האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

MEDICINAL CHEMISTRY - 64662

Last update 10-10-2021

HU Credits: *5*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *School of Pharmacy*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *Ein Karem*

Course/Module Coordinator: *Prof. Amiram Goldblum*

Coordinator Email: *amiramg@ekmd.huji.ac.il*

Coordinator Office Hours: *Mon-Tue- Wed 13-19*

Teaching Staff:

Prof Amiram Goldblum

Course/Module description:

Medicinal Chemistry: Principals and Application 64662
Teacher: Prof. Amiram Goldblum (Cell. 0544653292)
amiramg@ekmd.huji.ac.il
First Semester: Wednesdays 16-19, Fridays 12-14

Syllabus
A. Basics of Drug Action:
• General: Definitions, how are drugs discovered, Drug and Target. Molecular level of drug action, experimental support by X-ray crystallography, Nuclear Magnetic Resonance, Spectroscopy, Computations
• Biological targets: Proteins, Membranes, DNA/RNA, Water
• How do drugs bind to targets ? Molecular energy, Free energy, Enthalpy and Entropy, Hydrophobic effect
• Intermolecular interactions: strong and weak, electrostatics, hydrogen bonds, Van der Waals interactions
• Degrees of freedom and Entropy
• Drug properties: Electronic structure (Quantum mechanical), Frontier Orbitals, Acidity and basicity, conformations, volume, surface area, lipophilicity

B. Rational methods for drug design and discovery:
• Main current and future targets
• High Throughput Screening
• Structure-Activity relations: SAR and Quantitative SAR: Hammet and Hansch equations, Lipinski's rule of five
• Examples of Drug discovery by computaitons
• General approaches: Bioisosteres, Conformational restriction
• Multi-targeted drugs

C. Proteases and Enzyme activity – Drugs' viewpoint
• Enzymes: kinetics, catalysis, transition state, Michaelis-Menten approximation, Kinetic constants, inhibition equations and effects on Km and kcat.
• Protease families: serine, thiol (Cysteine), aspartic, metaloproteases: mechanisms, specificity and selectivity, associated diseases
• Protease inhibitors: reversible and irreversible, inhibitor design: minimal substrate, natural inhibitors, transition state analogs, intermediate's analogs
• Examples of protease inhibitors: use of crystallography and computations for AIDS drugs, ACE inhibitors for hypertension
• Why aren't there drugs that kill SARS-CoV-2 (COVID-19) ?

D. Drugs for receptors and channels
• GPCRS and membrane channels
• CNS drugs

• Cannabinoids and Psychotropic drugs
• Alzheimer's disease and Acetylcholinesterase
• Drugs for Genetic diseases of the young :Muscular Dystrophy

Course/Module aims:

1) Acquaintance with basic principals of drug action and their application ifor major drug-targets: enzymes and receptors
2) Understanding structure-activity relations
3) Understanding how a drug is "born" and how do medicinal chemists improve drugs

Learning outcomes - On successful completion of this module, students should be able to:

1) know the basics of drug action
2) have the ability to understand and to criticize issues of drug developments and reports that are raised in the public domain - news, popular reports etc.

Attendance requirements(%):

None

Teaching arrangement and method of instruction: ZOOM + 3 frontal meetings

Course/Module Content:

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Required Reading:
popular literature on drugs will be posted to students

Additional Reading Material:

Course/Module evaluation:
End of year written/oral examination 100 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information: