MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Module Title** | Fundamentals of Biochemistry | | | | **Module Delivery** | | |
| **Module Type** | Core | | | | * **☒ Theory** * **☐ Lecture** * **☒ Lab** * **☐ Tutorial** * **☐ Practical** * **☐ Seminar** | | |
| **Module Code** | ITC320140 | | | |
| **ECTS Credits** | 5.00 | | | |
| **SWL (hr/sem)** | 125 | | | |
| **Module Level** | | 2 | **Semester of Delivery** | | | | 4 |
| **Administering Department** | | BID | **College** | BMIC | | | |
| **Module Leader** | M.Sc. Omar A | | **e-mail** | omara.m@ uoitc.edu.iq | | | |
| **Module Leader’s Acad. Title** | | Assistant Lecturer | **Module Leader’s Qualification** | | | | M.Sc. |
| **Module Tutor** | Name (if available) | | **e-mail** | E-mail | | | |
| **Peer Reviewer Name** | | omarA.M | **e-mail** | omara.m@ uoitc.edu.iq | | | |
| **Scientific Committee Approval Date** | | 18/06/2023 | **Version Number** | | | 1.0 | |

| **Relation with other Modules**  **العلاقة مع المواد الدراسية الأخرى** | | | |
| --- | --- | --- | --- |
| **Prerequisite module** | Fundamentals of Organic Chemistry / BID212 | **Semester** | 3 |
| **Co-requisites module** | None | **Semester** |  |

| **Module Aims, Learning Outcomes and Indicative Contents**  **أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** | |
| --- | --- |
| **Module Aims**  **أهداف المادة الدراسية** | 1. Provide the basics of protein structure and function; carbohydrate, lipid, and nitrogen metabolism; and molecular biology of macromolecules to non-majors of biochemistry. 2. Students will learn about topics such as the structure of biomolecules, and how they interact in essential processes and pathways in our cells. 3. Study the structural and functional properties of carbohydrates, proteins, lipids and nucleic acids. 4. Emphasize the role of biomolecules by providing basic information on specific metabolic diseases and their disorders. 5. simple introduction about metabolism and bioenergetics (ATP Cell’s Energy ) |
| **Module Learning Outcomes**    **مخرجات التعلم للمادة الدراسية** | 1. Demonstrate understanding of the principles of the protein structure and synthesis together with an ability to explain their functions in general terms 2. Understand the key principles of enzyme Biochemistry, enzyme classification and basic principles of some enzyme functioning. 3. Demonstrate understanding of the basic principles of structure and function of Nucleic acid. 4. Structural organization of different types of nucleic acids (DNA and RNAs). 5. Carbohydrate Biochemistry. Understand biochemical principles, biological functions and applications 6. Lipids. Demonstrate knowledge of the principles of classification, structure and functions. 7. Biological membranes. Understand basic mechanisms of static integration of biologically active compounds into membranes. |
| **Indicative Contents**  **المحتويات الإرشادية** | Part A - What is Biochemistry?, Biological Molecules, Cells contain four major types of biomolecules,  Biological Polymers, Energy and Metabolism, Life is thermodynamically possible, The Origin and Evolution of Life ,The Three Domains(group or taxa Classification System,1.Prokaryotes , Eukaryotes  Part B- AQUEOUS CHEMISTRY   | Water Molecules form Hydrogen Bonds, Hydrogen bonds are one type of electrostatic forceWater dissolves many compounds, The Hydrophobic Effect, Amphiphilic molecules experience both hydrophilic interactions and the hydrophobic effect, The hydrophobic core of a lipid bilayer is a barrier to diffusion Acid–Base Chemistry, [H+] and [OH-] are inversely related The pH of a solution can be altered A pK value describes an acid’s tendency to ionize . The pH of a solution of acid is related to the pK .Tools and Techniques: Buffers, Why Do Some Drugs Contain Fluorine? , CLINICAL CONNECTION Acid–Base Balance in Humans  Part C : PROTEIN STRUCTURE Tools and Techniques: Analyzing Protein Structure  Proteins Are Chains of Amino Acids, The 20 amino acids have different chemical properties, Peptide bonds link amino acids in proteins, The amino acid sequence is the first level of protein structure, Secondary Structure: The Conformation of the Peptide Group, The α helix exhibits a twisted backbone conformation, The β sheet contains multiple polypeptide strands, Proteins also contain irregular secondary structure Tertiary Structure and Protein Stability, Proteins have hydrophobic cores, Protein structures are stabilized mainly by the hydrophobic effect, Cross-links help stabilize proteins, Protein folding begins with the formation of secondary structures. Quaternary Structure Chromatography takes advantage of a polypeptide’s unique properties, Mass spectrometry reveals amino acid sequences, Protein structures are determined by X-ray crystallography, electron crystallography, and NMR spectroscopy.  Part D : PROTEIN FUNCTION Myoglobin and Hemoglobin: Oxygen-Binding Proteins:  Myoglobin and Hemoglobin: Oxygen-Binding Proteins, Oxygen binding to myoglobin depends on the oxygen concentration, Myoglobin and hemoglobin are related by evolution, Oxygen binds cooperatively to hemoglobin, A conformational shift explains hemoglobin’s cooperative behavior, H+ ions and bisphosphoglycerate regulate oxygen binding to hemoglobin in vivo  Part E: Lipids, The Lipid Bilayer, Membrane Proteins, The Fluid Mosaic Model  Fatty acids contain long hydrocarbon chains, Some lipids contain polar head groups, Lipids perform a variety of physiological functions  Part F:  How Enzymes Work  What Is an Enzyme? , The Chemistry of Catalysis , The Unique Properties of Enzyme Catalysts | | --- |   Part G : classifying Carbohydrates  Part H: lipids and membranes |

| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| --- | --- |
| **Strategies** | The main strategy is to encourage students’ participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| **Student Workload (SWL)**  **الحمل الدراسي للطالب** | | | |
| --- | --- | --- | --- |
| **Structured SWL (h/sem)**  **الحمل الدراسي المنتظم للطالب خلال الفصل** | 63 | **Structured SWL (h/w)**  **الحمل الدراسي المنتظم للطالب أسبوعيا** | 4 |
| **Unstructured SWL (h/sem)**  **الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 62 | **Unstructured SWL (h/w)**  **الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 4 |
| **Total SWL (h/sem)**  **الحمل الدراسي الكلي للطالب خلال الفصل** | 125 | | |

| **Module Evaluation**  **تقييم المادة الدراسية** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **As** | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 2 | 10% (10) | 5, 10 | LO #1, 2 and 4 |
| **Assignments** | 2 | 10% (10) | 2, 12 | LO # 3, 4, 6 and 7 |
| **Projects / Lab.** | 1 | 10% (10) | Continuous |  |
| **Report** | 1 | 10% (10) | 13 | LO # 1-6 |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10% (10) | 7 | LO # 1-6 |
| **Final Exam** | 3hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) |  |  |

| **Delivery Plan (Weekly Syllabus)**  **المنهاج الاسبوعي النظري** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1** | Introduction - Chemical Basis of Life (Biological Molecules, Cells contain four major types of biomolecules, Biological Polymers) |
| **Week 2** | Energy and Metabolism, Life is thermodynamically possible, The Origin and Evolution of Life ,The Three Domains(group or taxa Classification System,1.Prokaryotes , Eukaryotes |
| **Week 3** | AQUEOUS CHEMISTRY( Properties of Water & Intermolecular Forces |
| **Week 4** | Acids, Bases & Buffers  Aqueous Buffers |
| **Week 5** | Amino Acids & Protein Structure  Case Study: Aspirin Overdose |
| **Week 6** | Protein Structure, Hemes, & Mb  Case Study: Structure of Insulin  Ion Exchange Chromatography & Mass Spectroscopy |
| **Week 7** | Mid-term Exam 1 |
| **Week 8** | Proteins Are Chains of Amino Acids, The 20 amino acids have different chemical properties, Peptide bonds link amino acids in proteins, The amino acid sequence is the f rst level of protein structure |
| **Week 9** | Secondary Structure: The Conformation of the Peptide Group, The α helix exhibits a twisted backbone conformation, The β sheet contains multiple polypeptide strands, Proteins also contain irregular secondary structure |
| **Week 10** | Tertiary Structure and Protein Stability, Proteins have hydrophobic cores, Protein structures are stabilized mainly by the hydrophobic effect, Cross-links help stabilize proteins, Protein folding begins with the formation of secondary structures ; PROTEIN STRUCTURE Quaternary Structure |
| **Week 11** | Tools and Techniques: Analyzing Protein Structure |
| **Week 12** | Oxygen-binding Proteins & Structural Proteins PROTEIN FUNCTION Myoglobin and Hemoglobin: Oxygen-Binding Proteins |
| **Week 13** | How Enzymes Work ; Enzyme Activity & Rate Equations , Lipids, The Lipid Bilayer, Membrane Proteins (Fatty acids contain long hydrocarbon chains, Some lipids contain polar head groups, Lipids perform a variety of physiological functions) |
| **Week 14** | Second Exam |
| **Week 15** | **Preparatory week before the final Exam \*** |

| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1-2** | Lab 1-2: Introduction to **Clinical chemistry (Function of the blood, The clotting process, Blood collection and handling, Calorimetric analysis)** |
| **Week 3-4** | Lab 3-4: Estimation of Blood Glucose BY Glucose Oxidase Method |
| **Week 5-7** | Lab 5, 6, 7: Determination of blood glucose level |
| **Week 8-9** | Lab 8-9: Determination of Hemoglobin and Mid - exam |
| **Week 10** | Lab 10: Determination of Serum cholesterol |
| **Week 11-12** | Lab 11-12: KIDNEY FUNCTION TESTS |
| **Week 13-14** | Lab 13-14: Liver function test |
| **Week 15** | Presentations and Discussions of real cases or test -exam- |

| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
| --- | --- | --- |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | ESSENTIAL BIOCHEMISTRY THIRD EDITION CHARLOTTE W. PRATT KATHLEEN CORNELY | no |
| **Recommended Texts** | 1. Satyanarayana & U. Chakrapani, “Biochemistry” Books And Allied (p) Ltd., UISBN: 8187134801.  2. David L. Nelson, Albert Lester Lehninger, Michael M. Cox “Lehninger Principles of Biochemistry”, Edition 5, illustrated, W. H. Freeman, 2008.  3. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, “Biochemistry” Edition 7, W. H. Freeman, 2012. | No |
| **Websites** |  | |

| **Grading Scheme**  **مخطط الدرجات** | | | | |
| --- | --- | --- | --- | --- |
| **Group** | **Grade** | التقدير | **Marks (%)** | **Definition** |
| **Success Group**  **(50 - 100)** | **A -** Excellent | **امتياز** | 90 - 100 | Outstanding Performance |
| **B -** Very Good | **جيد جدا** | 80 - 89 | Above average with some errors |
| **C -** Good | **جيد** | 70 - 79 | Sound work with notable errors |
| **D -** Satisfactory | **متوسط** | 60 - 69 | Fair but with major shortcomings |
| **E -** Sufficient | **مقبول** | 50 - 59 | Work meets minimum criteria |
| **Fail Group**  **(0 – 49)** | **FX –** Fail | **راسب (قيد المعالجة)** | (45-49) | More work required but credit awarded |
| **F –** Fail | **راسب** | (0-44) | Considerable amount of work required |
|  |  |  |  |  |
| **Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. | | | | |