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| **Course** | BIOL 4461 Biophysical Chemistry |
| **Professors** | Don Gray |
| **Term** | Spring 2013 |
| **Meetings** | Meets Mon and Weds 9:30-11:15 am in SLC 2.302 |

## Professor's Contact Information


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| **Office Phone** | Gray: 972-883-2513 |
| **Office Location** | Gray: FO 3.210 |
| **Email Address** | Gray: dongray@utdallas.edu |
| **Office Hours** | M,W 11:30-12:30 |


## General Course Information

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| **Pre-requisites, Co-requisites, & other restrictions** | Students are required to have a prior background in calculus, physics, and biochemistry (BIOL3361/CHEM 3361 or equivalent). |
| **Course Description** | This 4-hour course treats topics at the interface of biochemistry and structural biology. The concepts emphasized include thermodynamics, chemical bonding, spectroscopy, and crystallography as applied to biological macromolecules. |
| **Learning Outcomes** | Students will be able to:<br>1. Recognize the physical and chemical concepts that underlie techniques used to determine and characterize biomolecular structures.<br>2. Explain or give examples of the physical and chemical concepts that underlie techniques used to determine and characterize biomolecular structures. |
| **Required Texts & Materials** | *Principles of Physical Biochemistry*. Van Holde, Johnson, & Ho, Prentice-Hall, Second Edition (2006).ISBN 0-13-046427-9. |
| **Suggested Texts, Readings, & Materials** | Reference text: *Physical Chemistry*. Tinoco, Sauer, Wang, & Puglisi, Prentice-Hall, Fourth Edition (2002). ISBN 0-13-095943-X, or other physical chemistry text.<br>Lecture notes will be provided on eLearning. |

## Assignments & Academic Calendar

*[Topics, Reading Assignments, Due Dates, Exam Dates]*

| Date | Topics | Chapter Reading Assignments (plus other materials presented in class) |
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| Mon, Jan. 14 | Structure of macromolecules | Chap 1 |
| Weds, Jan. 16 | Structure of macromolecules, continued | Chap 1 |
| Mon, Jan. 21 | **No class - Martin Luther King Day** | |
| Weds, Jan. 23 | Research paper 1: Design of a photocontrolled DNA-binding protein | Morgan et al. (2010) JMB 399:94-112 |
| Mon, Jan. 28 | Thermodynamic principles | Chap 2 |
| Weds, Jan. 30 | Thermodynamic principles, continued<br>Discuss HOMEWORK #1 on Chaps 1, 2, research paper 1<br>**(Weds, Jan. 30 - Last day to drop without a "W")** | Chap 2 |
| Mon, Feb. 4 | Thermodynamic principles, continued | Chap 2 |
| Weds, Feb. 6 | Thermodynamic principles, continued | Chap 2, 13 |

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| Mon, Feb. 11 | Research paper 2: Thermodynamic parameters from melting curves | Marky & B (1987) Biopol 26:1601-1620 |
| Weds, Feb. 13 | Discuss HOMEWORK #2 on Chaps 2, 13, research paper 2 | |
| Mon, Feb. 18 | **EXAM #1: Chapters 1, 2, and 13, research paper 2** | |
| Weds, Feb. 20 | Molecular thermodynamics | Chap 3 |
| Mon, Feb. 25 | Molecular thermodynamics, continued | Chap 3 |
| Weds, Feb. 27 | Statistical thermodynamics | Chap 4 |
| Mon, Mar. 4 | Statistical thermodynamics, continued | Chap 4 |
| Weds, Mar. 6 | Statistical thermodynamics, continued<br>Discuss HOMEWORK #3 on Chaps 3, 4<br>**(Sat, Mar. 9 - Midterm grades due)** | Chap 4 |
| Mon, Mar. 11 | **No class - Spring Break** | |
| Weds, Mar. 13 | **No class - Spring Break** | |
| Mon, Mar. 18 | Diffusion, sedimentation, and electrophoresis | Chap 5 |
| Weds, Mar. 20 | Structure determination by X-ray crystallography | Chap 6 |
| Mon, Mar. 25 | X-ray diffraction, continued | Chap 6 |
| Weds, Mar. 27 | Discuss HOMEWORK #4 on Chaps 4, 5, 6 (part I) | |
| Mon, Apr. 1 | **EXAM #2: Chapters 3, 4, 5, and 6 (part I)**<br>**(Last day to drop with WP/WF)** | |
| Weds, Apr. 3 | X-ray diffraction, continued | Chap 6 |
| Mon, Apr. 8 | X-ray diffraction, continued | Chap 6 |
| Weds, Apr. 10 | Transition energies and dipoles | Chap 8.4, 8.5 |
| Mon, Apr. 15 | Absorption spectroscopy | Chap 9 |
| Weds, Apr. 17 | Linear and circular dichroism<br>Discuss HOMEWORK #5 on Chap 6 (part II), 8, 9 | Chap 10 |
| Mon, Apr. 22 | Linear and circular dichroism, continued | Chap 10 |
| Weds, Apr. 24 | Emission spectroscopy | Chap 11 |
| Mon, Apr. 29 | Emission spectroscopy, continued | Chap 11 |
| Weds, May. 1 | Discuss HOMEWORK #6 on Chaps 10, 11<br>Final review | |
| Mon, May 13 | **FINAL EXAM: Chapters 6, 8 to 11, research paper 1**<br>**NOTE: FINAL EXAM TIME is 8:00 am!!**<br>**(Grades available on-line Fri May 17)** | |
| **Exam Dates and Times** | **In class at 9:30 am: Exam 1 - 2/27/12; Exam 2 - 4/9/12.**<br>**FINAL EXAM: 5/13/12, 8:00 - 10:45 am** | |

**Course Policies**

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| **Grading (credit) Criteria** | There will be three closed-book exams, including the final exam. Each will count as 30% of the final grade. Class discussion will count as 10% of the final grade.<br><br>Final grades: A (90-100 points), B (75-89 points), C (60-74 points), D (50-59 points), F (< 50 points)<br><br>Class material will be posted on eLearning. |
| **Make-up Exams** | A make-up oral exam will be considered in the case of a medical excuse that is communicated no later than the next scheduled class following the missed exam. |
| **Extra Credit** | **N/A** |
| **Late Work** | **N/A** |
| **Special Assignments** | **N/A** |

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| **Class Attendance** | Attendance is required to obtain answers to homework problems and exams. |
| **Classroom Citizenship** | It is expected that cell phones will be turned off during class. |
| **UT Dallas Syllabus Policies and Procedures** | *The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.*<br><br>*Please go to http://go.utdallas.edu/syllabus-policies for these policies.* |

***These descriptions and timelines are subject to change at the discretion of the Professor.***