Department of Life Sciences, School of Science
University of Management and Technology

BT-301: BIOINFORMATICS

Lecture Schedule	Tuesday / Friday – **Section N2** (11:00 AM – 12:15 PM)	Semester	Spring 2021
Pre-requisite	--	**Credit Hours**	• 03 (***03 contact hours***) theory • 01 (***02 contact hours***) lab
Instructor	Muhammad Ali	**Contact**	muhammad_ali@umt.edu.pk
Office	S3-37 (Ext. 3449)	**Office Hours**	03:00 – 05:00 PM (***Monday - Saturday***)
Specific Outcome	The challenge facing scientists is to access and analyze genomic data to extract useful information pertaining to biological systems. This course focuses on employing existing *in silico* resources – mainly web-based programs and databases – to access the wealth of data to answer questions relevant to the average biologist, and is highly hands-on.		
Learning Outcomes	The students will be able to: • Find structural analogs for a protein sequence • Describe the structure of genes and genomes • Distinguish between prokaryotic and eukaryotic genes • Find information about a specific gene • Interpret a GenBank entry • Examine whole genomes • Identify errors in a DNA sequence • Explain the significance of folding and three-dimensional protein structure • Perform secondary structure prediction		
Course Content	Following topics will be included in this course (*detailed week-wise breakup is*		

	given at the end of the document): • Biological data acquisition: the form of biological information. • Retrieval methods for DNA sequence, protein sequence and protein structure information; Databases – Format and Annotation: conventions for database indexing and specification of search terms, common sequence file formats. • Annotated sequence databases - primary sequence databases, protein sequence and structure databases; organism specific databases; Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus global. Distance metrics. Similarity and homology. • Scoring matrices. Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA, BLAST and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment; Genome Analysis: Whole genome analysis, existing software tools; Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. • Methods of phylogenetic analysis: UPGMA, WPGMA, neighbour joining method, Fitch/Margoliash method, Character Based Methods • Protein Structure Prediction and Interaction	
Learning Resources	Text Books	• Database annotation in molecular biology, principles and practices, Arthur M. Lesk • Bioinformatics: Databases and Systems, by Stanley I. Letovsky • Bioinformatics Databases: Design, Implementation, and Usage (Chapman & Hall/ CRC Mathematical Biology & Medicine), by Sorin Draghici

	Reference Book	• Current topics in computational molecular biology, Tao, Jiang, Ying Xu, Michael Q. Zang
Teaching Kits	All didactic material will be shared on: • PowerPoint slides and book shared on LMS • Recording (if any) on https://www.youtube.com/channel/UCRhcR-WWDuSrluUsRE7rd7g	
Grading Policy	• Assignments 05% • Quizzes 10% • Midterm 20% • Presentation 05% • Lab 20 • Final 40%	

Date (DD-MM-YYY)	Week	Topic	Recording
02-03-2021	1	Bioinformatics and the Databases	https://www.youtube.com/watch?v=vlq8KJSTkoQ
05-03-2021			
09-03-2021	2	Bioinformatics and the Databases	-
12-03-2021			
16-03-2021	3	Sequence Alignment	-
19-03-2021			-
23-03-2021	4	Phylogenetic Analysis	-
26-03-2021			-
30-03-2021	5	Sequence Analysis	-
02-04-2021			-
06-04-2021	6	Mutations	

Date	Week	Topic	Link
09-04-2021			https://www.youtube.com/watch?v=knj4FCsOdYk
13-04-2021	7	Mutations	
16-04-2021			
20-04-2021	8	Primer designing	-
23-04-2021			-
27-04-2021	**9**	**Midterm**	**-**
30-04-2021			-
04-05-2021	10	Primer designing	-
07-05-2021			-
11-05-2021	11	Protein Structure Prediction	-
14-05-2021			-
18-05-2021	12	Protein Structure Prediction	-
21-05-2021			-
25-05-2021	13	Protein Structure Prediction	-
28-05-2021			-
01-06-2021	14	Protein Ligand Interaction	-
04-06-2021			-
08-06-2021	15	Protein Ligand Interaction	-
11-06-2021			-
15-06-2021	16	Data Science R Basics	-
18-06-2021			-
22-06-2021	17	Data Science R Basics	-
25-06-2021			-
Final Exam		**June 28 to July 10, 2021**	**-**

Last date of course withdrawal: **June 18, 2021**

Eidul Fitar: **May 10-15, 2021**