هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Principles of Biochemistry**
Course Code:	**CHEM 439**
Program:	**Bachelor in Chemistry**
Department:	***Chemistry Department***
College:	***College of Science***
Institution:	***Jazan University (JU)***

Table of Contents

A. Course Identification

1. Credit hours: 3h	**Workload: 168** **ECTS: 6.0**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	***Level 8 / Year 4***
4. Pre-requisites for this course (if any)**:**	None
5. Co-requisites for this course (if any)**:**	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom** **LAB**	**30** **30**	**100%**
2	**Blended**	--	--
3	**E-learning**	--	--
4	**Distance learning**	--	--
5	**Other**	--	--

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**30**
2	**Laboratory/Studio**	**30**
3	**Tutorial**	**--**
4	**Others** (specify)	**--**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Principles of Biochemistry	CHEM 439	2	2	3	Fourth Year	Eighth Level	.....

Course objectives: They are to identify the following.

- Biological fluids and metabolic reactions (catabolic and anabolic)
- Nucleic acids, its structure and functions (DNA and RNA).
- Enzymes classification, regulation, factors affecting enzyme action.
- The importance of biochemistry in our life.

- **Syllabus: A-Theoretical contents**

General introduction to the study of bio-molecules – biological fluids - metabolic reactions (catabolic and anabolic) – production of bioenergetics – structure and function of macrobio-molecules, including proteins, amino acids, enymes and carbohydrates (monosaccharides , disaccharides and polysaccharides) – Biological oxidation of glucose to obtain energy - lipids – classification and biological importance – structure and function of lipids - Fatty acids – beta oxidation of fatty acids to obtain energy – nucleic acids; structure and function - DNA and RNA, structure and function

Syllabus: B-Practical contents

- Selected experiments related to Biochemistry analysis (See attachment)

*See attachment

2. Course Main Objective

This course aims to provide students basic principles and definition of biochemistry, structure, functions and a general idea of metabolic reactions, biological functions of proteins, amino acids, enzymes and Nucleic acids. Carbohydrates studies and their function and Glucose oxidation to get energy. Lipids and their biological importance

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding** ***Upon completing this course, student will be able to***	K
1.1	*Demonstrate knowledge and an understanding of fundamental biochemistry principles, including bimolecular structure, metabolic*	***K.1***

CLOs		Aligned PLOs
	pathways. *(M)*	
1.2	*Explain the essential facts in biochemistry and correlate between the metabolic disorders and diagnosis of diseases.* *(M)*	***K.2***
2	***Skills :*** ***Upon completing this course, student will be able to***	***S***
2.1	*Solve problems in biochemistry, differentiate between metabolic pathways and the energy production level from different bio-molecules, and evaluate the level of different biological metabolites in biological fluids.* *(M)*	***S.1***
2.2	*Design, carry out, and record the results of biochemical experiments using classical techniques and modern instruments, then analyze those results to draw reasonable, accurate conclusions.* *(M)*	***S.2***
2.3	*Apply proper procedures and regulations for safe use and disposal of Biological fluids, chemicals, and respond to emergencies in the laboratory.* *(M)*	***S.3***
2.4	*Use communication and on line technology in biochemical concepts and experimental results through effective written and oral communication.* *(M)*	***S.4***
3	***Values:*** ***Upon completing this course, student will be able to***	*V*
3.1	*Work as a group leader in cooperation with other colleagues . (M)*	*V1*

C. Course Content

1-Theoritical Course contents:

No	List of Topics	Contact Hours
1	An introduction to bio chemistry and carbohydrates identification and classification.	2
2	Nomenclature of monosaccharide's and their derivatives and reactions.	2
3	Metabolism of carbohydrates.	4
4	Amino acids chemistry and classification.	2
5	Chemical properties of amino acids and peptide formation.	2
6	Protein structure and functions.	2
7	Lipids identification and classification. Triglycerides functions. Compound lipids (Conjugated and derived).	4
8	Fatty acid oxidation (Beta Oxidation) and energy production.	2
9	Enzymes identification, classification, structure and catalysis mechanism. Enzyme Inhibitors.	3
10	Nucleic acids identification and classification. Nitrogenous bases and nucleotide structure.	2
11	DNA and RNA structure; identification of gen and genome.	2
12	DNA Transcription , RNA translation and protein synthesis.	3
13	Lab Experiments	30
Total		60

2- Practical course topics in attached file.

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding** ***Upon completing this course, student will be able to***		
1.1	*Demonstrate knowledge and an understanding of fundamental biochemistry principles, including bimolecular structure, metabolic pathways*	*Lectures, directed reading, group discussion and assignments*	*Examinations, quizzes, and assignments*
1.2	*Explain the essential facts in biochemistry and correlate between the metabolic disorders and diagnosis of diseases*	*Lectures, directed reading, group discussion and assignments*	*Examinations, quizzes, and assignments*
2.0	**Skills** ***Upon completing this course, student will be able to***		
2.1	*Solve problems in biochemistry, differentiate between metabolic pathways and the energy production level from different bio-molecules, and evaluate the level of different biological metabolites in biological fluids.*	*Lectures, group discussion, Laboratory works, and assignments*	*Examinations, quizzes, and assignments*
2.2	*Design, carry out, and record the results of biochemical experiments using classical techniques and modern instruments, then analyze those results to draw reasonable, accurate conclusions*	*Lab work, group work*	*lab report/ Lab notebook, Quiz and Practical examination.*
2.3	*Apply proper procedures and regulations for safe use and disposal of Biological fluids, chemicals, and respond to emergencies in the laboratory*	*Lab works*	*Quiz in Safety*
2.4	*Use communication and on line technology in biochemical concepts and experimental results through effective written and oral communication.*	*individual assignment and individual research projects, oral presentation*	*Reports, and seminar oral presentation*
3.0	**Values** ***Upon completing this course, student will be able to***		
3.1	*Work as a group leader in cooperation with other colleagues .*	*Lab Work, Group work*	*Group evaluation rubric, laboratory reports, Practical Assignment*

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
1	**Homework assignment**		**2**	**1**
2	**Lecture Quizzes**		**4**	**1**
3	**Quiz in Safety**		**5**	**0**
4	**Mid-term exam**		**6**	**15**
5	**Homework assignment**		**8**	**1**
6	**Lecture Quizzes**		**10**	**1**
7	**Presentation session**		**11**	**0**
8	**Homework assignment**		**12**	**1**
9	**LAB**	**Safety Quiz**	**13**	**0**
		LAB sheet	**15**	**10**
		Final practical exam	**15**	**20**
10	**Final Exam**		**16**	**50**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:
Members of staff be available for academic counseling on daily basis for at 4h/day during office hours.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Lehninger, principales of biochemistry (sixth edition) by David L. Nelson Michafi M. Cox. W. H. FREEMAN AND COMPANY. New York. 2013 • Concise Text of Biochemistry. T.N Pattabiraman, 3rd Ed, 2001. • اسس الكيمياء الحيوية. الدكتور عبد المنعم الاعسر , المجلد الاول, المكتبة الاكاديمية 2011 • - Textbook-of-Biochemistry-For-Medical-Students-6th-Edition.pdf (online)
Essential References Materials	None
Electronic Materials	Biochemistry, Donald Voet, Wiley; third edition (2004).
Other Learning Materials	• www.wikipedia.org/ • ***http://www.wpi.edu/Academics/Depts/Chemistry/Courses/General*** • http://med-mu.com/wp-content/uploads/2018/06/DM-Vasudevan-Textbook-of-Biochemistry-For-Medical-Students-6th-Edition.pdf

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	***1 Lecture room(s) for groups of 40 students*** ***1 Lab for groups of 20 students***
Technology Resources (AV, data show, Smart Board, software, etc.)	***1 Computer laboratories for groups of 25 students***
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	***Colorimetric devices, Bunsen burner, microscopes, reagent bottles, beakers, Buchner funnel, Test tube and many more. Scientific videos***

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes	***Students, Instructor &*** Course coordinator	***(direct & indirect)***
Quality of learning resources	***Program coordinator***	***Indirect***
Exam Quality assessment	***Assessment committee***	***Indirect***

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)

Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Chemistry Department Council
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021

EXP

Week	EXP, titles	Chemicals and tools	hours
1	Course Introduction include: -Safety during handling with Chemicals and biological samples. Introduction to the devices used in the laboratory.	Safety tools, and Devices	2
2-3	Carbohydrate detection	Molisch's, Barfoed. Reducing tests, Fehling's, Bendict`s, Ammonical silver nitrate, Rapid furfural, furfural, Osazone formation and Iodine test	4
4	Estimation of the content of reducing sugars using Fehling's and Benedict's test	Fehling's and Benedict's reagent; copper(II) sulfate, potassium sodium tartrate, Potassium hydroxide	2
5-6	Estimation of glucose in serum by phenol-sulphuric acid method	Spectrophotometer, ethanol Phenol, Sulfuric acid, Water bath, Tubes with covers, filter paper, Cones	4
7	General tests for proteins ,	Ninhydrin reagent, copper sulfate in a strong base, sodium hydroxide solution, water bath	2
8	Solubility and Precipitation of protein	heavy metals (e.g. Hg2+, Pb2+, Cu2+), Alkaloidal reagents (e.g. tannate & trichloroacetate), by denaturation (heat coagulation test, strong acids, strong base)	2
9	Color reactions of proteins, Biuret test, Millon's test and Reduced sulfur test, Hopkins-Colé test	copper sulfate, sodium hydroxide, Millon's reagent, Hopkins-Colé reagent, H_2SO_4	2
10	Estimation of amino acid	-Using Ninhydrin - titration with potassium hydroxide in the presence of formaldehyde	2
11-12	Properties of fats and oils	Melting point, Crystallization, Viscosity, Density, Solubility, Refractive index, The Saponification number, iodine number, Rancidity	2
13	Estimation of triglyceride	4-chlorophenol , Magnesium aspartate, Sodium Azide	2
14	Revision on the theoretical part of the experiments		2
15	FINAL EXAM		