

Course Plan for Bachelor Program - Study Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-4.0E
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Study Plan No.	2021/2022	University Specialization	Bachelor of Pharmacy
Course No.	0201550	Course Name	Drug Informatics and Computational Biology
Credit Hours	3	Prerequisite *Co-requisite	Medicinal Chemistry 3 + Pharmacology 3
Course Type	☐ Mandatory University Requirement ☐ University Elective Requirement	☐ Faculty Mandatory Requirement ☐ Support course family requirements	☐ Mandatory Requirement ☒ Elective Requirement
Teaching Style	☐ Full Online Learning	☒ Blended Learning	☐ Traditional Learning
Teaching Model	☐ 1 Synchronous: 1 Asynchronous	☒ 1 Face to Face: 1 Asynchronous	☐ 2 Traditional

Faculty Member and Study Divisions Information (to be filled in each semester by the subject instructor)

Academy Member and Study Division Information (to be filled in each semester by the subject instructor)					
Name	Academic rank	Office No.	Phone No.	E-mail	
Dr. Rima Hajjo					
Office Hours (Days/Time)	Sunday, Tuesday, Thursday ()		Monday, Wednesday ()		
Division number	Time	Place	Number of Students	Teaching Style	Approved Model
				Blended Learning	1 Face to Face: 1 Asynchronous

Brief Description

This course is designed to get a better understanding of the drug discovery pipeline and the use of pharmacoinformatic (both chemoinformatics and bioinformatics) tools to speed up drug discovery and minimize clinical failures.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	1) Chemoinformatics in Drug Discovery, Tudor I. Oprea (Editor); Raimund Mannhold (Series Editor); Hugo Kubinyi (Series Editor); Gerd Folkers (Series Editor), ISBN:9783527307531, Wiley-VCH Verlag GmbH & Co. KGaA, 2005. 2) Bioinformatics and Computational Biology in Drug Discovery and Development, edited by William T. Loging, Mount Sinai School of Medicine, New York. Cambridge University Press, 2016.
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	- PC/laptop with headphones and camera - Microsoft Office - Moodle
Supporting Websites	- PubChem – Comprehensive database of chemical molecules and their biological activities - https://pubchem.ncbi.nlm.nih.gov - ChEMBL – Manually curated database of bioactive drug-like molecules with binding, functional, and ADMET data - https://www.ebi.ac.uk/chembl - DrugBank – Database of approved drugs, experimental drugs, and their targets - https://go.drugbank.com

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	- NCBI (National Center for Biotechnology Information) – Sequence data, BLAST searches, and genomics tools https://www.ncbi.nlm.nih.gov - STRING Database – Protein–protein interaction networks https://string-db.org - Cytoscape – Open-source software for visualizing complex networks https://cytoscape.org			
The Physical Environment for Teaching	☒ Classroom	☐ Labs	☒ Virtual Educational Platform	☐ Others
Necessary Equipment and Software	Moodle			
Supporting People with Special Needs	-			
For Technical Support	E-Learning & Open Educational Resources Center Email: ellearning@zu.edu.jo ; Phone: +962 6 429 1511 ext. 425/362			

Course learning outcomes (*K= Knowledge, S= Skills, C= Competencies*)

No.	Course Learning Outcomes	The Associated Program Learning Output Code
Knowledge		
The student should be able to:		
K1	Outline the drug discovery pipeline, its main obstacles, and the role of drug repurposing in accelerating the process.	MK2
K2	Describe diverse cheminformatics and bioinformatics tools, including public databases, used for drug discovery, target identification, and safety assessment.	MK2
K3	Analyze applications of advanced computational approaches, such as machine learning, to drug discovery data.	MK2
Skills		
The student should be able to:		
S1	Evaluate different digital file formats for storing and manipulating drug discovery data of chemical compounds and biomolecules.	MS2
S2	Apply cheminformatics tools to calculate molecular descriptors and relate chemical structure to biological activity.	MS2
S3	Employ bioinformatics tools (e.g., network biology, gene and protein sequence searches) to identify plausible drug targets and biomarkers.	MS2
Competencies		
The student should be able to:		
C1	Integrate cheminformatics and bioinformatics resources to: (a) search efficiently for drug, drug target, and disease information; (b) identify plausible links between drugs, genes, and diseases; (c) predict potential drug side effects and toxicities.	MC3
C2	Demonstrate responsibility in professional and personal development by attending lectures, submitting tasks on time, and staying updated with pharmacoinformatic tools.	MC3

Mechanisms for Direct Evaluation of Learning Outcomes

Type of Assessment	Fully Electronic	Blended Learning	Traditional	Traditional
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/ Learning Style	Learning		Learning (Theory Learning)	Learning (Practical Learning)
Midterm Exam	30%	30%	30%	0%
Participation / Practical Applications	0%	0%	30%	60%
Asynchronous Interactive Activities	30%	30%	0%	0%
Final Exam	40%	40%	40%	40%

Note 1: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, and work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Note 2: According to the Regulations of granting Master's degree at Al-Zaytoonah University of Jordan, 40% of final evaluation goes for the final exam, and 60% for the semester work (examinations, reports, research or any scientific activity assigned to the student).

Schedule of Simultaneous / Face-to-Face Encounters and their Topics

Week	Subject	Learning Style*	Reference ** (Pages in Course Book)
1	Drug discovery pipeline, clinical trial failures, and repositioning	Lecture	Ref 2
2	Cheminformatics methods: hit identification, lead optimization, virtual screening	Lecture	Ref 1 & 2
3	Structural file formats & molecular descriptors	Lecture and Hands-on training	Ref 1 & 2
4	Machine learning (ML) and artificial (AI) intelligence for big data (supervised & unsupervised)	Lecture	Ref 1
5	Chemical vs. Bioinformatics Databases & Libraries	Lecture	Ref 1
6	Cheminformatics applications: QSAR, pharmacophore, docking	Lecture	Ref 1
7	Open-source cheminformatics tools & public data	Hands-on training	Ref 1
8	Drug Discovery in Academia	Case study	Ref 1
9	Midterm Exam	-	-
10	Bioinformatics methods for disease understanding and for target and biomarker identification	Lecture	Ref 2
11	Sequence analysis, searches, and alignment	Lecture	Ref 2
12	Network biology: drug-gene-disease connections	Lecture	Ref 2

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13	Integrated bioinformatics project (small dataset analysis)	Hands-on training	Multiple Websites
14	Open-source & commercial tools for bioinformatics and network biology	Hands-on training	Multiple Websites
15	Student presentations: tool demonstration or case application	Active learning	Multiple Websites
16	Final Exam	-	-

* Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.

** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.

Schedule of Asynchronous Interactive Activities (in the case of e-learning and blended learning)

Week	Task / Activity	Reference	Expected Results
1	Watch recorded lecture & complete short quiz	Video (E-learning platform)	Demonstrate understanding of the drug discovery pipeline basics (K1).
2	Participate in online discussion forum: "Why do drugs fail in clinical trials?"	Video + Reading	Critically reflect on pipeline obstacles; engage in peer-to-peer exchange (K1).
3	Watch recorded lecture + interactive molecular file demo	Video + Demo file	Identify structural file formats and practice converting between them (S1).
4	Mini-project: Use an online ML visualization tool	Tutorial video	Submit screenshot/brief reflection on ML application to drug discovery data (K3).
5	Self-study: Assigned reading on cheminformatics methods	Selected article	Submit 1-page summary highlighting informatics applications (K2, S2).
6	Watch recorded lecture + embedded case vignette quiz	Video	Apply QSAR and docking concepts to solve a mini-case (S2).
7	Hands-on asynchronous lab: Explore PubChem or ChEMBL	Database website	Upload a dataset of 5 compounds with properties (K2, S2).
8	Self-study: Literature review on "Drug Discovery in Academia"	Journal article	Submit a reflective assignment on the opportunities, challenges, and pharmacist's potential role in academic drug discovery (C2).

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9	Midterm Exam	-	-
10	Watch recorded lecture + online poll ("target vs biomarker")	Video + Poll	Differentiate target vs. biomarker applications in drug discovery (S3).
11	Practical exercise: Run a sequence search (BLAST tutorial)	Online database	Submit screenshot and brief description of alignment results (S3).
12	Recorded lecture + concept map activity (draw connections)	Video + concept mapping tool	Build a concept map linking genes, proteins, and diseases (S3, C1).
13	Self-study: Assigned reading on network biology	Selected topic	Write a short essay: "How can network biology improve drug safety assessment?" (S3, C1).
14	Guided online workshop: Explore UniProt & STRING	Database websites	Submit annotated screenshots with identified drug-gene connections (S3).
15	Peer activity: Record a 3-minute video demo of a chosen bioinformatics/cheminformatics tool	Multiple Websites	Demonstrate tool application and develop communication skills (C2).
16	Final Exam	-	-