Hall, adjacent to Criser Hall. For other hours or weekends, call the Alachua County Crisis Center, (352) 264-6789. For sexual assault recovery services call the Student Health Care Center at (352) 392-1161. For life-threatening emergencies always call 911.
21. **Emergency Numbers and Web Sites:**  
UFPD (UF Police Department): In case of emergency dial 911. The UF campus police non-emergency number is (352) 392-1111. Their web site: <http://www.police.ufl.edu/>,  
UF Emergency management: (352) 273-2100. <https://emergency.ufl.edu/>,  
Infirmary (student health center): (352) 392-1161, <http://shcc.ufl.edu/>.  
EH&S (Environmental Health & Safety): (352) 392-1591, <http://www.ehs.ufl.edu/>.

22. **Other Academic Resources:** UF provides several other resources for students, such as Library Support can be obtained here: <http://cms.uflib.ufl.edu/ask>, where you can find various ways to receive assistance with respect to using the libraries or finding resources. The Career Resource Center is located on level One in the Reitz Union, (352) 392-1601, and provides career assistance and counseling. Refer to <http://www.crc.ufl.edu/> for further info. The Teaching Center is located in Broward Hall, call (352) 392-2010 or (352) 392-6420 and provides students with tutoring services and counseling regarding general study skills. Refer to <http://teachingcenter.ufl.edu/> for further info. It may also provide employment opportunities as tutors for well qualified students. The Writing Studio is located at 302, Tigert Hall, (352) 846-1138, and provides help with brainstorming, formatting, and writing papers, see: <https://writing.ufl.edu/writing-studio/>. The Ombuds Office is located at 31 Tigert Hall, (352) 392-1308, and provides students assistance in resolving problems and conflicts that arise in the course of interacting with the University of Florida. By considering problems in an unbiased way, the Ombuds works to achieve a fair resolution and works to protect the rights of all parties involved. For further information go to <http://www.ombuds.ufl.edu/> or refer to the official complaints policy here: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).
23. **Honors Code:** This class will operate under the policies of the student honor code which can be found at: <http://www.registrar.ufl.edu/catalog/policies/students.html> The students, instructor, and TAs are honor-bound to comply with the Honors Pledge: **We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.**

If you have further questions, please contact me. Have a great semester!

Sincerely, Alexander Angerhofer.