# SYLLABUS

| *Course Code* | *Course Num.* | *Course Name* | *Credit Hours* | *Lec.* | *Lab.* | *Tut.* | *Private study* | *Pre-requisites* | *Course Level* | *Teaching Language* |
|---|---|---|---|---|---|---|---|---|---|---|
| **BIO** | **434** | **Bioinformatics** | **3** | **2** | **2** | **0** | **5** | **-** | **7** | **English** |

## A. Course Description

The course is designed to introduce the most important and basic concepts, methods, and tools used in Bioinformatics. Topics include (but not limited to) bioinformatics databases, sequence and structure alignment, protein structure prediction, protein folding, protein-protein interaction. Emphasis will be put on the understanding and utilization of these concepts and algorithms. The objective is to help the students to reach rapidly the frontier of bioinformatics and be able to use the bioinformatics tools to solve the problems on their own research.

## B. Course Outcomes

Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data. As an interdisciplinary field of science, bioinformatics combines computer science, statistics, mathematics, and engineering to analyze and interpret biological data.

This course aims to identify the biological sequences data and the analysis of similar DNA sequences and proteins.

So, successful completion of the course , the student will be able :

1. To illustrate bio-data sequences.
2. To describe similar sequences DNA.
3. To describe similar protein sequences.

## C. References:

### Required Textbook

- Marketa Zvelebil Jeremy Baum Understanding Bioinformatics, Publisher: Garland Science; 1 edition (August 29, 2007), ISBN-10: 0815340249.
- Teresa Attwood, David Parry-Smith Hal Introduction to Bioinformatics Paperback, 240 pages; March 8, 1999, 1st edition; Prentice. ISBN: 0582327881.

### Other references:

- Pavel pevezer , Bioinformatics for biologists.1th ed. 2011.ISBN: 13 : 978-1107648876.
- Cynthia Gibas and Per Jambeck. Developing Bioinformatics Computer Skills, (2001).
- Publications and magazines Saudi Society of Life Sciences.
- Bulletins and - Periodicals of King Abdul-Aziz City for Science and Technology.
- Magazines and science faculties Periodicals in some Saudi universities.
- Journal of Biology.
- Journal of Genetics.

- Journal of Genetic Engineering.
- Genetic Engineering Electronic Journal.
- Genetics Electronic Journal.
- Bio Electronic Journal.

- Genetics online.
- Genetic Links
- Clinical Genetics Site
- Genetic And The Internet
- Genetic Catalog - Genetics Web Site Searrh Engines
- Genetics Disorders & Birth Defects - Sri Lanka Collection
- Links, For Gene Therapy
- Nature Technology Corporation's Homepage

**Other learning material such as computer-based programs/CD, professional standards or regulations and software.**

- CDs and Electronic biological programs and genetics Software
  Mathematical Genetics and Bioinformatics

**Course Website:** Google Classroom Webpage: http://www.imamm.org/

## D. Topics Outline

### D1. Lectures Topics

1. Class Introduction. Bioinformatics: What and why?
2. Genomic sequences. Online databases. Intro to sequence alignment.
3. Sequence alignment. Scoring Matrices. Pairwise alignment. Gaps.
4. Database searching; BLAST. Limits of detection, significance.
5. Advanced BLAST: PSI-BLAST, Genomic DNA. Find-a-gene project.
6. Multiple sequence alignment. Relevance to inferences about evolution.
7. Midterm review; molecular phylogeny introduction.
8. Molecular phylogeny and evolution.
9. mRNA and gene expression introduction. Unigene
10. Statistics for differential expression, multiple testing.
11. Functional interpretation of array data.
12. Characterizing eukaryotic genomes.
13. Human variation and disease.
14. Linking genes and disease.
15. Sequence variation, phenology, and comparative genomics.
16. Personalized medicine. Multiple testing revisited.

### D2. Laboratories Topics

1. Finding information in online databases.

2,3. Pairwise sequence alignment.Cellular division and their types.

4,5.BLAST.

6,7. Advanced BLAST and find-a-gene help.

8. Using online multiple sequence alignment tools.

9,10. Molecular phylogeny.

11,12. Finding differentially expressed genes.

13,14. Interpreting expression variation.

15. General revision.

### E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

### F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homework:** During the semester.
- **Lab exam:** 15th week.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

| | | | |
|---|---|---|---|
| **Midterm 1:** 15 % | **Midterm 2:** 15 % | **Lab exam:** 20 % | **Final Exam:** 40 % |
| **Quizzes, Homework, Attendance & Participation:** 10 % | | | |

The grading distribution:

| A+ | A | B+ | B | C+ | C | D+ | D | F |
|---|---|---|---|---|---|---|---|---|
| [95, 100] | [90, 95) | [85, 90) | [80, 85) | [75, 80) | [70, 75) | [65, 70) | [60, 65) | [0, 60) |

## G. Student Workload

| # | Teaching/Learning activities | Contact hours | Frequency | Total contact hours | Self-study hours | Total self-study hours | Student learning time |
|---|---|---|---|---|---|---|---|
| 5 | Lecture | 2 | 15 | 30 | 2 | 30 | 60 |
| 2 | Tutorial | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | Lab\practical | 2 | 15 | 30 | 1 | 15 | 45 |
| 5 | Homework | 0 | 4 | 0 | 2 | 8 | 8 |
| 4 | Quiz | 0.5 | 2 | 1 | 1 | 2 | 3 |
| 6 | Midterm | 1.5 | 2 | 3 | 5 | 10 | 13 |
| 7 | Final Exam | 2 | 1 | 2 | 12 | 12 | 14 |
| **Total** | | | | **66** | | **77** | **143** |

The independent self-study is approximately 5 hours per week.

## H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

**Executive Rules for Study Regulations and Exams**

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