

Subject Description Form

Subject Code	ABCT2423
Subject Title	ORGANIC CHEMISTRY
Credit Value	3
Level	2
Pre-requisite	General Chemistry I
Co-requisite	None
Objectives	The aim of this subject is to enable students to understand organic chemistry through a study of the basic reaction types, the basic principles and the uses of common spectroscopic techniques available for functional group identification. Emphasis will be placed on reactions and compounds with structural interest as well as biological and industrial importance. This subject will be supplemented by practicals to equip students with the basic skills and techniques in organic chemistry.
Intended Learning Outcomes	On successfully completing this subject, students will be able to a) recognize the general aspect of safety and treatment of chemical waste in the organic chemistry laboratory; b) demonstrate skills in basic laboratory techniques such as recrystallization, simple and fractional distillations, etc. in an organized and planned manner and correlate the experimental results with the theoretical aspects of the subject; c) comprehend the concept of acid/base, the knowledge of organic functional groups and their reactions as well as the basic principles of stereochemistry for studying various reaction mechanisms; d) recognize factors affecting reactivity and predict reactivity of various basic reactions in different conditions; e) understand the basic principles of mass spectrometry, UV, IR and proton NMR spectroscopies and apply knowledge acquired to deduce structure of simple organic molecules via chemical reactions as well as a combined use of spectroscopic techniques; f) appreciate the importance of organization skills, ethical values, teamwork, and social responsibility; g) demonstrate the abilities of problem-solving skills, analytical thinking and interpersonal skills.
Subject Synopsis/ Indicative Syllabus	<u>Alkanes, Alkenes, Alkynes and Aromatic Compounds</u> Structures, reactivity and properties; conformation of alkanes and cycloalkanes; addition reactions; mechanism, stereochemistry and regioselectivity; hydration; halogenation; hydrohalogenation; hydrogenation; hydroxylation; epoxidation; hydroboration; electrophilic aromatic substitution reactions; Friedel-Crafts reactions; substituent effects in electrophilic aromatic substitution; mechanism; nitration; sulphonation. <u>Stereochemistry</u> Structural parameters and strains; stereoisomerism-configuration and conformation; chirality, enantiomerism, sigma- and pi-diastereomerism.

	<p><u>Spectral Analysis of Functional Groups</u> Basic principles and uses of mass spectrometry, infrared, ultraviolet-visible and ^1H nuclear magnetic resonance spectroscopies in the identification of functional groups of simple organic compounds.</p> <p><u>Alkyl Halides</u> Structure of alkyl halides; preparation of alkyl halides; nucleophilic substitution reactions; elimination reactions; mechanism and stereochemistry; regioselectivity; factors affecting nucleophilic substitution and elimination reactions: molecular structure, solvent, nucleophile, leaving group and neighbouring group.</p> <p><u>Alcohols, Phenols, Ethers and Thiols</u> Structure, reactivity and preparation; hydrogen bonding; acidity; dehydration; oxidation.</p> <p><u>Aldehydes and Ketones</u> Structure, properties and reactions; oxidation; nucleophilic addition reactions; hydration; acetal formation; imine formation; alcohol formation.</p> <p><u>Carboxylic Acids and Derivatives</u> Classification, reactivity and preparation; acidity of carboxylic acids; nucleophilic acyl substitution reactions.</p> <p><u>Amines and Heterocyclic Amines</u> Structure, properties and preparation; basicity of amines; acylation.</p>																																																				
<p>Teaching/Learning Methodology</p>	<p>Lectures will be used to provide fundamental principles and concepts of different topics in organic chemistry including chemical functional groups, chemical reactivity, chemical reactions, reaction mechanisms and spectroscopic analysis of organic compounds in organic chemistry. Tutorials are designed to assist students to consolidate their learned concepts, to improve their problem-solving skills and to stimulate their further interest in the subject. Laboratory experiments will be performed by students to improve their understanding of the principles and to develop their ability to observe and analyze as well as their practical proficiency and teamwork capability. Assessment will include tests and laboratory reports as well as written examination at the end of the term.</p>																																																				
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="7">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> </tr> </thead> <tbody> <tr> <td>1. Exam</td> <td>50</td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>2. Test</td> <td>30</td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>3. Lab</td> <td>20</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td>√</td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="7"></td> </tr> </tbody> </table>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)							a	b	c	d	e	f	g	1. Exam	50			√	√	√		√	2. Test	30			√	√	√		√	3. Lab	20	√	√				√		Total	100 %							
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	<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Tests and examination are employed to gauge how much students have learned in the chemical functional groups, chemical reactivity, chemical reactions, reaction mechanisms and spectroscopic analysis of organic compounds in organic chemistry as well as problem-solving skills and analytical thinking. The performance of the students in laboratory and written reports will be used to assess the ability of the students to apply the acquired chemistry knowledge to solve practical problems related to organic chemistry experiments; for examples, recognizing the general aspect of safety in the organic chemistry laboratory; basic laboratory techniques such as recrystallization, simple and fractional distillations.</p>	
Student Study Effort Expected	Class contact:	
	<ul style="list-style-type: none"> ▪ Lecture 	26 Hrs.
	<ul style="list-style-type: none"> ▪ Tutorial 	13 Hrs.
	<ul style="list-style-type: none"> ▪ Lab 	9 Hrs.
	Other student study effort:	
	<ul style="list-style-type: none"> ▪ Self study (reading on textbooks, reference books, etc) 	60 Hrs.
	<ul style="list-style-type: none"> ▪ Lab reports 	10 Hrs.
	Total student study effort	118 Hrs.
Reading List and References	<p><u>Essential</u></p> <p>Carey, F. A. Organic Chemistry (7th ed.) McGraw-Hill 2008</p> <p>Pavia, D.L. Introduction to Spectroscopy: A Guide for Students of Organic Chemistry (3rd ed.) Thomson Learning 2001</p> <p><u>Supplementary</u></p> <p>Vogel, A.I., Furnis, B.S., Hannaford, A.J. and Smith, P.W.G. Vogel's Textbook of Practical Organic Chemistry (5th ed.) Prentice-Hall 1996</p> <p>Shriner, R.L., Hermann, C.K.F., Morrill, T.C., Curtin, D.Y. and Fuson, R.C. The Systematic Identification of Organic Compounds: A Laboratory Manual (8th ed.) Wiley 2004</p> <p>Lehman, J.W. Microscale Operational Organic Chemistry: A Problem-Solving Approach to the Laboratory Course (2nd ed.) Prentice-Hall 2008</p>	