

Course Detailed Description – Procedures of the Course Plan Committee /Faculty of Pharmacy	QF02/0408–2.1E
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Department	Pharmacy
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Course Name	Pharmaceutical Organic Chemistry (2)	Course No.	0201216
Prerequisite	Pharmaceutical Organic Chemistry (1)	Credit Hours	3
Number & date of course plan approval		Brief Description	See form QF02/0409

Course Objective	This course aims to teach the undergraduate-students the organic functional groups, in a continuation to those mentioned in Pharmaceutical Organic Chemistry (1), in terms of nomenclature, synthesis and reactions. In addition, applying these methodologies in synthesis of new derivatives of known active pharmaceutical ingredients.		
Intended Learning Outcomes	<ol style="list-style-type: none"> <li>1) To recognize most modern synthetic reagents and illustrate their common use with sample reactions of their devising.</li> <li>2) To understand and illustrate the mechanistic for all reactions to which they are exposed.</li> <li>3) To locate accurate literature precedent for any transformation they wish to suggest, and to cite it the correct format.</li> <li>4) To design an original synthesis for any molecule presented to them, complete with accurate, appropriate literature references for all non-trivial steps.</li> <li>5) To communicate mechanistic logic with electron pushing arrows.</li> </ol>		
Course Topics	Pharmaceutical organic chemistry is primarily a lecture and problem-solving course, which builds upon the first course of organic chemistry to prepare the student for other courses in pharmacy, biochemistry medicinal chemistry and phytochemistry. The curriculum is divided between advance topics in three areas of organic chemistry: (1) structures, properties, and nomenclatures of organic compounds, (2) mechanistic theory, and (3) synthesis and reactions. The course is composed of series of lectures, guided problem sets, and exams.		
Text Books	Organic Chemistry, T.W.G. Solomons & C.B.Fryhle, John Wiley & Sons, 10th edition.		
References	<ol style="list-style-type: none"> <li>1. Organic Chemistry By Morrison &amp; Boyd, 6th Edition.</li> <li>2. Organic Chemistry By McMurry, 7th Edition.</li> </ol>		
Grade	1 <sup>st</sup> Exam = 25% 2 <sup>nd</sup> Exam = 25%	Practical Course	Course Work = 50% (Reports, Term Papers, Quizzes)

Determination	Final Exam = 50%	Grade Determination	Final Exam = 50%	
Course Outline				
Week	Hours	Subjects	Chapters in Textbook	Notes
1	1 1 1	<b>Ethers and epoxides</b> <b>*Ethers</b> a- Structure b- Nomenclature c- Physical properties <b>Preparations of Ethers</b> Williamson synthesis <b>*Reaction of Ethers</b> Cleavage by strong acids <b>Epoxides</b> a- Structure b- Nomenclature of epoxides <b>*Preparation of Epoxides: Epoxidation</b> <b>Reactions of Epoxides:</b> a-Acid-catalyzed ring opening reactions b-Base -catalyzed ring opening reactions	11	
2	1 1 1	<b>Aromatic Compounds, Aromaticity and Reactions of Aromatic Compounds</b> <b>*Introduction , nomenclature of benzene derivatives</b> <b>*Kekule's Structure of benzene and stability of benzene</b> Aromaticity and Huckel's rule, <b>*Other polycyclic aromatic compounds</b>	14	
3	1 1 1	<b>Reactions of Aromatic Compounds</b> <b>*Electrophilic aromatic substitution reactions-Mechanism</b> <b>*Effect of substitutions on reactivity and orientation of substitution, theory of orientation.</b> <b>*Synthetic applications</b>	15	
4	1 1 1	<b>Phenols</b> <b>*Structure and nomenclature of other derivatives, physical properties</b> <b>*Synthesis of phenols</b> <b>*Reactions of phenols as Acids</b>	21	Ref. 1 & 2
5	1 1 1	<b>Aldehydes and Ketones</b> <b>*Nomenclature</b> <b>Physical properties</b>	16	Ref. 1 & 2

		*Synthesis of aldehydes and ketones * <b>Reactions of Aldehydes and Ketones</b> Mechanism of nucleophilic addition to C=O. The Addition of HCN		
6	1 1 1	*The Addition of ylides (Wittig reaction) The Addition of organometallic reagents * The Addition of alcohols: hemiacetals and acetals *The Addition of primary and secondary amines Oxidation & reduction of aldehydes and ketones	16	Ref. 1 & 2
7	1 1 1	<b>Reactions at the <math>\alpha</math>-H of carbonyl compounds, Condensation and Conjugate addition reactions of carbonyl compounds.</b> *The acidity of the $\alpha$ -H of carbonyl compounds Reactions <i>via</i> enols and enolate anions *Aldol reactions (without crossed Aldol reactions) *Cyclizations <i>via</i> Aldol	18 + 19	Ref. 1 & 2
8	1 1 1	*Addition to $\alpha$ , $\beta$ -unsaturated aldehydes and ketones * <b>Carboxylic Acids and Their Derivatives, Nucleophilic Addition-Elimination at the Acyl Carbon</b> *Nomenclature	18 17 17	Ref. 1 & 2
9	1 1 1	*Physical properties *Preparation of carboxylic acids *Nucleophilic addition – elimination at the acyl carbon	17	Ref. 1 & 2
10	1 1 1	*Relative reactivity of acyl compounds *Acyl chlorides *carboxylic acid anhydrides	17	
Week	Hours	Subjects	Chapters in Textbook	Notes
11	1 1 1	*esters *amides *nitriles	17	
12	1 1 1	* <b>Amines</b> *Nomenclature (one system) and physical properties Basicity of amines *Synthesis of amines	20	Ref. 1 & 2



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13	1 1 1	*Reactions of amines, *reactions with nitrous acid. *Replacement reactions of arenediazonium salts.	20	Ref. 1 & 2
14	1 1 1	*Coupling reactions of arenediazonium salts *Reaction of amines with sulfonyl chloride. *Sulfa drugs-synthesis	20	Ref. 1 & 2
15	1 1 1	<b>Heterocyclic compounds</b> *Five-membered ring systems and Six-membered ring systems-nomenclature *Aromaticity and structure *Simple examples of electrophilic substitution reactions and definition of the Fused rings: Indole, Benzofuran, Benzothiophene, Quinoline and Isoquinoline	<b>Based on the instructor's selection</b>	
		Final Examination		

Approved by Dept. Chair		Date of Approval	
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**Extra Information:** (Updated every semester and filled by course instructor)

<b>Course Instructor</b>	
<b>Office No.</b>	
<b>Extension Email</b>	
<b>Office hours</b>	