# *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:*

*Syllabus*

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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:*