Bioinformatics; Code: PM E10C

A- Basic Information

Programme(s) on which the course is given:	Bachelor of Pharmacy (Pharm D clinical)
Department responsible for offering the course:	Microbiology and Immunology
Department responsible for teaching the course:	Microbiology and Immunology
Academic year:	Level four- Fall semester
Course title and code:	Bioinformatics, PM E10C
Prerequisite:	Registration
Contact hours (Credit hours):	Lectures: 1 (1), Practical: 2 (1), Total: 3 (1+1)
Course Coordinator:	Dr. Ann Ayman Elshamy

B- Professional Information

1 - Overall Aim of the Course

The course aims to know all the gene sequences in many organisms and to understand all the genes' functions in all these organisms, and how all the genes interact locally to produce a phenotype, and how they interact globally to explain the similarities and differences observed in the great diversity of life. Bioinformatics fuses biology with mathematics (especially statistics) and computer science (algorithms and their implementations to: find genes within a genomic sequence, align sequences in databases to determine the degree of matching, predict the structure and function of gene products, describe the interactions between genes and gene products at a global level within the cell and between organisms, postulate phylogenetic relationships for sequences, DNA and protein structures, characterization of genomic DNA, genome organization in bacteria, yeasts, & humans, sequences alignments, polymorphisms & gene mapping, genome sequencing, web and internet sites for comparing and identifying protein domains

2 - Course Learning Outcomes

Domain 1: Fundamental knowledge

The students should be able to:

Program key elements	Course learning outcomes
1.1.1.1 Explain the basic knowledge of micro-organisms, infectious/non-infectious diseases, bioinformatics, biotechnology, and epigenetics.	**1.1.1.1** Demonstrate understanding of knowledge of pharmaceutical and biomedical sciences and all about genes and gene sequences
1.1.2.1 Utilize genetic, microbial, and epidemiological terms in pharmacy practice.	**1.1.2.1** Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice including gene and protein sequences

Domain 2: Professional and ethical practice

The students should be able to:

Program key elements	Course learning outcomes
2.2.4.3 Follow the basics of bioinformatics in pharmacy practice.	**2.2.4.3** Adopt the principles of bioinformatics using softwares and internet sites

Domain 3: Pharmaceutical care

The students should be able to:

Program key elements	Course learning outcomes
3.1.1.2 Apply the basis of genomics in health state and clinical management of body disorders.	**3.1.1.2** Apply the basis of genomics in health and disease states **3.1.1.2.a** know all the gene sequences in many organisms and to understand all the genes' functions in all these organisms **3.1.1.2.b** know how all the genes interact locally to produce a phenotype **3.1.1.2.c** Learn how genes interact globally to explain the similarities and differences observed in the great diversity of life.

Domain 4: Personal practice

The students should be able to:

Program key elements	Course learning outcomes
4.3.1 Apply professional self-assessment to enhance personal competencies.	**4.3.1** Perform self-assessment to enhance professional and personal competencies.
4.3.2 Develop self-learning skills for continuous professional improvement.	**4.3.2** Practice independent learning on different softwares needed for continuous professional development.

3 - Course Contents

Week	Lectures		Practical	
	Topic	Credit hrs. (1)	Topics	Credit hrs. (1)
1	An introduction to bioinformatics	1	---	1
2	Biological databases	1	- Introduction to Bioinformatics - Biological Databases	1
3	Open reading frame (ORF) analysis	1	Open reading frame (ORF) analysis	1
4	BLAST search tools and analysis	1	BLAST search tools and analysis	1
5	**Midterm**			
6	Primer design	1	Tutorial 1	1
7	Multiple sequence alignment and membrane proteins	1	Primer design	1
8	Proteomics; Protein Classification and Structure prediction	1	Multiple sequence alignment	1
9	Programs: CDD, PSORT	1	Proteomics; Protein Classification and Structure prediction	1
10	Phylogenetic analysis 1	1	Tutorial 2	1
11	Phylogenetic analysis 2	1	**Practical exam**	
12	Formative assessment	1	---	
13	**Final Written Exam**		---	

4 - Teaching and Learning Methods:

4.1- Lectures (tools: board, projector, handouts).

4.2- Practical sessions (online interactive sessions, in-lab tutorials)

5 - Student Assessment Methods:

Written Midterm exam	To assess	The ability of students to follow-up the course subjects.
Practical exam and assessment of semester work (class activities)	To assess	The ability of students to apply and practice scientific knowledge
Final written exam	To assess	The overall outcomes
Oral exam	To assess	The ability of students in expressing and presenting their knowledge clearly and in systematic approach.

Assessment Schedule

Assessment 1	Periodic exams	Week 5
Assessment 2	Practical exam	Week 11
Assessment 3	Oral exam	Week 13
Assessment 3	Final written exam	Week 13

Weighting of Assessments	**marks**
Periodical examination	15
Final-term Examination	50
Oral Examination	10
Practical Examination	25
Other types of assessment	---
Total	**100**

6 - List of References

- Bishop, O. T. ed. (2014). Bioinformatics and Data Analysis in Microbiology. Caister Academic Press.
- Choudhuri, S. ed. (2014). Bioinformatics For Beginners: Genes, Genomes , Molecular Evolution, Databases and Analytical Tools. Elsevier.
- Christensen, H. ed. (2018). Introduction to Bioinformatics in Microbiology. Cham: Springer International Publishing doi:10.1007/978-3-319-99280-8.
- Singh, D. B., and Pathak, R. K. eds. (2022). Bioinformatics: Methods and Applications. Chennai, India: Elsevier doi:10.1016/C2020-0-03034-3.
- Hasija, Y. ed. (2023). All About Bioinformatics: From Beginner to Expert. Elsevier.

7 - Facilities Required for Teaching and Learning

Modern libraries, audiovisual tools, computers

Course Members:

Prof. Dr. Khaled M. Anwar Aboshanab
Assoc. Prof. Dr. Sarra Ebrahim Saleh
Dr. Ann Ayman Elshamy

Course Coordinator: Dr. Ann Ayman Elshamy

Ann Elshamy

Acting Head of Department: Assoc. Prof. Dr. Sarra Ebrahim Saleh

Sarra Saleh

Course name	**Bioinformatics**
Code	**PM E10C**

Course Plan & Matrices

Course Contents		Program Key Elements	Course learning outcomes	Teaching and Learning Methods	Student Assessment Methods
Week # 1	An introduction to bioinformatics P: ---	1.1.1.1, 1.1.2.1	1.1.1.1, 1.1.2.1	Lectures	Periodic, Written
Week # 2	Biological databases P: - Introduction to bioinformatics - Biological databases	1.1.1.1, 1.1.2.1, 2.2.4.3	1.1.1.1, 1.1.2.1, 2.2.4.3	Lectures, Practical training, Assignments	Periodic, Written, Practical
Week # 3	Open reading frame (ORF) analysis P: Open reading frame (ORF) analysis	1.1.1.1, 1.1.2.1, 2.2.4.3, 3.1.1.2 4.3.1, 4.3.2	1.1.1.1, 1.1.2.1, 2.2.4.3, 3.1.1.2.a, 3.1.1.2.b, 3.1.1.2.c, 4.3.1, 4.3.2	Lectures, Practical training, Assignments	Periodic, Written, Practical
Week # 4	BLAST search tools and analysis P: BLAST search tools and analysis	1.1.1.1, 1.1.2.1, 3.1.1.2 4.3.1, 4.3.2	1.1.1.1, 1.1.2.1, 3.1.1.2.a, 3.1.1.2.b, 3.1.1.2.c, 4.3.1, 4.3.2	Lectures, Practical training, Assignments	Written, Practical
Week # 5	**Midterm**				
Week # 6	Primer design P: Tutorial 1	1.1.1.1, 1.1.2.1	1.1.1.1, 1.1.2.1	Lectures, Open discussion	Written, Practical
Week # 7	Multiple sequence alignment and membrane proteins P: Primer design	1.1.1.1, 1.1.2.1	1.1.1.1, 1.1.2.1	Lectures, Practical training, Assignments	Written, Practical
Week # 8	Proteomics; Protein Classification and Structure prediction P: Multiple sequence alignment	1.1.1.1, 1.1.2.1, 2.2.4.3	1.1.1.1, 1.1.2.1, 2.2.4.3	Lectures, Practical training, Assignments	Written, Practical
Week # 9	Programs: CDD, PSORT	1.1.1.1, 1.1.2.1,	1.1.1.1, 1.1.2.1,	Lectures,	Written, Practical

	P: Proteomics; Protein Classification and Structure prediction	2.2.4.3	2.2.4.3	Practical training, Assignments	
Week # 10	Phylogenetic analysis 1 P: Tutorial 2	1.1.1.1, 1.1.2.1	1.1.1.1, 1.1.2.1	Lectures, Open discussion	Written, Practical
Week # 11	Phylogenetic analysis 2 P: Practical exam	1.1.1.1, 1.1.2.1	1.1.1.1, 1.1.2.1	Lectures	Written
Week # 12	Formative assessment			Brainstorming	Written

In case of emergency or necessity, the study will be converted into recorded and interactive lectures.

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