



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 ()	Doctorate (X)
4. COMPONENT IDENTIFICATION:		
Name:	ADVANCED ORGANIC CHEMISTRY II	
Code:	CEP9611	
Hours:	96	
Credits:	06	
Optional course:	Yes ()	No (X)
Compulsory course:	Yes ()	No (X)
Area:	Organic chemistry	
5. PROFESSOR:		
MARY ANNE SOUSA LIMA MARCOS CARLOS DE MATTOS MARIA DA CONCEIÇÃO FERREIRA DE OLIVEIRA DIEGO LOMONACO OTILIA DEUSDÊNIA LOIOLA PESSOA		
6. ABSTRACT: Radical reactions; Oxidation and reduction reactions; Rearrangements; Pericyclic reactions; Reactions of organometallic compounds; Introduction to organic synthesis		
7. COURSE PROGRAM		
1. Unit 1: Radical Reactions: Mechanism and stereochemical implications (12 h)		
1.1 Free radical generation and characterization.		
1.2 Types of radical reactions: Fragmentation, substitution, addition, cyclization, coupling, oxidation and reduction.		
1.2.1 Fragmentation reactions in peroxyesters, aldehydes and carboxylic acids.		
1.2.2 Radical substitution reactions: alkane halogenation, allyl substitution, hydrogen substitution.		
1.2.3 Radical addition reactions via the addition of Hydrogen halides, halomethanes, acyls and thiols.		
1.2.4 Bu ₃ SnH/AIBN cyclization reaction.		
1.2.5 Coupling reactions: Pinacol reaction, McMurry reaction, acyloin reaction.		
1.2.6 Oxidation reactions.		
1.2.7 Reduction reactions with dissolved metals.		
1.3 Applications in organic synthesis.		
Unit 2: Oxidation and reduction reactions (12 h)		

2.1. Reaction, mechanism and stereochemical implications of oxidation and reduction processes of the main classes of organic compounds: alkanes, alkenes, arenes, alcohols, aldehydes, ketones, phenols, amines, carboxylic acids and derivatives.

2.2 Applications in organic synthesis.

Unit 3: Rearrangements: Mechanism and stereochemical implications (12 h)

3.1 Nucleophilic rearrangements (Rearrangement of benzyl acid, Favorskii, Baeyer-Villiger, Beckmann, Wolff, Hofmann, Curtius, Schmidt, Lossen, Stevens, etc.).

3.2 Electrophilic rearrangements (Rearrangement 1,2-pinacol, semipinacol, dienone-phenol, Rupe Fries, Jacobsen, Wagner-Meerwein, etc.).

3.3 Radical rearrangements (Di- π -methane, etc.).

3.4 Applications in organic synthesis.

Unit 4: Elimination reactions (12 h)

4.1 Mechanisms, energy diagram and stereochemical implications of the reactions of E1, E2 and E1cb: 1,2 Elimination in halides, alcohols and amines.

4.2 Main factors affecting the mechanisms E1, E2 and E1cb (solvent effects, strength of the base, group leaving, substrate structure).

4.3 Competition reactions: E1 x E2, and elimination x substitution.

4.4 Elimination reactions in vinyl halides.

4.5 Applications in organic synthesis.

Unit 5: Pericyclic reactions: Mechanisms and stereochemical implications (12 h)

5.1 Cycloaddition reactions: 1,3-dipolar, [2+2] and [4+2].

5.2 Electrocyclic reactions.

5.3 Sigmatropic rearrangements.

5.4 Applications in organic synthesis.

Unit 6: Reactions of organometallic compounds (12h)

6.1 Nucleophilic character of organometallic compounds.

6.2 Preparation reactions of organometallic compounds (organolithium and organomagnesium).

6.3 Alkylation reactions.

6.4 Cross-coupling reactions.

6.5 Applications in organic synthesis.

Unit 7: Introduction to organic synthesis (24 h)

7.1 Retrosynthetic analysis.

7.2 Protection groups.

7.3 Asymmetric synthesis concepts.

7.4 Strategies for total synthesis of organic molecules.

8. EVALUATION PROCESS:

Content will be evaluated through written tests. Optionally, seminars may be presented 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.