Detailed Course Description - Course Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-3.0E

Faculty	Pharmacy	Department	Pharmacy
Course number	201112	Course title	Pharmaceutical Organic Chemistry I
Number of credit hours	3	Pre-requisite/co-requisite	General Chemistry

Brief course description
This course introduces the basics of organic chemistry in terms of structure and reactivity. A functional group approach is applied by studying the structure, nomenclature, classification, physical properties, synthesis, and reactions of one functional group at a time. Functional groups covered include the hydrocarbons (alkanes, alkenes, and alkynes), alkyl halides, alcohols and ethers.

	Course goals and learning outcomes
Goal 1	Examination of the structure of an organic compound in terms of functional groups, physical properties like solubility and boiling point, nomenclature, and chemical reactivity.
Learning outcomes	1.1 Students should be able to identify the functional groups present in an organic compound. 1.2 Students should gain the ability to give the IUPAC name of an organic compound and convert an IUPAC name into a structure. 1.3 Students should understand how to interpret the physical properties and chemical reactivities of a compound from its structure.
Goal 2	Comprehension of the concept of isomerism.
Learning outcomes	2.1 Students should be able to determine types of isomerism. 2.2 Students should gain the ability to differentiate between conformational isomers, constitutional isomers, and stereoisomers. 2.3 Students should be familiar with stereochemical differences.
Goal 3	Understand the major types of reactions in organic chemistry
Learning outcomes	3.1 Students should gain the ability to differentiate between chemical reactions. 3.2 Students should be able to determine reaction mechanisms. 3.3 Students should be able to describe the major type of reaction of each functional group in organic chemistry.
Textbook	1.- Organic Chemistry, by Solomons & Fryhle. Publisher: Wiley.
Supplementary references	1.- Organic Chemistry, by McMurry. Publisher: Brooks/Cole. 2.- Organic Chemistry, by Bruice. Publisher: Pearson. 3.- Organic Chemistry, by Carey & Giuliano. Publisher: McGraw Hill.

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Course timeline				
Week	**Number of hours**	**Course topics**	**Pages (textbook)**	**Notes**
01	**1** **1** **1**	**Chapter 1: The Basics: Bonding and Molecular Structure** The structural theory of organic chemistry Chemical bonds, the octet rule and writing Lewis structures Formal charge and resonance theory Atomic Orbitals and electron configuration Hybridization: sp^3, sp^2, and sp hybrid orbitals		
02	**1** **1** **1**	**Chapter 2: Functional Groups and Intermolecular Forces** Carbon-carbon covalent bonds Polar and nonpolar molecules Functional groups		
03	**1** **1** **1**	**Chapter 3: An Introduction to Organic Reactions and Their Mechanisms: Acids and Bases** Reactions and their mechanisms Carbocations and carbanions Acid-base reactions Ka and pKa, predicting the outcome of acids and bases		
04	**1** **1** **1**	The relationship between structure and acidity Energy changes A mechanism for an organic reaction **Chapter 4: Nomenclature and Conformations of Alkanes and Cycloalkanes** Introduction Shapes of alkanes		
05	**1**	IUPAC nomenclature		

	1 **1**	Physical properties Sigma bonds and bond rotation Conformational analysis		
06	**1** **1** **1**	Relative stabilities of cycloalkanes: ring strain Angle strain and torsional strain Conformations of cyclohexane Index of hydrogen deficiency		
07	**1** **1** **1**	**Chapter 5: Stereochemistry: Chiral Molecules** The handedness of life Isomerism Enantiomers and chiral molecules Planes of symmetry		
08	**1** **1** **1**	Nomenclature of enantiomers: The R,S-System Optical activity Chiral drugs Molecules with more than 1 chirality center Fischer projection formulas Stereoisomerism of cyclic compounds Resolution		
09	**1** **1** **1**	**Chapter 6: Ionic Reactions** Organic halides Nucleophilic substitution reactions Nucleophiles, leaving groups An S_N2 reaction		
10	**1** **1** **1**	A mechanism for S_N2 reaction The stereochemistry of S_N2 reactions An S_N1 reaction A mechanism for S_N1 reaction: carbocations The stereochemistry of S_N1 reactions		
11	**1** **1** **1**	Factors affecting the rates of S_N1 and S_N2 reactions Organic synthesis: functional group transformations using S_N2 reactions Eliminations reactions of alkyl halides		

12	**1** **1** **1**	The E2 reaction The E1 reaction Substitution versus elimination Overall summary		
13	**1** **1** **1**	**Chapter 7: Alkenes and Alkynes I: Properties and Synthesis** Introduction The E,Z system for designating alkene diastereomers Relative stabilities of alkenes, cycloalkenes		
14	**1** **1** **1**	Synthesis of alkenes via elimination reactions Dehydrohalogenation of alkyl halides Acid catalyzed dehydration of alcohols Synthesis of alkynes by elimination reactions The acidity of terminal alkynes Alkylation of alkynide anions Hydrogenation of alkenes and alkynes Introduction to synthesis		
15	**1** **1** **1**	**Chapter 8: Alkenes and Alkynes II: Addition Reactions** Addition to alkenes Electrophilic addition of hydrogen halides to alkenes: mechanism and Markovnikov's rule Stereochemistry of the ionic addition to an alkene Addition of water to alkenes Alcohols from alkenes through hydroboration-oxidation: Anti-Markovnikov syn addition Electrophilic addition of bromine to alkenes Halohydrin formation Oxidation of alkenes: Syn 1,2-dihydroxylation Electrophilic addition of bromine to alkynes Addition of hydrogen halides to alkynes		
16	**1** **1** **1**	**Chapter 11: Alcohols and Ethers** Structure and nomenclature Physical properties Synthesis of alcohols from alkenes Reactions of alcohols Alcohols as acids Conversion of alcohols into alkyl halides Synthesis of ethers Reactions of ethers Epoxides		

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Theoretical course evaluation methods and weight	First exam 25% Second exam 25% Final exam 50%	**Practical (clinical) course evaluation methods**	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%

Approved by head of department		**Date of approval**	

Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Laurance Bourghli	Office Number	**410**
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Office hours			