**COURSE SYLLABUS**

<table>
<thead>
<tr>
<th>Course Number: CHM 2210</th>
<th>Course Title: Organic Chemistry I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite(s): CHM 1045 and CHM 1046 or equivalents with passing grade.</td>
<td>Course Hours: 3 per week</td>
</tr>
<tr>
<td>College: Arts and Sciences</td>
<td>ACS; <em>Preparing for your ACS Examination in Organic Chemistry: The Official Guide</em>.</td>
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<tr>
<td>Department: Chemistry</td>
<td>Supplies: Molecular Model Set</td>
</tr>
<tr>
<td>Faculty Name: Dr. E. Onyeozili</td>
<td>Other Requirements: 1. Internet access. 2. Email account</td>
</tr>
<tr>
<td>Term and Year: Spring 2010</td>
<td></td>
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<tr>
<td>Place and Time: 101 BLPC (General Classroom Bldg) Section 001; MWF 12:20-1:10 p.m.</td>
<td>Telephone: (850) 412–5328</td>
</tr>
<tr>
<td>Office Location: FHS (Science Research Building) Rm. 119</td>
<td>e-mail: <a href="mailto:edith.onyeozili@famu.edu">edith.onyeozili@famu.edu</a></td>
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</tbody>
</table>

**Course Description**

Study of nomenclature and fundamental physical and chemical properties of acyclic and cyclic aliphatic hydrocarbons, alkyl halides, and alcohols, with special emphasis on the relationship of structure to physical and chemical properties; special consideration given to mechanism and stereochemical effects.

CHM 2210 is a first semester organic chemistry for chemistry, pharmacy, pre-med and engineering majors and other students whose curricula call for a rigorous and comprehensive exposure to organic structure, nomenclature, reactions and mechanisms as they pertain to organic compounds with a wide spectrum of functional groups and their stereochemistries and spectroscopy. The course will therefore be presented in such a manner as to help the student develop the ability to relate organic structure and stereochemistry to reactions in an organized way. Emphasis will be placed on reaction mechanisms as a basis for learning organic reactions.
Course Purpose
Required course for science, engineering, pharmacy and pre-health professions majors.

REFERENCES
5. Organic Chemistry by John McMurry (7e, 2008),

Conceptual Framework
The Conceptual Framework in the Professional Education Unit (PEU) at Florida A&M University is an integrated approach to providing educational experiences that result in exemplary professional educators. The Framework is comprised of six themes with the mission of developing high quality classroom teachers, administrators and support personnel. The term “exemplary” refers to the kind of graduates the PEU strives to produce. The figure below provides a diagram of the Exemplary Professional Conceptual Framework:

TECHNOLOGY

• CF 2
• Through this focal area, the FAMU professional education candidate will:

| CF: 2.1 (S) | Use of available technology and software to support student learning. | F: 2, 4, 12 | I: 6 |
| CF: 2.5 (S) | Use fundamental concepts in technology. | F: 12 | I: 6 |
| CF: 2.7 (S) | Facilitate the use of technology by students. | F: 4, 12 | I: 6 |

VALUES

• CF3
• Through this focal area, the FAMU professional education candidate will:

| CF: | Recognize the importance of peer |

### CRITICAL THINKING

• CF 4
  • Through this focal area, the FAMU professional education candidate will:

| CF: 4.3 (D) | Value critical thinking and self-directed learning as habits of mind. | F: 4 | I: 1, 4 |
| CF: 4.5 (S) | Demonstrate the use of higher order thinking skills. | F: 8 | I: 4 |

### PROFESSIONALISM

• CF 5
  • Through this focal area, the FAMU professional education candidate will:

| CF: 5.1 (K) | Know the content | F: 8 | I: 1 |

### National and State Standards Addressed in the Course

#### Interstate New Teacher Assessment and Support Consortium (INTASC) Standards

**Standard 1: Subject Matter:** The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

1.10 **Knowledge**

1.12 The teacher understands how students' conceptual frameworks and their misconceptions for an area of knowledge can influence their learning.

1.13 The teacher can relate his/her disciplinary knowledge to other subject areas.

1.20 **Dispositions**

1.24 The teacher is committed to continuous learning and engages in professional discourse about subject matter knowledge and children's learning of the discipline.

1.30 **Performances**

1.35 The teacher develops and uses curricula that encourage students to see, question, and interpret ideas from diverse perspectives.

**Standard 4: Instructional Strategies:** The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

4.10 **Knowledge**

4.11 The teacher understands the cognitive processes associated with various kinds of learning (e.g. critical and creative thinking, problem structuring and problem solving, invention, memorization and recall) and how these
processes can be stimulated.

4.12 The teacher understands the principles and techniques, along with advantages and limitations, associated with various instructional strategies (e.g. cooperative learning, direct instruction, discovery learning, whole group discussion, independent study, interdisciplinary instruction).

4.13 The teacher knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes and discs, local experts, primary documents and artifacts, texts, reference books, literature, and other print resources).

4.20 Dispositions
4.21 The teacher values the development of students' critical thinking, independent problem solving, and performance capabilities.

4.23 The teacher values the use of educational technology in the teaching and learning process.

4.30 Performances
4.31 The teacher carefully evaluates how to achieve learning goals, choosing alternative teaching strategies and materials to achieve different instructional purposes and to meet student needs (e.g. developmental stages, prior knowledge, learning styles, and interests).

4.33 The teacher constantly monitors and adjusts strategies in response to learner feedback.

4.34 The teacher varies his or her role in the instructional process (e.g. instructor, facilitator, coach, audience) in relation to the content and purposes of instruction and the needs of students.

4.36 The teacher uses educational technology to broaden student knowledge about technology, to deliver instruction to students at different levels and paces, and for advanced levels of learning.

Standard 5, Learning Environment
The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

5.10 Knowledge
5.11 The teacher can use knowledge about human motivation and behavior drawn from the foundational sciences of psychology, anthropology, and sociology to develop strategies for organizing and supporting individual and group work.

5.12 The teacher understands how social groups function and influence people, and how people influence groups.

5.13 The teacher knows how to help people work productively and cooperatively with each other in complex social settings.

5.14 The teacher understands the principles of effective classroom management and can use a range of strategies to promote positive relationships, cooperation, and purposeful learning in the classroom.

5.15 The teacher recognizes factors and situations that are likely to promote or diminish intrinsic motivation, and knows how to help students become self-motivated.
5.20 Dispositions
5.21 The teacher takes responsibility for establishing a positive climate in the classroom and participates in maintaining such a climate in the school as a whole.

5.22 The teacher understands how participation supports commitment, and is committed to the expression and use of democratic values in the classroom.

5.23 The teacher values the role of students in promoting each other's learning and recognizes the importance of peer relationships in establishing a climate of learning.

5.24 The teacher recognizes the values of intrinsic motivation to students' life-long growth and learning.

5.25 The teacher is committed to the continuous development of individual students' abilities and considers how different motivational strategies are likely to encourage this development for each student.

5.30 Performances
5.31 The teacher creates a smoothly functioning learning community in which students assume responsibility for themselves and one another, participate in decision making, work collaboratively and independently, and engage in purposeful learning activities.

5.32 The teacher engages students in individual and group learning activities that help them develop the motivation to achieve, by, for example, relating lessons to students' personal interests, allowing students to have choices in their learning, and leading students to ask questions and pursue problems that are meaningful to them.

5.33 The teacher organizes, allocates, and manages the resources of time, space, activities, and attention to provide active and equitable engagement of students in productive tasks.

5.34 The teacher maximizes the amount of class time spent in learning by creating expectations and processes for communication and behavior along with a physical setting conducive to classroom goals.

5.35 The teacher helps the group to develop shared values and expectations for student interactions, academic discussions, and individual and group responsibility that create a positive classroom climate of openness, mutual respect, support, and inquiry.

5.36 The teacher analyzes the classroom environment and makes decisions and adjustments to enhance social relationships, student motivation and engagement, and productive work.

5.37 The teacher organizes, prepares students for, and monitors independent and group work that allows for full and varied participation of all individuals.

Standard 6, Communication
The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

6.10 Knowledge
6.11 The teacher understands communication theory, language development, and the role of language in learning.

6.12 The teacher understands how cultural and gender differences can affect communication in the classroom.
6.13 The teacher recognizes the importance of nonverbal as well as verbal communication.

6.14 The teacher knows about and can use effective verbal, nonverbal, and media communication techniques.

6.20 Dispositions

6.21 The teacher recognizes the power of language for fostering self-expression, identity development, and learning.

6.22 The teacher values many ways in which people seek to communicate and encourages many modes of communication in the classroom.

6.23 The teacher is a thoughtful and responsive listener.

6.24 The teacher appreciates the cultural dimensions of communication, responds appropriately, and seeks to foster culturally sensitive communication by and among all students in the class.

6.30 Performance

6.31 The teacher models effective communications strategies in conveying ideas and information and in asking questions (e.g. monitoring the effects of messages, restating ideas and drawing connections, using visual, aural, and kinesthetic cues, being sensitive to nonverbal cues given and received).

6.32 The teacher supports and expands learner expression in speaking, writing, and other media.

6.33 The teacher knows how to ask questions and stimulate discussion in different ways for particular purposes, for example, probing for learner understanding, helping students articulate their ideas and thinking processes, promoting risk-taking and problem-solving, facilitating factual recall, encouraging convergent and divergent thinking, stimulating curiosity, helping stimulate students to question.

6.34 The teacher communicates in ways that demonstrate a sensitivity to cultural and gender differences (e.g. appropriate use of eye contact, interpretation of body language and verbal statements, acknowledgment of and responsiveness to different modes of communication and participation).

6.35 The teacher knows how to use a variety of media communication tools, including audio-visual aids and computers, including educational technology, to enrich learning opportunities.

Standard 10: Collaboration, Ethics, and Relationships: The teacher communicates and interacts with parents/guardians, families, school colleagues, and the community to support students' learning and well-being.

10.10 Knowledge

10.11 The teacher understands schools as organizations within the larger community context and understands the operations of the relevant aspects of the system(s) within s/he works.

10.12 The teacher understands how factors in the students' environment outside of school (e.g. family circumstances, community environments, health and economic conditions) may influence students' life and learning.

10.13 The teacher understands and implements laws related to student's rights and teacher responsibilities (e.g. for equal education, appropriate education for students with disabilities, confidentiality, privacy, appropriate treatment of students, reporting in situations related to possible child abuse).

10.20 Dispositions
10.21 The teacher values and appreciates the importance of all aspects of a child's experience.

10.22 The teacher is concerned about all aspects of child's well-being (cognitive, emotional, social, and physical), and is alert to signs of difficulties.

10.23 The teacher respects the privacy of students and confidentiality of information.

10.24 The teacher is willing to consult with other adults regarding the education and well-being of her/his students.

10.25 The teacher is willing to work with other professionals to improve the overall learning environment for students.

10.30 Performances

10.31 The teacher participates in collegial activities designed to make the entire school a productive learning environment.

10.32 The teacher makes links with the learners' other environments on behalf of students, by consulting with parents, counselors, teachers of other classes and activities within the schools, and professionals in other community agencies.

10.33 The teacher can identify and use community resources to foster student learning.

10.34 The teacher establishes respectful and productive relationships with parents and guardians from diverse home and community situations, and seeks to develop cooperative partnerships in support of student learning and well being.

10.35 The teacher talks with and listens to the student, is sensitive and responsive to clues of distress, investigates situations, and seeks outside help as needed and appropriate to remedy problems.

10.36 The teacher acts as an advocate for students.

Florida Educator Accomplished Practices (FEAP)

Accomplished Practice #2: COMMUNICATION

2.1 The preprofessional teacher recognizes the need for effective communication in the classroom and is in the process of acquiring techniques which she/he will use in the classroom.
2.2 STANDARD: Communication -- Uses effective communication techniques with students and all other stakeholders.
2.a Establishes positive interactions in the learning environment that uses incentives and consequences for students.
2.b Establishes positive interactions between the teacher and student that are focused upon learning.
2.c Varies communication (both verbal and nonverbal) according to the nature and needs of individuals.
2.d Encourages students in a positive and supportive manner.
2.e Communicates to all students high expectations for learning.
2.h Practices strategies that support individual and group inquiry.
2.j Identifies communication techniques for use with colleagues, school/community specialists, administrators, and families, including families whose home language is not English.

Accomplished Practice #4: Critical-thinking
4.1 The pre-professional teacher is acquiring performance assessment techniques and strategies that measure higher order thinking skills in students and is building a repertoire of realistic projects and problem-solving activities designed to assist all students in demonstrating their ability to think creatively. (A) Uses appropriate techniques and strategies which promote and enhance critical, creative, and evaluative thinking capabilities of students.

1. Uses assessment strategies (traditional and alternate) to assist the continuous development of the learner. ASSESSMENT

4.2. Uses appropriate techniques and strategies which promote and enhance critical, creative, and evaluative thinking capabilities of students.

4.a Provides opportunities for students to learn higher-order thinking skills.

4.b Identifies strategies, materials, and technologies that she/he will use to expand students’ thinking abilities.

4.g Demonstrates and models the use of higher-order thinking abilities.

Accomplished Practice #7: HUMAN DEVELOPMENT AND LEARNING

7.1 Drawing upon well established human development/learning theories and concepts and a variety of information about students, the preprofessional teacher plans instructional activities.

7.a Recognizes developmental levels of students and identifies differences within a group of students.

7.d Communicates with students effectively by taking into account their developmental levels, linguistic development, cultural heritage, experiential background, and interests.

7.e Varies activities to accommodate different student learning needs, developmental levels, experiential backgrounds, linguistic development, and cultural heritage.

7.h Develops short-term personal and professional goals relating to human development and learning.

Accomplished Practice #8: KNOWLEDGE OF SUBJECT MATTER

8.2 Demonstrates knowledge and understanding of the subject matter.

8.b Increases subject matter knowledge in order to integrate the learning activities.

8.f Develops short- and long-term personal and professional goals relating to knowledge of subject matter.

Accomplished Practice #11: ROLE OF THE TEACHER

11.1 The preprofessional teacher communicates and works cooperatively with families and colleagues to improve the educational experiences at the school.

11.2 STANDARD: Role of the Teacher -- Works with various education professionals, parents, and other stakeholders in the continuous improvement of the educational experiences of students.

11.b Provides meaningful feedback on student progress to students and families and seeks assistance for self and families.

Accomplished Practice #12: TECHNOLOGY

12.b Uses technology tools on a personal basis.

12.c Demonstrates awareness of and models acceptable use policies and copyright issues.

12.d Identifies and uses standard references in electronic media.

12.i Selects and utilizes educational software tools for instructional purposes based upon reviews and recommendations of other professionals.

12.j Uses digital information obtained through intranets and/or the Internet (e.g., e-mail and research).

12.k Uses technology to collaborate with others.

12.l Develops professional goals relating to technology integration.

National Science Teachers Association Standards (NSTA)

Standard 1: Content
Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they:

a. Understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.
b. Understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards.
c. Understand and can successfully convey to students important personal and technological applications of science in their fields of licensure.
d. Understand research and can successfully design, conduct, report and evaluate investigations in science.
e. Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.

B.4. To create interdisciplinary perspectives and to help students understand why science is important to them, elementary/middle level science specialists should have all of the competencies described for the elementary generalist, but also should be prepared to lead students to understand:

33. Use of technological tools in science, including calculators and computers.

C.3.a. **Core Competencies.** All teachers of chemistry should be prepared lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand:

10. Functional and polyfunctional group chemistry.

C.3.b. **Advanced Competencies.** In addition to the core competencies, teachers of chemistry as a primary field should also be prepared to effectively lead students to understand:

14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter.
21. Chemical reactivity and molecular structure including electronic and steric effects.
22. Organic synthesis and organic reaction mechanisms.
26. How to design, conduct, and report research in chemistry.

**Standard 10: Professional Growth**

Teachers of science strive continuously to grow and change, personally and professionally, to meet the diverse needs of their students, school, community, and profession. They have a desire and disposition for growth and betterment. To show their disposition for growth, teachers of science must demonstrate that they:

a. Engage actively and continuously in opportunities for professional learning and leadership that reach beyond minimum job requirements.
b. Reflect constantly upon their teaching and identify ways and means through which they may grow professionally.
c. Use information from students, supervisors, colleagues and others to improve their teaching and facilitate their professional growth.
### Professional Organization/Learned Society Standards

National Society of Science Teachers Association  
Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills

### Professional Society / National and State Standards Addressed in the Course

#### American Chemical Society (ACS) Expected Outcomes:

This course should ensure that students know basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics, equilibria, and kinetics. Students need to be competent in basic laboratory skills such as safe practices, keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers, data analysis, and report writing.

### Course Artifacts

<table>
<thead>
<tr>
<th>Standards</th>
<th>Name of the Artifact 1</th>
<th>Name of the Artifact 2</th>
<th>Name of the Artifact 3</th>
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<tbody>
<tr>
<td><strong>PEU CF</strong></td>
<td>Introduction to the study of organic chemistry: Explain sigma and pi bonds, atomic radii, bond length, bond strength, electron spin, and electronegativity, bonding and antibonding molecular orbitals and the process of sp³, sp², sp hybridization of carbon in organic compounds.</td>
<td>Structure, nomenclature, and introduction to reactivity. Thermodynamics and kinetics of organic reactions.</td>
<td>Stereochemistry: The arrangement of atoms in space; the Stereochemistry of addition reaction:</td>
</tr>
<tr>
<td><strong>FEAPS</strong></td>
<td>2, 2.1, 2.5, 2.7, 3.5, 4.3, 4.5, 5.1</td>
<td>2.1, 2.5, 2.7, 3.5, 4.3, 4.5, 5.1</td>
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<td><strong>INTASC</strong></td>
<td>1, 4, 5, 6, 10</td>
<td>1, 4, 5, 6, 10</td>
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<td><strong>FTCE</strong></td>
<td>3.2, 3.3, 3.5, 3.6, 3.7, 3.9, 3.10, 3.11</td>
<td>2.8, 2.9, 5.1, 5.2, 5.3, 5.4, 5.5, 5.7</td>
<td>1.5, 1.8, 3.4, 6.5, 6.7, 6.8</td>
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<tr>
<td><strong>NSTA</strong></td>
<td>1; 1.B.4.33; 1.C.3.a.10; 1.c.3.b.14, 1.C.3.b.21, 22, 26; 10.a, 10.b, 10.c</td>
<td>1; 1.B.4.33; 1.C.3.a.10; 1.c.3.b.14, 1.C.3.b.21, 22, 26; 10.a, 10.b, 10.c</td>
<td>1; 1.B.4.33; 1.C.3.a.10; 1.c.3.b.14, 1.C.3.b.21, 22, 26; 10.a, 10.b, 10.c</td>
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</tbody>
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### Assignment

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Behavioral Objectives</th>
<th>INTASC Standards</th>
<th>FTCE SAE</th>
<th>FEAPS</th>
<th>NSTA</th>
<th>PEU Conceptual Framework</th>
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</table>


Homework:
Selected biochemistry problems from the textbook and additional instructor addendums
Each homework assignment will address course content and is aimed at development of problem solving skills.

<table>
<thead>
<tr>
<th>Students will</th>
<th>1, 4, 5, 6, 10</th>
</tr>
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<tbody>
<tr>
<td>1. Demonstrate knowledge of the lecture material, and 2. Develop and enhance the skill of analytical analysis and problem solving</td>
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<tr>
<td>3.2, 3.3, 3.5, 3.6, 3.7, 5.3, 5.4, 5.10, 5.11, 2.8, 2.9, 5.1, 5.2, 5.3, 5.5, 5.7, 1.5, 1.8, 3.4, 6.5, 6.7, 6.8</td>
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<tr>
<td>2, 4, 7, 8, 11, 12</td>
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<td>1; 1.B.4.33; 1.C.3.a.10; 1.C.3.b.14, 1.C.3.b.21, 22,26; 10.a, 10.b, 10.c.</td>
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<tr>
<td>2.1, 2.5, 2.7, 3.5, 4.3, 4.5, 5.1</td>
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Quizzes:
Selected biochemistry problems from the textbook and additional instructor addendums
Each homework assignment will address course content and is aimed at development of problem solving skills.

| Develop critical thinking and written communication skills |
| 1, 4, 5, 6, 10 |
| 3.2, 3.3, 3.5, 3.6, 3.7, 5.3, 5.4, 5.10, 5.11, 2.8, 2.9, 5.1, 5.2, 5.3, 5.5, 5.7, 1.5, 1.8, 3.4, 6.5, 6.7, 6.8 |
| 2, 4, 7, 8, 11, 12 |
| 1; 1.B.4.33; 1.C.3.a.10; 1.C.3.b.14, 1.C.3.b.21, 22,26; 10.a, 10.b, 10.c. |
| 2.1, 2.5, 2.7, 3.5, 4.3, 4.5, 5.1 |

Exams:
Four one-hour tests, each test covering specific chapters. Final exam is comprehensive and will cover the material of Chapters 1 -21.

| Develop critical thinking and written communication skills |
| 1, 4, 5, 6, 10 |
| 3.2, 3.3, 3.5, 3.6, 3.7, 5.3, 5.4, 5.10, 5.11, 2.8, 2.9, 5.1, 5.2, 5.3, 5.5, 5.7, 1.5, 1.8, 3.4, 6.5, 6.7, 6.8 |
| 2, 4, 7, 8, 11, 12 |
| 1; 1.B.4.33; 1.C.3.a.10; 1.C.3.b.14, 1.C.3.b.21, 22,26; 10.a, 10.b, 10.c. |
| 2.1, 2.5, 2.7, 3.5, 4.3, 4.5, 5.1 |

**Overall Goals of the Course**
Specific topics to be covered include, atomic structure and chemical bonding, hybridization of orbitals, resonance phenomenon, introduction to functional groups, acid-base equilibria, acidity and basicity of organic compounds, nomenclature and reactions of alkanes, alkenes, alkynes, alcohols, ethers, epoxides, thiols and amines, rates of chemical reactions, stereochemistry and conformational analysis, nucleophilic aliphatic substitution reaction mechanisms (Sₙ₂, Sₙ₁), elimination reaction mechanisms (E₁ and E₂), electrophilic addition reaction mechanism and reactions of carbon-carbon multiple bonds.
Academic Learning Compact (ALC) / Expected Outcome

At the end of the course each student should be able to:

- Know basic terminology for organic chemistry.
- Discuss the bonding properties of carbon which cause it to be present in such a large number and variety of important compounds.
- Correlate molecular structure with physical and chemical properties.
- Recognize and name the major functional groups.
- Appreciate the use of theories (models) of varying complexity to rationalize chemical structure and reactivity.
- Correlate energy changes with molecular structure changes.
- Write systematic names and Draw accurate structures
- Explain the relationship between structure and physical and chemical properties and to make predictions concerning these properties.
- Explain several ways in which the vast amount of information in the field of organic chemistry may be organized.
- Think creatively about synthesis (of ideas as well as compounds).
- Explain the important role of organic chemistry in life, both biological and economical.

Students enrolled in this course are expected upon completion of the course to grasp the following skills known collectively as Academic Learning Compact:

1. Communication
Demonstrate the ability to effectively communicate chemical concepts and principles in oral (e.g., class participation, seminars) and written (e.g., homework, quiz, exams) formats.

2. Content
Identify and apply the principles and concepts of the basic and subfields of chemistry, including organic chemistry, analytical chemistry, physical chemistry, inorganic chemistry and biochemistry.
- Knowledge: e.g., use appropriate terminology, identify functional group structures and names
- Comprehension: e.g., draw 3-dimensional structures from various perspectives
- Application: e.g., use nomenclature rules to develop systematic names for complex organic structures

3. Critical Thinking
- Analysis: e.g., analyze and solve chemical problems using sound scientific theory; select the most appropriate reaction mechanism for a given situation
- Synthesis: e.g design and conduct independent research projects; use a knowledge of many organic reactions to assemble a pathway that converts one molecule into another
- Evaluation: e.g evaluate the design of chemical experiments; assess the significance of recent developments on social or political issues

Specific Behavioral Objectives

Satisfactory completion of the course should enable the student to acquire the following competencies:

Chapter 1: An introduction to the study of organic chemistry 1: (Standards Addressed in this chapter: FTCE 3.2, 3.3, 3.5, 3.6, 3.7, 5.3, 5.4, 5.10, 5.11.; ACS)
List all those elements that are found in organic compounds.
State reasons why carbon, of all elements, is able to form a large number of organic compounds.
Discuss the impact of organic chemistry on modern civilization.
Explain what is meant by ionic and covalent bonds.
List and sketch all the atomic orbitals important in organic chemistry (s, p, d orbitals).
State the principles that guide the order in which atomic orbitals are filled in an element.
Write electron configurations of element relevant to organic chemistry.
Explain sigma and pi bonds, atomic radii, bond length, bond strength, electron spin, and electronegativity.
Understand and explain to someone else what is meant by bonding and antibonding molecular orbitals.
Differentiate between sigma and pi bonds.
Explain the process of sp³, sp², sp hybridization of carbon in organic compounds.
State the molecular geometry, shape, and bond angles in compounds with sp³, sp², sp- hybridized carbons.
Use molecular models to build hydrocarbon structures to demonstrate the tetrahedral carbon.
Discuss hybridization of atoms other than carbon, e.g. N, O, B, S, P etc.
Distinguish between bond dissociation energy and bond energy.
Differentiate between bond polarity and molecular polarity.
Relate molecular geometry to dipole moment.
Indicate net dipole moment and its direction for given structures of organic compounds.
Distinguish between ionic and nonionic substances and simple test to tell them apart.
Explain the molecular basis of such phenomena as melting, boiling, and solubility.
Define H-bonding and Van der Waals interaction.
Define Lowry-Bronsted acid/base and Lewis acid/base with lists of examples.
State how to predict relative acid/base strength and also the direction of acid/base reactions.
Explain structural isomerism and be able to write possible structural isomers for a given molecular formula.
Solve unfamiliar problems based on concepts presented in this chapter.

Chapter 2: An introduction to organic compounds: Nomenclature, physical properties, and representation of structure (Standards Addressed in this chapter: FTCE 1.6, 3.4, 3.7, 3.11, 3.14, 6.6, 6.7; ACS)

- Define a hydrocarbon and classify a given hydrocarbon as to its type within the hydrocarbon family.
- Classify a given organic compound based on the functional group of each particular class.
- Use molecular models to build hydrocarbon structures to demonstrate the tetrahedral carbon.
- Explain the four major classes of organic reactions with lists of examples.
- Classify a given organic reaction into one of the four reaction types.
- Write balanced equations for the complete or partial combustion of a given hydrocarbon.
- Identify and write down structures of some common alkyl soups.
- Write down structural isomers for alkanes containing five to eight carbon atoms.
- Identify in any given structure the various classes of carbon and hydrogen atoms.
- Write common names for alkanes containing one to ten carbon atoms.
- Write down IUPAC names for a given alkane based on IUPAC nomenclature rules.
- Relate structure of an alkane to its boiling point, density, and melting point.
- List the various natural sources of aliphatic and aromatic hydrocarbons.
- Describe the different cracking processes by which the petroleum hydrocarbons are converted to lower molecular weight branched chain alkanes.
- Explain the concept of octane rating of gasoline.
- List common additives found in gasoline and their functions in gasoline.
- Demonstrate knowledge of chemical air pollutants from automobiles and use of catalytic converters to minimize them.
- List the different types of coal and describe the destructive distillation of coal.
- Explain gasification and liquification of coal.
- List major chemical reactions of alkanes.
- Use molecular models to demonstrate such concepts as dihedral angle, torsional strain, steric strain.
- Generate different conformations of any given alkane and rank the conformations in order of stability.
- Sketch an energy diagram for given conformations of an alkane.
- Solve unfamiliar problems based on concepts presented in this chapter.

Chapter 3: Alkenes: Structure, nomenclature, and introduction to reactivity. Thermodynamics and kinetics (Standards Addressed in this chapter: FTCE 2.8, 2.9, 5.1, 5.2 5.3, 5.4, 5.5, 5.7; ACS)

- Recognize the alkene functional group in organic compounds no matter how complex.
- Calculate the degree of unsaturation of a compound.
- Provide correct IUPAC names for alkenes.
- Provide orbital explanation for the formation of the carbon-carbon double bond.
- Identify alkenes that are capable of exhibiting geometric isomerism.
- Use of the Cahn-Ingold-Prelog Rules to name substituted alkenes by the E/Z system.
- Recognize basis for stability of alkenes.
- Arrange alkenes in order of stability.
- Explain how alkenes react.
- Use curved arrows to show the flow of electrons.
- Use a reaction coordinate diagram to describe a reaction.
- Use thermodynamics to describe a reaction at equilibrium.
- Use kinetics to explain rates of chemical reactions.
- Solve other unfamiliar problems based on ideas and topics presented in this chapter.

Chapter 4: The reactions of alkenes (Standards Addressed in this chapter: FTCE 4.1, 4.2, 4.8, 5.3, 5.5; ACS)

- Discuss the basis of the three broad reaction types associated with alkenes.
- Summarize with relevant chemical equations the addition reaction of alkenes.
- Explain the stereochemistry of addition of Br₂ to alkenes.
- Explain the theoretical basis of Markonikov’s rule for addition of HX to alkenes.
- Compare and contrast the addition of water to alkenes by acid–catalyzed hydration, oxymercuration-demercuration and by hydroboration-oxidation.
- Write complete mechanisms for oxymercuration-demercuration and hydroboration-oxidation.
- Write reactions for the epoxidation of alkenes.
- Write reactions for the hydroboration–oxidation of alkenes.
- Write reactions for the syn hydroxylation and antihydroxylation of alkenes.
- Work other unfamiliar problems based on principles presented in this chapter.

Chapter 5: Stereochemistry: The arrangement of atoms in space; the Stereochemistry of addition reactions (Standards Addressed in this chapter: FTCE 1.5, 1.8, 3.4, 6.5, 6.7, 6.8; ACS)

- Define and explain stereochemistry of reactions.
- Distinguish regioselective, stereoselective and stereospecific reactions.
- Look at a reaction and determine its stereoselectivity or stereospecificity.
- Distinguish erythro and threo compounds.
- Explain enantiospecific and enantioselective reactions.
- Analyze stereochemistry of reactions involving the generation of a second chiral carbon.
- Use molecular models to confirm predicted outcomes of stereoselective and stereospecific reactions.
- Define and explain conformation, conformers, three dimensions, two dimensions, one dimension.
- Distinguish constitutional isomers and stereoisomers, ordinary light and plane polarized light, dextrorotary, and levorotary, specific rotation, and observed rotation.
- Use expression for specific rotation to calculate the concentration of a solution of an organic compound.
- Use molecular models to demonstrate nonsuperimposability or enantiomers.
- Identify chiral carbons in a given organic compound.
- Explain why racemic mixtures are optically inactive.
- Assign configurations (R or S) to chiral centers in organic compounds with or without the aid of molecular models.
- Interpret and use Fischer projection formulas in stereochemical problem solving.
- Draw correct stereochemical formulas of any compound whose complete IUPAC name is given.
- Assign configuration to a compound with two or more chiral centers.
- Identify diastereomers from a pool of stereoisomers.
- Identify compounds with meso structures.
- Identify prochiral compounds, prochiral atoms, enantiotopic atoms.
- Explain how racemic mixtures can be resolved in the laboratory.
- Explain how enzymes are able to recognize only one of two enantiomers.
- Calculate the optical purity of an enantiomer based on knowledge of its specific rotation.
- Work problems based on concepts and principles discussed in this lecture.

**Chapter 6: The reactions of alkynes: An introduction to multistep synthesis (Standards Addressed in this chapter: FTCE 3.4, 3.5, 3.7, 3.9, 3.11, 3.13, 3.15, 4.1, 4.2, 4.8, 6.3, 6.4, 6.7; ACS)**

- Analyze the structure and properties of alkynes.
- Give common and systematic (IUPAC) names of alkynes.
- Give examples of terminal and internal alkynes.
- Explain the acidity of terminal alkynes.
- Write down those reactions that depend on the acidity of terminal alkynes.
- Summarize with chemical equations the addition reactions of alkynes (e.g. reactions with X₂, HX, and H₂O).
- Write complete mechanisms of the addition reactions of alkynes.
- Explain the concept of tautomerism.
- Distinguish tautomerism, resonance, and equilibrium.
- Discuss the hydroboration of alkynes.
- Summarize reduction reactions of alkynes.
- List and discuss possible qualitative tests for alkynes.
- Distinguish alkynes, alkenes, and alkanes by simple qualitative tests in the laboratory.
- Design synthesis using acetylide ions.
- Design a multistep synthesis.
- Solve other problems requiring principles and concepts discussed in this lecture.

**Chapter 7: Delocalized electrons and their effect on stability, reactivity, and pKa. More about molecular orbital theory (Standards Addressed in this chapter: FTCE 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.8, 4.9, 6.5, 6.7; ACS)**

- Explain resonance and distinguish it from equilibrium and tautomerism.
- Identify compounds that can exhibit resonance.
- List broad rules for writing resonance structures.
- Write resonance structures for simple aliphatic compounds.
- Assess relative stability of resonance structures.
- Comment on uses of resonance in organic chemistry.
- Identify the different types of dienes found in organic compounds.
- Explain the relative stability of the different types of dienes.
Explain the electronic basis for the unusual stability of conjugated dienes.
Summarize with chemical equations the electrophilic 1,2- and 1,4-addition reactions of conjugated dienes.
Write mechanisms for the 1,2- and 1,4-addition of conjugated dienes.
Explain Diels–Alder reaction as a 1,4-addition reaction.
Explain kinetic control and thermodynamic control of chemical reactions.
Solve applied problems based on concepts developed in this lecture.

Chapter 8: Substitution reactions of alkyl halides (Standards Addressed in this chapter: FTCE 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.8, 4.9, 4.10, 6.6, 6.7, 6.8; ACS)

- List names and corresponding general structures of the various kinds of alkyl halides.
- Name alkyl halides according to IUPAC.
- Explain why alkyl halides are considered electrophilic.
- Summarize methods for preparing alkyl halides in the laboratory.
- Identify the key components of an $S_N2$ reaction.
- Explain the key features of the $S_N2$ reaction mechanism.
- List and discuss the key factors that influence the rate of an $S_N2$ reaction.
- Rank alkyl halides in order of reactivity toward $S_N2$ reaction.
- Identify the key components of an $S_N1$ reaction.
- Explain the key features of the $S_N1$ reaction mechanism.
- List and discuss the key factors that influence the rate of an $S_N1$ reaction.
- Rank alkyl halides in order of reactivity toward $S_N1$ reaction.
- Distinguish polar protic and polar aprotic solvents.
- Predict which course ($S_N1$ or $S_N2$) a given reaction will follow.
- Distinguish $S_N2$ and $S_N1$ reactions with numerous examples.
- Summarize features of the mechanism of $S_N1$ reaction.
- Discuss clearly the stereochemistry and kinetics of the $S_N1$ reaction.
- Identify the rate-limiting step in the reaction.
- Discuss structures, stability, and rearrangement of carbocations.
- Solve unfamiliar problems based on principles and ideas raised in this lecture.

Chapter 9: Elimination reactions of alkyl halides. Competition between substitution and elimination (Standards Addressed in this chapter: FTCE 3.4, 4.1, 4.2, 4.12, 4.13, 6.5, 6.7; ACS)

- Summarize the feature of an $E_2$ reaction.
- Discuss the regioselectivity of an $E_2$ reaction.
- Summarize features of an $E_1$ reaction.
- Sketch an energy diagram for any $E_1$ reaction.
- Distinguish $E_2$ and $E_1$ reactions.
- Compare and contrast $E_2$ and $E_1$ reactions with respect to (a) substrate and (b) attacking base.
- Compare $E_1$ and $S_N1$ reactions and $E_2$ and $S_N2$ reactions with respect to substrate structure, nucleophile/base strength, solvent, and temperature.
- Summarize factors affecting elimination ($E_1$ & $E_2$) and substitution ($S_N1$ & $S_N2$) reactions.
- Discuss competition between substitution and elimination.
- Discuss consecutive $E_2$ elimination reactions.
- Design a synthesis.
- Work unfamiliar problems based on concepts and principles presented in this lecture.

Chapter 10: Reactions of alcohols, amines, ethers, epoxides, and sulfur-containing compounds. Organometallic compounds (Standards Addressed in this chapter: FTCE 1.4, 1.6, 1.8, 3.4, 3.5, 3.6, 3.7, 3.10, 3.11, 3.14, 3.15, 4.2, 4.8, 4.13, 5.2, 5.3, 5.463, 6.4, 6.7; ACS)
- Identify an alcohol group in an organic structure.
- Identify different classes of alcohols.
- Name alcohols by IUPAC.
- Predict boiling points of alcohols.
- Arrange alcohols in order of acidity.
- Explain oxidation and reduction as they apply to organic chemical reactions.
- Summarize the various reactions for the laboratory preparation of alcohols.
- Appreciate the centrality of alcohols in organic chemical reactions.
- Rationalize the reactivity of alcohols towards hydrogen halides.
- Predict reactivity of alcohols towards dehydration.
- Write the structures of the inorganic esters of alcohol and comment on their uses.
- Summarize the major reactions of alcohols complete with reaction conditions.
- Provide IUPAC names for ethers.
- Summarize the industrial approach to the preparation of ethers.
- Summarize the laboratory preparation of ethers.
- Discuss mechanisms of ether cleavage by acids.
- Discuss nucleophilic substitution reactions of ethers.
- Discuss nucleophilic substitution reactions of epoxides.
- Write equations for the preparation of Grignard and Gilman reagents in the laboratory.
- Rationalize the polarity of Grignard and Gilman reagents.
- Explain, with several examples, what is meant by an organometallic reagent or compound.
- Explain, with several examples, what is meant by a coupling reaction.
- Distinguish the Heck, Stille, and Suzuki reactions.
- Solve unfamiliar problems based on the concepts presented in this lecture.

Professional Organization/Learned Society Standards

American Chemical Society (ACS) Expected Outcomes:

This course should ensure that students know basic chemical concepts such as nomenclature, structure, hybridization, resonance, aromaticity, acids and bases, stereoisomerism, nucleophilic substitutions and eliminations, electrophilic additions, nucleophilic addition at carbonyl groups, nucleophilic substitution at carbonyl groups, enols and enolate ion reactions, electrophilic and nucleophilic aromatic substitution, free radical substitutions and additions, oxidations and reductions, spectroscopy, synthesis and analysis.

Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills

1 Knowledge of the nature of matter
   1. Differentiate between pure substances, homogeneous mixtures, and heterogeneous mixtures.
   2. Determine the effects of changes in temperature, volume, pressure, or quantity on an ideal gas.
   3. Apply units of mass, volume, and moles to determine concentrations and dilutions of solutions.
   4. Analyze the effects of physical conditions on solubility and the dissolving process.
   5. Evaluate problems relating colligative properties, molar mass, and solution concentrations.
   6. Analyze the effects of forces between chemical species on properties (e.g., melting point, boiling point, vapor pressure, solubility, conductivity) of matter.
   7. Solve problems involving an intensive property (e.g., density, specific heat) of matter.
   8. Differentiate physical methods (e.g., chromatography, filtration, extraction) for separating the components of mixtures.

3 Knowledge of bonding and molecular structure
1. Identify the basic theory and applications of spectroscopy (e.g., MRI, x-ray, mass spectrometry, UV, microwave, NMR, IR).
2. Identify types and examples of metallic, ionic, and covalent (polar and nonpolar) bonds.
3. Apply electronegativity to bond type.
4. Identify characteristics of simple organic compounds.
5. Given the structural formula for a simple organic compound, identify the hybridization of the atoms.
6. Identify sigma and pi bonds in a compound.
7. Interpret the information derived from the following models: Lewis electron dot structures, valence shell electron pair repulsion (VSEPR) theory, and molecular orbital (M/O) theory.
8. Select the most probable Lewis electron dot structure for an ionic or covalent formula (e.g., CO$_2$, Na$_2$CO$_3$) that follows the octet rule.
9. Predict geometry of simple molecules (e.g., symmetry elements).
10. Predict polarity of simple compounds.
11. Predict physical or chemical properties based upon the type of bonding involved.
12. Identify an inorganic chemical formula (ionic or molecular), given the name.
13. Select the name of an inorganic chemical compound (ionic or molecular), given its formula.
14. Identify properly named formulas for simple organic compounds.
15. Identify common organic functional groups.
16. Differentiate between the structures of common biochemical compounds, such as lipids, amino acids, carbohydrates, and nucleic acids.

4 Knowledge of chemical reactions and stoichiometry
1. Balance chemical equations.
2. Given common chemical species and reaction conditions, predict probable reaction products.
3. Solve mass-mass stoichiometry problems.
5. Solve solution stoichiometry problems.
7. Determine empirical formulas from experimental data.
8. Analyze the effects of concentration, temperature, pressure, surface area, and the presence or absence of catalysts on the rates of reaction.
9. Assess the effects of changes in concentration, temperature, or pressure on a state of a system initially at equilibrium (Le Chatelier's principle).
10. Determine rate laws from concentration and rate data.
11. Calculate either the equilibrium constant or concentration of a reaction species at equilibrium (e.g., K$_a$, K$_b$, K$_{sp}$, K$_w$, K$_{eq}$).
12. Identify the characteristics of a chemical system in dynamic equilibrium.
13. Identify major characteristics of strong and weak acids or bases.
14. Evaluate the properties of buffer systems.
15. Interpret graphical and numerical titration data.
17. Balance incomplete redox equations in acidic and basic solutions.
18. Determine the spontaneity of a chemical reaction using standard reduction potentials.
19. Identify the characteristics of biochemical and fossil fuel combustion reactions.
20. Solve problems related to pH of strong acids or bases.
21. Analyze electrolytic and/or voltaic cells.

5 Knowledge of atomic theory and structure
1. Using the periodic table, determine the number of protons, neutrons, and electrons in a specific isotope of an atom or ion.
2. Using the periodic table, relate the physical properties of atoms and ions to the elements' positions on the table.
3. Using the periodic table, relate the chemical reactivity of elements to their positions on the table.
4. Using the periodic table, determine electron configurations for main group and transition elements.
5. Relate chemical activity to electron configuration.
6. Identify characteristics of the wave and particle nature of matter.
7. Identify characteristics of unstable nuclei and the particles and energies emitted.
8. Given measurable quantities, calculate parameters of radioactive decay.
10. Analyze the processes of nuclear fission and fusion, including interconversion of mass and energy.
11. Identify electron density distribution diagrams and characteristics for s, p, and d orbitals (e.g., nodes).

6 Knowledge of the nature of science
1. Identify the characteristics and components of scientific inquiry.
2. Identify how the characteristics of scientific research differ from those of other areas of learning.
3. Identify variables in a given experimental design.
4. Identify bias in an experimental design.
5. Evaluate, interpret, and predict from empirical data.
6. Interpret graphical data.
7. Analyze the relationship between experimental observations and underlying assumptions, hypotheses, conclusions, laws, or theories.
8. Relate experimental evidence to models.
9. Differentiate between the uses of qualitative and quantitative data.
10. Analyze the relationship between basic scientific research and applied research, technology, the economy, or the public good.
11. Identify how science and society influence each other.
12. Identify evidence of the progressive development of science.

**Topical Outline**

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<th>Topic</th>
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<td>An introduction to organic compounds: Nomenclature, physical properties, and representation of structure.</td>
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<td>Alkenes: Structure, nomenclature, and an introduction to reactivity. Thermodynamics and Kinetics.</td>
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<td>The reactions of alkenes.</td>
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<td>The reactions of alkynes: an introduction to multistep synthesis.</td>
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<td>Delocalized electrons and their effect on stability, reactivity, and pKa. More about molecular orbital theory.</td>
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<tr>
<td>Substitution reactions of alkyl halides.</td>
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</table>
Elimination reactions of alkyl halides. Competition between substitution and elimination.
Reactions of alcohols, amines, ethers, epoxides, and sulfur–containing compounds. Organometallic compounds.

Teaching Methodology
Lecture Style, Use of Overheads, and Powerpoint, Web-Based Instruction (Course Compass, Blackboard, etc.)

Course Schedule

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<tr>
<td>Jan. 11th</td>
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<td>2.1–2.14</td>
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<td>Jan. 18th</td>
<td>7-8</td>
<td>Jan. 21st: MLK Day An Introduction to Organic Compounds: Nomenclature, Physical properties and Representation of structure: Continued Conformations of organic compounds: conformational analysis of straight-chain and cyclic hydrocarbons.</td>
<td>2.1–2.14</td>
<td>Homework #2 (Ch. 2) In-text and end of chapter problems.</td>
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### The position of absorption bands.
Absorption bands. The shape of absorption bands.
Infrared inactive vibrations. Identifying infrared spectra.

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<td>13.1–13.22</td>
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<td>$^{13}$C NMR spectroscopy</td>
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<td><strong>Homework #7 (Ch. 6)</strong> In-text and end of chapter problems.</td>
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<tr>
<td>Mar. 23&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>25-27</td>
<td>Stereochemistry: Arrangement of atoms in space; the stereochemistry of addition reactions <em>continued</em>.</td>
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<td>Meso Compounds</td>
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<td>R, S System of nomenclature for isomers</td>
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<td>Reactions of compounds containing more than one asymmetric carbon, Absolute configuration of glyceraldehydes, Separating enantiomers</td>
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<td>Dis atom of enantiomers by biological molecules</td>
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<td><strong>Homework #8 (Ch. 5)</strong> In-text and end of chapter problems.</td>
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*Exam #2 (Ch. 13, 3, 4 & 6) Thursday, Mar. 18<sup>th</sup>*
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Mar. 22nd</td>
<td>28-30</td>
<td>Electron Delocalization and Resonance; Molecular Orbital theory.</td>
<td>7.1-7.12</td>
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<td>Thermodynamic/kinetic control of reactions, Diels-Alder reactions.</td>
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<td>Delocalized electron: the structure of benzene Bonding in benzene,</td>
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<td>Drawing resonance contributors, Predicted stabilities of resonance</td>
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<td>contributors, Resonance energy, Resonance contributors, Stability of</td>
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<td>allylic and benzylic cations, Stability of allylic and benzylic</td>
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<td>Mar. 29th</td>
<td>31-33</td>
<td>Electron Delocalization and Resonance; Molecular Orbital theory.</td>
<td>7.1-7.12</td>
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<td></td>
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<td>Some chemical consequences of electron delocalization</td>
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<td>Effect of electron delocalization on pKa</td>
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<td>Molecular orbital description of stability</td>
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<td>Thermodynamic/kinetic control of reactions, Diels-Alder reactions.</td>
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<td>How alkyl halides react, The mechanism of SN2 reaction, Factors</td>
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<td>affecting SN2 reactions</td>
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<tr>
<td>April 5th</td>
<td>34-36</td>
<td>Substitution Reactions of Alkyl Halides: Mechanisms of SN2 and SN1</td>
<td>8.1–8.12</td>
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<td>reactions contd.</td>
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<td>How alkyl halides react, The mechanism of SN2 reaction, Factors</td>
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<td>affecting SN2 reactions</td>
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<td>Nov. 11</td>
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<td>Veteran’s Day</td>
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<td>Nov. 11</td>
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<td>Reversibility of an SN2 reaction, The mechanism of an SN1 reaction,</td>
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<td>Nov. 11</td>
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<td>Factors affecting SN1 reactions</td>
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<td>Mar. 22nd</td>
<td>28-30</td>
<td>Electron Delocalization and Resonance; Molecular Orbital theory.</td>
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<td>radicals</td>
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More about the stereochemistry of $S\text{N}_2$ and $S\text{N}_1$ reactions
Halides: benzylic, allylic, vinylic, and aryl
Competition between $S\text{N}_2$ and $S\text{N}_1$ reactions
The role of solvent in $S\text{N}_2$ and $S\text{N}_1$ reactions
Biological methylating reagents

| April 12th | Elimination Reactions of Alkyl Halides, mechanism of E2 and E1 reactions, Competition between substitution and elimination. The E2 reaction, The Regioselectivity of the E2 reaction, The E1 reaction Competition between E2 and E1 reactions Stereochemistry of E2 and E1 reactions Elimination from cyclic compounds | 9.1–9.11 | Homework #11 (Ch. 9) In-text and end of chapter problems. Exam #3 (Ch. 5, 7 & 8) Thursday, Apr. 15th |
| April 19th | 39-41 | April 25th: Last day of classes. | Mock Exam |
| April 28th | FINAL EXAM | COMPREHENSIVE | Ch. 1–9. |

**Course Evaluation**

Written quizzes and exams, homework.

**Grading**

**Examinations:** There will be a total of four exams, THREE ONE-HOUR EXAMINATIONS AND THE FINAL, in the semester, to assess student's understanding and application of concepts covered in class since the beginning of the semester. Questions may involve multiple choice, essays, definitions, short answers and true/false responses. **STUDENTS ARE STRONGLY ADVISED TO WORK IN-TEXT AND END-OF-CHAPTER PROBLEMS.** This will help to prepare you for the exams. Thus it is very important that you devote enough time to problem solving. Your performance in the three scheduled exams will determine a major part of your grade.

The final grade for this class will be based on the following:

<table>
<thead>
<tr>
<th>Event</th>
<th>Points</th>
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<tr>
<td>Three Exams, 100 points each</td>
<td>300 points</td>
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</table>
Final Exam, 200 points | 200 points
---|---
Five **Unannounced** Quizzes, 10 points each | 50 points (bonus points)

**Total:** 500 points

*PLEASE NOTE THAT THERE WILL BE NO MAKE-UPS FOR ANY MISSED EXAM OR QUIZ*

**QUIZZES:** Quizzes are for extra credits and are unannounced. There will be **NO MAKE-UP.**

**VERY IMPORTANT**

FOLLOWING EACH ASSESSMENT (QUIZ, HOMEWORK, OR EXAM), RESULTS WILL BE POSTED ON BLACKBOARD, NOT MORE THAN THREE DAYS AFTER THE ASSESSMENT. STUDENTS HAVE PRECISELY SEVEN DAYS AFTER RESULTS ARE POSTED ON BLACKBOARD TO BRING ANY CONCERNS, COMPLAINTS OR DISCREPANCIES TO MY ATTENTION. AFTER THIS SEVEN-DAY PERIOD, SUCH CONCERNS, COMPLAINTS OR DISCREPANCIES WILL NO LONGER BE ENTERTAINED.

Students are encouraged to keep track of their performance in all the exams, homework, and quizzes so that they can compute their grades at the end of the semester.

**Final Grade:** 85 – 100% (A) 75 – 84% (B) 65 – 74% (C) 50 – 64% (D) 0-50% (F)

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**Course Policies**

**Student Conduct**

**Cell Phones:** Once a class period has begun, cell phones are not to be seen or heard in the classroom. Complete all calls before entering the classroom, and once in the classroom, turn off all cell phones, pagers, etc. **VIBRATE IS NOT OFF.** Students will be warned about violation of this request. A persistent disregard for this request will result in a student being asked to leave the classroom and not returning until they have conferred with the Chair of the Chemistry Department. ANY TEXT MESSAGING WILL RESULT IN **AUTOMATIC AND PERMANENT DISMISSAL** FROM THE COURSE.

**PLEASE, USE THE RESTROOM, ETC BEFORE CLASS BEGINS.**
Lateness to class is discouraged. If you are entering the classroom late, **PLEASE, DO NOT WALK IN FRONT OF THE PODIUM. PLEASE USE THE SIDE ISLES IF LATE TO CLASS.**

**Please do not talk when the instructor is teaching.** This is very distracting to the instructor and to the rest of the class. If you have something to say or question(s) to ask, please simply raise your hand, and you will be recognized. Please do not disrupt the class. If you choose to disrupt the class, you will be warned and if the problem continues, asked to leave the classroom.

**Missed Exams:** It is your responsibility to notify me promptly if you will miss a test. In which case an arrangement will be made for you to write the test before the scheduled time. If a student misses an exam, this will count as the drop grade. **UNDER NO CIRCUMSTANCES WILL MAKE-UP EXAMS OR QUIZZES BE GIVEN.**
Regrade policy: If you feel that your test has been graded improperly, you may request in writing that it be re-graded. After a test result is published, you have exactly one week to come to my office to view your test and register any complaints or concerns, and a written request for regarding if you so wish. The written request for regarding of a test must be a single paragraph stating what you feel has been graded improperly and why you are requesting for re-grading. Under no circumstances is a request for test re-grading accepted after one week of publishing the test result, or without the written request. Under no circumstances will disputed test items be discussed until this procedure is followed exactly. The re-grading may be done by another organic professor (a neutral individual) in the department of chemistry. If a different score results from the re-grading process, this score (higher or lower) shall replace the old exam score.

Attendance Policy: ATTENDANCE IS TAKEN DURING EACH CLASS MEETING. IT IS YOUR RESPONSIBILITY TO WRITE YOUR SIGNATURE NEXT TO YOUR NAME ON THE DAILY ROLL SHEET. IF YOU FAIL TO DO THIS, YOU ARE ABSENT—No exceptions. TWO (2) UNEXCUSED ABSENCES FOR THE CLASS RESULT IN A LOWERING OF YOUR GRADE. A STUDENT EXCEEDING THE NUMBER OF UNEXCUSED ABSENCES MAY BE DROPPED FROM THE COURSE AND ASSIGNED THE GRADE OF "F." STUDENTS MAY BE READMITTED TO THE CLASS WITH THE DEAN’S AND THE INSTRUCTOR’S PERMISSION. These regulations are fully given on page 31 of the 2006-2008 General Catalog.

Academic Honor Policy: It is the aim of the faculty of Florida A and M university to foster a spirit of complete honesty and high standard of integrity. Any one caught cheating in any manner is awarded the grade of “F” (No warnings will be given). It is your responsibility to do your own work. The use of textbooks, notes, pagers, cell phones, and programmable calculators are not allowed in any quiz or exam. Both persons collaborating by cheating will receive the Final grade of “F” with offenders also liable to serious consequences, possibly academic suspension. The University’s Academic Honor Policy is located in the FANG Student Handbook, under the Student Code of Conduct- Regulation 2.012 section, beginning on page 55-56.

Students with disabilities: All students with disabilities should notify me immediately at the latest before the beginning of the third week of classes. At that time, you should bring the appropriate signed paperwork from the disabilities office so that I can help you. Official Statement: Any student whose disability falls within the American Disabilities Act (ADA) and requires accommodations should contact the Office of Services for Students with Disabilities. The office is located in the Student Service Building Room 204. You may also reach the office by phone at 259-6035

Policy Statement on Non-Discrimination: It is the policy of Florida Agricultural and Mechanical University to assure that each student of the University community be permitted to attend classes in an environment free from any form of discrimination including race, religion, color, age, disability, sex, marital status, national origin, veteran status and sexual harassment as prohibited by state and federal statutes.

Procedure for resolving faculty-student conflict
• Student first attempts to resolve issue with instructor
• Student submits written notification of problem to chair.
• Chair forwards student letter to instructor.
• Instructor responds in writing to chair.
• Chair meets with instructor and/or student if necessary.
• Chair forwards response/recommendation to Dean’s office.
• Dean decides what further course of action is available to the student.