

## Pharmaceutical Sciences Graduate Courses

### **PHSC 7310 Fundamentals of Pharmaceutical Sciences 3.0 cr.**

Fall and Spring Crosslisted TXCL 7310

Core course explores key aspects of Pharmaceutical Sciences. Major themes will focus on macromolecular interactions, pharmaceuticals, pharmacokinetics, pharmacodynamics, apoptosis, signal transduction and immunology. Critical thinking and problem solving skills will be emphasized via lectures, discussions and computer-based data analysis.

### **PHSC 7320 Physical Pharmacy and Pharmaceutical Sciences 3.0 cr.**

Spring semester Crosslisted TXCL 7320

This course was designed to provide students with a thorough overview of physical chemical principles vital to Pharmaceutical Sciences; a course for someone whose research efforts will involve pharmaceutical development and/or the evaluation of drugs.

### **PHSC 7326 Clinical Pharmacokinetics & Pharmacodynamics Journal Club 1.0 cr.**

Fall and Spring semesters Prereq: Permission from instructor.

This course is comprised of discussions and presentations of contemporary journal articles or research in progress related to clinical pharmacokinetics and pharmacodynamics.

### **PHSC 7330 Development of Drugs and Biologics 3.0 cr.**

alternating Spring semesters Prereq: Permission from instructor.

This will be a survey course designed to introduce students to pharmacokinetic and pharmacodynamics principles used in drug research and development. The Phoenix Winnonlin Computer software, a pharmaceutical industry standard, will be used in the course to complete the homework assignments.

### **PHSC 7305 Hands-on Metabolomics Workshop 0.0 cr.**

Dr. N. Reisdorph (Fall) Prereq: One year of full-time biomedical graduate study and Instructor Permission.

The objective of this workshop is to provide hands-on training in the context of typical metabolomics workflows. Participants will gain specific knowledge of techniques utilized for graduate student credit. Meets for four consecutive days in November from 8am-5pm. Go to [www.ucdenver.edu/massspec](http://www.ucdenver.edu/massspec) and follow Metabolomics Workshop link.

### **PHSC 7405 Hands-on Metabolomics Workshop 0.0 cr.**

Dr. N. Reisdorph (Spring) Prereq: One year of full-time biomedical graduate study and Instructor Permission.

Provides a comprehensive view of metabolomics. Participants will learn introductory metabolomics science and applicable protocols/technologies. Appropriate for individuals with little to no experience in mass spectrometry and who will use this technology in their research. Meets for four consecutive days in March from 8am-5pm.

Go to [www.ucdenver.edu/massspec](http://www.ucdenver.edu/massspec) and follow Metabolomics Workshop link.

### **PHSC 7345 Nanotechnology and Drug Delivery 2.0 cr.**

(Spring) Prereq: Student should be enrolled in a graduate or equivalent program.

Course presents physicochemical and biological principles of drug delivery including drug delivery system design for various applications. In addition, it will address principles of nanotechnology related to the design of nanosize delivery systems intended for drug delivery, imaging and diagnosis.

### **PHSC 7350 Proteins 3.0 cr.**

Structural Biology & Biochemistry Faculty / Pharmaceutical Sciences Faculty – (Spring) Crosslisted: STBB 7350.

Chemical and physical basis for protein structure, folding, function and stability; role of molecular dynamics, use of molecular simulations in investigations of protein-ligand and protein interactions; methods and principles of protein/peptide purification and enzyme catalysis, including electron transfer and mutagenesis.

### **PHSC 7354 Structural Analysis of BioMolecules I 2.0 cr.**

Structural Biology & Biochemistry Faculty / Pharmaceutical Sciences Faculty – (Spring) Crosslisted: STBB 7354

This course describes the fundamentals of spectroscopic methods used to study protein structure and function. These techniques include optical methods (CD spectroscopy, fluorescence and absorbance), vibrational methods (IR and ESR), analytical ultracentrifugation, mass spectrometry, calorimetry, light scattering and Biacore analysis.

### **PHSC 7400 Ethical Issues in Toxicology & Pharmaceutical Sciences 1.0 cr.**

Pharmaceutical Sciences Faculty - (Fall) Crosslisted: TXCL 7400.

The purpose of this course is to expose students to ethical issues in the fields of toxicology and pharmaceutical sciences. Emphasis will be placed on research conduct, animal use, and other timely issues relevant in these fields.

## Pharmaceutical Sciences Graduate Courses

### **PHSC 7452 Introduction to Clinical Pharmacology 3.0 cr.**

(Fall and Spring) Prereq: Permission of Course Director. Crosslisted with TXCL 7452

The course provides students with a foundational knowledge of clinical pharmacology, including pharmacokinetics, drug metabolism, assessment of drug effects, optimizing patient therapy and drug discovery and development. It is grounded in weekly topical lectures, supplemented by readings, discussion and assignments.

### **PHSC 7453 Introduction to the Pharmaceutical Industry 2.0 cr.**

(Fall) Prereq: Student should be enrolled in the Pharm.D. program or graduate program. Crosslisted: PHRD 7808

This elective will be offered as a hybrid between lectures offered through online learning and in live interactive courses. Students will be required to attend seven weekly classes on campus and eight others online. In-person lectures also available via Zoom®.

### **PHSC 7454 Structural Analysis of Biomolecules 2 2.0 cr.**

Structural Biology & Biochemistry Faculty / Pharmaceutical Sciences Faculty – (Spring) Crosslisted: STBB 7454.

Methods and strategies for determination of the primary and 3-dimensional structures of biologically important molecules. Crystallography, nuclear magnetic resonance spectroscopy and mass spectrometry will be taught in structural determination of proteins, nucleic acids complex carbohydrates, and lipid molecules

### **PHSC 7565 Applied Statistics for Toxicology and Pharmaceutical Sciences 2.0 cr.**

Fall semesters

Students will learn several basic statistical techniques for analyzing data including when and how to use them, appropriate assumptions for these methods, and how to clearly articulate their statistical results in the context of toxicology and pharmaceutical sciences studies.

### **PHSC 7568 Seminar in the Pharmaceutical Sciences 1.0-3.0 cr.**

Fall and Spring semesters

Discusses current literature and research in the pharmaceutical sciences. The only revision for this course is that the maximum credit hours possible will be three.

### **PHSC 7452 Immunology: Immunotoxicology and Immunopharmacology 2.0 cr.**

Fall Prereq: Student should be enrolled in a graduate or equivalent program.

This course is designed to introduce students to basic immunology principles used in drug research and development and to provide essential knowledge on the immune response, its diagnosis and its modification by drugs and chemicals. Current research papers from literature and readings in *Principles of Immunopharmacology* will be assigned.

### **PHSC 7608 Molecular Interactions 3.0 cr.**

Structural Biology & Biochemistry Faculty / Pharmaceutical Sciences Faculty – (Spring) Crosslisted: STBB 7608.

Chemical and physical basis for protein structure, folding, function and stability; role of molecular dynamics, use of molecular simulations in investigations of protein-ligand and protein interactions; methods and principles of protein/peptide purification and enzyme catalysis, including electron transfer and mutagenesis.

### **PHSC 7609 BioPhysics & Spectroscopy 3.0 cr.**

Structural Biology & Biochemistry Faculty / Pharmaceutical Sciences Faculty – (Spring) Crosslisted: STBB 7609.

This course will teach fundamentals of modern molecular spectroscopies and biophysical techniques as applied to biomolecules and the structural/dynamic information they afford.

### **PHSC 7340 Molecular Biophysics and Enzymology 2.0 cr.**

Drs. D. Bain and C. Catalano - (Fall) Prereq: Consent of instructor.

This course will present advanced topics in thermodynamics, kinetics, macromolecular interactions, and enzymology. Underlying theory and applications as found in the literature will be discussed. It is intended for those with a specialized research interest in the subject.

### **PHSC 7650 Research Rotation in the Pharmaceutical Sciences 1.0-10.0 cr.**

Pharmaceutical Sciences Faculty - (Fall, Spring, Summer) Prereq: Consent of instructor.

Research work in pharmaceutical sciences.

### **PHSC 7651 Pharmaceutical Biotechnology 3.0 cr.**

Fall or Spring semester Crosslisted: CHEN 5900. **Location: CU Boulder; Concurrent Registration Required**

Course covers role of bioengineering in development of pharmaceutical biotechnology products.

## Pharmaceutical Sciences Graduate Courses

In particular, the student will learn to apply solution thermodynamics as well as mass and heat transfer concepts to the stabilization/formulation of macromolecules and production of drug delivery systems.

### **PHSC 7653 Protein Formulation 2.0 cr.**

Spring semester

This course will provide instruction in rational design of stable therapeutic protein formulations with emphasis on the practical and mechanistic aspects of developing aqueous solution and freeze-dried formulations. Students will read papers from the literature and participate in critical discussions.

### **PHSC 7658 Advanced Topics in Pharmaceutical Sciences 1.0-5.0 cr.**

Summer semester Prereq: Permission from instructor

Considers special topic of current interest in pharmaceutical sciences. Used mainly for PHSC grad students completing Summer internships at Pharmaceutical Companies such as Eli-Lilly, Amgen, Regeneron, etc. that have been pre-arranged by PHSC Faculty.

### **PHSC 7660 Liposome-based Drug Delivery 2.0 cr.**

Dr. T. Anchordoquy (Spring semester)

This literature-based course introduces the basic physicochemical characteristics of liposomes and then rigorously discusses how these properties are exploited for intravenous drug delivery. The readings include literature from the early days of liposomes up to formulations used in current clinical trials. While focusing on lipid-based delivery systems, the fundamentals barriers (e.g., stability in blood, targeting, drug loading, clearance) are relevant to all delivery systems. Because many current clinical trials strive to deliver nucleic acids, the latter portion of the course discusses how traditional liposomes have been modified for this application.

### **PHSC 7665 Pharmacokinetic Principles and Applications 3.0 cr.**

Alternating Spring semesters

This will be a survey course designed to introduce students to pharmacokinetic and pharmacodynamics principles used in drug research and development. The Phoenix Winnonlin Computer software, a pharmaceutical industry standard, will be used in the course to complete the homework assignments.

### **PHSC 8990 Doctoral Thesis 1.0-10.0 cr.**

Pharmaceutical Sciences Faculty - (Fall, Spring, Summer) Prereq: Consent of instructor.

Doctoral thesis work in pharmaceutical sciences.