



# GRADUATE PROGRAMS

FACULTY OF PHARMACEUTICAL SCIENCES  
KHON KAEN UNIVERSITY



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Assistant Professor Dr. Narin Chansri  
Dean of Faculty of Pharmaceutical Sciences

# Doctor of Philosophy Program in Research and Development in Pharmaceuticals









# Doctor of Philosophy Program in Research and Development in Pharmaceuticals

Faculty of Pharmaceutical Sciences  
General information



## • Program

Doctor of Philosophy (Research and Development in  
Pharmaceuticals)



## • Degree

Ph.D. (Research and Development in Pharmaceuticals)



## • Total credits

Type 1.1	48 credits (3 year program)
Type 1.2	72 credits (4 year program)
Type 2.1	48 credits (3 year program)
Type 2.2	72 credits (4 year program)



## • Study plan

- 1) Type 1.1 Dissertation only
- 2) Type 1.2 Course work and Dissertation
- 3) Type 2.1 Course work and Dissertation
- 4) Type 2.2 Course work and Dissertation



## • Language (Mode of teaching)

Thai and English



## • Future career after graduation

- (1) Researcher
- (2) University Instructor
- (3) Industrial pharmacist
- (4) Compounding pharmacist

## ● Program structure

	Program structure			
	Type 1.1	Type 1.2	Type 2.1	Type 2.2
1) Compulsory	2*	3*	2	3
2) Electives I	-	1**	7	7
Electives II		2**	3	14
3) Dissertation	48	72	36	48
	<b>48</b>	<b>72</b>	<b>48</b>	<b>72</b>

Note: Type 1.1, 2.1 for Master's Degree or equivalent

Type 1.2, 2.2 for Bachelor's Degree or equivalent

\* Compulsory for Type A/1, A1/2 (audit)

## Compulsory

Code	Course	Credit
PS617 991	Seminar I	1(1-0-3)
PS617 992	Seminar II	1(1-0-3)
PS617 993	Seminar III	1(1-0-3)

## Electives I

Code	Course	Credit
PS617 830	Application of Statistics in Pharmaceutical Research	2(1-2-4)
PS617 831	Instrumental Analysis in Pharmaceutical Sciences	3(2-3-6)
PS617 832	Consideration for Pharmaceutical Research	2(2-0-4)
PS617 833	Academic communication and presentation	2(2-0-4)

## Electives II

### Subject Groups

#### I : Drug Discovery Technologies

Code	Course	Credit
PS617 834	Advanced Medicinal Chemistry	3(3-0-6)
PS617 835	Synthesis of Organic Medicinal Agents	3(3-0-6)
PS617 836	Spectroscopy in Medicinal Chemistry	3(3-0-6)
PS617 837	Techniques in Medicinal Chemistry	3(3-0-6)
PS617 838	Drug Discovery from Natural Sources	3(2-3-6)
PS617 839	Natural Products for Health	3(3-0-6)
PS617 842	Biological Matrices and Trace Analysis	2(1-3-4)

#### II : Pharmaceutical Biotechnology

Code	Course	Credit
PS617 840	Drug and Xenobiotic Metabolism	3(3-0-6)
PS617 841	Application of Biotechnology in Pharmaceutical Sciences	2(1-3-4)
PS617 843	Selected Topics in Pharmaceutical Molecular Genetics	1(1-0-2)
PS617 849	Advancement in Pharmaceutical Nanotechnology	2(2-0-4)
PS617 851	Concepts of Biosimilar and Bioequivalence	1(1-0-2)
PS617 852	Pharmaceutical Plant Tissue Culture	2(1-3-4)

#### III : Drug Delivery and Pharmaceutical Quality Assurance

Code	Course	Credit
PS617 842	Biological Matrices and Trace Analysis	2(1-3-4)
PS617 844	Development of Drug Delivery Systems	2(2-0-4)
PS617 845	Pharmacokinetics for Product Development	2(2-0-4)
PS617 846	Development and Selection of Pharmaceutical Excipients	2(1-3-4)
PS617 847	Drug Stability Influencing Formulation Development	2(2-0-4)
PS617 848	Analytical Method Validation	2(1-3-4)
PS617 849	Advances in Pharmaceutical Nanotechnology	2(2-0-4)
PS617 850	Development of Pharmaceutical Products	1(1-0-2)

## Dissertation

Code	Course	Credit
PS617 996	Dissertation	72 credits
PS617 997	Dissertation	48 credits
PS617 998	Dissertation	48 credits
PS617 999	Dissertation	36 credits

## Example for Study Plan Type 1.1, 1.2

Year 1, Semester 1		Credits	
		Type 1.1	Type 1.2
PS617 991	Seminar I	1(1-0-3)	1(1-0-3)
PSXXX XXX	Elective Courses; Group I	-	1-3 (1 subject)
PSXXX XXX	Elective Courses; Group II	-	1-3 (1 subject)
PS617 996	Dissertation	-	9
PS617 997	Dissertation	9	-
<b>Total credits</b>		<b>10</b>	<b>12-16</b>
<b>Accumulate credits</b>		<b>9</b>	<b>9</b>

Year 1, Semester 2		Credits	
		Type 1.1	Type 1.2
PS617 992	Seminar II	1(1-0-3)	1(1-0-3)
PSXXX XXX	Elective Courses; Group II	-	1-3 (1 subject)
PS617 996	Dissertation	-	9
PS617 997	Dissertation	9	-
<b>Total credits</b>		<b>10</b>	<b>11-13</b>
<b>Accumulate credits</b>		<b>18</b>	<b>18</b>

Year 2, Semester 1		Credits	
		Type 1.1	Type 1.2
PS617 993	Seminar II	-	1(1-0-3)
PS617 996	Dissertation	-	9
PS617 997	Dissertation	9	-
<b>Total credits</b>		<b>9</b>	<b>9</b>
<b>Accumulate credits</b>		<b>27</b>	<b>27</b>

Year 2, Semester 2		Credits	
		Type 1.1	Type 1.2
PS617 996	Dissertation	-	9
PS617 997	Dissertation	9	-
<b>Total credits</b>		<b>9</b>	<b>9</b>
<b>Accumulate credits</b>		<b>36</b>	<b>36</b>

Year 3, Semester 1		Credits	
		Type 1.1	Type 1.2
PS617 996	Dissertation	-	9
PS617 997	Dissertation	9	-
<b>Total credits</b>		<b>9</b>	<b>9</b>
<b>Accumulate credits</b>		<b>45</b>	<b>45</b>

Year 3, Semester2		Credits	
		Type 1.1	Type 1.2
PS617 996	Dissertation	-	9
PS617 997	Dissertation	3	-
<b>Total credits</b>		<b>3</b>	<b>9</b>
<b>Accumulate credits</b>		<b>48</b>	<b>54</b>



Year 4, Semester 1		Credits	
		Type 1.1	Type 1.2
PS617 996	Dissertation	-	9
<b>Total credits</b>		-	<b>9</b>
<b>Accumulate credits</b>		-	<b>63</b>

Year 4, Semester 2		Credits	
		Type 1.1	Type 1.2
PS617 996	Dissertation	-	9
<b>Total credits</b>		-	<b>9</b>
<b>Accumulate credits</b>		-	<b>72</b>

### Example for Study Plan Type 2.1, 2.2

Year 1, Semester 1		Credits	
		Type 2.1	Type 2.2
PS617 830	Application of Statistics in Pharmaceutical Research	2(1-2-4)	2(2-0-4)
PS617 831	Instrumental Analysis in Pharmaceutical Sciences	3(2-3-4)	3(2-3-4)
PS617 832	Consideration for Pharmaceutical Research	2(2-0-4)	2(2-0-4)
PSXXX XXX	Elective Courses	3	3
<b>Total credits</b>		<b>10</b>	<b>10</b>
<b>Accumulate credits</b>		<b>10</b>	<b>10</b>

Year 1, Semester 2		Credits	
		Type 2.1	Type 2.2
PS617 991	Seminar I	1(1-0-3)	1(1-0-3)
PS617 xxx	Elective II	-	8
PS617 898	Dissertation	-	9
PS617 999	Dissertation	9	-
<b>Total credits</b>		<b>10</b>	<b>18</b>
<b>Accumulate credits</b>		<b>19</b>	<b>19</b>

  

Year 2, Semester 1		Credits	
		Type 2.1	Type 2.2
PS617 992	Seminar II	1(1-0-3)	1(1-0-3)
PS617 xxx	Elective II	-	3
PS617 998	Dissertation	-	6
PS617 999	Dissertation	8	-
<b>Total credits</b>		<b>9</b>	<b>10</b>
<b>Accumulate credits</b>		<b>28</b>	<b>29</b>

Year 2, Semester 2		Credits	
		Type 2.1	Type 2.2
PS617 993	Seminar III	-	1(1-0-3)
PS617 998	Dissertation	-	9
PS617 999	Dissertation	9	-
<b>Total credits</b>		<b>9</b>	<b>10</b>
<b>Accumulate credits</b>		<b>37</b>	<b>39</b>

Year 3, Semester 1		Credits	
		Type 2.1	Type 2.2
PS617 998	Dissertation	-	9
PS617 999	Dissertation	9	-
<b>Total credits</b>		<b>9</b>	<b>9</b>
<b>Accumulate credits</b>		<b>46</b>	<b>48</b>

Year 3, Semester 2		Credits	
		Type A2/1	Type A2/2
PS617 998	Dissertation	-	9
PS617 999	Dissertation	2	-
<b>Total credits</b>		<b>2</b>	<b>9</b>
<b>Accumulate credits</b>		<b>48</b>	<b>57</b>

Year 4, Semester 1		Credits	
		Type 2.1	Type 2.2
PS627 998	Dissertation	-	9
<b>Total credits</b>		<b>-</b>	<b>9</b>
<b>Accumulate credits</b>		<b>-</b>	<b>66</b>

Year 4, Semester 2		Credits	
		Type 2.1	Type 2.2
PS627 999	Dissertation	-	6
<b>Total credits</b>		<b>-</b>	<b>6</b>
<b>Accumulate credits</b>		<b>-</b>	<b>72</b>

## Course description

<b>PS617 830</b>	<b>Application of Statistics in Pharmaceutical Research</b>	<b>2(1-2-4)</b>
Prerequisite : No		
Selection and application of statistic for the pharmaceutical research, experimental design, data analysis and conclusions by mean of statistic		
<b>PS617 831</b>	<b>Instrumental Analysis in Pharmaceutical Sciences</b>	<b>3(2-3-6)</b>
Prerequisite : No		
Analytical methods of drugs and chemical compounds by using spectrophotometry, i.e., UV-visible Spectrophotometry, Spectrofluorometry, FT-IR, NIR and chromatography, i.e., TLC, CC, HPLC, UHPLC and Capillary Electrophoresis technique		
<b>PS617 831</b>	<b>Instrumental Analysis in Pharmaceutical Sciences</b>	<b>3(2-3-6)</b>
Prerequisite : No		
Analytical methods of drugs and chemical compounds by using spectrophotometry, i.e., UV-visible Spectrophotometry, Spectrofluorometry, FT-IR, NIR and chromatography, i.e., TLC, CC, HPLC, UHPLC and Capillary Electrophoresis technique		
<b>PS617 832</b>	<b>Consideration for Pharmaceutical Research</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Drug discovery process, acute and chronic toxicity tests in animals, pharmacokinetics of drugs in animals and human, research and development in pharmacodynamics, preclinical and clinical studies and research ethics		
<b>PS617 833</b>	<b>Academic Communication and Presentation</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Effective writing and academic communication procedure, skill in specialized field for review literature and communication, document presentation in academic articles, reports, theses and oral presentation, ethics and rights with respect to the academic writing and communication		

<b>PS617 834</b>	<b>Advanced Medicinal Chemistry</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Applications of chemical, physical and biological principles to rational drug design and development process, traditional and modern approaches as well as innovative drug design strategies, methodologies and impacts from technology leading to drug design and development, bioinformatics, diseases on target diseases for research. Case studies		
<b>PS617 835</b>	<b>Synthesis of Organic Medicinal Agents</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Reaction of synthesis of organic medicinal compounds classified by their functional groups. Mechanisms of the reactions of carbon and heterocyclic compounds		
<b>PS617 836</b>	<b>Spectroscopy in Medicinal Chemistry</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Theories and principles used to determine structure, conformation and configuration using infrared, mass spectrometer, nuclear magnetic resonance with an emphasis on spectroscopic methods used in solving structural problems and in analyzing biological molecules		
<b>PS617 837</b>	<b>Techniques in Medicinal Chemistry</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Combinatorial chemistry, quantitative structure-activity relationship, computer used in molecular design studies, molecular modeling and simulation of the interaction between drug molecule and biological target		
<b>PS617 838</b>	<b>Drug Discovery from Natural Sources</b>	<b>3(2-3-6)</b>
Prerequisite : No		
History of drug discovery from natural sources. Isolation, purification, screening tests of function groups and some specific pharmacological activities for the bioactive compounds		

<b>PS617 839</b>	<b>Natural Products for Health</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Definition and significance of health, concepts for health promotion, natural therapy, food and health, nutraceuticals, sources and values of food, health products from plants and their parts, health products from animals and minerals, national health policy, regulations and laws related to health food		
<b>PS617 840</b>	<b>Drug and Xenobiotic Metabolism</b>	<b>3(3-0-6)</b>
Prerequisite : No		
Mechanism of biotransformation of drug and xenobiotics catalyzed by enzymatic reactions, including phase 0, I, II, and III. Molecular and biochemical factors affecting basic mechanisms of enzyme inhibition/ induction. Drug-drug or drug-xenobiotic interaction. Genetic polymorphism and pharmacogenetics		
<b>PS617 841</b>	<b>Application of Biotechnology in Pharmaceutical Sciences</b>	<b>2(1-3-4)</b>
Prerequisite : No		
Principle of pharmaceutical biotechnology and advanced molecular and biotechnological-related techniques. Biotechnological derived pharmaceutical products. Gene therapy. Advanced bioinformatics in pharmaceutical sciences		
<b>PS617 842</b>	<b>Biological Matrices and Trace Analysis</b>	<b>2(1-3-4)</b>
Prerequisite : No		
Extraction and analytical methods of compounds in biological matrices and trace analysis techniques using solid phase extraction, pre- and post-column derivatization in cooperation with high performance liquid chromatography-electrochemical detector, high performance liquid chromatography-spectrofluorometer, high performance liquid chromatography-ultraviolet-visible detector, liquid chromatography-mass spectrophotometry and gas chromatography-mass spectrophotometry		
<b>PS617 843</b>	<b>Selected Topics in Pharmaceutical Molecular Genetics</b>	<b>1(1-0-2)</b>
Prerequisite : No		
Current selected topic in molecular genetics focusing on biotechnological derived pharmaceutical products. Direction, consideration, and ethical concerns on genetically modified pharmaceutical products		

<b>PS617 844</b>	<b>Development of Drug Delivery Systems</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Principle and strategy of physicochemical pharmacy in drug delivery system development. Factors influencing drug delivery system design. Mechanisms of drug targeting and utilization of these mechanisms in the development of delivery systems for drugs and macromolecules		
<b>PS617 845</b>	<b>Pharmacokinetics for Pharmaceuticals Development</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Development and screening of optimal pharmaceutical products through prediction and simulation of in vitro/in vivo, correlation between laboratory findings and pharmacokinetic study in animals or humans		
<b>PS617 846</b>	<b>Development and Selection of Pharmaceutical Excipients</b>	<b>2(1-3-4)</b>
Prerequisite : No		
Principles of the pharmaceutical excipient selection. Preformulation study using the relevant physicochemical characteristics of pharmaceutical excipients. Development of pharmaceutical excipients		
<b>PS617 847</b>	<b>Drug Stability Influencing Formulation Development</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Principle of drug stability, compatibility of drug and pharmaceutical excipients. Evaluation of drug products, methods of stability testing and techniques to improve drug stability, prediction of expiry date of drug using computerize simulation program, study design of stability of pharmaceutical dosage forms		
<b>PS617 848</b>	<b>Analytical Method Validation</b>	<b>2(1-3-4)</b>
Prerequisite : No		
Regulations, analytical method validation, quality control for pharmaceutical products, instrumental calibration and good laboratory practice		



<b>PS617 849</b>	<b>Advancement in Pharmaceutical Nanotechnology</b>	<b>2(2-0-4)</b>
Prerequisite : No		
Nanotechnology, pharmaceutical nanotechnology, bionanotechnology. Current advances in applications of nanotechnology in delivery of drugs, cosmetics and nutrients, in diagnostic agents, therapeutics and environmental hygiene, toxicity of nanomaterials		
<b>PS617 850</b>	<b>Development of Pharmaceuticals</b>	<b>(1-0-2)</b>
Prerequisite : No		
Principles, design, dosage form, factors of dosage form design		
<b>PS617 851</b>	<b>Concepts of Biosimilar and Bioequivalence</b>	<b>1(1-0-2)</b>
Prerequisite : No		
Biologic drugs and biosimilars generic drugs and bioequivalence, concepts for validation and selection of the high quality of the biologic drug and generic drug compared to the original one		
<b>PS617 852</b>	<b>Pharmaceutical Plant Tissue Culture</b>	<b>2(1-3-4)</b>
Prerequisite : No		
Principles and basic technique of plant tissue culture, organization of tissue culture laboratory and equipment, composition and preparation of nutrient media for plant tissue culture, plant tissue techniques, storage of plant cell culture, transferring of the plantlets from nutrient medium to soil, applications of plant tissue culture technique for the secondary metabolite production, variety selection, controlling of culture condition, feeding of precursor, elicitation, immobilization, transformation by Agrobacterium, plant tissue culture in bioreactor, application of for improvement of plant or plant tissue with high yield production of secondary metabolite which possesses pharmaceutical activity		
<b>PS617 991</b>	<b>Seminar I</b>	<b>1(1-0-3)</b>
Prerequisite : No		
Survey, review, discussion group working and presentation of recent interesting research aspect in research and development in pharmaceuticals		



<b>PS617 992</b>	<b>Seminar II</b>	<b>1(1-0-3)</b>
Prerequisite : No		
Survey, review, discussion group working and presentation of recent interesting research aspect possibly related to doctoral dissertation		
<b>PS617 993</b>	<b>Seminar III</b>	<b>1(1-0-3)</b>
Prerequisite : No		
Survey, review, discussion group working and presentation of research aspect related to doctoral dissertation		
<b>PS617 997</b>	<b>Dissertation</b>	<b>48 credits</b>
Prerequisite : No		
Research of high quality illustrating the innovation of concept or knowledge or technology applicable to the pharmaceuticals or related area, identification, writing dissertation, a poster presentation or oral presentation in the international conference, national and international publications of the dissertation in national and international journals ethics in research and writing article		
<b>PS617 998</b>	<b>Dissertation</b>	<b>48 credits</b>
Prerequisite : No		
Research of high quality illustrating the innovation of concept or knowledge or technology applicable to the pharmaceuticals or related areas. Identification, solving the problem scientifically, ethics in research and writing article and presenting in a dissertation form, a poster presentation or an oral presentation in an international conference, an international publication of the dissertation		
<b>PS617 999</b>	<b>Dissertation</b>	<b>36 credits</b>
Prerequisite : No		
Research of high quality illustrating the innovation of concept or knowledge or technology applicable to the pharmaceuticals or related areas. Identification, solving the problem scientifically, ethics in research and writing article and presenting in a dissertation form, a poster presentation or an oral presentation in an international conference, an international and a national publication of the dissertation		