Module Description Form

نموذج وصف المادة الدراسية

| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Module Title** | Immunoinformatics | | | | **Module Delivery** | | |
| **Module Type** | Core | | | | * **☒ Theory** * **☐ Lecture** * **☒ Lab** * **☐ Tutorial** * **☐ Practical** * **☐ Seminar** | | |
| **Module Code** | ITC320160 | | | |
| **ECTS Credits** | 5.00 | | | |
| **SWL (hr/sem)** | 125 | | | |
| **Module Level** | | 2 | **Semester of Delivery** | | | | 4 |
| **Administering Department** | | BID | **College** | BMIC | | | |
| **Module Leader** | **Zainab salim jaafar** | | **e-mail** | **Zainab.al-kadimy@uoitc.edu.iq** | | | |
| **Module Leader’s Acad. Title** | | Assistant Prof. | **Module Leader’s Qualification** | | | | MSc. |
| **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** | Biology and Cell Biology / BMI111 , Applied Bioinformatics / BID211 | **Semester** | 1, 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. The aim of an immunoinformatics course is to provide students with a comprehensive understanding of the principles, methodologies, and applications of bioinformatics in the field of immunology. 2. The course aims to bridge the gap between immunology and computational biology, equipping students with the knowledge and skills to analyze and interpret immune-related data using computational tools and techniques. 3. To provide an overview of the field of immunoinformatics and its importance in immunology. 4. To understand immunological data such as sequencing data, protein structure, gene expression profiles, and immune repertoire. 5. To explore the principle and methodologies of epitope prediction, including B-cell and T-cell epitope and their applications in vaccine design and development. 6. Discussing emerging trends, advancements and challenges in the field of immunoinformatics such as high-throughput sequencing technologies and personalized immunomics. |
| **Module Learning Outcomes**  **مخرجات التعلم للمادة الدراسية** | 1. Students will gain a solid understanding of the principles, concepts and methodologies of immunoinformatics. 2. Students will get proficiency in computational tools and techniques relevant to immunoinformatics. 3. Students will develop the ability to analyze and interpret immunological data using computational approaches. 4. In addition, students will learn epitope prediction methods and their application in vaccine design. 5. Students will develop critical thinking skills to evaluate and interpret immunological data. |
| **Indicative Contents**  **المحتويات الإرشادية** | 1. Introduction to immunology and immunoinformatics  * Overview of the immune system. * Applications of immunoinformatics.  1. Immune system components  * Cells tissues, and organs of the immune system * Type of immunity * B-cell, T-cell and antibody structure. * Lymphocytic and immune response.  1. Immune system Diseases  * Autoimmune diseases * Immunodeficiency disorders * Cancer immunology  1. Vaccine  * Vaccine development * Vaccine Design * Types of vaccine. * Computational vaccine design.  1. Immunological Database  * Tools and software. * Sequence analysis of immunological data. |

| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| --- | --- |
| **Strategies** | To enhance students understandings, a combination of learning and teaching strategies will be used this will be include:   * Lecturers, interactive discussions, hands-on activities, case studies. * Group projects, and technology tools and resources. * Textbooks, online lectures, video tutorials, research papers and interactive online platforms. * Incorporation with real-world examples, relate the concepts to real applications. |

| **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** | 3 | 10% (10) | 3, 6 and 9 | LO #1, 2 and 3 |
| **Assignments** | 2 | 10% (10) | 4 and 8 | LO # 3 and 4 |
| **Projects / Lab.** | 1 | 10% (10) | Continuous |  |
| **Report** | 2 | 10% (10) | 6 and 12 | LO # 4 and 5 |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10% (10) | 7 | LO # 1-5 |
| **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 Immunology and immunoinformatics**   * An overview of the immune system. * Introduction to the historical background and key milestones. * Immunoinformatics applications |
| **Week 2** | **Cells and Tissues of the Immune System**   * Hematopoiesis and development of immune cells. * Organs and tissues of the immune system. |
| **Week 3** | **Innate Immunity and Adaptive Immunity**   * Components of innate immunity. * Recognition of pathogens. * Antigens and antibodies. * Major histocompatibility (MHC). |
| **Week 4** | **B-Cell and T-cell-Mediated Immunity**   * B-cell and T-cell development and maturation * Antibody structure and function * B-cell and T-cell activation. |
| **Week 5** | **Lymphocyte Activation and Immune Responses**   * T-cell and B-cell receptor signaling. * Immune response to different types of pathogens. |
| **Week 6** | **Autoimmune Diseases and Hypersensitivity**   * Types of hypersensitivity reactions. * Mechanisms of autoimmunity. * Common autoimmune disease. |
| **Week 7** | **Midterm Exam** |
| **Week 8** | **Immunological Database and Resources**   * Immunoinformatics tools and software’s. * Introduction to immunological databases (IMGT, VDJbase, etc). * Tools for antibody ant T-cell receptor sequence analysis. |
| **Week 9** | **Vaccines and Immunotherapy**   * Vaccines development * Different types of vaccines. * Mechanisms of action. |
| **Week 10** | **Computational Vaccine Design**   * Reverse volcanology and in silico vaccine design strategies. * Immunoinformatics approaches for vaccine antigen prediction. * Adjuvant design and optimization. |
| **Week 11** | **Immunodeficiency Disorders**   * Primary and secondary immunodeficiency disorders. * Genetic Immunodeficiency’s. * AIDS and HIF infections. |
| **Week 12** | **Cancer Immunology**   * Immune response against cancer. * Immunotherapy approaches. |
| **Week 13** | **Immunogenetics** |
| **Week 14** | **Immunoinformatics Applications in Disease Research**   * Immunoinformatics approaches in infectious disease research * Immunoinformatics in cancer immunology and immunotherapy * Autoimmunity and immunoinformatics applications |
| **Week 15** | **Tutorial about the course topics** |

| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1** | Overview of Immunology and Basic Concepts |
| **Week 2** | Overview of Immunoinformatics and its Applications. |
| **Week 3** | Bioinformatics and Computational Biology Tools. |
| **Week 4-5** | Immunological Database and Tools (e.g., ImmPort, IEDB) |
| **Week 6** | Sequence Analysis and Epitope Prediction. |
| **Week 7** | Structural Immunoinformatics. |
| **Week 8** | Midterm Exam |
| **Week 9** | Immunoinformatics Tools and Software’s |
| **Week 11-12** | Vaccine Design and Development |
| **Week 13-14** | Immunogenomics and High-Throughput Sequencing |
| **Week 15** | Discussions and Presentations of Short Projects related to Immunoinformatics. |

| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
| --- | --- | --- |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | 1. "Janeway's Immunobiology" by Kenneth Murphy, Casey Weaver, and Allan Mowat 2. "Kuby Immunology" by Judy Owen, Jenni Punt, and Sharon Stranford | NO |
| **Recommended Texts** | 1. "Immunology: A Short Course" by Richard Coico and Geoffrey Sunshine 2. "Immunoinformatics: Predicting Immunogenicity In Silico" edited by Darren R. Flowe 3. "Immunoinformatics: Methods and Applications" edited by Vladimir Brusic, Matthew J. V. Brown, and Vladimir Bajic | NO |
| **Websites** | 1. American Academy of Allergy, Asthma & Immunology (AAAAI) 2. British Society for Immunology (BSI) 3. Immune Epitope Database and Analysis Resource (IEDB) 4. Immunoinformatics Research Group (IRG) | |

| **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. | | | | |