**MODULE DESCRIPTION FORM**

**نموذج وصف المادة الدراسية**

| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Module Title** | Biophysics | | | | **Module Delivery** | | |
| **Module Type** | Basic | | | | * **☒ Theory** * **☐ Lecture**   **☒ Lab**  **☐ Tutorial**   * **☐ Practical** * **☐ Seminar** | | |
| **Module Code** | ITC320060 | | | |
| **ECTS Credits** | 6 | | | |
| **SWL (hr/sem)** | 150 | | | |
| **Module Level** | | 1 | **Semester of Delivery** | | | | 2 |
| **Administering Department** | | BID | **College** | BMIC | | | |
| **Module Leader** | M.Sc.FarahQahtan | | **e-mail** | [farah.qahtan-bic@uoitc.edu.iq](mailto:farah.qahtan-bic@uoitc.edu.iq) | | | |
| **Module Leader’s Acad. Title** | | Assistant Lecturer | **Module Leader’s Qualification** | | | | MSc |
| **Module Tutor** |  | | **e-mail** |  | | | |
| **Peer Reviewer Name** | | jwan k alwan | **e-mail** | jwanism@uoitc.edu.iq | | | |
| **Scientific Committee Approval Date** | | 28 /01/2025 | **Version Number** | | | 1.0 | |

| **Relation with other Modules**  **العلاقة مع المواد الدراسية الأخرى** | | | |
| --- | --- | --- | --- |
| **Prerequisite module** | General Chemistry / ITC320030 | **Semester** | 1 |
| **Co-requisites module** |  | **Semester** |  |

| **Module Amis, Learning Outcomes and Indicative Contents**  **أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** | |
| --- | --- |
| **Module Aims**  **أهداف المادة الدراسية** | ∙ To provide an understanding of the various mechanisms occurring in a biological environment with special emphasis on macromolecules, their structural and thermodynamic properties, and their relevance in drug design.   * To provide students with biophysics knowledge, paving the way for advanced applications of the concepts in various fields. |
| **Indicative Contents**  **المحتويات الإرشادية** | This module covers biophysics, where students combine two courses to form the module. They choose courses that best meet their individual needs. Topics covered by the different courses include:  **PART A - Fundamental Concepts in Physics**  Definition of atoms and their properties: Size and charge of electrons, nucleus, protons, and neutrons. Types of interactions between atoms: Bond distance, hydrogen bonding, van der Waals interactions, electrostatic interactions. Classical Mechanics: Newton’s laws of motion, the law of conservation of mass and energy. Thermodynamics: Laws of thermodynamics, enthalpy, entropy, free energy, Gibbs and Helmholtz free energy, internal energy, and the Boltzmann constant, Difference between classical and quantum mechanics.  **PART B - Biological macromolecules in Biophysics**  Proteins, nucleic acids (like DNA and RNA), lipids, and polysaccharides. Biophysics combines principles from physics and biology to understand the physical properties of these molecules and how they interact with each other and their environment.  **PART C – TECHNIQUES IN BIOPHYSICS**  Optical Properties Of Materials By Using UV-VIS Spectroscopy , Infrared (IR) and Raman Spectroscopy , Atomic Absorption Spectroscopy (AAS) , Ultrasound , Electrocardiogram (ECG), Nuclear Magnetic Resonance (NMR) , Mass Spectrometry |

| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| --- | --- |
| **Strategies** | The primary strategy adopted for delivering this module is to encourage active student participation in exercises while simultaneously refining and expanding their critical thinking skills. This will be achieved through lectures, interactive tutorials, and simple experiments involving sampling activities that are engaging and interesting for 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** | 87 | **Unstructured SWL (h/w)**  **الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 6 |
| **Total SWL (h/sem)**  **الحمل الدراسي الكلي للطالب خلال الفصل** | 150 | | |

| **Module Evaluation**  **تقييم المادة الدراسية** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **A** | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 2 | 10% (10) | 5, 10 | LO #1, 2, and 10 |
| **Assignments** | 2 | 10% (10) | 3, 7 | LO # 3, 4, 5 and 7 |
| **Projects / Lab.** | 1 | 10% (10) | 12 | All |
| **Attendance and Interaction** | 1 | 10% (10) | Continuous |  |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10% (10) | 9 | LO # 1-8 |
| **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 to Biophysics |
| **Week 2** | Molecular Biophysics: Introduction to Atomic Structure &Interactions |
| **Week 3** | Molecular Biophysics :Types and Functions of Biological Macromolecules |
| **Week 4** | Classical Mechanics and Its Applications in Biophysics |
| **Week 5** | Thermodynamics: The Laws of Thermodynamics |
| **Week 6** | Thermodynamics: Energy and Its Types |
| **Week 7** | Thermodynamics in Biophysics: Pressure |
| **Week 8** | Thermodynamics in Biophysics: Temperature |
| **Week 9** | **Mid - term - exam** |
| **Week 10 - 11** | Molecular Transduction: Ambient Energy |
| **Week 12** | Energy Interactions in the Human Body |
| **Week 13** | From Classical to Quantum Mechanics |
| **Week 14** | Molecular Motion |
| **Week 15** | Presentation |

| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1** | Introduction to Biophysics Laboratory & Laboratory Safety Rule |
| **Week** 2 | Optical Properties Of Materials By Using UV-VIS Spectroscopy |
| **Week 3 - 4** | Infrared (IR) and Raman Spectroscopy |
| **Week 5- 6** | Atomic Absorption Spectroscopy (AAS) |
| **Week 7- 8** | Ultrasound |
| **Week** 9- 10 | Electrocardiogram (ECG) |
| **Week 1**1**-1**2 | Nuclear Magnetic Resonance (NMR) |
| **Week 1**3**-1**4 | Mass Spectrometry |
| **Week 1**5 | Review and Test |

| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
| --- | --- | --- |
| **l** | **Text** | **Available in the Library?** |
| **Required Texts** | “Biophysics” [William C. Parke](https://link.springer.com/book/10.1007/978-3-030-44146-3#author-0-0) | No |
| **Recommended Texts** | 1. Carl Branden & John Tooze (1999), “Introduction to Protein Structure” Garland Publishing, New York & London. 2. Wolfram Saenger (1983), “Principles of nucleic acid structure” Springer- Verlag, New York. 3. Andrew R. Leach (2000), “Molecular Modelling Principles and Applications” Prentice Hall. 4. Puri B.R. , L.R. Sharma, M.S. Pathania (2008), “Principles of Physical Chemistry” VISHAL PUBLISHING Company. 5. Murugesan R. (2004), “Modern Physics” S. Chand & Co. 6. introduction to spectroscopy by Pavia and Lampman and Kriz 7. Vasantha Pattabhi & Gautham (2002), “Biophysics” Narosa Publishing. | no |
| **Websites** | <https://www.biophysics.org>  <https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering> | |

| **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. | | | | |