PharmD Courses and Curriculum

University at Buffalo General Education Requirements

Transfer students entering with less than 24 credit hours and current UB students must also satisfy the University at Buffalo's general education requirements, which include one 3-credit course in the Arts, World Civilization I (UGC 111), World Civilization II (UGC 112), and American Pluralism or US History (UGC 211). Although these courses are not required for admission to the PharmD program, they must be completed by the end of the 3rd professional year. This note does not apply to transfer students with 24 or more credit hours or students who have earned a degree.

PharmD Courses and Curriculum

The doctor of pharmacy curriculum consists of courses in basic biomedical sciences, clinical sciences, pharmaceutical sciences, and pharmacy practice. The course work is integrated with patient-centered practice experiences and is capped by a 9-month experiential program, with its focus centered on educating entry-level practitioners capable of providing pharmaceutical care. The curriculum contains courses in the following areas:

Pharmaceutical and Clinical Sciences consisting of Physical Pharmacy, Pharmacy Calculations, Pharmacokinetics, Pharmacodynamics, Pharmacogenomics, and Pharmacotherapy;

Biomedical Sciences consisting of Physiology, Microbiology, Biochemistry, and Pharmacology;

Pharmaceutical Care consisting of Pharmacoeconomics/Pharmacoepidemiology, Pharmacy Informatics, Drug Literature Evaluation, Biostatistics, Disease Management, Ethics, Pharmacy Law, Professional Practice, Physical Assessment, Communication; and

Experiential Education consisting of both Introductory Pharmacy Practice Experiences (IPPEs) and Advanced Pharmacy Practice Experiences (APPEs). IPPEs take place in the P1 through P3 years, while APPEs take place in the P4 year.

Curriculum Tracks

The doctor of pharmacy curriculum provides the educational foundation for an entry-level pharmacy practitioner. These tracks were developed to enable students to learn more about specific areas of pharmacy practice while completing their program. Students choose their track during their second professional (P2) year. All tracks enable interested students to pursue post-doctoral training opportunities such as residencies, fellowships, or graduate studies. Students select one of the four tracks listed below during the second professional year. Students in these tracks take additional courses during their third professional year, which apply as elective credit.

Outpatient Care Track (Default track)

Students learn about and gain experiences in areas such as community pharmacy care (e.g. CVS, Walgreens, and Rite Aid) or ambulatory pharmacy care (e.g. In-patient clinics).

PHM 537: Pharmacy Management (3 Hours) - Fall Semester

PHM 594: Advanced Ambulatory Pharmacotherapeutics (2 Hours) - Spring Semester

Applied Pharmacotherapy Track

Students learn about and gain experiences in patient care across various settings including long term care, hospice, and hospitals.

PHM 529: Topics in Health Pharmacy Practice Systems (2 Hours) - Fall Semester

PHM 595: Advanced Pharmacotherapeutics (2 Hours) - Spring Semester

Course designations refer to courses taught by the following departments:

(BCH) Biochemistry
(MCH) Medicinal Chemistry
(MIC) Microbiology
(PHC) Pharmaceutical Sciences
(PHM) Pharmacy
(PGY) Physiology
(PMY) Pharmacology and Toxicology

Clinical Research Track

Students work one-on-one with a faculty member conducting a research project and complete a two month research rotation during their experiential (P4) year. Students must have at least a 3.0 GPA or permission to enter this track.

PHM 516: Clinical Research Methods 1 (3 Hours) - Fall Semester

PHM 615: Clinical Research Methods II (1 Hour) - Spring Semester

PHC 543: Molecular Genetic Methods (1 Hour) - Between Fall and Spring Semester

PHM 505: Biometry in the Pharmaceutical Sciences (3 Hours) - Spring Semester

Pharmaceutical Sciences Research Track

Students work one-on-one with a faculty member conducting a research project and complete a two month research rotation during their experiential (P4) year. Students must have at least a 3.0 GPA or permission to enter this track.

PHM 516: Clinical Research Methods 1 (3 Hours) - Fall Semester

PHC 543: Molecular Genetic Methods (1 Hour) - Between Fall and Spring Semester

PHC 332: Introduction to Research (1 Hour) - Spring Semester

Electives

Students in the doctor of pharmacy program must complete ten elective credits throughout their first three professional years. The courses in their tracks will count as electives. In addition, students may take a maximum of three credit hours of electives outside the School of Pharmacy and Pharmaceutical Sciences if the Office of the Associate Dean for Academic Affairs has approved this course.

First Professional (P1) Year – 33 Hours

BCH 403. *Biochemical Principles.* A general biochemistry course for science majors and students of pharmacy. Covers protein structure and function, metabolism, and nucleic acid structure and molecular biology.

PGY 451, 452. *Human Physiology 1, 2.* A two-semester lecture course in human body function.

MCH 311. *Medicinal Chemistry.* Physicochemical and structural basis of drug action; drug sources; mechanisms of drug action; drug design and drug selectivity; drug incompatibility; drug interactions.

PHM 311. *Pharmaceutical Calculations.* Prescription interpretation and a variety of mathematical calculations used in pharmacy practice. The course is a prerequisite for Physical Pharmacy (PHC 312).

PHM 315. *Pharmaceutical Care I.* Introduction to the profession of pharmacy, professionalism, and the concept of pharmaceutical care. Small group and large group discussions of areas involved in practice which include but are not limited to career options, U.S. health care system, prescriptions, medical orders, introduction to compounding and the professional practice laboratory, patient-oriented pharmaceutical care, adherence, and interpersonal and interprofessional communication practices as encountered in contemporary pharmacy practice. Students will be involved in small group problem based learning exercises and videotaping. Students will be taking PHC 311 Pharmacy Math concurrently.

MIC 301. *Fundamentals of Microbiology.* Principles of microbiology for students of medical technology, pharmacy and nursing programs; microorganisms and immunologic phenomena of importance for man.

PHC 312. *Physical Pharmacy.* Physical chemical properties of drugs; theory and practice applicable to design and evaluation of drug dosage forms; principles of solubility, solution equilibria, chemical kinetics, heterogenous systems, solids.

PHM 430. *Pharmacy Law.* A detailed presentation of the laws that govern and affect the practice of pharmacy. Major topics include general legal principles, non-controlled and controlled prescription requirements, over-the-counter drug requirements, NYS Board of Pharmacy law and regulations, Poison Prevention Packaging Act, hypodermic syringes and needles, regulations affecting hospitals, and Food and Drug law.

PHM 316. *Pharmaceutical Care II.* A continuation of PHM 315 with further emphasis on patient-oriented education, interpersonal and interprofessional communication, patient interviewing, history taking, patient adherence and counseling, pharmacy law, the evaluation of drug orders and prescriptions for accuracy and safety, drug informatics and management of medication distribution and control systems. A continuation of the professional practice laboratory.

PHM 111. *All School Conference*. PHM 111 is not an actual course but a required seminar time for all professional pharmacy students to have available for events, which are announced throughout the semester.

PHM 541, 542. *Introductory Pharmacy Practice Experience (IPPE) 1a, 1b*. Please note: Students may complete part of their IPPE-2a and IPPE-2b during the summer as PHM 560 to get credit for this in the Second Professional Year.

Second Professional (P2) Year – 32 Hours

PHC 531, 532. *Introduction to Pharmacokinetics and Biopharmaceutics I, II.* A study of factors influencing the absorption, distribution, excretion and metabolism of drugs in man and the role these processes play in the therapeutic and adverse effects of drugs. Elementary compartmental modeling, mechanisms of drug absorption, mechanisms of renal clearance, and assessment of drug bioavailability.

PHM 510, 511. *Pharmacotherapeutics I, II.* A course series in clinical pharmacology and advanced therapeutics which includes major disease problems and use of therapeutic interventions in areas such as: fluids and electrolytes, nephrology, cardiology, pediatrics, neurology, endocrinology, infectious diseases, psychiatry, immunology, rheumatology, hematology, pulmonary, gastroenterology, critical care, dermatology, women's health, nutrition, and oncology. Course material typically includes disease symptomology, current concepts regarding appropriate drug treatment, patient monitoring, drug mechanism/effects/pharmacokinetics, and drug interactions. Literature review and case studies are included.

PMY 511, 512: *Principles of Pharmacology I, II.* Explores principles of drug action on biological systems, action mechanism of each agent class on specific organ systems, a review and extension of pertinent physiologic concepts of that

system, chemical structure-drug activity relationships, sites of action, metabolic patterns of principal drugs, and therapeutic and toxicologic aspects.

PHM 531. *Professional Practice I.* Practical application of drug dosage formulation, the storage, preparation, dispensing and compounding of medicines and the use of non-medications which include but are not limited to: solid and liquid dosage forms, intravenous admixtures, and devices. Emphasis is on application of pharmaceutical preparations, mathematical skills, pharmacy law, critical thinking, patient education/counseling and practitioner consultation.

PHM 532. *Professional Practice II.* A continuation of PHM 431 with emphasis on more advanced product selection. In addition, drug and non-drug products include, but are not limited to: advanced intravenous therapy, pre-packing and unit dose, chemotherapy, total parenteral nutrition, home health care, and home infusion therapy. Emphasis is on patient education, counseling, practitioner consultations, as well as product incompatibilities, preparation, law, and critical thinking.

PHM 517. *Pharmaceutical Care III.* A continuation of the pharmaceutical care sequence with emphasis on patient-oriented pharmaceutical care. Disease and therapeutics will be reinforced by application to case studies. Included are practitioner consultations and therapy recommendations, use of information technology in the maintenance of records and in retrieval of medical information, pharmacy law, patient interviewing, evaluation of patient-specific medical information, patient case studies and interventions with resultant positive outcomes.

PHM 518. *Pharmaceutical Care IV.* A continuation of the pharmaceutical care sequence with further emphasis on patient-oriented pharmaceutical care. Introduction of pharmacy informatics and disease state management. Modules and patient cases will be used to reinforce learning of diseases covered in Pharmacotherapeutics. Monitoring and modifying patient care plans are studied with the goal of assuring positive outcomes. Pharmaceutical care through application of the ASHP modules is emphasized.

PHM 111. *All School Conference*. PHM 111 is not an actual course but a required seminar time for all professional pharmacy students to have available for events, which are announced throughout the semester.

PHM 561, 562. *Introductory Pharmacy Practice Experience (IPPE) 2a, 2b*. Please note: Students may complete part of their IPPE-3a and IPPE-3b during the summer as PHM 660 to get credit for this in the Second Professional Year.

Third Professional (P3) Year – 27 Hours

PHM 512, 513. *Pharmacotherapeutics III, IV.* A course series in clinical pharmacology and advanced therapeutics which includes major disease problems and use of therapeutic interventions in areas such as: fluids and electrolytes, nephrology, cardiology, pediatrics, neurology, endocrinology, infectious diseases, psychiatry, immunology, rheumatology, hematology, pulmonary, gastroenterology, critical care, dermatology, women's health, nutrition, and oncology. Course material typically includes disease symptomology, current concepts regarding appropriate drug treatment, patient monitoring, drug mechanism/effects/pharmacokinetics, and drug interactions. Literature review and case studies are included.

PHM 504. *Statistics in Pharmacy.* Methods used in statistical analysis and evaluation of studies in health care.

PHM 572. *Managed Care Pharmacy.* Discussions of the origin, organization, delivery and financing of health care in the United States. Important health care issues and how they relate to pharmacy practice are discussed.

PHM 519-520. *Pharmaceutical Care V.* Student skills are further refined with respect to communication, managing a patient's and practice management skills.

PHC 533. *Applied Clinical Pharmacokinetics 1.* The study of the factors that influence drug disposition and drug effects in disease states and the factors that influence therapeutic monitoring of drugs in patients and patient care.

PHC 517. *Principles of the Human Genome, Pharmacogenomics and Bioinformatics.* Introduces the principles and concepts in pharmacogenomics and pharmaceutical genetics. The course goal is to give an understanding of the principles of human genetics and genomics such that these skills can then be applied to problems in therapy optimization and patient care.

PHM 608, 609. *Pharmacy Project I, II.* Students in the entry-level doctor of pharmacy program will be expected to complete a project in one area of pharmacy practice. The areas may include patient care, disease state management, literature evaluation, clinical research, post-graduate education, scope of practice, and other areas of interest between faculty and students. Students will be given a list of potential projects and faculty preceptors for the project. The student will be expected to work on an independent basis to draft a written description of the project to be completed. Please note: Students are only required to complete one Pharmacy Project in the fall or in the spring semester. Students in the Clinical Research Track do not have to complete a pharmacy project.

PHM 508. *Pharmacy Informatics.* Sources of drug information and how to access them, systematic drug literature searches, case study approach to answering drug information questions received from patients, other health professionals; oral and written responses to questions.

PHM 520. *Pharmaceutical Care VI.* A continuation of PHM 519.

PHM 509. *Patient Assessment.* Instruction to the basis of patient diagnosis with physical and historical examination of major organ systems.

PHM 111. *All School Conference*. PHM 111 is not an actual course but a required seminar time for all professional pharmacy students to have available for events, which are announced throughout the semester.

PHM 661, 662. *Introductory Pharmacy Practice Experience (IPPE) 3a, 3b*.

Fourth Professional (P4) Year – 37 Hours

Advanced Pharmacy Practice Experiential Year

The advanced pharmacy practice experiences are designed to build on the previous academic base with a wide range of exposure to various clinical pharmacy practice environments and medical sub-specialty areas.

Advanced pharmacy practice experiences are academic learning experiences in patient care settings and are a vital component of the doctor of pharmacy program. The advanced pharmacy practice experiences involve the students in the provision of advanced clinical pharmacy services and provide experience in various medical sub-specialty environments. Major goals are the development of independent judgment and the integration of fundamental knowledge with clinical applications. These advanced pharmacy practice experiences are conducted throughout the Western New York region (Buffalo, Rochester, etc.). Each module of advanced pharmacy practice experiences time is six weeks.

Advanced Pharmacy Practice Experiences (APPE)

PHM 620: Inpatient Care
PHM 621: Inpatient Care Specialization
PHM 624: Outpatient Care Specialization
PHM 630: Professional Selectives
PHM 631: Clinical Research Elective
PHM 640: Professional Experiential Elective
PHM 641: Professional Practice Elective
PHM 598: Professional Development (1 Hour)

Required advanced pharmacy practice experiences include a minimum of six core rotations. Additional time may be spent in any of these areas if the student desires.

NOTE: All requirements are subject to change