

PS-Track Curriculum:

Core Courses are indicated in blue-bold.

Year 1 Fall Semester:

PSGP 5101	Medicinal Chemistry for Graduate Students	3 hrs.
BIOS 5013	Biostatistics I	3 hrs.
	Elective	3 hrs.
PSGP 5113 sect 002	Research	1 hrs.
	TOTAL	10 hrs.

Year 1 Spring Semester:

PSGP 5102	Pharmaceutics for Graduate Students	3 hrs.
	Elective	3 hrs.
	Elective	3 hrs.
PSGP 5113 sect 002	Research	1 hrs.
	TOTAL	10 hrs.

Summer 1:

PSGP 5111	Responsible Research	3 hrs.
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Year 2 Fall Semester:

PCOL 5107	Pharmacology and Exp Therap	3 hrs.
	Elective (as needed)	3 hrs.
	Elective (as needed)	3 hrs.
PSGP 5113 sect 002	Research	4 - 6 hrs.
	TOTAL	10 hrs.

Year 2 Spring Semester:

	Elective (as needed)	3 hrs.
	Elective (as needed)	3 hrs.
PSGP 5113 sect 002	Research	4 - 6 hrs.
	TOTAL	10 hrs.

Summer 2

PSGP 5113 sect 002	Research CANDIDACY EXAM	1 hrs.
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Year 3 Fall & Spring Semesters

PSGP 6201 sect 002	Doctoral Dissertation	10 hrs./sem.
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Summer 3

PSGP 6201 sect 002	Doctoral Dissertation	1 hrs./sem.
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Year 4 Fall & Spring Semesters

PSGP 6201 sect 002	Doctoral Dissertation	10 hrs./sem.
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Summer 4

PSGP 6201 sect 002	Doctoral Dissertation	1 hrs./sem.
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CORE COURSES

PSGP 5101 Medicinal Chemistry for Graduate Students (3 hr) - This course is an overview of concepts from organic and medicinal chemistry and pharmacology that are fundamental to understanding the design of drugs, including factors affecting stability, absorption, distribution and metabolism.

PSGP 5102 Pharmaceutics for Graduate Students (3 hr) – The primary objective of this course is to provide an overview of the discipline of pharmaceutics (the study of drug delivery systems) for graduate students. Particular emphasis is placed on physico-chemical properties of drugs and dosage forms, both *ex vivo* and *in vivo*, that are important for basic research in the fields of the pharmaceutical sciences.

PSGP 5111 Responsible Research (3 hr) - This course will explore the philosophies, rules, regulations and social structure of a responsible research environment. Emphasis will be on faculty culture, professionalism, federal regulation, ethical use of humans and animals, conflicts of interest, scientific misconduct, and the overall regulatory, normative and cognitive structures of a responsible research environment.

PCOL 5043 Graduate Pharmacology and Experimental Therapeutics (3 hr) – This course provides coverage of all the categories of pharmacological agents and discusses their mechanisms of action, uses, consequences and potential interactions with other drugs and/or disease related circumstances.

BIOS 5013 Biostatistics I (3 hr) - Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, non-parametric tests, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments. Prerequisite, consent.

PSGP 5113 sect 002 Research in Pharmaceutical Sciences (1-9) Prerequisite: graduate standing and consent of major advisor.

PSGP 6201 sect 002 Doctoral Dissertation – a total of 18 hours is required for the Ph.D. degree at UAMS.

ELECTIVE COURSES

PSGP 5104 Methods in Pharmaceutical Sciences (3 hr) – This course presents an overview of pharmaceutical science methods. Three main aspects are covered. The initial section discusses the development of a testable hypothesis, design of the experiment, and interpretation of results. The second section covers general laboratory procedures and safety issues. The third section covers several current model systems and their application to specific research questions. Prerequisites are graduate standing or the consent of the instructor.

PSGP 5106 Molecular Modeling (3 hr) - Molecular modeling is an introduction to the computational techniques used to understand chemical structure, reactivity and the relationship between structure and biological function. The class will meet for two hours of lectures, and one laboratory session every week. During the laboratory sessions the students will use advanced graphics workstations.

PSGP 5108 Advanced Biopharmaceutics and Pharmacokinetics (2-3) - This course covers the quantitative treatment of the dynamics of drug absorption, distribution and excretion including the development of mathematical models for these processes and their clinical applications. Prerequisite: graduate standing and consent of instructor.

PSGP 5110 Pharmacokinetic Research Design and Data Analysis (3 hr) - Review of current methods used in the design of pharmacokinetic investigations in animals and man, and of techniques used for analysis of pharmacokinetic data. Emphasis will be placed on advantages of various mathematical techniques for data analysis, the ethics and logistics of pharmacokinetic study design, and methods used to present pharmacokinetic data. Prerequisite: graduate standing and consent of instructor.

PSGP 6102 Bioorganic Mechanisms (3 hr) - This course will cover the detailed chemical and biochemical mechanism of action of selected drug molecules at target proteins that include enzymes, receptors and DNA. Emphasis will focus on underlying chemical principles of drug action. Prerequisites: consent.

PSGP 6103 Biosynthesis of Selected Natural Products (3 hr) - This course will introduce students to the general families of secondary metabolites, typically called "natural products" and their biosynthesis as well as techniques used to study these compounds. Such natural products are of enormous commercial importance to the pharmaceutical and agricultural industries.

PSGP 6104 Design of Molecules with Drug Like Properties (3 hr) – Of the thousands of novel drug molecules that emerge as leads from discovery initiatives, only a small fraction have appropriate ADME/TOX properties to be considered as drug products. This course will address the challenges involved in the optimization of lead compounds with promising biological activity to efficacious, drug-like molecules.

PSGP 6105 Advanced Organic Chemistry (3 hr) – This course is an overview of concepts from organic and medicinal chemistry and pharmacology that are fundamental to understanding the design of drugs, including factors affecting stability, absorption, distribution and metabolism.

PSGP 6106 Pharmacognosy and Alternative and Complementary Medicine (3 hr) – This course provides an overview of the composition, beneficial properties, and potential negative effects of the most commonly used herbal products and dietary supplements and the properties of the main kinds of bioactive natural products. In addition this course we will outline of the most popular Complementary and Alternative Medicine approaches.

PSGP 6107 Controlled Release Dosage Forms (3 hr) – This course covers the physicochemical principles and quantitative skills involving the system designs for the controlled release of biologically active compounds. The main emphasis on this course is the mathematical analysis of controlled release system and the properties of polymeric materials used for controlled drug delivery. Prerequisite: Consent of instructor.

PSGP 6108 Drug Action and Design (3 hr) – This course is an overview of concepts from organic and medicinal chemistry and pharmacology that are fundamental to understanding the design of drugs, including factors affecting stability, absorption, distribution and metabolism.

PSGP 6109 Clinical and Pharmaceutical Analysis (3 hr) – This course is designed to introduce basic chemical, biological, analytical, and regulatory concepts involved in the measurement, interpretation, and application of laboratory data as it pertains to pharmacotherapy.

PSGP 6110 Pharmacogenetics of Drug Metabolism and Transport (2 hr) - This course will examine factors that affect drug response including genetics, environment, diet, age, and concurrent drug therapy and health status. Methods important to pharmacogenomics research will be presented. The course will use a combination of lectures and student-led discussion of recent papers from the primary literature.

PSGP 6111 Advanced Pharmacogenetics and Pharmacogenomics (3 hr) - This course will focus on pharmacogenetics and pharmacogenomics research design, including utilization of key knowledge from the human genome and HapMap projects, candidate gene, versus genome-wide approaches, other considerations in design of human pharmacogenomics investigations, and approaches to defining functional effects of pharmacogenetic candidates. Prerequisite: PSGP 6111.

PSGP 6112 Radiation Biology for Graduate Students (3 hr) – This is a course designed as an introduction to the interaction of ionizing radiation (IR) and biological systems. Topics include the basic principles of radiation biology, including the effects of IR on macromolecules, cells, tissues, and organisms. It will also cover some of the topics regarding cancer radiotherapy and normal tissue protection.

PSGP 6114 Practice in Drug Discovery and Development (3 hr) - This course will introduce students to the principles of drug discovery and design as well as illustrate the process of drug development. After an introduction to the principles, a representative group of approved drugs and target platforms will be discussed in relation to their receptor interactions and associated medicinal chemistry.

PSGP 7150 Special Problems in the Pharmaceutical Sciences (1-4 hr) Individual investigation, other than thesis, of a special problem elected or assigned.

PEP-Track Curriculum: _____ student

Core Courses are indicated in bold.

Year 1 Fall Semester

PSGP 5116 Foundations of Pharmaceutical Evaluation and Policy	3 hrs.		
PSGP 5109 Pharmaceutical Evaluation and Policy Seminar	1 hrs.		
BIOS 5013 Biostatistics I	3 hrs.		
<i>Two of the following Courses:</i>			
EPID 5112 Epidemiology I	3 hrs.		
PSGP 5121 U.S. Health Care System for Pharmacists	3 hrs.		
PCOL 5117 Scientific Communication and Ethics I	1 hrs.		

Year 1 Spring Semester

PSGP 5109 Pharmaceutical Evaluation and Policy Seminar	1 hrs.		
BIOS 5212 Biostatistics II	3 hrs.		
PSGP 5118 Applied Research Methods using Retrospective Data	3 hrs.		
PSGP 5123 Patient-Reported Outcomes Measures	3 hrs.		
<u>PHPR 3612 Drug Information</u> or One Additional Course in Area of Concentration or Required courses not completed or PSGP 5113 Research			

Summer 1

PSGP 5113 Research	1 hrs.		
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Year 2 Fall Semester

<u>PSGP 6113 Pharmacoepidemiology</u>	3 hrs.		
PSGP 5109 Pharmaceutical Evaluation and Policy Seminar	1 hrs.		
PSGP 5120 Pharmaceutical Economics and Policy	3 hrs.		
Additional Courses in Area of Concentration, Required Courses not completed, or PSGP 5113 Research			

Year 2 Spring Semester

PSGP 5109 Pharmaceutical Evaluation and Policy Seminar	1 hrs.		
PSGP 5119 Pharmacoeconomics and Health Care Technology	3 hrs.		
PSGP 5122 Applied Health Econometrics	3 hrs.		
Additional Courses in Area of Concentration, Required Courses not completed, or PSGP			

Summer 2

PSGP 5113 Research	1 hrs.		
CANDIDACY EXAM			

Year 3 Fall & Spring Semesters

PSGP 5109 Pharmaceutical Evaluation and Policy Seminar	1 / sem		
PSGP 6201 Dissertation	9 hrs.		
Requirements or Courses in Area of Concentration not completed.			

Summer 3

PSGP 6201 Dissertation	1 hrs.
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Year 4 Fall & Spring Semesters

PSGP 6201Dissertation	10 hrs./sem.
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Summer 4

PSGP 6201 Dissertation	1 hrs.
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CORE COURSES

(New courses are underlined. Completed new course approval forms are provided in the Appendix)

PGSP 5109 Pharmaceutical Science Seminar - Members of faculty and graduate students meet regularly for discussion and current studies in the field of the pharmaceutical sciences.

PSGP 5116 Foundations of Pharm Eval and Policy Res Methods - The purpose of this course is to provide students with the introductory skills to become a researcher in Pharmaceutical Evaluation and Policy. The student will be exposed to a wide range of topics including sources for funding for research, identifying research problems and writing study objectives, disseminating research, study measures, and study design. Core Courses

PSGP 5118 Applied Research Methods Using Retrospective Data - This course will outfit students with the skills necessary to analyze and conduct studies using retrospective health care data with a focus on large administrative claims data such as Medicaid and private payer insurance claims. Students will use SAS to analyze actual health care data. Instruction on study design, statistical techniques, and data integrity issues specific to observational studies using these data sources will be offered.

PSGP 5119 Pharmacoeconomics and Health Technology Assessment - The purpose of this course is to provide students with the skills to design, conduct, analyze and rate investigations that assess the value or outcomes of health care technologies with a focus on pharmacy related products and services. The course will also integrate the theoretical prefaces to health care technology assessment as well as provide real world applications using decision modeling software to conduct cost effectiveness and other related studies.

PSGP 5120 Pharmaceutical Economics and Policy Evaluation - This course provides an understanding of pharmaceutical product markets and institutions from an economic perspective. Principles of economic theory are used to analyze the nature of demand and supply of pharmaceutical products, market structure of pharmaceutical industry, welfare implications, R&D and innovation, marketing, pricing, public policy, and government regulation.

PSGP 5121 US Healthcare System - This course provides an overview of major components of the U.S. healthcare sector and addresses key challenges in financing and delivery of healthcare services. Topics include healthcare expenditures, quality, access, managed care, Medicare, Medicaid, health behavior, measurement of health, public health, pharmaceutical benefit management, health care reform, and asymmetric information. This is a three credit hour course and will be required for all persons without a prior U.S. degree in a health filed such as pharmacy, medicine, public health, or nursing.

PSGP 5122 Applied Health Econometrics - This course is designed to provide students with training in health econometrics techniques applicable to health care data. This course starts with basic

econometrics theory, followed by discussions of selected econometric techniques that are commonly used in health economics. The course emphasizes application of these techniques and uses primarily Stata. Introduction to Stata is provided. Prerequisites: Biostats I & II or permission of the instructor.

PSGP 5123 Patient-Reported Outcomes Measures - This course will provide graduate students a solid grounding in patient reported outcomes (PROs) and health-related quality of life (HRQL) concepts and how to measure them. Materials will cover PRO instrument development, including psychometric and utility theory. The course will provide students hands on experience with statistical analyses and psychometric testing using SAS. It will cover how to select appropriate PRO instruments for clinical studies to comply with governmental regulatory guidance. The course also offers students opportunities to assess and evaluate literature involved with HRQL information and PRO instruments in specific diseases/conditions as well.

PSGP 6113 Pharmacoepidemiology - Pharmacoepidemiology is the study of the use of and the effects of medications in large numbers of people. This specialty combines information from clinical pharmacology (the study of effects of drugs in humans) and epidemiology (the use and effects of exposure in large populations) to form a unique area of study.

PHPR 3612 Drug Information - This course will introduce the P1 student to the top 200 drugs available in the U.S. and to the drug and medical literature that is available at UAMS. The instructors will emphasize how to locate, evaluate and communicate medical and drug information. The course will involve didactic lectures and assignments that will require the student to utilize the information resources available on the UAMS Library website, the UAMS Intranet and the Internet. This is a two credit hour course and will be required for all persons without a prior degree in a health field such as pharmacy, medicine, or nursing.

BIOS 5013 Biostatistics I - Introductory topics in descriptive biostatistics and epidemiology, database principles, basic probability, diagnostic test statistics, tests of hypotheses, sample-size estimation, power of tests, frequency cross-tabulations, correlation, nonparametric test, regression, randomization, multiple comparisons of means and analysis of variance for one and two-factor experiments.

BIOS 5212 Biostatistics II - Non-parametric analyses of variance. Multiple regression and linear models for analysis of variance. Experimental designs (randomization, data handling, analysis) with factorial treatment arrangements, repeated measures and multiple covariates. Introduction to logistic regression and survival analysis.

ELECTIVE COURSES

(New courses are underlined. Completed new course approval forms are provided in the Appendix)

HPMT 6011 Mathematics and statistics primer – Provides an overview of fundamental mathematical and statistical concepts used in health systems research including linear and matrix algebra, differential equations methods, optimization methods, and probability theory. Prerequisites: Doctoral student status.

HPMT 6114 Advanced Health Policy and Management – Examines the development, implementation, and impact of public policies and health management strategies on population health. Includes policy and management theories as well as policy analysis and decision analysis methods. Prerequisites: Doctoral student status or permission of the instructor.

HPMT 6313 Advanced Methods in Health Services Research – Provides an overview of study design and methods for health services research (HSRE) applied to health policy and public health problems. Emphasis given to non-experimental and quasi-experimental designs most often employed in health policy and services research, along with regression and maximum likelihood models. Prerequisites: HSRE 9011 and HSRE 9303

HPMT 5104 Introduction to Health Economics – Provides an overview of economic theory applied to health care problems. Topics include competitive markets and health care, health insurance, health care demand, health production, physician agency, and the role of government in health care. Prerequisites: Doctoral student status or permission of the instructor.

HPMT 6104 Health Care Economics - Theory and Quantitative Analysis – The course provides an overview of economic theory with health care applications. Economics is the study of optimal allocation of scarce resources. Health economics considers the allocation of health care resources to evaluate whether more efficient or equitable distributions can be achieved. Economics concepts and principles will be introduced, followed by the application of these principles to health care, health management, and health policy. Prerequisites: BIOS 5013: Biostatistics I; HPMT 5103: The Health Care System; or permission of instructor.

HBHE 6325 Survey Research Methods – This course will provide students with a practical overview of survey research methods. Topics to be covered include questionnaire and interview design; tailoring instruments for specific settings; populations; and methods of administration; reliability and validity; scales and indices; sampling methods; sampling bias, and maximizing response rates. Prerequisites: Doctoral student standing

HPMT 6315 Qualitative Methods - This course introduces qualitative modes of social and behavioral research within the context of public health programs and research. Research methods and data sources examined include action research, case studies, grounded theory, observation, interviews, focus groups, ethnography and content analysis. The use of qualitative methods to inform public health programs and the role of constituents as partners in the research process are examined. Prerequisites: Doctoral student standing.

HBHE 6212 Applied Behavioral Research Methods – This course addresses behavioral research: the role of theory, problem definition, and hypothesis generation; research design; measurement of health behaviors; and critical review and interpretation of published research. Prerequisites: Doctoral student standing in the UAMS College

EPID 5322 Epidemiology II – Extends consideration of concepts, methods and strategies introduced in Epidemiology I. The course focuses on methodological tools and skills needed to conduct or evaluate epidemiologic research and emphasizes tools and skills related to study design and data collection. Prerequisites: Epidemiology I and Biostatistics I or equivalents; Biostatistics II is strongly recommended and may be taken concurrently with Epidemiology II; this prerequisite may only be waived with the instructor's permission.

EPID 5343 Epidemiology III – Extends consideration of concepts, methods, and strategies introduced in Epidemiology I and II. The course focuses on methodological tools and skills needed to conduct or evaluate epidemiologic research and emphasizes tools and skills related to data analysis and interpretation. Prerequisites: Epidemiology I and Epidemiology II; Biostatistics I and Biostatistics II.

BIOS 5213 Biostatistics Computing with SAS I – Brief overview of software packages commonly used for data management and analysis that include Excel, Access, SPSS and Stata, followed by primary focus on use of SAS software in data management and recoding techniques. These include working with SAS libraries, inputting raw data, reading and writing from external files, using logical structures, using numerical and character functions, working with dates and using arrays. Course focuses on programming techniques with limited use of analytical procedures. Class activities include lecture/discussion and intensive programming work using SAS. Prerequisite: Prior completion or concurrent enrollment in Biostatistics I is recommended.

BIOS 5313 Nonparametric Methods – Comparison of parametric and nonparametric methods, choice of statistical model and method of analysis, practice in the use of various nonparametric techniques in the analysis of experiments involving one or more samples, and nonparametric methods of correlation. Prerequisite: BIOM 5013.

BIOS 5233 Statistical Methods for Clinical Trials – Principles underlying the planning, management, and implementation of modern clinical trials, the application of statistical methods used in the analysis of data from clinical trials and the interpretation of results. Basic statistical techniques used in design and analysis of Phase I-III single- and multicenter trials. Recommended prerequisites: basic statistics, SAS software. Prerequisite: BIOM 5013 and consent.

BIOS 6223 Biostatistics III - Survival analysis with covariates and grouping factors. Introduction to non-linear regression and pharmacokinetic models. Multivariate regression and multivariate analysis of

variance. Principle component and factor analysis. Introduction to clustering and classification methods. Introduction to time series. Prerequisite: BIOM 5023.

BIOS 5213 Application of Microcomputers to Data Management and Analysis – Brief overview of software packages commonly used for data management and analysis that include Excel, Access, SPSS and Stata, followed by primary focus on use of SAS software in data management and recoding techniques. These include working with SAS libraries, inputting raw data, reading and writing from external files, using logical structures, using numerical and character functions, working with dates and using arrays. Course focuses on programming techniques with limited use of analytical procedures. Class activities include lecture/discussion and intensive programming work using SAS.