This is the course section of the 2003-2005 College of Pharmacy Catalog for the University of Minnesota.

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Course Descriptions

The college's courses are offered by five departments: medicinal chemistry, pharmaceutics, pharmaceutical care and health systems, experimental and clinical pharmacology, and–on the Duluth campus–pharmacy practice and pharmaceutical sciences. Medicinal chemistry courses (biochemistry of medicinals, medicinal agents, biotechnology, immunology) and pharmacology courses focus on understanding the actions and therapeutic uses of various types of medications that affect organ systems, immune functions, and infectious disease related problems. Pharmaceutics courses (drug delivery, pharmacokinetics, biopharmaceutics) concentrate on principles involved in drug dosage formulations; dosage form design; and how drugs are absorbed, distributed, and eliminated from the body. The experimental and clinical pharmacology course includes the pharmacotherapy sequence that applies basic and clinical sciences principles to the patient by focusing on the nature and cause of various disease states and the treatment of these disorders. Pharmaceutical care and health systems encompasses a pharmaceutical care sequence which examines the various roles of the pharmacist, current and future pharmacy practice, and a pharmacy management and public policy sequence. All courses on the Duluth campus are offered by the pharmacy practice and pharmaceutical sciences department.

College of Pharmacy Courses

Phar 5201. Health Sciences Applied Terminology. (2 cr. Prereq–[1002 or basic knowledge of human anatomy/physiology], course orientation [online or in-person]) Self-study course. Medical terms, how to apply them when documenting/reporting patient care procedures.

Phar 5270. Therapeutics of Herbal and Other Natural Medicinals. (2 cr; A–F only. Prereq–Phsl 6051, organic chemistry, pathophysiology of disease states, third yr pharmacy student) Herbal products/supplements. Pharmacology, clinical indications, and drug interactions of most commonly used products in nontraditional complementary health care. Historical significance and evidenced-based role of these products in health care. Case studies of clinical applications.


Phar 6100. Computer and Internet Skills in Pharmacy. (1 cr; A–F only) Computer applications in pharmacy.

Phar 6111. The Practice of Pharmaceutical Care I. (4 cr; A–F only. Prereq–1st yr pharmacy student, ¶6171) Practice of pharmaceutical care, the pharmacy profession, drug information retrieval, professional communications, problem-solving skills, introductory clerkship.

Phar 6112. The Practice of Pharmaceutical Care II. (4 cr; A–F only. Prereq–1st yr pharmacy student, 6111, ¶6172) Comprehensive pharmaceutical care, health belief model, legal issues, prescription processing, clerkship continued and introduction to pharmaco therapy issues.


Course Symbols

———The comma, used in prerequisite listings, means “and.”
§ .... Credit will not be granted if credit has been received for the course listed after this symbol.
¶.... Concurrent registration is required (or allowed) in the course listed after this symbol.
#.... Approval of the instructor is required for registration.

A prerequisite course listed by number only (e.g., prereq 5246) is in the same department as the course being described.

A class rank prerequisite (e.g., 3rd yr) states the minimum class standing a student must hold to register for a course without special permission from the Academic Standing Committee.
Phar 6131. Pharmacy and the Health Care System. (3 cr; A–F only. Prereq–1st yr pharmacy student) Delivery of pharmaceuticals and pharmacy services in the U.S. health care system, issues in hospital and community practice, characteristics of the pharmaceutical industry, economic and financial issues in delivering pharmaceutical services.


Phar 6133. Pharmacy Practice Management. (3 cr; A–F only. Prereq–2nd yr pharmacy student) Principles of pharmacy management, including inventory control, purchasing, pricing, financial analysis, and personnel management.

Phar 6134. Law and Ethics in Pharmacy Practice. (2 cr; A–F only) Minnesota and federal laws, rules, regulations and court decisions affecting pharmacy practice. Moral and ethical considerations that affect and influence pharmacy practice.

Phar 6141. Medical Microbiology and Immunizations. (1 cr; A–F only) Background knowledge in medical microbiology. Evaluating information on emerging infectious diseases, recommending immunization schedules for childhood/adult vaccines.

Phar 6150H. Honors Course: Medicinal Chemistry Seminar. (1 cr [max 2 cr]; A–F only. Prereq–#) Current topics in medicinal chemistry.

Phar 6151. Biochemistry of Medicinals I. (3 cr; A–F only. Prereq–1st yr pharmacy student, ¶6171) Biochemistry topics required for understanding pharmacodynamic action and therapeutic use of medicinal agents.

Phar 6152. Biochemistry of Medicinals II. (3 cr; A–F only. Prereq–6151, ¶6172) Intermediary metabolism of carbohydrates, lipids, amino acids and nucleic acids and how these pathways are affected by therapeutic agents. Introduction to bioenergetics and drug metabolism.


Phar 6154. Medicinal Agents I. (3 cr; A–F only. Prereq–6152, ¶Phcl 5101) Basic principles of drug design, metabolism of action, and receptor interaction. Chemical/biological properties and therapeutic uses of autonomic, anti-infective and antineoplastic agents.

Phar 6155. Medicinal Agents II. (2 cr; A–F only. Prereq–6154, ¶6174, ¶Phcl 5102) Chemical/biological properties and therapeutic uses of drugs affecting central nervous, endocrine, and intermediary metabolism systems.

Phar 6156. Medicinal Agents III. (4 cr; A–F only. Prereq–6152, 6153, 6154) Therapeutic properties and uses of antiviral, anti-infective and antineoplastic agents.

Phar 6157. Human Nutrition and Drug Therapy. (3 cr; A–F only. Prereq–6152) Basic concepts of human nutrition and clinical application.

Phar 6158. Recombinant DNA-Derived Drugs. (1 cr; A–F only. Prereq–6151) Biotechnology as it relates to basic/clinical pharmaceutical sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease.


Phar 6160. Drug Delivery I. (3 cr; A–F only. Prereq–¶6171) Mathematics associated with drug dispensing; technology of common pharmaceutical dosage forms. Phenomenological and theoretical basis of equilibrium and steady-state processes controlling drugs and dosage forms.

Phar 6162. Drug Delivery II. (3 cr; A–F only. Prereq–6161, ¶6172) Phenomenological and theoretical basis of kinetic and dynamic processes controlling drugs and dosage forms.

Phar 6163. Pharmacokinetics. (3 cr; A–F only. Prereq–Calculus II (quarter), calculus I (semester) or equiv, 6162) Physiological basis for drug absorption, distribution, metabolism and excretion; use of mathematical principles and equations to describe these processes as well as design dosage regimens for individual patients.


Phar 6165. Pharmaceutical Calculations. (1 cr; A–F only. Prereq–1st yr pharmacy student) Performing pharmaceutical calculations for patient care in all pharmacy practice environments.

Phar 6171. Pharmaceutical Care Lab I. (2 cr; A–F only. Prereq–¶6151, ¶6111, ¶6161) Integrating basic and clinical science curriculum in a lab setting.

Phar 6172. Pharmaceutical Care Lab II. (1 cr; A–F only. Prereq–6112, 6152, 6162) Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

Phar 6173. Pharmaceutical Care Lab III. (1 cr; A–F only. Prereq–¶6121, ¶6132) Integrating basic and clinical science curriculum in a lab setting.
Phar 6174. Pharmaceutical Care Lab IV. (2 cr; A–F only. Prereq–6122) Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

Phar 6175. Pharmaceutical Care Lab V. (1 cr; A–F only. Prereq–¶6123, ¶6164) Integrating basic and clinical science curriculum in a lab setting.

Phar 6176. Patient Assessment. (2-3 cr; A–F only. Prereq–Phcl 5101, Phl 5102, Phl 6051) Physical/patient assessment skills as they relate to provision of pharmaceutical care.

Phar 6177. Patient Assessment. (1 cr; A–F only. Prereq–1st yr pharm student) How to obtain accurate health histories and perform systemic physical assessments of adult patients in pharmacy practice.

Phar 6181. Pharm. D. Paper and Seminar. (1 cr; A–F only. Prereq–2nd yr pharmacy student) How to write a research paper. Students present research project plan. Professional behavior, patient confidentiality, universal precautions.

Phar 6182. Pharm.D. IV Seminar. (1 cr; S-N only. Prereq–4th yr pharmacy student, 6181) Students present thesis topics to peers and faculty evaluators.

Phar 6183. Pharm.D. IV Paper. (2 cr; S-N only. Prereq–4th yr pharmacy student, 6181) Final paper describing a hypothesis-driven research project, patient-care oriented project, management project, drug-usage evaluation, or extensive literature review.

Phar 6210. Immunization Tour. (1 cr; A–F only. Prereq–¶6175 or ¶6175, pharmacy student, #) Role that health care practitioners play with respect to population based disease prevention. Students work collaboratively with students from another health discipline in planning/delivering influenza vaccination clinics. Student-led collaborative public health intervention.

Phar 6211. Non-Prescription Drug Therapy: Focus on Patient Self-Care. (2 cr; A–F only. Prereq–6112) Expands on over-the-counter medications presented in 6112. Diagnostic and durable medical equipment available in community pharmacies as well as the use of alternative medications is discussed.

Phar 6212. Dermatology. (1 cr; A–F only. Prereq–2nd or 3rd yr pharmacy student) Pathophysiology and pharmacotherapy of dermatologic disorders.

Phar 6213. Pharmacy Practice in Ambulatory Setting. (2 cr; A–F only. Prereq–2nd or 3rd yr pharmacy student) Pharmaceutical care in an ambulatory (community) setting, and the role of a general pharmacy practitioner.

Phar 6214. Pharmaceutical Care Clinic. (1-2 cr. Prereq–Pharm student! Patients make appointments for pharmacy students to provide pharmaceutical care in presence of practitioner. Second/third year students learn “gold standard” for patient care. First year students participate in patient assessments as care plan team members. Weekly student case presentations/discussions.


Phar 6216. Pharmacokinetic Data Analysis and Simulation With SAAM II. (2 cr; A–F only. Prereq–6163 with grade of at least B or #) Introduction to SAAM II: an application for modeling, simulating, and analyzing pharmacokinetic/pharmacodynamic data.


Phar 6222. Advanced Pharmaceutical Compounding. (2 cr; A–F only. Prereq–2nd or 3rd yr pharmacy student) Expands compounding skills beyond those gained in pharmaceutical care lab.

Phar 6223. Pharmacokinetics Research Seminar. (1 cr [max 2 cr]; A–F only. Prereq–6163 with grade of at least B) Students critically evaluate literature in pharmacokinetics, pharmacodynamics, and drug metabolism.

Phar 6231. Community Pharmacy Management. (2 cr; A–F only. Prereq–6133) Management techniques needed in community pharmacy practice, with emphasis on marketing and service.


Phar 6234. Pharmaceutical Economics and Public Policy. (2 cr; A–F only) Economic and public policy aspects of the U.S. health care system. Health economic principles and trends applied to the pharmaceutical market.

Phar 6246. Honors Course: Chemical Aspects of Drug Metabolism and Bioactivity. (2 cr; A–F only. Prereq–¶) Chemical/enzymatic mechanisms of biotransformation/bioactivation of drugs/other xenobiotics. Reactivity/fate of bioactivated metabolites.

Phar 6246H. Honors Course: Chemical Aspects of Drug Metabolism and Bioactivation. (2 cr; A–F only. Prereq–¶) Chemical/enzymatic mechanisms of biotransformation/bioactivation of drugs and other xenobiotics. Reactivity/fate of bioactivated metabolites. Taught every other year.

Phar 6247H. Honors Course: Advanced Concepts in Drug Design. (2 cr; A–F only. Prereq–¶) Current approaches to rational design of drugs.

Phar 6250H. Honors Course: Social and Administrative Pharmacy Seminar. (1 cr; A–F only. Prereq–¶) Current topics in hospital pharmacy.
Phar 6200H. Honors Course: Pharmaceutics Seminar. (1 cr; A–F only. Prereq–#) Contemporary topics in pharmaceutics research.

Phar 6270H. Honors Course: Critical Care Seminar. (2 cr; A–F only. Prereq–#) Research/topics of importance to experimental clinical pharmacology.

Phar 6293. Directed Research I. (1-5 cr. Prereq–#) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

Phar 6294. Directed Study I. (1-5 cr. Prereq–#) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

Phar 6393. Directed Research II. (1-5 cr. Prereq–#) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

Phar 6394. Directed Study II. (1-5 cr. Prereq–#) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

Phar 6493. Directed Research III. (1-5 cr. Prereq–#) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

Phar 6494. Directed Study III. (1-5 cr. Prereq–#) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.


Phar 7120. Community Externship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Students assigned to participating community pharmacies and involved in community practice activities full-time for 5 weeks.

Phar 7121. Institutional Externship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Students assigned to participating hospital pharmacies. Student participation in drug distribution, IV compounding, clinical services and administrative activities full-time for 5 weeks.

Phar 7122. Acute Patient Care Clerkship I. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients full-time for 5 weeks.

Phar 7123. Ambulatory Patient Care Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience in an ambulatory setting; students responsible for drug-related needs of individual patients full-time for five weeks.

Phar 7124. Geriatrics Patient Care Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Evaluation/pharmacotherapy of geriatric patients. Students work with other healthcare professionals/caregivers in outpatient and long-term care settings for five weeks.

Phar 7125. Pediatrics Patient Care Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Students responsible for drug-related needs of individual pediatric patients full-time for 5 weeks. Understanding pharmacokinetic and pharmacodynamic differences between adult and pediatric patients.

Phar 7126. Patient Care Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Patient care experience in any setting; students responsible for drug-related needs of individual patients full-time for 5 weeks.

Phar 7128. Acute Patient Care Clerkship II. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients full-time for 5 weeks.

Phar 7211. Patient Care Clerkship I. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Patient care experience in any patient care setting. Students are responsible for drug-related needs of individual patients full-time.

Phar 7212. Patient Care Clerkship II. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Patient care experience in any setting. Students are responsible for drug-related needs of individual patients full-time.

Phar 7213. Patient Care Clerkship III. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Patient care experience in any setting. Students are responsible for drug-related needs of individual patients full-time.

Phar 7215. Community Patient Care Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Patient care experience in a community pharmacy in which student is responsible for assessing drug-related needs of patients, developing care plans and performing follow-up evaluations full-time for 5 weeks.

Phar 7221. Community Pharmacy Management Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using management techniques in a community pharmacy full-time for 5 weeks.

Phar 7222. Institutional Pharmacy Management Clerkship. (4 cr; A–F only. Prereq–Pharm.D. I-III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using management techniques in an institutional pharmacy full-time for 5 weeks.
Phar 7223. Specialty Management Clerkship I. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using management techniques in any pharmacy setting full-time for 5 weeks.

Phar 7224. Specialty Management Clerkship II. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using management techniques in any pharmacy setting full-time for 5 weeks.

Phar 7225. Specialty Management Clerkship III. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using management techniques in any pharmacy setting full-time for 5 weeks.

Phar 7221. Research Clerkship I. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using research techniques in basic or clinical sciences or pharmacy practice full-time for 5 weeks.

Phar 7222. Research Clerkship II. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using research techniques in basic or clinical sciences or pharmacy practice full-time for 5 weeks.

Phar 7223. Research Clerkship III. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Experience using research techniques in basic or clinical sciences or pharmacy practice full-time for 5 weeks.

Phar 7242. Clerkship Elective II. (4 cr; A–F only. Prereq–Pharm.D. I–III, Minn Board of Pharm intern, criminal bkgr chk, BLS CPR cert for infants/child/adults, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity) Clerkship experience in pharmacy-related area full-time. Five weeks.

Contributing Departments

ECP 5610. Pharmacopepdiomology. (2.0 cr; prereq [PubH 5320, PubH 5330] or #) Application of epidemiologic principles to study, use, and beneficial/adverse outcomes of drugs in human populations.

ECP 5620. Drug Metabolism and Disposition. (3.0 cr; prereq Grad student or #; A–F only) Oxidative/conjugative enzymes systems involved in human drug metabolism/disposition. Various in vitro models used to evaluate drug metabolism or chemical entity, pros/cons of each. Factors involved in conducting in vivo studies. Components used to predict in vivo drug disposition from in vivo studies.

MedC 5185. Principles of Biomolecular Simulation. (3 cr; Prereq–Chem 3502 or #) Molecular simulation for students in medicinal chemistry, pharmaceutics, biochemistry, and chemical physics.


MedC 5245. Introduction to Drug Design. (3 cr; A–F only. Prereq–Chem) Concepts that govern design/discovery of drugs. Physical, bioorganic, medicinal chemical principles applied to explain rational design, mechanism of action drugs.

MedC 5494. Advanced Methods in Quantitative Drug Analysis. (3 cr; A–F only. Prereq–MedC grad student or #) Quantitative methods (HPLC, GC, TLC, and immunoassays) for analysis of drugs and metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, and tandem mass spectrometry. Chromatographic theory and statistical approaches to method validation.

MedC 5495. Vistas in Medicinal Chemistry Research. (1 cr; S-N only) Selected topics of contemporary interest in medicinal chemistry.

MedC 5600. General Principles of Medicinal Chemistry. (3 cr; A–F only. Prereq–MedC grad student or #) Fundamental principles of drug receptors as therapeutic targets, drug-receptor interactions, enzyme inhibitors, drug metabolism and disposition.

Phcl 5101. Pharmacology for Pharmacy Students. (3 cr; A–F only. Prereq–Regis 2nd yr pharmacy student or #) Action/fate of drugs. Lectures, lab.

Phcl 5102. Pharmacology for Pharmacy Students. (2 cr; A–F only. Prereq–5101 or #) Action/fate of drugs.

Phsl 6051. Systems Physiology. (4 cr; A–F only. Prereq–[Prev or current] neuroscience course; [biochemistry, human anatomy] recommended) General physiology, endocrine, circulatory, respiratory, digestive, energy metabolism, and renal physiology examined at molecular, cellular, and organ level. Emphasizes homeostasis and basic regulatory aspects of physiological processes of organ systems.