SOUTHERN CONNECTCUT STATE UNIVERSITY

Course Number and Title CHE 260 Organic Chemistry I
Fall 20xx

Name: **Office** **Phone:** **E-mail:**	**Office Hours:**

COURSE NUMBER 260 **CREDIT HOURS**: 4 **PREREQUISITES: CHE120/121**

COURSE TITLE: Organic Chemistry I

COURSE DESCRIPTION:
The course will focus on the basic principles of the chemistry of organic compounds as well as their detailed reaction mechanisms. In addition, these concepts will be applied through the laboratory portion of the course. The laboratory portion will also teach proper and safe techniques as well as emphasize the development of scientific writing skills on the basis of formal lab reports. Furthermore, the use of current organic instrumentation such as nuclear magnetic resonance spectroscopy, infrared spectroscopy, gas chromatography, mass spectrometry, and ultra violet spectroscopy will be a major focus of the laboratory component as well as the lecture component.

Expected Student Activity	**Average estimated weekly hours needed for each activity**	**Estimated semester (14 weeks) hours needed for each activity**
lecture (contact hours)	3	42
laboratory time (contact hours)	4	56 (11 experiments plus 1 hour for check-in and check-out)
study time	5.5	77
take-home assignments	0.5	7
lab reports preparation	4	56 (11 reports)
final exam		2
Total	17	240

Note: these times are only estimates based on the Department of Education's definition of a credit hour and do not guarantee a specific grade in the course. Students may find that they require more or less time to succeed in the course.

COURSE'S CONTRIBUTION:
This is the first of a two course sequence in organic chemistry that chemistry and pre-med students are required to take. The course will emphasize active understanding of the material and not just rote memorization. The other component of learning that will be emphasized is problem solving. Applications of certain concepts will be related to everyday uses.

LEARNER OUTCOMES & ASSESSMENT

• Learn how structure, bonding, and molecular properties apply to organic compounds. Students will be expected to be able to discuss concepts and answer questions on exams and problem sets using appropriate molecules that demonstrate an understanding of resonance, molecular orbital theory, hybridization, and VSEPR. (NSTA 1, 5; INTASC 1)

• Learn how organic compounds are represented and gain an understanding of functional groups. Students will be expected to be able to properly use and interpret line structures when drawing all organic molecules for any reason. Student will be expected to be able to draw molecules containing any of the common functional groups. (NSTA 1, 5; INTASC 1)

• Learn how acid/base properties apply to organic compounds. Students will be expected to be able to discuss concepts and answer questions on exams and problem sets using appropriate molecules that demonstrate an understanding of acidity and pK_a. (NSTA 1, 5; INTASC 1)

• Learn how to acquire and interpret various types of spectra important to organic chemistry. These may include but are not limited to NMR (nuclear magnetic resonance spectroscopy), IR (infrared spectroscopy), and mass spectrometry. Students will demonstrate mastery of material by showing the ability to properly interpret spectra to solve problems such as identifying compounds based on their spectra. Students will also be expected to be able to predict what a spectrum will look like given the compound's structure. This will be tested by answering questions on exams and problem sets as well as proper interpretation of spectra from laboratory experiments. (INTASC 1, 4; NSTA 1, 3, 4, 5)

• Learn the concepts of conformational analysis and stereochemistry and their importance to the area of organic chemistry. Also, learn the proper use of a molecular model kit. Students will be expected to be able to analyze both cyclic (chair conformations) and acyclic molecules (Newman Projections) for stability. In addition, they will be expected using appropriate examples be able to identify enantiomers, diastereomers, and other such isomeric examples. (INTASC 3, 4; NSTA 1, 3, 4, 5)

• Understand the chemistry and nomenclature of alkanes, alkenes, and alkynes. Students will be expected to be able to name organic molecules given structures or convert given names into structures in questions on exams and problem sets (NSTA 1; INTASC 1)

• Learn the reactions of alkenes and alkynes, specifically, addition reactions. Students will be expected to be able to answer questions predicting starting materials or products of various alkene addition reactions including HX addition, hydrogenation, halogenations, hydroboration, oxymercuration, and epoxidation. Students will also be expected to answer questions regarding the mechanisms of these reactions. Additionally, students will perform some of these reactions in the lab and be able to analyze the results in written lab reports. (NSTA 1; INTASC 1)

• Learn how to propose simple synthetic routes. Students will be expected to be able to design synthetic schemes from a starting compound to a more complicated product using retrosynthetic analysis along with the reactions that they have learned thus far in the course. (NSTA 1; INTASC 1)

• Learn basic organic laboratory techniques such as recrystallization, melting points, extraction, distillation, and chromatography. Students will be expected to show understanding through prelab quizzes on the upcoming procedure as well as proper analysis of their experimental results in both formal and informal lab reports according to the criteria given in the course syllabus. (NSTA 1, 3; INTASC 1).

• Students will be expected to apply the concepts learned in the lecture component of the course to the laboratory portion. Students will demonstrate through the writing of lab reports based on the criteria in the laboratory syllabus (NSTA 1, 2, 3, 6, 9; INTASC 1)

• Continue development of proper scientific writing style through the use of formal and informal laboratory reports. Students will be expected to write both formal and informal lab reports as well as revise formal lab reports to improve on their writing skills. Students will be expected to write syllabi according to proper scientific writing (ACS) guidelines as well as the criteria in their laboratory syllabus. (NSTA 1, 2, 3, 4, 6, 8, 9, 10)

• Learn safe laboratory practices in working with organic chemicals. Students will demonstrate through lab quizzes, lab reports, and proper keeping of a lab notebook based on the examples in their lab manual as well as the requirements given in the course syllabus. (NSTA 9)

MODES OF LEARNING

Lectures, demonstrations, assigned problems, in-class group assignments, and quizzes will be all used during the lecture component of the course. Furthermore, the laboratory experiments and hands-on instrumental use will serve to reinforce concepts learned during the lecture. In addition, important techniques used by organic chemists will be learned along with safety issues. Students are expected to perform all of their experiments and receive a passing grade of > 60% in the laboratory component in order to pass the course.

COURSE CONTENT OUTLINE

1. Structure, Bonding and Molecular Properties of Organic compounds (6 lectures)
   - Structure of atoms, atomic orbitals
   - Chemical Bonding (ionic bonds, covalent bonds)
   - Valence-bond theory (hybridization)
   - Molecular Orbital (MO) theory (HOMO and LUMO)
   - Resonance
   - Electronegativity, dipole moments
   - Acids and bases

2. Alkanes and Cycloalkanes (1 lecture)
- Alkanes as building blocks (isomers)
- Functional groups
- Nomenclature

3. MS spectrometry (1 lecture)

4. IR spectroscopy (1 lecture)

First exam: 9/22/10

5. ^{13}C NMR (3 lectures)
- Theory of NMR
- ^{13}C NMR
- DEPT ^{13}C NMR

6. ^{1}H NMR (3 lectures)
- Chemical Shift
- Integration
- Splitting

7. Conformational Analysis of Alkanes (1 lecture)

8. Conformational Analysis of Cycloalkanes (2 lectures)

Second exam: 10/15/10

9. Stereochemistry (4 lectures)
- Optical activity - enantiomers
- Diastereomers
- Meso compounds
- Racemic mixtures
- Stereochemistry of heteroatoms
- Prochirality

10. Organic Reaction Mechanisms (2 lectures)
- Radical reactions
- Addition reactions
- Displacement reactions
- Thermodynamics, kinetics, energy diagrams
- Intermediates, transition state, using curved arrows

11. Alkenes: Structure and Reactions (3 lectures)
- Cis-trans (E, Z) isomerism and degrees of unsaturation
- Hyperconjugation and regioselectivity (Markovnikov's rule)
- Hammond postulate
- Carbocations and their rearrangements

Third exam: 11/12/10

12. Alkenes: More reactions and their synthesis (3 lectures)
- Addition of halogens and water
- Reductions, hydroxylation and oxidative cleavage

13. Alkynes (3 lectures)
- Naming

- Synthesis
- Reactions

14. Alkyl Halides (2 lectures)
- Naming
- Radical halogenation (reactivity vs. selectivity)
- Allylic halogenation
- Reactions of alkyl halides

Fourth exam: 12/10/10

15. Conjugated Compounds and Ultraviolet Spectroscopy (2 lectures)
- Conjugation
- Ultraviolet Spectroscopy

Final comprehensive exam: 12/15/10 (as scheduled by the University)

REQUIRED TEXTS
- McMurray, J. *Organic Chemistry, 7th ed. with CengageNOW*, 2008, Brooks/Cole Publisher.
- Pavia, D. *Introduction to Organic Laboratory Techniques: a Microscale Approach*, 4th ed.
- Molecular Model Kit (two options available in the bookstore).
- Goggles (available from chemistry club).
- Hardcover Lab Notebook.

COURSE REQUIREMENTS

Exams:
The exams will be taken during regular class time. Students who arrive late will not be allotted extra time. Any changes will be announced in class. Only students with valid (documented) excuses will be permitted to take a make-up exam or quiz. Conflicts in scheduling should be resolved in advance (at least one week before the exam). All exams will be comprehensive written tests, but they will concentrate on the material covered since the previous test. They will be constructed in such a way as to emphasize active understanding of the material. Books, scratch paper (other than furnished), cell phones (and similar electric devices), and calculators will not be allowed.

Attendance:
Lecture attendance is strongly recommended. Laboratory attendance is mandatory.

Academic Integrity:
All forms of academic dishonesty will not be tolerated. Such infractions are considered cause, at the least, for awarding a **grade of "0"** on the assignment or exam in question. Cheating on an exam may result in failure of the course. For more details, see the student handbook on the subject. This policy will be *strictly* enforced.

Assigned Problems:
1. Structure, Bonding and Molecular Properties
Chapter 1: 18, 20, 22, 24, 25, 28, 30, 31, 33, 37, 40, 41, 42, 46, 48, 49, 50, 51, 53, 54. Chapter 2: 25, 26, 27, 29, 31, 32, 33, 34, 37, 38, 39, 40, 41, 43, 45, 48, 49, 53, 54, 56, 58.

2. Alkanes and Cycloalkanes
Chapter 3: 19, 21, 24, 25, 27, 28, 29, 30, 31, 34, 38, 41. Chapter 4: 21, 25, 26.

3. MS spectrometry
Chapter 12: 13, 17, 18, 20, 21, 22, 24.

4. IR spectroscopy
Chapter 12: 12, 27, 30, 31, 33, 34, 38, 41, 42.

5. ^{13}C NMR
Chapter 13: 33, 34, 56, 59, 60, 61, 62, 63, 64.

6. ^{1}H NMR
Chapter 13: 31, 36, 37, 38, 39, 40, 41, 42, 44, 48, 49, 51, 52, 53, 54, 55, 57, 58.

7. Conformational Analysis of Alkanes
Chapter 3: 42, 43, 46, 47, 51.

8. Conformational Analysis of Cycloalkanes
Chapter 4: 22, 24, 27, 28, 29, 32, 33, 34, 37, 42, 43, 44, 48, 53.

9. Stereochemistry
Chapter 9: 31, 35, 36, 37, 39, 43, 44, 45, 46, 50, 53, 55, 63, 64, 65, 72, 78, 79.

10. Organic Reaction Mechanisms
Chapter 5: 20, 21, 24, 26, 27, 29, 30, 31, 32, 36.

11. Alkenes: Structure and Reactions
Chapter 6: 23, 24, 26, 27, 29, 31, 33, 35, 39, 40, 43, 48, 49, 52, 58.

12. Alkenes: More reactions and their synthesis
Chapter 7: 24, 25, 26, 27, 28, 29, 30, 31, 33, 36, 39, 41, 42, 43, 45, 49, 51, 52, 57. Chapter 9: 59, 60, 61, 62, 67, 68, 69.

13. Alkynes
Chapter 8: 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 31, 33, 35, 41, 46.

14. Alkyl Halides
Chapter 10: 17, 18, 19, 22, 23, 25, 27, 31, 33, 35, 37, 39, 42.

15. Conjugated Compounds and Ultraviolet Spectroscopy
Chapter 14: 2, 3, 7, 9, 11, 15, 21, 23, 27, 32, 33, 34, 37, 39, 40, 57, 58

EVALUATION CRITERIA
Students are required to complete all laboratory experiments. The lab experiments reinforce many of the chemical concepts covered in lecture and students are expected to apply the concepts to the laboratory experiments. Please remember that to receive a passing grade in CHE 261, you **must pass the laboratory portion** of the course. A passing grade for the laboratory portion of the course is 60%.

The course grade is based on the following criteria:

- Three mid-term exams, 40%
- Comprehensive final exam, 20%.
- Five problem sets, 15%
- Laboratory grade, 25%. All projects must be completed and a passing grade (≥60%) must be received in the laboratory component of the course in order to receive a passing grade in the course.

Final grades will be assigned by the following scale:

A+ (100-96)	B+ (85-82)	C+ (73-70)	D+ (61-58)	F <50
A (95-91)	B (81-78)	C (69-66)	D (57-54)	
A- (90-86)	B- (77-74)	C- (65-62)	D- (53-50)	

The instructor reserves the right to adjust the grading scales for class average at the end of the semester.

STANDARDS GUIDELINES

INTASC [Interstate New Teachers' Assessment & Support Consortium]

Scholarship

1. Knowledge of subject matter
2. Knowledge of human development & learning
3. Instruction adapted to meet diverse learners
4. Use of multiple instructional strategies & resources

Attitudes and Disposition

5. Effective learning environment created
6. Effective communication
7. Lesson planning

Integrity

9. Reflection and professional development

Leadership

8. Assessment of student learning to improve teaching

Service

10. Partnership with school and community

Professional Standards

National Science Teacher's Association

1. Content - Structure and interpret the concepts, ideas and relationships in science

2. Nature of Science - Define the values, beliefs and assumptions inherent to the creation of scientific knowledge within the scientific community

3. Inquiry - Formulating solvable problems, constructing knowledge from data, exchanging information for seeking solutions, developing relationships from empirical data

4. Context of Science - Relate science to daily life: technological, personal, social and cultural values.

5. Skills of Teaching - Science teaching actions, strategies and methodologies, interaction with students, effective organization and use of technology.

6. Curriculum - Extended framework of goals, plans, materials and resources for instruction.

7. Social Context - Social and community support network, relationship of science to needs and values of the community, involvement of people in the teaching of science.

8. Assessment - Alignment of goals, instruction and outcomes, evaluation of student learning.

9. Environment for Learning - Physical spaces for learning, psychological and social environment, safety in science instruction.

10. Professional Practice - Knowledge and participation in the professional community, ethical behavior, high quality of science instruction, working with new colleagues as they enter the profession.

APPLICATION OF KNOWLEDGE THROUGH

2.1 instructional planning based upon knowledge of subject, students, curriculum & community
2.2 selection and/or creation of learning tasks that make subject meaningful for students
2.3 establishment and maintenance of appropriate behavior standards and creation of positive learning environment
2.4 creation of instructional opportunities supporting students' academic, social and personal development
2.5 use of verbal, nonverbal and media communication fostering individual and collaborative inquiry
2.6 employment of various instructional strategies in support of critical thinking, problem solving and skills demonstration
2.7 use of various assessment techniques to evaluate student learning & modify instruction

DEMONSTRATION OF PROFESSIONAL RESPONSIBILITY THROUGH:

3.1 professional conduct in accordance with the Code of Professional Responsibilities for Teachers
3.2 shared responsibility for student achievement and well-being
3.3 continuous self-evaluation regarding choices & actions on students and school community
3.4 commitment to professional growth
3.5 leadership in the school community
3.6 demonstrations of a commitment to students and a passion for improving the profession

TENTATIVE COURSE CALENDAR
See "Course Content Outline" above.

DISABILITY ACCOMMODATION STATEMENT

I believe in providing reasonable accommodations for students with documented disabilities on an individualized and flexible basis. If you are a student with a documented disability, the university's Disability Resource Center (DRC) determines appropriate accommodations through consultation with the student. Before you may receive accommodations in this class, you will need to make an appointment with the Disability Resource Center, located in EN C-105A. To speak with me about other concerns, such as medical emergencies or arrangements in case the building must be evacuated, please make an appointment as soon as possible.