

Engineering Molecules 1

Instructor: Niren Murthy

Units : 3

Course Format: (3 hours lecture)

Prerequisites : Chem 3A

Grading: Letter

Short Course Description for General Catalog

This course focuses on providing students with a foundation in organic chemistry and biochemistry needed to understand contemporary problems in synthetic biology, biomaterials and computational biology.

Course Objectives: The goal of this course is to give students the background in organic chemistry and biochemistry needed understand problems in synthetic biology, biomaterials and molecular imaging. Emphasis is on basic mechanisms.

Desired Course Outcomes: Students will learn aspects of organic and biochemistry required to begin the rational manipulation and/or design of biological systems and the molecules they are comprised of.

Grading policy. The students will be graded based on their performance on 2 midterms (30% of grade each), a final exam (30% of grade). Homework will be 10% of the grade.

Final Exam will be written

Textbook: Clayden, Greeves, Warren and Wothers, "Organic Chemistry" 2nd edition and "Principles of Biochemistry" by Albert Leningher.

Class Syllabus and Full Course Description:

Lecture Outline for Weeks 1-6 Organic chemistry

Week 1: Chapters 4, 5 and 6 of the Clayden book.

Chapter 4 Structure of molecules.

Chapter 5 Organic reactions.

Chapter 6 Nucleophilic addition to carbonyl group.

Week 2: Chapter 7, 8 and 9 of the Clayden book.

Chapter 7 Delocalization and conjugation

Chapter 8 Acidity, basicity and pKa

Chapter 9 Using organometallic reagents to make C-C bonds

Week 3: Chapters 10, 11, and 12 of the Clayden book.

Chapter 10 Nucleophilic substitution at the carbonyl

Chapter 11 Nucleophilic substitution at carbonyl with a loss of carbonyl oxygen

Chapter 12 Equilibria and rates

Week 4: Chapters 13, 14 and 15 of the Clayden book.

Chapter 13 H-NMR proton nuclear magnetic resonance

Chapter 14 stereochemistry

Chapter 15 Nucleophilic substitution at carbon

Week 5: Chapters 17, 22 and 23 of the Clayden book.

Chapter 17 Elimination reactions

Chapter 22 Conjugate addition

Chapter 23 Chemoselectivity and protecting groups

Week 6 : Review and Exam I

Exam 1 will be in class on Thursday February 28

Weeks 7-13 Biochemistry

Week 7: Chemical structure of amino acids and three dimensional structure of peptides and proteins

Chapters 3 and 4 of the Leningher book, pages 75-157

Week 8: Protein function and Enzymes

Chapters 5 and 6 of the Leningher book, pages 157-238

Week 9: Chemical structure of nucleic acids, three dimensional structure of DNA and RNA, DNA technologies

Chapters 8 and 9 of the Leningher book, pages 273-343

Week 10 DNA metabolism

Chapter 25 p 948-995 of the Leningher book

Weeks 11: RNA metabolism

Chapter 26 p 995-1024 of the Leningher book

Week 12: Review and Midterm II

Exam 2 will be in class on Thursday April 25

Week 13: Protein metabolism

Chapter 27 p1024-1081 of the Leningher book

Week 14: Bioenergetics and metabolism

Chapters 13 and 16, p480-521 and p601-631

Week 15: RRR week.

Final Exam on Thursday May 16th from 3-6PM in same room as class