



**Course Syllabus**  
**According to JORDAN National Qualification**  
**Framework (JNQF)**

**Course Name: Chemistry of Biomolecules**

**Course Number: 11013215**

**General Course Information:**

<b>Course title</b>	Chemistry of Biomolecules
<b>Course number</b>	11013215
<b>Credit hours</b>	3 hours
<b>Education type</b>	Face-to-Face
<b>Prerequisites/corequisites</b>	11012212
<b>Academic Program</b>	BSc
<b>Program code</b>	01
<b>Faculty</b>	Science
<b>Department</b>	Chemistry
<b>Level of course</b>	Second year (Chemistry Students)
<b>Academic year /semester</b>	First semester / ( 2022/2023)
<b>Awarded qualification</b>	Bachelor (B.Sc.)
<b>Other department(s) involved in teaching the course</b>	none
<b>Language of instruction</b>	English
<b>Date of production/revision</b>	18/10/2022

**Course Coordinator:**

<b>Coordinator's name</b>	Samer Hasan Ahmad Hussein-Al-Ali
<b>Office No</b>	7322
<b>Office Phone extension number</b>	2749
<b>Office Hours</b>	Mon, Wed (11-12)
<b>Email</b>	samer.alali@iu.edu.jo

**Other Instructors:**

<b>Instructor name</b>	
<b>Office No</b>	
<b>Office Phone extension number</b>	
<b>Office Hours</b>	
<b>Email</b>	

**Course Description (English/Arabic):**

English	Introduction to the structure, properties, and functions of simple and complex biomolecules: amino acids, peptides, proteins, enzymes, carbohydrates, fats, and nucleic acids.
Arabic	مقدمة في تركيب وخصائص ووظائف الجزيئات الحيوية البسيطة والمعقدة: الأحماض الأمينية والبيبتيدات والبروتينات والإنزيمات والكربوهيدرات والدهون والأحماض النووية.

**Text Book: Author(s), Title, Publisher, Edition, Year, Book website.**

Organic Chemistry, 7<sup>th</sup> Edition By John McMurry

**References: Author(s), Title, Publisher, Edition, Year, Book website.**

1. Organic Chemistry, Solomons
2. Organic Chemistry, Morrison and Boyd
3. Biochemistry, Streyer

**Course Educational Objectives (CEOs):**

1.	Identify and draw the molecules that represent the building blocks of the four classes of biomolecules to be studied in this course; proteins, nucleic acids, carbohydrates and lipids. This would include the amino acids, nucleotides, select monosaccharides and basic lipid structures.
2.	Describe and draw the nature of the linkages between the various building blocks to the creation of higher order structures. This would include peptide bonds, glycosidic linkages and phosphodiester linkages.
3.	Describe the various forces, covalent and non-covalent, contribute to the formation and stabilization of the various biomolecules.
4.	Appreciate the specificities and catalytic power of enzymes, understand the mechanisms of their actions and identify factors that affect their activity.
5.	Know the principles and applications of different biochemical techniques used in biological research.
6.	Explain the relative stability of bio-compounds and demonstrate their metabolic sources of acids and bases, the concept of pH and pKa, and regulatory mechanism against changes of pH.

**Intended Learning Outcomes (ILO's):**

	Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire:	Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	Descriptors**
<b>A</b>	<b>Knowledge and Understanding:</b>				
<b>A1</b>	Will be able to define and classify of Carbohydrates (e.g. mono and disaccharides).	1, 2	1	Knowledge	Knowledge
<b>A2</b>	Will be able to know the types of glycosidic bond	3, 6	2	Knowledge	Knowledge
<b>A3</b>	Will be able to define proteins (collagen, myoglobin, and hemoglobin)..	2, 4, 5	3	Knowledge	competency
<b>B</b>	<b>Intellectual skills:</b>				
<b>B1</b>	Will be able to know the differentiate between the various sugar molecules, lipids, nucleic acids, and amino acids	1,2	1	Knowledge	Knowledge
<b>B2</b>	Will be able to calculate isoelectric point of small polypeptides. Predict changes in enzyme kinetics according to inhibitor type.	3,6	3	Analysis	competency
<b>B3</b>	Will be able to determine enzyme class according to catalyzed reaction and involved cofactor. Turnover number and specific activity. Interpretation of technical results.	4,5	1	Evaluation	Knowledge

<b>D</b>	<b>Transferable skills:</b>				
<b>D1</b>	Develop of problem solving and critical thinking skills.	6	1	Evaluation	Knowledge
<b>D2</b>	Use oral communication to effectively transmit ideas and conclusions to a scientific audience	6	2	Analysis	Knowledge

**\*Bloom Taxonomy Levels**

Level #	1	2	3	4	5	6
Level Name	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis

**\*\* Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

**Program Learning Outcome (PLOs):**

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (Chemistry) program will demonstrate		Descriptors
1.	Describe the fundamental scientific principles and theories across the four subfields of chemistry (Organic, inorganic, analytical and physical).	Knowledge
2.	Identify and confirm chemical compounds structures as well as determine chemical composition.	Knowledge
3.	Establish and concludes mechanisms of physical and chemical processes in addition to the ability of mastering qualitative and quantitative determination.	competency
4.	Solve the scientific problems using different mechanisms and procedures based on critical thinking.	skill
5.	Conduct scientific experiments in chemistry.	competency
6.	Commitment and interest in lifelong learning, and collaborate effectively with other people in a team.	competency
7.	Prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists.	skill
8.	Commitment to the ethical principles of chemical research.	competency
9.	Find information about chemistry through databases and information	skill
10.	Evaluation of calculations in chemistry experiments and information analysis using computer software.	competency
11.	Demonstrate safety laboratory techniques.	skill

**\* Descriptors according to the national qualifications framework (knowledge, skill, adequacy)**

**Weekly Schedule (please choose the type of teaching)**

☒ **Face to Face**

☐ **Hybrid (2 Lectures Face – To - Face +1 Lecture Asynchronous)**

☐ **Hybrid (1 Lectures Face – To - Face +1 Lecture Asynchronous)**

☐ **Online (2 Lectures Synchronous +1 lecture Asynchronous)**

Week	First Lecture (Face – To - Face)	Second Lecture (Face – To - Face)	Third Lecture (Face – To - Face)	Ach. ILOs	Ach. PLOs	Descriptors*
1	<b>Chapter 25: Carbohydrates</b> Classification of Carbohydrates	<b>Chapter 25: Carbohydrates</b> Classification of Carbohydrates	Depicting Carbohydrate Stereochemistry:	A1,B1	1,2	Knowledge
2	Fischer Projections	D,L Sugars	Configurations of the Aldoses,	A1,B1	1,2	Knowledge
3	Cyclic Structures of Mono saccharides	Anomers	Reactions of Monosaccharides	A1,B1	1,2	Knowledge
4	The Eight Essential Monosaccharides, Disaccharides , Polysaccharides and Their Synthesis, Some Other Important Carbohydrates	The Eight Essential Monosaccharides, Disaccharides , Polysaccharides and Their Synthesis, Some Other Important Carbohydrates	The Eight Essential Monosaccharides, Disaccharides , Polysaccharides and Their Synthesis, Some Other Important Carbohydrates	A1,B1	1,2	Knowledge
5	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Structures of Amino Acids	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> the Henderson–Hasselbalch Equation,	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Isoelectric Points,	A2, A3, B2	2,3,5	Knowledge competency
6	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Synthesis of Amino Acids, Peptides and Proteins.	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Peptide Sequencing: The Edman Degradation,	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Peptide Synthesis	A2, A3, B2	2,3,5	Knowledge competency
7	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> The Merrifield Solid-Phase Method, Protein Structure,	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> The Merrifield Solid-Phase Method, Protein Structure,	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Enzymes and Coenzymes, How Do Enzymes Work? Citrate Synthase.	A2, A3, B2	2,3,5	Knowledge competency
8	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Coenzymes, How Do Enzymes Work? Citrate Synthase.	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Coenzymes, How Do Enzymes Work? Citrate Synthase.	<b>Chapter 26: Amino Acids, Peptides, and Proteins</b> Enzymes and Coenzymes, How Do Enzymes Work? Citrate Synthase.	A2, A3, B2	2,3,5	Knowledge competency
9	<b>Chapter 27: Lipids</b> Waxes, Fats, and Oils	<b>Chapter 27: Lipids</b> Waxes, Fats, and Oils	<b>Chapter 27: Lipids</b> Soap	A3, B1	3,4	competency skill
10	الاختبار النصفي					
11	<b>Chapter 27: Lipids</b> Phospholipids, Prostaglandins and Other Eicosanoids, Terpenoids, Steroids.	<b>Chapter 27: Lipids</b> Biosynthesis of Steroids.	<b>Chapter 27: Lipids</b> Biosynthesis of Steroids.	A3, B1	3,4	competency skill
12	<b>Chapter 28:Nucleic Acids</b>  Nucleotides and Nucleic Acids, Base Pairing in DNA: The Watson–Crick Model, Replication of DNA,Transcription of RNA,and Translation of RNA: Protein Biosynthesis,DNA Sequencing, DNA Synthesis, The Polymerase Chain Reaction.	<b>Chapter 28:Nucleic Acids</b>  Nucleotides and Nucleic Acids, Base Pairing in DNA: The Watson–Crick Model, Replication of DNA,Transcription of RNA,and Translation of RNA: Protein Biosynthesis,DNA Sequencing, DNA Synthesis, The Polymerase Chain Reaction.	<b>Chapter 28:Nucleic Acids</b>  Nucleotides and Nucleic Acids, Base Pairing in DNA: The Watson–Crick Model, Replication of DNA,Transcription of RNA,and Translation of RNA: Protein Biosynthesis,DNA Sequencing, DNA Synthesis, The Polymerase Chain Reaction.	A1, A2, B3	1,2,6	Knowledge competency
13	<b>Chapter 28: Nucleic Acids</b>	<b>Chapter 28: Nucleic Acids</b> Base Pairing in DNA	<b>Chapter 28: Nucleic Acids</b> Base Pairing in DNA	A1, A2, B3	1,2,6	Knowledge competency

	Nucleotides and Nucleic Acids					
14	<b>Chapter 28: Nucleic Acids</b> The Watson–Crick Model	<b>Chapter 28: Nucleic Acids</b> Replication of DNA	<b>Chapter 28: Nucleic Acids</b> Transcription of DNA, and Translation of RNA	A1, A2, B3	1,2,6	Knowledge competency
15	<b>Chapter 28: Nucleic Acids</b> Protein Biosynthesis, DNA Sequencing, DNA Synthesis, The Polymerase Chain Reaction.	<b>Chapter 29: The Organic Chemistry of Metabolic Pathways</b>	<b>Chapter 29: The Organic Chemistry of Metabolic Pathways</b>	A1, A3, B3, D1,D2	1,3,6	Knowledge competency
16	الاختبار النهائي					
17						

\* K: Knowledge, S: Skills, C: Competency

#### Teaching Methods and Assignments:

**Development of ILOs is promoted through the following teaching and learning methods:**

- **Interactive videos**
- **Practice Labs**
- **Discussion Forums**
- **Quizzes**
- **Other Interactive online activities**
- **Reports**

#### Course Policies:

##### A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

##### B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

##### C- Academic Health and safety procedures

##### D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

##### E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm **30%**
- Final Exam **50%**

##### F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

#### Required equipment:

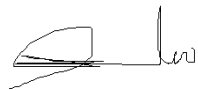
- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: <https://elearn.iu.edu.jo/>**
- **E-learning plan**
- **Satisfaction questionnaires for online and face-to-face learning**

- Software for e-learning
- Training

### Assessment Tools implemented in the course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:.....

### Responsible Persons and their Signatures:

<b>Course Coordinator</b>	<b>Dr. Samer Al-Ali</b>	<b>Completed Date</b>	18/10/ 2022
		<b>Signature</b>	
<b>Received by (Department Head)</b>	<b>Dr. Manal khabbas</b>	<b>Received Date</b>	19/10/ 2022
		<b>Signature</b>	