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Course Description

BC411 covers fundamental concepts of physical chemistry and their application to understanding the behavior of biological systems. It is aimed at providing the student with an appreciation for the basic laws of thermodynamics, biochemical equilibria, reaction rates and kinetics in biological reactions, introductory quantum theory, and molecular spectroscopy.

Learning Outcomes and Assessment

Students are expected to learn the applications of quantitative and experimental methods to study and understand biochemical processes. Students are expected to enter the course with a background in chemistry, physics, biology, mathematics (up to and including calculus II), and one full year of comprehensive biochemistry. Thus, students enrolled in BC411 will demonstrate the ability to understand the foundational principles from which fundamental biochemical processes are derived; understand how to interpret equations, formulas, and concepts that underlie these principles; and apply these equations, formulas, and concepts to conceptually understand various biochemical processes and solve problems based on experimental observations and quantitative data.

Class hours: BC411 is a hybrid course with primary lectures, distributed as videos on Canvas, that are supplemented with face-to-face (F2F) sessions with the professors. Each student must choose one F2F session with the professors and one recitation session with TAs, and attend these weekly for the entire semester. Students are not permitted to switch sections without instructor permission.

BC411 Professor F2F Sessions: Mondays and Wednesdays 9:00–9:50 AM in Biology 136

BC411 TA F2F Recitations:
Thu 9:00–9:50 AM in Clark A202
Thu 2:00–2:50 PM in PATH 109
Fri 9:00–9:50 AM in BIOL 136

Office hours: Dr. Ho: Friday, 1:00 – 1:50 PM in MRB 375
Dr. Peersen: Friday, 1:00 – 1:50 PM in MRB 341
Zachary Hazlett: Mondays 1 – 2:30 pm virtual
Lindsay Peterkin: Tuesdays 1 – 2:30 pm virtual

Pre/Co-requisites: BC401 (or BC351 with approval), CHEM113, MATH161 or MATH255.

Text: Required: *Biophysical Chemistry* (2017) by Klostermeier & Rudolph

ChemWiki QM:

https://chem.libretexts.org/Core/Physical_and_Theoretical_Chemistry/Quantum_Mechanics

Grading: The traditional grading (A, B, C, ...) system will be used. Grades in BC411 will be based on six exams (100 pts each) and weekly problem sets (150 pts total). The six exams will be administered on-line in Canvas on Wednesday mornings (9:00 – 9:50).

Students are expected to devote 10 hours each week to watch the assigned videos and complete the assigned homework. A portion of the homework grade will come from in-recitation presentations of answers to the problem sets.

CSU Student Honor Code: This course will adhere to the Academic Integrity Policy of the Colorado State University [General Catalog](#) {Page 7} and the [Student Conduct Code](#).

BC411 Syllabus – Fall 2020

<i>Dates</i>	<i>Subject</i>	<i>Videos & Reading for entire week</i>	<i>Prof</i>
Week 1 Aug. 24 M Aug. 26 W Aug. 28 F	Introduction to Thermodynamics/Ideal gas laws Introduction to Course (Virtual) Wednesday F2F Group for Wk1 recap lecture Monday F2F Group for Wk1 recap lecture	VMod 1&2 Chapter 2.1, 2.2	SH SH SH
Week 2 Aug. 31 M Sep. 2 W Sep. 4 F	Thermodynamic Laws/Free Energy Monday F2F Group for Wk2 recap lecture Wednesday F2F Group for Wk2 recap lecture <i>Recitation</i>	VMod 3 & 4 Chapter 2.3, 2.4, 3.4	SH SH
Week 3 Sep. 7 M Sep. 9 W Sep. 11 F	Protein Folding Labor day – no class Wednesday F2F Group for Wk3 recap lecture / exam review <i>Recitation</i> <i>End for Exam I</i>	VMod 5 Ch 15, 16	SH SH
Week 4 Sep. 14 M Sep. 16 W Sep. 18 F	Quantum: Introduction to QM/Particle 1-D Box oscillator Monday F2F Group for Wk3 recap lecture / exam review Exam I – Thermodynamics – On-line <i>Recitation</i>	VMod 6 & 7 Wiki QM 1, 2, 3, 5	SH
Week 5 Sep. 21 M Sep. 23 W Sep. 25 F	Quantum: H-atom/Atomic Orbital Theory Monday F2F Group for Wk4/5 recap lecture Wednesday F2F Group for Wk4/5 recap lecture <i>BC463 Exam</i> <i>Recitation</i>	VMod 8 & 9 Wiki QM 6 & 9	SH SH
Week 6 Sep. 28 M Sep. 30 W Oct. 2 F	Molecular Orbital Theory/Spectroscopy Monday F2F Group for Wk6 recap lecture Wednesday F2F Group for Wk6 recap lecture <i>Recitation</i> <i>End for Exam II</i>	VMod 10 & 11 Wiki QM 11, 16	SH SH
Week 7 Oct. 5 M Oct. 7 W Oct. 9 F	X-ray crystallography: Crystals/Diffraction Theory Exam II – Quantum – On-line Wednesday F2F Group for Wk7 recap lecture <i>Recitation</i>	VMod 12 & 13 Chapter 22	SH
Week 8 Oct. 12 M Oct. 14 W Oct. 16 F	X-ray crystallography: The Phase Problem Monday F2F Group for Wk8 recap lecture Wednesday F2F Group for Wk8 recap lecture <i>BC463 Exam</i> <i>Recitation</i> <i>End for Exam III</i>	VMod 14 Chapter 22	SH

<i>Dates</i>	<i>Subject</i>	<i>Videos & Reading for entire week</i>	<i>Prof</i>
Week 9 Oct. 19 M Oct. 21 W Oct. 23 F	Optical Spectroscopy (UV/VIS, CD, Fluor) Monday F2F Group for Wk9 recap lecture Exam III – Crystallography – On-line <i>Recitation</i>	VMod 15 Chapter 19	OP
Week 10 Oct. 26 M Oct. 28 W Oct. 30 F	Spectroscopy II, Mass Spectrometry Monday F2F Group for Wk10 recap lecture Wednesday F2F Group for Wk10 recap lecture <i>Recitation</i> <i>End for Exam IV</i>	VMod 16 Chapter 26.1	OP OP
Week 11 Nov. 2 M Nov. 4 W Nov. 6 F	Reaction Kinetics Exam IV – Spectroscopy & Mass Spec – On-Line Wednesday F2F Group for Wk10 recap lecture <i>Recitation</i>	VMod 17 Chapters 6–10	OP
Week 12 Nov. 9 M Nov. 11 W Nov. 13 F	Enzyme Kinetics and Inhibition Monday F2F Group for Wk12 recap lecture Wednesday F2F Group for Wk12 recap lecture <i>Recitation</i> <i>BC463 Exam End for Exam V</i>	VMod 18 Chapters 11–12	OP OP
Week 13 Nov. 16 M Nov. 18 W Nov. 20 F	Transient Kinetics, Temperature Effects Monday F2F Group for Wk13 recap lecture Exam V – Kinetics – On-Line <i>Recitation</i>	VMod 19 & 20 Chapter 25.1-2 Chapter 13	OP
Nov 21-29	Fall Break week – no classes <i>All classes are on-line after break</i>		
Week 14 Nov. 30 M Dec. 2 W Dec. 4 F	Enzyme Catalysis and Selectivity Monday F2F Group for Wk14 recap lecture Wednesday F2F Group for Wk14 recap lecture <i>Recitation</i>	VMod 21 & 22 Chapter 14	OP OP
Week 15 Dec. 7 M Dec. 9 W Dec. 11 F	Computational Biology Methods Monday F2F Group for Wk15 recap lecture Wednesday F2F Group for Wk15 recap lecture <i>Recitation</i>	VMod 23 & 24 Chapter 18	OP OP
Finals Week Dec. 14 Monday	Exam VI – On-Line 8:30 – 9:30 AM		