PHRM 240 **Molecules & Medicine – Principles of Drug Design**

Fall Semester 2020

Course Director: Wolfgang Dostmann, Professor of Pharmacology, Larner College of Medicine

Syllabus

This 3-credit course conveys the molecular mechanisms by which drugs act in the body and the principles drug design. It highlights the importance of medicinal chemistry as it overlaps with the disciplines of chemistry, biochemistry, microbiology, cell biology, and pharmacology.
Most lectures are split into two parts. Part 1 lasts 40-45 minutes and loosely follows the flow of the textbook. Following a short questions/answers break, Part 2 will be more relaxing, and we will take a trip back in time and review an example of the "*Most important drugs in history".* These are world changing, famous compounds that have had a significant impact on civilization.

Prerequisites

Organic Chemistry and Background in Biology or Biochemistry or Permission

Lecturers

Dr. Wolfgang Dostmann, Larner College of Medicine, wdostman@uvm.edu
Dr. Brent Osborne, Larner College of Medicine, bosborne@uvm.edu

Format

Windows Teams (details will be announced on Blackboard shortly).
All lectures will be live and fully remote. All lecture materials (recorded lectures, ppt files, handouts, etc) will be made available through Blackboard.
Note: attendance during the live Teams lectures is not mandatory (you can watch the lectures later, should you have time conflicts).

Time

Tuesdays and Thursdays 11:40 am – 12:55 pm, remotely on Teams

Discussion Forum

Thursdays, 2-3 pm, remotely on Teams

Required Textbook

An Introduction to Medicinal Chemistry (6th Ed), Graham L. Patrick, Oxford Press, 2017
The textbook is an essential component of the course. You will be using it a lot! It is a "fun" book too.

Examination Format

Throughout the course students will be taking four, 75-minute exams. Exams will be given remotely through Blackboard. All exams are essentially cumulative.

Extra Credit

All Students who wish to obtain extra credit can do so by submitting up to **two papers** on a subject **approved by the course director**. Each paper is approximately worth an **additional 5-7%** of any of your exams (equivalent of a full letter grade bump up). Details on deadlines, paper format and topics will be posted on Blackboard before the first exam. The additional term paper(s) need to be on a drug considered to be one of the "most important drugs in history". The paper(s) should include the drug's discovery, structure, chemical properties, synthesis, biological effects and historical significance. Students will be graded 0-10 points on the thoroughness and quality of their paper. Graduate Students taking the course for graduate school credit will have to submit an additional term paper on a drug considered to be one of the most important drugs in history. Students will be graded (pass/fail) on the thoroughness and quality of their paper.

Course Schedule

Part I: Drug Targets

09/01 Lecture 1: Dostmann
Introduction
Intermolecular bonding forces
Most important drugs in history: Salvarsan

09/03 Lecture 2: Dostmann
Proteins: Structure/Function
Enzymes: Structure/Function
Most important drugs in history: Penicillin

09/08 Lecture 3: Dostmann
Receptors: Structure/Function
Receptors: Signal Transduction
Most important drugs in history: 6-Mercaptopurine

09/10 Lecture 4: Dostmann
Nucleic acids: structure and function
Most important drugs in history: Thalidomide

09/15 Lecture 5: Dostmann
Enzymes and Receptors as drug targets

09/17 **EXAMINATION 1**

09/22 Lecture 6: Dostmann
Nucleic acids as drug targets
Most important drugs in history: Ivermectin

09/24 Lecture 7: Dostmann
Pharmacokinetics I
Most important drugs in history: Hydrocortisone

09/29 Lecture 8: Dostmann
Pharmacokinetics II
Most important drugs in history: Librium

Part II: Drug discovery, design and development

10/01 Lecture 9: Dostmann
Drug discovery: finding a lead I
Most important drugs in history: AZT

10/06 Lecture 10: Dostmann
Drug discovery: finding a lead II
Most important drugs in history: Cyclosporine I

10/08 Lecture 11: Dostmann
Rational Approaches to Lead Discovery I
Most important drugs in history: Thorazine

10/13 Lecture 12: Dostmann
Rational Approaches to Lead Discovery II

10/15 **EXAMINATION 2**

10/20 Lecture 13: Dostmann
Drug design: optimizing target interactions
Most important drugs in history: Sumatriptan I

10/22 Lecture 14: Dostmann
Drug design: optimizing access to the target I
Most important drugs in history: Sumatriptan II

10/27 Lecture 15: Dostmann
Drug design: optimizing access to the target II
Most important drugs in history: Quinine I

10/29 Lecture 16: Dostmann
Drug Design: Novel design strategies
Most important drugs in history: Quinine II

Part III: Selected topics in medicinal chemistry

11/03 Lecture 17: Dostmann
Anti-ulcer agents I
Most important drugs in history: Cimetidine

11/05 Lecture 18: Dostmann
Anti-ulcer agents II
Most important drugs in history: Omeprazole

11/10 **EXAMINATION 3**

11/12 Lecture 19: Osborne
The challenges of getting a drug to the market I

11/17 Lecture 20: Osborne
The challenges of getting a drug to the market II

11/19 Lecture 21: Dostmann
Antibiotics

11/24 ***No Class - Thanksgiving Recess***

11/26 ***No Class - Thanksgiving Recess***

12/01 Lecture 22: Dostmann
Opioid analgesics I
Most important drugs in history: Methadone

12/03 Lecture 23: Dostmann
Opioid analgesics II
Most important drugs in history: Artemisinin

12/8 **EXAMINATION 4 - FINAL 1:30pm-4:15pm**