



Biomedical Engineering Program Specification

Course Specification of Biochemistry

Course Code (BE202)

● Course Identification and General Information:					
1	Course Title:	Biochemistry			
2	Course Code & Number:	BE202			
3	Credit hours:	C.H			TOTAL
		Th.	Seminar	Pr	
		2	--	1	--
4	Study level/ semester at which this course is offered:	Third Level / First Semester			
5	Pre –requisite (if any):	General Biology (BE101)			
6	Co –requisite (if any):	None			
7	Program (s) in which the course is offered:	Biomedical Engineering Program			
8	Language of teaching the course:	English			
9	Location of Teaching the Course:	Faculty of Engineering			
10	Prepared by:	Dr. Waled Al-Dubai			
11	Reviewed by:	Dr. Mohammed Al-Olofi			
12	Date of Approval:				

● Course Description:

The aim of biochemistry is to help students to identify the importance of biochemical compounds in the body during health and diseases, biochemistry is concerned with

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structure, composition, classification, and importance of carbohydrates, lipids, proteins, vitamins and enzymes, which has made vital contributions to medical devices.

• Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
Knowledge and Understanding: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
a1	Explain the importance and the composition of proteins, carbohydrates, lipids, enzymes and vitamins.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
a2	Classify biochemical compounds of the body.	
B. Cognitive/ Intellectual Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
b1	Diagram the principle of lab tests of biochemistry	B1 Apply engineering principles; basic of life-science; mathematical theories; and modern tools professionally in modelling, analyzing, designing, and constructing physical digital systems; devices and/or processes relevant to Biomedical Engineering fields.
b2	Integrate between the symptoms of diseases and deficiency of biochemical compounds.	
C. Professional and Practical Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
c1	Perform biochemical	C1 Apply integrally knowledge of mathematics,

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	experiments safely to differentiate between biochemical compounds.	life science, IT, design, business context and engineering practice to solve problems and to design systems/processes relevant to Biomedical Engineering.
c2	Choose appropriate lab test used in biochemistry.	C2 Use a wide range of analytical tools, techniques, IT, modern engineering tools, software packages and develop required computer programs to solve, modeling and analyzing Biomedical Engineering problems.
D. Transferable Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
d1	Work in the lab alone or as team effectively	D1 Lead and motivate individuals, show capability to work in stressful environments and within constraints, collaborate effectively within multidisciplinary team.
d2	Communicate effectively and cooperate with colleagues and others	D5 Demonstrate efficient IT capabilities and communicate effectively both orally and in writing technical reports.

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1. Explain the importance and the composition of	<ul style="list-style-type: none"> Interactive lectures, Presentation 	<ul style="list-style-type: none"> Written tests (mid and final terms and quizzes),

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proteins, carbohydrates, lipids, enzymes and vitamins.		
a2. Classify biochemical compounds of the body	<ul style="list-style-type: none"> Interactive lectures, Presentation 	<ul style="list-style-type: none"> Written tests (mid and final terms and quizzes),

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1. Diagram the principle of lab tests of biochemistry	<ul style="list-style-type: none"> Presentation Directed self- study 	<ul style="list-style-type: none"> Written tests (mid and final terms and quizzes), Home works and assignments
b2. Integrate between the symptoms of diseases and deficiency of biochemical compounds.	<ul style="list-style-type: none"> Presentation Directed self- study 	<ul style="list-style-type: none"> Written tests (mid and final terms and quizzes), Home works and assignments

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1. Perform biochemical experiments safely to	<ul style="list-style-type: none"> Laboratory/Practical experiments based session 	<ul style="list-style-type: none"> Lab\Project report Practical lab performance

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differentiate between biochemical compounds.		assessment
c2. Choose appropriate lab test used in biochemistry.	<ul style="list-style-type: none"> Laboratory/Practical experiments based session 	<ul style="list-style-type: none"> Lab\Project report Practical lab performance assessment,

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Work in the lab alone or as team effectively	<ul style="list-style-type: none"> Presentation Team work (cooperative learning) 	<ul style="list-style-type: none"> Coursework activities assessment, Home works and assignments,
d2. Communicate effectively and cooperate with colleagues and others	<ul style="list-style-type: none"> Presentation Team work (cooperative learning) 	<ul style="list-style-type: none"> Coursework activities assessment, Home works and assignments, Presentations.

• Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact
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					hours
1	Carbohydrates Chemistry	a1,a2, b2,d2	<ul style="list-style-type: none"> - Biochemistry and medicine - Defenation and function of carbohydrates - Classification of carbohydrates - Monosaccharides (classification, importance, properties) - Disaccharides (types, importance, properties) - Polysaccharides (classification, importance, properties) 	3	6
2	Lipid chemistry	a1,a2, b2,d2	<ul style="list-style-type: none"> - Classification of lipids - Simple lipids and their importance - Compound lipids - Phospholipids (types, structure, importance) - Lipoproteins (types, structure, importance) - Derived lipids (types, structure, importance) 	3	6
3	Mid-Term Theoretical Exam	a1,a2, b2	-MCQs and essay questions	1	2

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4	Protein chemistry	a1,a2, b2,d2	<ul style="list-style-type: none"> - Definition and importance of proteins - Aminoacids (classification , structure, properties, importance) - Structure of proteins (primary, secondary, tertiary, quaternary) - Classification of proteins with examples 	4	8
5	Vitamins and Enzymes	a1,a2, b2,d2	<ul style="list-style-type: none"> - Definition and classification of vitamins - -Fat soluble vitamins and Water soluble vitamins (sources, structure, active forms, absorption, storage, stability, functions, deficiency and clinical manifestation , toxicity). - -Definition and classification of enzymes - -Cofactors - -Mechanism of enzyme action - -Factors that affect the rate of enzyme action - -Enzymes inhibitors and isoenzymes -Clinical application of 	4	8

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			enzymes		
6	Final Theoretical Exam	a1,a2, b2		1	2
Number of Weeks /and Units Per Semester				16	32

B - Practical Aspect: (if any)				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Introduction to lab biosafety	2	4	c1
2	-Identification of carbohydrates: Molisch's test, Iodine test, Barfoed's test Benedict's test, Seliwanoff's test Carbohydrate scheme tests	3	6	c1,c2, b1,d1,d2
3	-Protein identification: Biuret test, Isoelectricpoint test, Heat and acid tests Proteins Scheme tests.	3	6	c1,c2, b1,d1,d2
4	-Lipid identification tests:	3	6	c1,c2, b1,d1,d2

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	Test for solubility, Suden IV, Salkowski reaction, Dichromate test			
5	Final Exam Practical	1		c1,c2, b1,d1
Number of Weeks /and Units Per Semester		12	24	

C. Tutorial Aspect:				
No.	Tutorial	– Number of Weeks	– Contact Hours	– Learning Outcomes (CILOs)
1				
Number of Weeks /and Units Per Semester				

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V. Teaching Strategies of the Course:

- Interactive lectures,
- Laboratory/Practical experiments based session
- Presentation
- Directed self- study
- Team work (cooperative learning)

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Home works and assignments
- Lab\Project report
- Practical lab performance assessment

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1				
2				
3				
Total				

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VIII. Schedule of Assessment Tasks for Students During the Semester:					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Attendance	14 th	10	10%	
2	Mid-Term Theoretical Exam	7 th	20	20%	a1,a2, b2
3	Final Practical Exam	15 th	20	20 %	c1,c2, b1,d1
4	Final Theoretical Exam	16 th	50	50 %	a1,a2, b2
Total			100	100 %	

IX. Learning Resources:	
<ul style="list-style-type: none"> Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher). 	
1- Required Textbook(s) (maximum two).	
	1-David, L. N., Michael, M. C (2017) Lehninger principles of biochemistry.7th edn. England: Macmillan Higher Education. 2-Victor, R.W., David, A.B., Kathleen, M.B., Peter, j. k., Anthony, P.W (2018). Harper's Illustrated Biochemistry.31st edn. United States : McGraw-Hill Education
2- Essential References.	
	1-Michael, L., Alisa, P (2014) Marks' Essentials of Medical Biochemistry: A .Clinical Approach. 2nd edn. China: Wolters Kluwer 2-Bhagavan, N. V., Chung-Eun Ha (2015) Essentials of Medical Biochemistry with Clinical Cases. 2nd edn. China: Academic Press.
3- Electronic Materials and Web Sites etc.	

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	<p>Websites:</p> <p>1-The Medical Biochemistry Page https://themedicalbiochemistrypage.org/</p> <p>2-Biochemistry Animations https://maxanim.com/biochemistry/</p>
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X. Course Policies:	
1	<p>Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.</p>
2	<p>Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.</p>
3	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam</p>
4	<p>Assignments & Projects: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.</p>
5	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.</p>

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Department of Biomedical Engineering



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6	Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7	Other policies: - Mobile phones are not allowed to use during a class lecture. It must be closed; otherwise the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.

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Course Specification of Biochemistry

Course Code (BE202)

I. Course Identification and General Information:						
1	Course Title:	Biochemistry				
2	Course Code & Number:	BE202				
3	Credit hours:	C.H			TOTAL	
		Th.	Seminar	Pr		Tr.
		2	--	1	--	3
4	Study level/ semester at which this course is offered:	Third Level / First Semester				
5	Pre –requisite (if any):	General Biology (BE101)				
6	Co –requisite (if any):	None				
7	Program (s) in which the course is offered:	Biomedical Engineering Program				
8	Language of teaching the course:	English				
9	Location of Teaching the Course:	Faculty of Engineering				
10	Prepared by:	Dr. Waleed Al-Dubai				
11	Reviewed by:	Dr. Mohammed Al-Olofi				
12	Date of Approval:					

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I. Course Description:

The aim of biochemistry is to help students to identify the importance of biochemical compounds in the body during health and diseases, biochemistry is concerned with structure, composition, classification, and importance of carbohydrates, lipids, proteins, vitamins and enzymes, which has made vital contributions to medical devices.

III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)

A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:

- | | |
|----|--|
| a1 | Explain the importance and the composition of proteins, carbohydrates, lipids, enzymes and vitamins. |
| a2 | Classify biochemical compounds of the body |

B. Intellectual Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|---|
| b1 | Diagram the principle of lab tests of biochemistry |
| b2 | Integrate between the symptoms of diseases and deficiency of biochemical compounds. |

C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|--|
| c1 | Perform biochemical experiments safely to differentiate between biochemical compounds. |
| c2 | Choose appropriate lab test used in biochemistry. |

D. Transferable Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|--|
| d1 | Work in the lab alone or as team effectively |
| d2 | Communicate effectively and cooperate with colleagues and others |

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IV. Course Contents:

A. Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	contact hours
1	Carbohydrates Chemistry	<ul style="list-style-type: none"> - Biochemistry and medicine - Defenation and function of carbohydrates - Classification of carbohydrates - Monosaccharides (classification, importance, properties) - Disaccharides (types, importance, properties) - Polysaccharides (classification, importance, properties) 	3	6
2	Lipid chemistry	<ul style="list-style-type: none"> - Classification of lipids - Simple lipids and their importance - Compound lipids - Phospholipids (types, structure, importance) - Lipoproteins (types, structure, importance) 	3	6

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		- Derived lipids (types, structure, importance)		
3	Mid-Term Theoretical Exam	-MCQs and essay questions	1	2
4	Protein chemistry	<ul style="list-style-type: none"> - Definition and importance of proteins - Aminoacids (classification , structure, properties, importance) - Structure of proteins (primary, secondary, tertiary, quaternary) Classification of proteins with examples 	4	8
5	Vitamins and Enzymes	<ul style="list-style-type: none"> - Definition and classification of vitamins - -Fat soluble vitamins and Water soluble vitamins (sources, structure, active forms, absorption, storage, stability, functions, deficiency and clinical manifestation , toxicity). - -Definition and classification of enzymes - -Cofactors - -Mechanism of 	4	8

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		enzyme action – -Factors that affect the rate of enzyme action – -Enzymes inhibitors and isoenzymes -Clinical application of enzymes		
6	Final Theoretical Exam		1	2
Number of Weeks /and Units Per Semester			16	32

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B. Case Studies and Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours
1	Introduction to lab biosafety	2	4
2	-Identification of carbohydrates: Molisch's test, Iodine test, Barfoed's test Benedict's test, Seliwanoff's test Carbohydrate scheme tests	3	6
3	-Protein identification: Biuret test, Isoelectricpoint test, Heat and acid tests Proteins Scheme tests.	3	6
4	-Lipid identification tests: Test for solubility, Sudan IV, Salkowski reaction, Dichromate test	3	6
5	Final Practical Exam	1	2
Number of Weeks /and Units Per Semester		12	24

C. Tutorial Aspect:

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No.	Tutorial	– Number of Weeks	– Contact Hours
1			
2			
3			
Number of Weeks /and Units Per Semester			

V. Teaching Strategies of the Course:

- Interactive lectures,
- Laboratory/Practical experiments based session
- Presentation
- Directed self- study
- Team work (cooperative learning)

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Home works and assignments
- Lab\Project report
- Practical lab performance assessment

VII. Assignments:

No.	Assignments	– Week Due	– Mark
1			

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VII. Assignments:			
No.	Assignments	– Week Due	– Mark
2			
Total			

VIII. Schedule of Assessment Tasks for Students During the Semester:				
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Attendance	14th	10	10%
2	Mid-Term Theoretical Exam	7th	20	20%
3	Final Practical Exam	15th	20	20 %
4	Final Theoretical Exam	16th	50	50 %
Total			100	100%

IX. Learning Resources:
<ul style="list-style-type: none"> ● <i>Written in the following order:</i>
<ul style="list-style-type: none"> ● <i>Written in the following order: (Author - Year of publication - Title - Edition - Place of publication - Publisher).</i>
1- Required Textbook(s) (maximum two):

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2-Victor, R.W., David, A.B., Kathleen, M.B., Peter, j. k., Anthony, P.W (2018). Harper's Illustrated Biochemistry.31st edn. United States : McGraw-Hill Education

2- Essential References:

1-Michael, L., Alisa, P (2014) Marks' Essentials of Medical Biochemistry: A Clinical Approach. 2nd edn. China: Wolters Kluwer.

2-Bhagavan, N. V., Chung-Eun Ha (2015) Essentials of Medical Biochemistry with Clinical Cases. 2nd edn. China: Academic Press.

3- Electronic Materials and Web Sites etc.:

Websites:

- The Medical Biochemistry Page
<https://themedicalbiochemistrypage.org/>
- Biochemistry Animations
<https://maxanim.com/biochemistry/>

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X. Course Policies:	
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3	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam</p>
4	<p>Assignments & Projects: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.</p>
5	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.</p>
6	<p>Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.</p>
7	<p>Other policies:</p>

Head of Department
Dr. Mohammed A. Al-Olofi

Quality Assurance Unit
Ass. Prof. Dr. Mohammad Algorafi

Dean of the Faculty
Prof. Dr. Mohammed AL-Bukhaiti

Academic Development
Center & Quality Assurance
Ass. Prof. Dr. Huda Al-Emad

Rector of Sana'a University
Prof. Dr. Al-Qassim Mohammed Abbas

Republic of Yemen

Sana'a University

Faculty of Engineering

Department of Biomedical Engineering



Biomedical Engineering Program Specification

<ul style="list-style-type: none">- Mobile phones are not allowed to use during a class lecture. It must be closed; otherwise the student will be asked to leave the lecture room.- Mobile phones are not allowed in class during the examination.- Lecture notes and assignments might be given directly to students using soft or hard copy.

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