

Doctor of Philosophy Program in Pharmacy

(Curriculum revised in 2024)

Curriculum Structure

| Course | Program | |
|--|-------------------|-------------------|
| | Plan 1 (Type 1.1) | Plan 2 (Type 2.1) |
| 1. Prerequisite Course not counted Credits | (2) | (2) |
| 2. Prerequisite Course counted Credits | - | 6 Credits |
| 3. Elective Courses not less than | - | 6 Credits |
| 4. Dissertation | 48 Credits | 36 Credits |
| Total not less than | 48 Credits | 48 Credits |

1. Prerequisite Course not counted Credits

| Code | Course | Credits |
|----------|-----------------------|----------|
| 0701 901 | Seminar in Pharmacy 1 | 1(0-3-0) |
| 0701 902 | Seminar in Pharmacy 2 | 1(0-3-0) |

2. Prerequisite Course counted Credits

| Code | Course | Credits |
|----------|---|----------|
| 0701 913 | Research Methodology in Pharmacy | 3(3-0-6) |
| 0701 920 | Statistical Methods for Pharmacy Research | 3(2-3-4) |

3. Elective Courses

| Code | Course | Credits |
|----------|--|----------|
| 0701 915 | Academic Writing and Presentation | 3(2-3-4) |
| 0701 917 | Business Management of Health Products | 3(3-0-6) |
| 0701 918 | Consumer Protection in Medicine and Health | 3(3-0-6) |
| 0701 921 | Quantitative Research Methods for Pharmacy | 3(2-3-4) |
| 0701 922 | Qualitative Research Methods for Pharmacy | 2(2-0-4) |
| 0701 923 | Advanced Primary Care Pharmacy | 2(2-0-4) |
| 0701 924 | Modern Medicine | 2(2-0-4) |
| 0701 925 | Innovation in New Drug Development | 2(2-0-4) |
| 0701 926 | Health Product and Health Service Entrepreneurship | 3(3-0-6) |
| 0702 901 | Current Topics in Pharmacy and Health Systems | 2(2-0-4) |

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| 0702 902 | Advanced Pharmacoepidemiology | 3(3-0-6) |
| 0702 903 | Evidence-Based Medicine | 2(2-0-4) |
| 0702 904 | Pharmacoeconomics | 3(3-0-6) |
| 0702 905 | Holistic Disease management | 2(2-0-4) |
| 0702 906 | Quality Improvement of Drug Use Systems | 2(2-0-4) |
| 0702 907 | Community Pharmacy | 2(2-0-4) |
| 0702 908 | Advanced Pharmacology | 3(3-0-6) |
| 0702 909 | Advanced Pharmacokinetics | 3(3-0-6) |
| 0702 910 | Research on Policy and Health Systems | 3(3-0-6) |
| 0702 911 | Advanced Pharmacotherapeutics | 2(2-0-4) |
| 0702 912 | Pharmaceutical Care in Patients with Infectious Diseases | 2(2-0-4) |
| 0702 913 | Pharmaceutical Care in Patients with Noncommunicable Diseases | 3(3-0-6) |
| 0702 914 | Clinical Trials and Research Ethics | 3(3-0-6) |
| 0702 915 | Program Evaluation | 2(2-0-4) |
| 0703 902 | Current Topics in Drug Delivery Systems | 2(2-0-4) |
| 0703 914 | Pharmaceutical Nanotechnology | 3(2-3-4) |
| 0703 915 | Advanced Formulation Techniques | 3(2-3-4) |
| 0703 916 | Advanced Phytochemistry | 3(2-3-4) |
| 0703 917 | Medicinal Chemistry of Natural Products | 3(3-0-6) |
| 0703 907 | Advanced Pharmaceutical Analysis | 3(2-3-4) |
| 0703 908 | Separation Techniques and Structure Elucidation of Organic Compounds | 3(2-3-4) |
| 0703 911 | Standardization of Medicinal Plants and Herbal Extracts | 2(1-3-2) |
| 0703 912 | Applied Thai Traditional Pharmacy | 3(2-3-4) |
| 0703 918 | Chinese Traditional Pharmacy | 2(2-0-4) |
| 0703 919 | Applied Ethnobotany and its Applications in Health Product Development | 3(3-0-6) |
| 0703 920 | Pharmaceutical Biochemistry | 3(3-0-6) |
| 0703 921 | Innovation for Health Product Development | 3(3-0-6) |

4. Dissertation

| Code | Course | Credits |
|----------|----------------------------------|-----------|
| 0701 951 | Dissertation (Plan 1 (Type 1.1)) | 48 Credit |
| 0701 952 | Dissertation (Plan 2 (Type 2.1)) | 36 Credit |

Example for Study Plan

| Course | Credits | |
|--|-------------------|-------------------|
| | Plan 1 (Type 1.1) | Plan 2 (Type 2.1) |
| Year 1, Semester 1 | | |
| 0701 901 Seminar in Pharmacy 1 | No Credit | - |
| 0701 913 Research Methodology in Pharmacy | - | 3(3-0-6) |
| 0701 95x Dissertation | 12 | - |
| 070x xxx Elective | - | 6 |
| Total | 12 | 11 |
| Year 1, Semester 2 | | |
| 0701 901 Seminar in Pharmacy 1 | - | No Credit |
| 0701 902 Seminar in Pharmacy 2 | No Credit | - |
| 0701 920 Statistical Methods for Pharmacy Research | - | 3(2-3-4) |
| 0701 xxx Dissertation | 9 | 12 |
| Total | 9 | 15 |
| Year 2, Semester 1 | | |
| 0701 902 Seminar in Pharmacy 2 | - | No Credit |
| 0701 95x Dissertation | 9 | 6 |
| Total | 9 | 6 |
| Year 2, Semester 2 | | |
| 0701 95x Dissertation | 6 | 6 |
| Total | 6 | 6 |
| Year 3, Semester 1 | | |
| 0701 95x Dissertation | 6 | 6 |
| Total | 6 | 6 |
| Year 3, Semester 2 | | |
| 0701 95x Dissertation | 6 | 6 |
| Total | 6 | 6 |

Course Description

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| 0701 901 | Seminar in Pharmacy 1 | 1(0-3-0) |
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Literature review of current topics in pharmacy; knowledge analysis; presentation and active participation in oral academic presentations

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| 0701 902 | Seminar in Pharmacy 2 | 1(0-3-0) |
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Critical review of literature; knowledge analysis; synthesis of research in pharmacy as a basis for dissertation; presentation and active participation in oral academic presentations

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| 0701 913 | Research Methodology in Pharmacy | 3(3-0-6) |
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Types of research; research conceptual frameworks; types of variables; research design and planning; principles of construction and selection of research tools; calculation of sample size and sampling weight; selection of appropriate statistics for variables; common basic statistics; univariate analysis

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| 0701 920 | Statistical Methods for Pharmacy Research | 3(2-3-4) |
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Sophisticated data recording for statistical analysis; biostatistics; probability distribution; sample distribution; analysis of variance; non-parametric statistics; parametric statistics for multivariate analysis; time-to-event analysis; correlation analysis; statistics for systematic reviews; data analysis specific to pharmaceutical sciences

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| 0701 915 | Academic Writing and Presentation | 3(2-3-4) |
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Formats and techniques in academic writing; analytical and critical reading; academic presentation and publication in reputable journals

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| 0701 917 | Business Management of Health Products | 3(3-0-6) |
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Application of theories and principles in business and marketing; analysis of customer behavior; improvement in communication skills and negotiation; customer satisfaction assessment; customer relationship management; business-related law; financial management; tools for organization quality assurance and improvement; ethics in business

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| 0701 918 | Consumer Protection in Medicine and Health | 3(3-0-6) |
| Application of theories in social sciences for consumer protection; health culture; behavior modification; risk management in medicine and health; communication for consumer protection; community and consumer empowerment; social measures and law enforcement | | |
| 0701 921 | Quantitative Research Methods for Pharmacy | 3(2-3-4) |
| Quantitative analysis methods commonly used in pharmacy practice; statistical methods and new techniques and their requirements; techniques for non-randomized studies; techniques for skewed data; techniques for repeated measures; quantitative analysis methods commonly used in pharmaceutical sciences | | |
| 0701 922 | Qualitative Research Methods for Pharmacy | 2(2-0-4) |
| Qualitative research methods in pharmacy; design and validation of instruments for data collection; data analysis; project management and publication; ethical issues | | |
| 0701 923 | Advanced Primary Care Pharmacy | 2(2-0-4) |
| Progress in primary care pharmacy, family medicine, and community medicine; analysis of health systems and policies involving the primary care system; evaluation of primary care service and drug systems in the community; health promotion and disease prevention for primary care pharmacy; roles of primary care pharmacists | | |
| 0701 924 | Modern Medicine | 2(2-0-4) |
| Modern sciences of biomolecules, pharmacogenomics, biopharmaceuticals, gene therapy; targeted immunotherapy; regenerative medicine; precision medicine; modern medicine in the health system | | |
| 0701 925 | Innovation in New Drug Development | 2(2-0-4) |
| Innovation in drug discovery technology and new active agent discovery; process of new drug, biological agent, and biosimilar development; pharmacological effect test; toxicity test; formulation development; clinical studies; drug registration; patent drug registration; post-marketing surveillance; development of generic drugs and bioequivalence; pharmacy research and development for herbal medicine and local wisdom; pharmaceutical industry in Thailand; national drug policy | | |

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| 0701 926 | Health Product and Health Service Entrepreneurship | 3(3-0-6) |
| Pharmaceutical and health products entrepreneurship; strategy development for healthcare products and services; marketing and branding for modern health entrepreneurs; case studies on the development of new entrepreneurs | | |
| 0702 901 | Current Topics in Pharmacy and Health Systems | 2(2-0-4) |
| Current key issues in pharmacy and the health system; the national health insurance system; techniques employed in the development of tools for pharmacy practice research; new techniques for economic evaluation; monitoring and evaluating payments; adjustment of health insurance system payments to incentivize health services | | |
| 0702 902 | Advanced Pharmacoepidemiology | 3(3-0-6) |
| Measurement of drug exposure and drug treatment outcomes; covariates; types of bias; methods to for addressing the bias problem; reviewing medical records; development of data collection models in epidemiological research; statistical methods for pharmacoepidemiology studies; meta-analysis; subgroup analysis | | |
| 0702 903 | Evidence-Based Medicine | 2(2-0-4) |
| Application of critical appraisals of evidence- based medicine into clinical practice; formulation and answering of clinical questions; searching medical and pharmacy research works; research work evaluation for validity and clinical utility; application of the evidence- based data in practice care and drug use evaluation; evidence- based data for nonprescription therapies for self-treating patients | | |
| 0702 904 | Pharmacoeconomics | 3(3-0-6) |
| Principles for the economic evaluation of drug treatment; cost study; epidemiological data management; economic modeling techniques; clinical outcomes measurement; measuring quality of life and utility; managing uncertainty with various techniques; model validation; impact analysis | | |
| 0702 905 | Holistic Disease management | 2(2-0-4) |
| Disease management concepts; chronic care models; health behavior theories; theories associated with organizational development within healthcare systems; indicators for monitoring the disease management system; data analytics applied for tracking service access and coverage; standard mortality rate | | |

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| 0702 906 | Quality Improvement of Drug Use Systems | 2(2-0-4) |
| <p>Approaches in quality improvement for medication use systems; strategies for improving medication- use processed in health systems in collaboration with patients, physicians, pharmacists, administrators and regulators</p> | | |
| 0702 907 | Community Pharmacy | 2(2-0-4) |
| <p>Application of theories and principles in business and marketing; analysis of customer behavior; improving communication skills and negotiation; measuring customer satisfaction; customer relationship management; laws related to community pharmacy; financial management; tools for organizational quality assessment and improvement; professional ethics in retail pharmacy management; public health problems; pharmaceutical care for health promotion; correct use of medicine in common illness and chronic diseases; role of community pharmacy in public health in foreign countries; development of community pharmacist competency to provide pharmacy services</p> | | |
| 0702 908 | Advanced Pharmacology | 3(3-0-6) |
| <p>Advanced theories of drug action or mechanisms of action; pharmacokinetic effects on drug action and drug interactions; methods and techniques in evaluation of organ or tissue responses in experimental animals; <i>in vitro</i> and <i>in vivo</i> models including ethics of using experimental animals</p> | | |
| 0702 909 | Advanced Pharmacokinetics | 3(3-0-6) |
| <p>Simulation models of biopharmaceuticals, pharmacokinetics and pharmacogenetics analysis of pharmacokinetic and pharmacodynamic data from routine clinical care and from drug development process; design of pharmacokinetic studies; pharmacogenetic studies; pharmacokinetic factors affecting absorption, distribution, metabolism and elimination; computer programs and statistics in pharmacokinetics</p> | | |
| 0702 910 | Research on Policy and Health Systems | 3(3-0-6) |
| <p>Goals and roles of the health system; basic components of the health system; theories about the health insurance system; household expenditure and financial impact; payments for health care providers and system costs; fundamental principles of analyzing large health service databases for monitoring and evaluating the system; policy analysis</p> | | |

0702 911 Advanced Pharmacotherapeutics 2(2-0-4)

Pharmacotherapy of standard treatment guidelines and evidence-based medicine for pharmaceutical care practice in infectious diseases, bone and joints diseases, cardiovascular system diseases, kidney diseases, and neurological and psychiatric disorders; a systematic approach to pharmaceutical care to prevent, monitor and resolve drug-related problems including adverse drug reactions

0702 912 Pharmaceutical Care in Patients with Infectious Diseases 2(2-0-4)

Applied knowledge of pharmacology, pharmacotherapy and antibiotic resistance for antibiotic selection, therapeutic goals, optimal therapeutic plans, dosage adjustment, and outcome monitoring; patient counseling through case studies based on clinical practice guidelines and evidence-based medicine

0702 913 Pharmaceutical Care in Patients with Noncommunicable Disease 3(3-0-6)

Pharmacotherapy; evidence-based medicine and a systematic approach in pharmaceutical care to prevent, monitor and resolve drug-related problems in important noncommunicable diseases including diabetes, obesity and metabolic syndromes, cardiovascular system disorders, cancer, and chronic respiratory diseases; health system for prevention and treatment of noncommunicable diseases

0702 914 Clinical Trials and Research Ethics 3(3-0-6)

Research methodology and statistics in clinical research; ethics in human research; research frameworks; clinical research design; reporting and quality assessment of clinical trials

0702 915 Program Evaluation 2(2-0-4)

Concepts and theories of program evaluation; types of evaluation; needs assessment; process evaluation; outcome evaluation; evaluation frameworks and indicators; tools and methods for evaluation; design and measurement in evaluation studies; methodology and lessons learned; writing proposals and reports

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| 0703 902 | Current Topics in Drug Delivery Systems | 2(2-0-4) |
| <p>Concept and theory of nasal, pulmonary, transdermal, parenteral, buccal, colonic, rectal, vaginal, ocular and gene delivery systems; current topics and issues in drug delivery technology</p> | | |
| 0703 914 | Pharmaceutical Nanotechnology | 3(2-3-4) |
| <p>Theory and preparation of polymeric nanoparticles, lipid nanocarriers, microemulsions, nanoemulsions and vesicular systems; measurement and evaluation of particle size; zeta potential; surface morphology; entrapment efficiency; release and permeation; stability tests; safety and toxicity studies; application of pharmaceutical nanotechnology</p> | | |
| 0703 915 | Advanced Formulation Techniques | 3(2-3-4) |
| <p>Preformulation; techniques for formulation and problem solving of liquid, semi-solid, solid and controlled release dosage forms</p> | | |
| 0703 916 | Advanced Phytochemistry | 3(2-3-4) |
| <p>Biosynthesis pathways of secondary metabolites important in medicinal plants; biological assay of the pharmacological active compounds in plants; discovery and development of natural products for developing new drugs; discussion of marketed drugs of natural origin</p> | | |
| 0703 917 | Medicinal Chemistry of Natural Products | 3(3-0-6) |
| <p>Drug discovery and development from medicinal plants; structural and physicochemical properties governing drug action; target of drug action; molecular interaction; drug potency; drug metabolism and pharmacokinetics; case studies and tools used in medicinal chemistry research</p> | | |
| 0703 907 | Advanced Pharmaceutical Analysis | 3(2-3-4) |
| <p>Pharmaceutical analysis and its applications in the study of drug stability; quantitative analysis in biological samples; statistical techniques and computer software for data calculation and analysis</p> | | |

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| 0703 908 | Separation Techniques and Structure Elucidation of Organic Compounds | 3(2-3-4) |
| <p>Extraction and separation techniques of active compounds from medicinal plants; liquid-liquid extraction; solid phase extraction; extraction methods for individual chemical groups; separation by chromatography methods; thin layer chromatography; rotation planar separation; medium pressure separation; high pressure separation; structure elucidation of organic compounds by mass spectrometry; infrared spectroscopy; nuclear magnetic resonance spectroscopy</p> | | |
| 0703 911 | Standardization of Medicinal Plants and Herbal Extracts | 2(1-3-2) |
| <p>Standardization of medicinal plants according to pharmacopoeia; Thai industrial standards of herbal extracts; qualitative and quantitative evaluation of herbal drugs and herbal extracts using various methods</p> | | |
| 0703 912 | Applied Thai Traditional Pharmacy | 3(2-3-4) |
| <p>Sources of medicine including, plants, animals, minerals and micro-organisms; properties and tastes of Thai traditional medicines; formulation and analysis of Thai traditional medicine preparation</p> | | |
| 0703 918 | Chinese Traditional Pharmacy | 2(2-0-4) |
| <p>Historical background of Chinese traditional medicine; etiology and pathology of disorders; medicinal plants in Chinese traditional medicine; formulation; complicated interactions between chemical ingredients in Chinese traditional formulas; classification of formulas; pharmaceutical dosage forms; principles of herbal therapy</p> | | |
| 0703 919 | Applied Ethnobotany and its Applications in Health Product Development | 3(3-0-6) |
| <p>Relationship between people and local plants; social impact of plants on human culture; utilization of plants by the local people for food and medicines; ethnobotany research and applications in health product development</p> | | |

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| 0703 920 | Pharmaceutical Biochemistry | 3(3-0-6) |
| Physicochemical properties of biomolecules; protein structure and function; enzyme kinetics and catalysis; carbohydrate and glycobiology; nucleotides and nucleic acids; lipids and biomembranes; metabolism of biomolecules; biosignaling; bioenergetic and biochemical reaction types; oxidative phosphorylation and photophosphorylation; regulation of gene expression; hormonal regulation and integration of mammalian metabolism; case study in pharmaceutical biochemical research | | |

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| 0703 921 | Innovation for Health Product Development | 3(3-0-6) |
| Healthcare product supply chains; related rules and regulations; health product research and development; advanced technology in the production of herbal and cosmeceutical products; innovation in herbal and cosmeceutical products | | |

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| 0701 951 | Dissertation (Plan 1 (Type 1.1)) | 48 Credits |
| Defining research problems; designing and developing a research proposal; conducting research; analyzing research data; writing a dissertation and disseminating research findings which contribute to a new body of knowledge or new methodology in the area of pharmacy under close supervision of a dissertation advisory committee | | |

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|---|---|-------------------|
| 0701 952 | Dissertation (Plan 2 (Type 2.1)) | 36 Credits |
| Defining research problems; designing and developing a research proposal; conducting research; writing a dissertation and disseminating research findings which contribute to a new body of knowledge or new methodology in the area of pharmacy under close supervision of a dissertation advisory committee | | |