



FEDERAL UNIVERSITY OF CEARÁ
Provost Office of Research and Graduate Studies

COURSE PROGRAM

1. PROGRAM:		
Program	GRADUATE PROGRAM IN CHEMISTRY	
2. COMPONENT TYPE:		
Activity ()	Course (X)	Module ()
3. LEVEL:		
Master's Degree (X)	Doctorate ()	
4. COMPONENT IDENTIFICATION:		
Name:	ADVANCED ORGANIC CHEMISTRY I	
Code:	CEP7233	
Hours:	96	
Credits:	06	
Optional course:	Yes ()	No (X)
Compulsory course:	Yes (X)	No ()
Area:	Organic Chemistry	
5. PROFESSOR:		
DIEGO LOMONACO JAIR MAFEZOLI JOSÉ NUNES DA SILVA JUNIOR MARIA DA CONCEIÇÃO FERREIRA DE OLIVEIRA MARCOS CARLOS DE MATTOS MARY ANNE SOUSA LIMA OTILIA DEUSDÊNIA LOIOLA PESSOA		
6. ABSTRACT Molecular orbital theory, organic acids and bases, stereochemistry, electrophilic addition reactions on alkenes and alkynes, electrophilic and nucleophilic substitution reactions on aromatic compounds, nucleophilic substitution reaction on saturated carbon, nucleophilic addition reactions on carbonyl compounds, nucleophilic substitution reactions on carboxylic acids and derivatives.		
7. COURSE PROGRAM UNIT 1: Theory of orbital molecular (6 h) 1.1 Atomic and molecular orbitals. 1.2 Orbital energy. 1.3 Frontier orbitals in reactions. 1.4 Stability of reactions intermediates. UNIT 2: Organic acids and bases (8 h) 2.1 Bronsted-Lowry, Lewis and Pearson concepts. 2.2 Kinetic and thermodynamic control.		

2.3 Factors that influence acidity and basicity.

2.4 Hammett's correlation.

UNIT 3: Stereochemistry (6 h)

3.1 Stereoisomerism.

3.2 Chirality in molecules containing centers, axes and planes.

3.3 Pro-chirality.

UNIT 4: Electrophilic addition reactions on alkenes and alkynes (14 h)

4.1 Mechanism, energy diagram and stereochemical implications of the halogenation, addition of acids, hydration, hydroboration, epoxidation, oximercuration, hydrogenation and dihydroxylation reactions.

4.2 Application in organic synthesis.

UNIT 5: Electrophilic and nucleophilic substitution reactions on aromatic compounds (12 h)

5.1 Mechanism and energy diagram of nitration, sulfonation, halogenation and acylation reactions.

5.2 Substitution reactions with diazo compounds.

5.3 Mechanism and energy diagram of nucleophilic reactions via benzene and S_NAr (addition-elimination).

5.4 Applications in organic synthesis.

UNIT 6: Nucleophilic substitution reactions on saturated carbon (14 h)

6.1 Mechanisms, energy diagram and stereochemical implications of S_N1 and S_N2 reactions.

6.2 Main factors implications of S_N1 and S_N2 reactions.

6.3 Competition reactions S_N1 x S_N2 .

6.4 Applications in organic synthesis.

UNIT 7: Nucleophilic addition reactions on carbonyl compounds (14 h)

7.1 Carbonyl addition models: Cram, Felkin-Anh and chelated Cram.

7.2 Mechanism, energy and stereochemical implications of the addition reactions of water, alcohols, cyanides, thiols, nitrogen compounds, organometallic compounds, hydrides and Wittig reagent.

7.3 Applications in organic synthesis.

UNIT 8: Nucleophilic substitution reactions on carboxylic acids and derivatives (12 h)

8.1 Mechanism energy diagram of the preparation reactions of derivatives: Halides acyl, esters, amides, anhydrides.

8.2 Hydrolysis reactions of carboxylic acids derivatives.

8.3 Reduction reactions of carboxylic acids derivatives.

8.4 Applications in organic synthesis.

8. EVALUATION PROCESS:

Content will be evaluated through written tests. Optionally, seminars may be added to the assessment, making up a maximum of 30% of the final average. Class frequency either equal to or greater than 75%

9. BIBLIOGRAPHY:

1. Bruckner, R. Advanced Organic Chemistry, Harcourt Academic Press, 2002.
2. Clayden, J., Greeves, N., Warren, S. Organic Chemistry, 2nd Ed. Oxford Press, 2012.
3. Carey, F. A., Sundberg, R. J. Advanced Organic Chemistry, 5th Ed., Springer, 2007.
4. Carroll, F. A. Perspectives on Structure and Mechanism in Organic Chemistry. 2nd Ed., John Wiley & Sons. 2010.
5. Eliel, E. L., Wilen, S. H., Doyle, M. P. Basic Organic Stereochemistry. Wiley Interscience. 2001.
6. Fleming, I. Frontier Orbitals and Organic Chemical Reactions. Student edition, John Wiley & Sons. 2009.

7. Li, J. J. Name Reactions: A Collection of Detailed Reaction Mechanisms, 1st Ed., Springer, 2002.
8. Smith, M. B. Advanced Organic Chemistry: Reaction Mechanism and Structure, 8th Ed., John Wiley & Sons, 2019.