MARMARA UNIVERSITY - FACULTY OF ENGINEERING

2017-2018 Spring

CSE4065 Introduction to Computational Genomics

# COURSE DESCRIPTION FORM

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| **Offering Department** | Department of Computer Engineering | | Technical Elective |
| **Course Code** | CSE4065 | | |
| **Course Name** | Introduction to Computational Genomics | | |
| **Language of Instruction** | English | | |
| **ECTS** | 5 | | |
| **Contact Hours** | Theoretical (T): 3 | Practice (P): 0 | Laboratory (L): 0 |
| **Pre-requisites** | | | |
| **Instructor** | **Name** | Betül Boz | |
| | **E-mail** | betul.demiroz@marmara.edu.tr | |
| **Course Materials** | **Mandatory** | Compeau Philip, Pevzner, Pavel: Bioinformatics Algorithms: An active Learning Approach | |
| | **Recommended** | Makinen, Belazzougui, Cunial, Tomescu: Genome-Scale Algorithm Design | |
| **Course Objectives** | The objective of this course is to introduce the genome structure, to teach and apply algorithms used for computations on genome. The course introduces the algorithms used to find similarities and differences on the sequences and aims to interpret the results found. | | |
| **Course Content** | DNA and RNA structure, Transcription and translation, Randomized Motif Search, Gibbs Sampling Algorithm, Dynamic Programming, DNA sequence alignment. | | |
| **Learning Outcomes** | **LO1** | Understand the DNA structure. | |
| | **LO2** | Find similarities between DNA sequences. | |
| | **LO3** | Understand the basics of genome analysis. | |
| | **LO4** | Analyze genome using different algorithms. | |
| | **LO5** | Undertsand the basics of sequence alignment. | |

| **Program Outcomes** | | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** |
|---|---|---|---|---|---|---|
| **PO1** | Adequate knowledge in mathematics, science (a) and computer engineering subjects (b) pertaining to the relevant discipline (1); ability to use theoretical and applied information in these areas to model and solve engineering problems (2). | 1a | 1a, 1b | 1a | 1b, 2 | 1a, 1b |

| **Subjects (Knowledge, Skills and Behaviours), Contributions of Subjects to Learning Outcomes, Assessment Methods** | **No** | **Week** | **Subjects** | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** |
|---|---|---|---|---|---|---|---|---|
| | **S1** | 1 | DNA and RNA structure | MF | | | | |
| | **S2** | 2 | Transcription and Translation | MF | | | | |
| | **S3** | 3-4 | Finding similar patterns on a DNA sequence | | MF, Q, P | MF | | |
| | **S4** | 5-6 | Finding similar patterns on different DNA sequences | | MF, P | MF, Q | | |
| | **S5** | 7 | Randomized Motif Search Algorithm | | | | MF, P | |
| | **S6** | 8 | Gibbs Sampling Algorithm | | | | MF, P | |
| | **S7** | 9-10 | Graph representation of DNA | | | | | MF |
| | **S8** | 11-12 | Sequence Alignment | | | | | MF |
| | **S9** | 13-14 | Sequence Alignment Algorithms | | | | MF | MF, Q |

| **Assessment Methods and Weights** | **No** | **Type** | **Weight** | **Implementation Rule** | **Make-up Rule** |
|---|---|---|---|---|---|
| | **MF** | Midterm, Final | 65% | There will be one midterm and one final exam. Exams are closed boks and notes. Calculation and communication tools are not allowed during the exams. | Marmara University regulations will be followed for make-up exams. |
| | **Q** | Quiz | 10% | 3 quizzes are applied. | |
| | **P** | Project | 25% | Programming projects are given. Students are asked to perform a demo for evaluation. | |
| | **TOTAL** | | 100% | | |

**Determining Letter Grades**

- The letter grades will be determined based on the midterm and final exams, quizzes and homeworks.
- In order to determine the letter grade, a curve or catalog based method will be followed based on the total average scores of the students.
- The final exam score and the total average score of the student must be at least 35 to pass the course.
- According to Marmara University Undergraduate regulations, the weight of the final exam must be at least 40 out of 100.

| Assessment | Midterm | Quizzes | Homeworks | Final | TOTAL |
|---|---|---|---|---|---|
| Weight | 25 | 10 | 25 | 40 | 100 |

**Teaching Method, Student Work Load**

**Time Applied by the Instructor**

| **No** | **Method** | **Explanation** | **Hours** |
|---|---|---|---|
| **1** | Lectures | Lectures are given in class using the board or via presentations. Example questions are solved to enhance the concepts. | 14x3=42 |
| **2** | Problem Session/ Practice | Problems related to the course topics are solved on the board. | |

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| | **3** | Laboratory | Experiments are done in the laboratory or theoretical concepts covered during the lectures are practiced using computer exercises. | |
| | **4** | Interactive Courses | Questions are asked to students during lectures and they are encouraged to guess the answers (peer learning is also in this category) | |
| | **5** | Field Work | Students attend activities outside the campus. | |
| | 6 | Midterm | Midterm exam is given during the midterm week. | 2 |
| | 7 | Final | Final exam is given during the final exam week. | 2 |
| | **Estimated Time to be Allocated by a Student** | | | |
| | **8** | Project | The students carry out research about the problem given in the project, design and implement their solution and prepare a report. | 30 |
| | **9** | Homeworks | Quiz preparation | 6 |
| | **10** | Pre-class learning of Course Material | The students study and learn the new subjects from course materials. | 14 |
| | **11** | Review of Course Material | Students review the course subjects from course materials to prepare for the exams and homeworks. | 28 |
| | **12** | Office Hour | Students ask questions to the instructor or the assistant during office hours. | 2 |
| | **Total** | | | 126 |
| **Academic Honesty** | Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.<br><br>In case academic dishonesty is observed, the first authority is the instructor of the course. The instructor may decide to give the student zero for the homework(s)/lab(s)/exam(s), give the letter grade FF, or may take disciplinary action. | | | |