CHEM 3114 **Organic Chemistry II** **Syllabus** **Spring 2009**

Instructor Dr. Nathan J. Malmberg

- Office: Wood Sciences Room 202F
- Email: nathan.malmberg@okbu.edu
- Website: http://www.okbu.net Click on Nathan Malmberg.
- Phone: (405)878-2048
- Office Hours: M 9–10, T 10–12, W 9–10, F 9–10, 1–2 or **by appointment**

Textbook Organic Chemistry, Fifth Edition by Paula Y. Bruice, Pearson Education, Inc. 2004 ISBN: 0-13-196316-3

Lab Text Microscale Organic Laboratory, Third Edition by Dana W. Mayo, Ronald M. Pike and Peter K. Trumper, John Wiley and Sons, Inc. 2000 ISBN: 0-471-32185-0

Course Meets MWF at 8:00-8:50 AM in Wood 102

Lab Meets Tuesday or Thursday at 1:00-5:00 PM in Wood 209

Description Application of principles from CHEM 3104 to organic reaction mechanisms and to organic qualitative analysis. Prerequisite: A grade of C or better in CHEM 3104 or its equivalent as determined by instructor. Additional fee required.

Goals In this class we will be focusing on overarching principles that govern all of organic chemistry. As such, more emphasis will be placed on understanding and applying general principles of organic chemistry, and less emphasis will be placed on memorizing reactions which are not well understood. We will also be spending time answering questions of the nature "How do we know this?". You will see problems such as determining the most likely product of a reaction, the best way to synthesize an organic molecule, and how to identify an unknown organic compound. You will also see, on occasion, a problem you have never encountered, in order to apply these general principles to a variety of different situations.

Additional Info regarding important semester deadlines, academic dishonesty, disabilities, etc. can be found in the university-wide syllabus attachment available online at http://www.okbu.edu/academics/forms/Syllabus_Attachment_Spring09.pdf.

Academic Dishonesty will not be tolerated. Offenses will result in a zero for the assignment, and may result in disciplinary action by the University. Academic dishonesty may include, but is not limited to:

- Copying from another student's exam or quiz.
- Sharing data analysis with your lab partner or other students.
- Insufficient rewording of material derived from another source.

Integration of Faith and Learning A Christian worldview provides us with the confidence that the world is governed by an orderly Creator. While many of the reactions we study may seem unrelated and confusing, the principles that govern the reactions are fairly simple, and allow us to make many predictions about reactions we haven't even seen yet.

Attendance Attendance will not be taken in this course. However, you are responsible for the information presented in class. In addition, your participation in class will not only help yourself, it also helps me identify that you are putting in a significant effort in the class.

Grades The value of each assignment for the semester is listed below:

Midterm Exams	400 pts
ACS Exam	100 pts
Quizzes	100 pts
Lab	200 pts
Group Presentations	50 pts
Total	850 pts

Grading Scale Grades will tentatively be assigned according to the following scale: 85-100%–A, 75-84%–B, 65-74%–C, 55-64%–D, below 55%–F. These scales may be adjusted downward, but don't count on it.

Exams Midterm exams will be held during normal class periods on *February 25, March 13, April 15 and May 8.* Each exam will be worth 100 points, and will test the material covered in lecture from each section of the course. The ACS exam will be held on the final exam time set by the university, will be worth 100 points, and will cover material from *the entire two-semester sequence* (comprehensive).

Quizzes There will be a quiz almost every week testing your comprehension of the material covered since the previous week. The major exceptions to this quiz rule will be on weeks of an exam. Each quiz will be worth 10 points.

Homework There will be homework problems assigned at the beginning of discussion of each chapter. These homework assignments will normally not be graded. However, *at the discretion of the instructor*, a few of these homework assignments *may* be collected for grading. For those collected homework assignments, five randomly selected problems will be graded at 2 points each, for a total of 10 points possible. For *any* credit on these assignments, *complete* lines of reasoning must be detailed for the problem. Each problem set will be "due" at the beginning of class following the completion of the chapter in lecture. Homework must be turned in on time, or it will not be accepted at all. Homework scores will be used to replace low quiz scores.

Presentation You will be required to give a 10-15 minute presentation about an chemical reaction of significance to organic chemistry. You will work on the presentation as a partnership, but you will give the presentation individually. The presentation will be given during the week of *April 28* in the lab time slot.

Important deadlines to consider regarding the preparation of the presentation:

March 12 Select partner and topic (reaction) by writing the names of the Tuesday presenter, the Thursday presenter, and the reaction on the signup sheet on Dr. Malmberg's door. Any incomplete entries (no reaction) will be deleted from the list, and corrections will require creating a new entry on the list. Reactions are first come, first served.

April 29, May 1 Present final presentations to class, Dr. Malmberg and other chemistry faculty.

Tutoring will be available in Wood 102 on Tuesdays, Thursdays and Sundays at 7:00 PM. The tutors will be able to answer your questions about organic chemistry, as well as to help you ask the right questions to your instructor.

Late Policy Exams and quizzes must be completed on the days on which they are given. Failure to take an exam or quiz in the alloted time will result in a zero for that exam or quiz. Exceptions will be made for exams or quizzes which are missed because of:

- University-sponsored activities. You must make alternative arrangements with me at least a week in advance.

- Documented medical absence.
- Death in the family.

Lab reports that are turned in late will be subject to the following penalties:

1 day	10 %
2 days	30 %
3 days	60 %
4 days	100 %

Tentative Lecture Schedule Spring 2009

Week	M	W	F	Topic
2/2–2/6	Intro, Chap. 12	12	Quiz, 12	Mass Spectrometry
2/9–2/13	12	Quiz, 12	13	Infrared, UV-Vis Spectroscopy
2/16–2/20	13	13	Quiz, 13	NMR
2/23–2/27	14	Exam I	14	Aromatic Compounds
3/2–3/6	14	15	Quiz, 15	Substituted Aromatic Compounds
3/9–3/13	15	16	Exam II	Naming Carboxylic Acid Derivatives
3/16–3/20	Spring Break			
3/23–3/27	16	16	Quiz, 17	Reactions of Carboxylic Acid Derivatives
3/30–4/3	17	Quiz, 17	17	Aldehydes and Ketones
4/6–4/10	18	18	Quiz, 18	Reactions at α-Carbons
4/13–4/17	18	Exam III	19	Redox Reactions
4/20–4/24	19	19	Quiz, 20	Amines
4/27–5/1	Evaluations, 20	21	Quiz	Carbohydrates
5/4–5/8	21	21	Exam IV	Amino Acids
5/11–5/15	22	22	Quiz, Review	Conclusions

Topics by Chapter Organic Chemistry by Paula Y. Bruice

Chap. 12 Mass Spectrometry and IR Spectroscopy: Mass Spectra, Isotopes and Molecular Formula Determination, Fragmentation, Spectroscopy, Absorption Bands, Functional Groups and IR, Absence of Absorption Bands, Ultraviolet and Visible Spectroscopy, Effects of Conjugation

Chap. 13 NMR: Basis for NMR Spectroscopy, Chemical Shift, Coupling, ^{13}C NMR, 2D-NMR, Number of NMR Signals, Integration of Signals, Time Dependence of NMR Signals, Solving Structures Using NMR

Chap. 14 Basis for Aromaticity, Chemical Consequences of Aromaticity, Antiaromaticity, Nomenclature of Monosubstituted Benzenes, Mechanism of Electrophilic Aromatic Substitution, Halogenation, Nitration, Sulfonation, Friedel-Crafts Acylation, Friedel-Crafts Alkylation, Acylation-Reduction

Chap. 15 Nomenclature of Polysubstituted Benzenes, Reactions of Benzene Substituents, Effects of Substituents on Reactivity of Benzene, Electron Donation and Withdrawal, Effects of Substituents on Reaction Orientation, Effects of Substituents on pKa, Synthesis Reactions and Benzene, Arenediazonium Salts, Reactions of Amines with Nitrous Acid, Nucleophilic Aromatic Substitution, Benzyne, Polycyclic Aromatic Compounds, Electrophilic Substitution of Naphthalene

Chap. 16 Nomenclature of Carboxylic Acid Derivatives, Physical Properties of Carbonyl Compounds, Nucleophilic Acyl Substitution Reactions, Reactivities of Carboxylic Acid Derivatives, Reactions of Carboxylic Acid Derivatives, Acid-Catalyzed and Base-Promoted Ester Hydrolysis, Acid-Catalyzed Amide Hydrolysis, Gabriel Synthesis, Hydrolysis of Nitriles, Synthesis of Carboxylic Acid Derivatives

Chap. 17 Nomenclature of Aldehydes and Ketones, Relative Reactivities of Aldehydes and Ketones, Nucleophilic Addition Reactions, Nucleophilic Addition with Carbon Nucleophiles, Nucleophilic Addition with Hydrides, Nucleophilic Addition of Amines, Acetals and Ketals, Protecting Groups, Thioacetals and Thioketals, Wittig Reaction, Stereochemistry of Addition Reactions, Synthesis and Synthetic Equivalents, Reactions of $\alpha - \beta$ Unsaturated Carbonyls

Chap. 18 Acidity of α Hydrogens, Keto-Enol Tautomerism, Enolates as Nucleophiles, Halogenation of Carbonyl Compounds, LDA and Enolates, Alkylation of Enolates, Enamines and Alkylation Reactions, Alkylation of the β Carbon, Aldol Addition Reactions, Aldol Condensation, Mixed Aldol Reactions, Claisen Condensations, Mixed Claisen Condensations, Intramolecular Reactions, Decarboxylation of β-Keto Acids, Malonic Ester Synthesis, Acetoacetic Acid Synthesis, Synthesis and Formation of Carbon-Carbon Bonds

Chap. 19 Reduction Reactions, Oxidation of Alcohols, Oxidation of Aldehydes and Ketones, Oxidation with Peroxyacids, Hydroxylation of Alkenes, Oxidative Cleavage of 1,2-Diols, Oxidative Cleavage of Alkenes and Alkynes, Synthesis and Functional Groups

Chap. 20 Nomenclature of Amines, Amines and pKa, Amines as Nucleophiles, Hofmann Elimination and Degradation Reactions, Cope Elimination, Synthesis of Amines, Aromatic Heterocycles

Chap. 21 Classification of Carbohydrates, Stereochemistry of Carbohydrates, Epimers, Redox Reactions of Sugars, Osazones, Kiliani-Fischer Synthesis, Ruff Degradation, Fischer Proof, Hemiacetals and Hemiketals in Sugars, Sugar Conformation, Anomers, Reducing and Nonreducing Sugars, Ring Size of Sugars, Glycosidic Bonds, Ira Remsen

Chap. 22 Classification of Amino Acids, Stereochemistry of Amino Acids, Acid-Base Properties of Amino Acids, Peptide Bonds, Resolution of Peptides, Synthesis of Peptides