MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Module Title** | Introduction to Bioinformatics | | | | **Module Delivery** | | |
| **Module Type** | Core | | | | * **☒ Theory** * **☐ Lecture** * **☒ Lab** * **☐ Tutorial** * **☐ Practical** * **☐ Seminar** | | |
| **Module Code** | ITC320050 | | | |
| **ECTS Credits** | 7.00 | | | |
| **SWL (hr/sem)** | 175 | | | |
| **Module Level** | | 1 | **Semester of Delivery** | | | | 2 |
| **Administering Department** | | BID | **College** | BMIC | | | |
| **Module Leader** | Maysaa Ahmed Abdulkaremm | | **e-mail** | [maysaa.ahmed-bic@uoitc.edu.iq](mailto:maysaa.ahmed-bic@uoitc.edu.iq) | | | |
| **Module Leader’s Acad. Title** | | Assistant Lecturer | **Module Leader’s Qualification** | | | | MSc |
| **Module Tutor** | Name (if available) | | **e-mail** | E-mail | | | |
| **Peer Reviewer Name** | | jwan k alwan | **e-mail** | jwaanism@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** | None | **Semester** | - |
| **Co-requisites module** | None | **Semester** | - |

| **Module Aims, Learning Outcomes and Indicative Contents**  **أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** | |
| --- | --- |
| **Module Aims**  **أهداف المادة الدراسية** | * To become familiar with a variety of recent genomic and proteomic   databases.   * To become familiar with a number of modern genomic and proteomic resources (for example, GenBank and Swiss-Prot), as well as analyze their search findings using online tools (e.g. BLAST, ClustalW). * To learn how to compare and analyze biological sequences and how to interpret the results of their analyses. * To learn how to construct phylogenetic trees based on biological sequence data. * Students will be able to locate consensus sequences, genes, and open reading frames within biological sequences. * To be able perform elementary predictions of protein structure and function. * To use the scientific method of inquiry to gain scientific knowledge. * 8. To use computer systems or other appropriate forms of technology to achieve educational and personal goals. |
| **Module Learning Outcomes**  **مخرجات التعلم للمادة الدراسية** | 1. Able to introduce the basic concepts of Bioinformatics and its significance in biological data analysis. 2. Able to describe the scope and importance of bioinformatics and role of the internet in Bioinformatics. 3. Able to explain the methods to characterize and manage the different types of biological data. 4. Able to classify different types of biological Databases. 5. Knows the sequence similarity search, in particular BLAST. 6. Able to understand the basics of sequence alignment and analysis using different tools. 7. Understands and can explain the main steps for the construction of phylogenetic trees. 8. Able to explain the biological macromolecular structures (Proteins) and structure prediction methods. 9. Explain about primary and secondary structures of proteins. 10. Explain about tertiary and quaternary structures of proteins. |
| **Indicative Contents**  **المحتويات الإرشادية** | Indicative content includes the following:   * Definition and scope of bioinformatics * Applications of bioinformatics in biology and medicine * Biological Databases and Data Retrieval:   + Overview of biological databases (e.g., GenBank, UniProt, PDB) * Data formats and data retrieval techniques * FASTA * FASTAQ * Sequence databases and their organization, and Structural databases and their organization * UniProt * Refseq * PDB * Structural Databases and their Organization: * PDB * PDBe * Proteomic Databases: * (EMBL), * SWISSPROT, * Protein International Re- source, * Families of Structurally Similar Proteins (FSSP), * Restriction Enzyme Database (REBASE), * PROSITE (ExPASy). |

| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| --- | --- |
| **Strategies** | **Active Learning:** Encourage active participation and engagement of students through hands-on activities, discussions, and problem-solving exercises. This can include analyzing real biological data, working with bioinformatics tools and software, and collaborating on projects or case studies.  **Visual Aids**: Utilize visual aids such as diagrams, illustrations, and multimedia presentations to enhance understanding of complex biological concepts. Visual representations can help students visualize abstract ideas and make connections between different components of bioinformatics.  **Practical Exercises:** Provide opportunities for students to practice bioinformatics techniques and tools. Assigning practical exercises, such as sequence alignment or database searching, can help students apply the concepts they have learned and develop practical skills.  **Online Resources and Tools:** Take advantage of online resources and bioinformatics tools available for learning. Incorporate online tutorials, interactive simulations, and web-based databases into the curriculum. This allows students to explore and experiment with bioinformatics tools and databases, gaining hands-on experience and a deeper understanding of the field.  \*\* By utilizing a combination of these strategies, educators can create an engaging and effective learning environment for an introduction to bioinformatics course, enabling students to grasp the fundamental concepts and develop essential skills in the field. |

| **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** | 112 | **Unstructured SWL (h/w)**  **الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 7 |
| **Total SWL (h/sem)**  **الحمل الدراسي الكلي للطالب خلال الفصل** | 175 | | |

| **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, 10 |
| **Assignments** | 2 | 10% (10) | 2, 13 | LO # 3, 4, 6 and 9 |
| **Projects / Lab.** | 1 | 10% (10) | Continuous |  |
| **Report** | 1 | 10% (10) | 15 | LO # 5, 7, 8 and 10 |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10% (10) | 7 | LO # 1-7 |
| **Final Exam** | 3hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) |  |  |

| **Delivery Plan (Weekly Syllabus)**  **المنهاج الاسبوعي النظري** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1** | Definition and scope of bioinformatics |
| **Week 2** | Applications of bioinformatics in biology and medicine |
| **Week 3** | Biological Databases and Data Retrieval: Overview of biological databases (e.g., GenBank, UniProt, PDB) |
| **Week 4-5** | Data formats and data retrieval techniques |
| **Week 6** | Sequence databases and their organization, and Structural databases and their organization |
| **Week 7** | Introduction to sequence alignment tools (e.g., BLAST), Basics of multiple sequence alignment |
| **Week 8** | Introduction to Genomics: |
| **Week 9** | Introduction to Proteomics: Overview of proteomics and protein characterization |
| **Week 10** | Protein structure and function prediction |
| **Week 11** | Primary and secondary structures of proteins |
| **Week 12** | Tertiary and quaternary structures of proteins |
| **Week 14-15** | Structural Bioinformatics: Introduction to protein structure and 3D visualization  Protein structure prediction methods |
| **Week 15** | Introduction to Systems Biology: |

| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| --- | --- |
| **Week** | **Material Covered** |
| **Week 1-2** | Lab 1: NCBI |
| **Week 2** | Complement lab 1 |
| **Week 3** | Lab 2: GENBANK |
| **Week 4** | Complement lab 2 |
| **Week 5** | Lab 3: SWISSPROT |
| **Week 6** | Complement lab 3 |
| **Week 7** | Lab 4: Protein Data Bank (PDB) |
| **Week 8** | Complement lab 4 |
| **Week 9** | Lab 5: Families of Structurally Similar Proteins (FSSP) |
| **Week 10** | Complement lab 5 |
| **Week 11** | Lab 6: PROSITE (ExPASy) |
| **Week 12** | Complement lab 6 |
| **Week 13** | Lab 7: BLAST, ClustalW |
| **Week 14** | Complement lab 7 |
| **Week 15** | Test examination |

| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
| --- | --- | --- |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | Lesk, A. (2019). *Introduction to bioinformatics*. Oxford university press. | No |
| **Recommended Texts** | Practical Bioinformatics, 1st ed., Agostino, M., Garland Science, 2013. | No |

| **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. | | | | |