

WINTERIM COURSE

Molecules and Medicine

Instructor: Scott C. Hartsel, Ph.D.

Biology or Chemistry 491, Special Topics for 3 credits in Winterim 1:00 PM-4:10 PM, Room P401

We are entering an exciting period in science where we are beginning to understand the workings of life processes at a molecular level. This has enabled the design of wholly new and effective pharmaceuticals for a wide range of disorders from mental illness to heart disease to diabetes. However, sometimes these remedies are overly-expensive, of questionable value and provoke unexpected side-effects. At the same time herbal and other "natural" medicines and nutraceuticals are occupying an increasingly large niche in U.S. and world medical expenditures. Some work as advertised but many certainly do not and even more are unproven or even potentially hazardous. Unfortunately U.S. health professionals generally have very little training and expertise in the area of natural product drugs despite the fact that a large fraction of the so-called "Western" pharmaceutical preparations are designed based on naturally occurring substances. The best example, of course, is that of the antibiotics (*e.g.* penicillin, erythromycin) which are largely fungal or bacterial natural products or derivatives. Thus I think many of you interested in medical research, pharmacy, pharmacological research or the practice of medicine could benefit from a course in *the molecular basis of medicinal activity which I have entitled "Molecules and Medicine."* I will cover the major classes of medicinally active natural and synthetic products, their structure, design, origin, biosynthesis and mode of action (where known). So that you may understand the modes of action of natural and synthetic products from a biological and chemical perspective, I will spend the first 2 weeks in an introduction of how drugs work, *Pharmacology and Medicinal Chemistry*. While this course is *not* intended as a comprehensive course in medicinal chemistry or herbal medicine, I will cover some of the more popular current herbal, natural product and prescription remedies and examine pro and con scientific evidence. Students will help here by giving presentations on a specific drug's (or herb) design, action, discovery, and history.

Due to the chemically rigorous and biologically detailed nature of the course, the **prerequisite** is Chem 326 (Organic II).

Biology 111, Biology 302 and/or Biochemistry (Chem 452/352) or equivalent courses are also

desirable but not required if you have a solid biology background. This course counts as either a Biology or Chemistry elective. B/MB majors especially may wish to use this course to fulfill the Biology elective requirement, while Biology majors may use this to finish minor programs in Chemistry. Please sign up for the appropriate course prefix.

Above is a **tentative** course topical outline for this course.

Weeks 1 and 2- Drug targets, Design, receptors and therapeutic principles

Selected Chapters from "Introduction to Medicinal Chemistry", Patrick and "Molecules and Medicine", Corey, Czakó and Kurti

1. Principles of Drug Action-Chapter 1-6
2. Quantitation
3. Drug Absorption, Metabolism and Excretion-Chapter 8
4. Pharmacogenomics
5. Pharmacokinetics
6. Computer modeling and Drug Design- Ch 9-10,15

Weeks 2 and 3-Medicinal Chemistry, Drug Design and Natural Product/Nutraceutical/Herbal Drugs

Selected Chapters from "Introduction to Medicinal Chemistry", Patrick and "Pharmacognosy and Pharmacobiotechnology", by Robbers, Speedie and Tyler and "Molecules and Medicine", Corey, Czakó and Kurti

Complex Polysaccharides & Glycosides
Lipids, Terpenoids, Steroids
Phenylpropanoids and Alkaloids
Antibiotics, Antivirals, Anticancer
Nervous system, Recreational drugs, Opiates
NSAIDS