



MS Pharmaceutical Sciences Curriculum – Focus on Pharmacometrics

Studies in preclinical and clinical pharmacology, pharmacokinetics, pharmacodynamics, and toxicology typically involve collection of various types of experimental data in individuals and groups of biologic preparations, animals, and human subjects. Appropriate methods of analysis of such data requires an understanding of the underlying science and well as use of biostatistics, computational methods, and pharmacokinetic and pharmacodynamic modeling. Scientists with proficiency in pharmacometrics can assist in the design and analysis of protocols and studies related to drug therapy questions and provide insights into the processes which control the time course of drug concentrations and clinical, pharmacologic and toxicologic responses.

Purpose: To prepare graduates for industrial or other positions or for more advanced academic training in areas requiring computer-assisted analysis of biopharmaceutic, pharmacokinetic, pharmacodynamic, toxicologic, or other types of experimental data.

Who Should Apply: Students interested in the computational aspects of pharmaceutical research would be well suited for the program. Applicants should have at least a Bachelors degree in Pharmaceutics, Pharmacy, Pharmacology, Biology, Chemistry, Biochemistry, Mathematics, Statistics, or another suitable discipline. Work and computer experience in a research or clinical laboratory will be a plus.

How to apply: Students interested in obtaining the MS degree can apply through the [Online Interactive Graduate Application](http://www.gradmit.buffalo.edu) (<http://www.gradmit.buffalo.edu>). For questions, contact Dr. Murali Ramanathan, Director of Graduate Studies (murali@buffalo.edu). Applications for fall are accepted through 2/15. Late applicants are considered on a space-available basis.

Prerequisites: Calculus (e.g., MTH 141) and computer programming (eg. C++, Fortran, Visual Basic).

Requirements: Enrollment in the Pharmaceutical Sciences Department and completion of 30 credits of academic work. It is expected that program completion will be within 1 yr.

A. Required Courses (12 credits) F = Fall, S = Spring

- PHC 607 (3) F Intermediate Pharmacokinetics
- PHC 504 (1-3) F Computational Basis of Pharmacometrics
- PHC 608 (2) S Advanced Pharmacokinetics
- PHC 609 (2) S Pharmacodynamics
- PHC 502 (3) F Biostatistics (also offered as PHM 598)

B. Recommended Elective Courses (16 credits)

- PHC 532 (4) S Applied Clinical Pharmacokinetics I
- PHC 630 (3) S Drug Metabolism and Disposition
- PHC 507 (2) S Biological Transport
- SPM 501 (4) F Epidemiology Principles
- SPM 505 (3) F Introductory Biostatistics
- SPM 506 (3) S Application of Statistics to Epidemiology
- PGY 520 (3) F Applications of Computers to Physiological Problems
- PMY 626 (2) F Toxicology Principles and Practice
- PMY 627 (2) F Target Organ Toxicity
- MCH 501 (4) F Molecular Structure and Reaction Mechanisms
- PMY 501 (2) F Mechanisms of Drug Action
- PMY 550 (2) F Receptor Pharmacology
- CSE 503 (3) F Computer Science for Non-Majors I
- PHM 516 (2) S Clinical Research Methods

Note: Students with a biological background should emphasize computational types of electives while those with a math/statistics background should take biomedical electives.

C. PHC 616 (1-5) S Research. Completion of a research project under supervision or collaboration with a suitable graduate faculty member in the School of Pharmacy. This project must involve data analysis and modeling. A project report in the form of a manuscript must be submitted and, if convenient, presentation of a poster at a suitable forum.

Supervision: One member of the Graduate Faculty of the School of Pharmacy will serve as Supervisor and two other faculty members will serve on the MS Committee.

D. PHC 613, 614 (1,1) F,S. Seminar. Students will be expected to attend the regular weekly departmental seminar.

Note: Students will be required to attend tutorials in use and applications of software such as Adapt II, Kinetica, WinNonMix, NonMem, and perhaps other programs.

E. Examination. A final oral examination will be required at the end of the academic and research program. This will be administered by the student's MS Committee in tandem with the presentation and defense of the research project.