Appendix D

Program Learning Outcomes

Table 1: Comparison between before and after revised objective of the program

Objective of the Program	Revised Objectve of the Program
เมื่อสิ้นสุดการเรียนการสอนตามหลักสูตรแล้ว ดุษฎีบัณฑิตจะมีความรู้ ความสามารถ และคุณธรรมจริยธรรมแห่งวิชาชีพ ดังนี้ ๑. มีคุณธรรม จริยธรรม และพฤติกรรมถูกต้องเหมาะสม ตามจรรยาบรรณแห่งวิชาชีพ ๒. มีความรู้ความสามารถในการติดตามความก้าวหน้าทางวิชาการใน สาขาวิชาเภสัชศาสตร์ ๓. ประยุกต์วิชาการด้านเภสัชศาสตร์ชีวภาพ ค้นคว้าวิจัย หรือสร้างนวัตกรรม เพื่อพัฒนาวิทยาศาสตร์และเทคโนโลยีได้ ๔. มีทักษะในการทำงานเป็นกลุ่ม สามารถจัดงานส่วนรวมได้สำเร็จลุล่วงตามวัตถุประสงค์ได้อย่างเหมาะสม มีความคิดริเริ่มสร้างสรรค์ มีความรับผิดชอบต่อหน้าที่และสังคม ๕. คัดกรองข้อมูลนำมาประยุกต์เพื่อการศึกษาและนำเสนอผลงาน สามารถสื่อสารอย่างมีประสิทธิภาพโดยใช้เทคโนโลยีสารสนเทศที่เหมาะสมกับบุคคลกลุ่มต่างๆ ได้	At the end of the course, Ph.D. (Biopharmaceutical Sciences) graduates are able to: 1. Have moral and suitable behavior according to code of ethics in professional 2. Acquire knowledge and be able to persue advance technology in biopharmaceutical sciences 3. Conduct self-directed research and apply the knowledge to develop science and technology 4. Work cooperatively as a team to the benefit of the society 5. Communicate, analyze and evaluate the scientific information by using appropriate information technology

Table 2: Relationship between objective of the program and program learning outcome

Objective of the Program	Program Learning Outcome*				
	PLO1	PLO2	PLO3	PLO4	PLO5
1. Have moral and suitable behavior according to code of ethics in professional	✓		✓		
2. Acquire knowledge and be able to persue advance technology in biopharmaceutical sciences		✓			
3. Conduct self-directed research and apply the knowledge to develop science and technology	✓		✓		
4. Work cooperatively as a team to the benefit of the society				✓	
5. Communicate, analyze and evaluate the scientific information by using appropriate information technology					✓

Program Learning Outcome*

PLO1 Create and conduct innovative research in each specialized major area either in advanced knowledge or technology with ethical responsibility

PLO2 Integrate principles in biopharmaceutical sciences for implementation of such techniques to facilitate the development of biopharmaceutical research

PLO3 Analyze the need for biopharmaceutical knowledge to address pressing social concerns and develop motivation for life-long learning

PLO4 Work effectively with others in multidisciplinary sciences

PLO5 Communicate the implementation of scientific information by using appropriate information technology

Table 3: Learning and Assessment Strategies for Program Learning Outcomes Evaluation

PLOs	Learning Method	Assessment
Create and conduct innovative research in each specialized major area either in advanced knowledge or technology with ethical responsibility	1) Lecture 2) Assignment 3) Discussion	1) Examination 2) Classroom behavioral observation 3) Students' punctuality from class attendance and submission of works 4) Quality of assignment
Integrate principles in biopharmaceutical sciences for implementation of such techniques to facilitate the development of biopharmaceutical research	1) Project assignment and presentation 2) Assessment and evaluation of research articles	1) Quality of assignment 2) Presentation evaluation 3) Examination
Analyze the need for biopharmaceutical knowledge to address pressing social concerns and develop motivation for life-long learning	1) Assignment 2) Discussion 3) Seminar 4) Assessment and evaluation of research articles	1) Behavioral observation 2) Presentation evaluation 3) Quality of assignment
Work effectively with others in multidisciplinary sciences	1) Group assignment and presenation 2) Group participation and discussion	1) Classroom behavioral observation 2) Student evaluation toward their group member, including oneself 3) Quality of assignment
Communicate the implementation of scientific information by using appropriate information technology	1) Presentation 2) Assignment 3) Discussion	1) Classroom behavioral observation 2) Quality of assignment 3) Presentative evaluation

Table 4: Relationship between Courses of the Program and Program Learning Outcomes

Code	Name	Credits	PLOs				
			1	2	3	4	5
GRID 603	Biostatistics	3 (3-0-6)	R	R			R
SCID 500	Cell and Molecular Biology	3 (3-0-6)	R	R	R		
PYID 685	Research Methodology in Pharmacy I	2 (2-0-4)	R	R	R	P/ R	R
PYBS 667	Integrative Seminar in Biopharmaceutical Sciences	1 (1-0-2)	R	R	R	P/ R	R
PYBS 679	Current Topics in Biopharmaceutical Sciences	2 (2-0-4)	R	R	R	P/ R	R
PYBS 668	Seminar in Biopharmaceutical Sciences	1 (1-0-2)	R	R	R	P/ R	R
PYMI 684	Applied Microbiology in Pharmacy	3 (2-3-5)	M	M	M	P/ R	R
PYMI 686	Pharmaceutical Biological Products	3 (3-0-6)	R	M	M		
PYBC 674	Advanced Biopharmaceutical Biochemistry	3 (3-0-6)	M	M	R		
PYBC 676	Applied Clinical Biochemistry	3 (3-0-6)	M	M	M		R
PYPM 684	Special Topics in Pharmacology	3 (3-0-6)	M	M	M		R
PYPM 687	Advanced Pharmacology	3 (3-0-6)	M	M	M		R
PYPS 691	Physiological Control System	3 (3-0-6)	R	M	R		R
PYPS 692	Special Topics in Physiology	3 (3-0-6)	R	M	R		R
PYMI 664	Industrial Pharmaceutical Microbiology	3 (2-3-5)	R	M	M	P/ R	M
PYMI 665	Quality Assessment and Microbiological Control	3 (2-3-5)	M	M	M	P/ R	M
PYMI 694	Biomolecular Techniques for Biopharmaceutical Sciences	3 (2-3-5)	M	M	M		R
PYMI 695	Basic Techniques in Animal Cell Culture	2 (1-3-3)	P	R	R		R

Code	Name	Credits	PLOs				
			1	2	3	4	5
PYBC 670	Human Metabolism	3 (3-0-6)	R	R		R	
PYBC 671	Biochemical Techniques for Drug Research and Development	3 (3-0-6)	R	R	R	P/R	R
PYBC 672	Biochemical Technology Laboratory	2 (0-6-2)	P/R	P/R	R	P/R	R
PYBC 673	Principle of Biomolecular Analysis	3 (3-0-6)	R	R	R		
PYBC 675	Biochemical Knowledge of Chemical and Biological Warfare	3 (3-0-6)	R	R	R		
PYPM 664	Essentials in Toxicology	3 (2-3-5)	P/R	P/R	R		R
PYPM 666	Drug Screening Techniques I	3 (3-0-6)	P/R	P/R	R	P/R	R
PYPM 678	Adverse Drug Actions	3 (3-0-6)	R	R	R		
PYPS 673	Current Topics in Pathophysiology	3 (3-0-6)	R	R	R	P/R	R
PYPS 693	Aging and Anti-aging	3 (3-0-6)	R	R	R	P/R	R
PYPS 695	Advanced Physiology in Renal System	3 (3-0-6)	R	R	R		R
PYPS 696	Advanced Physiology in Cardiovascular System	3 (3-0-6)	R	R	R		R
PYPS 697	Advanced Physiology in Endocrine System	3 (3-0-6)	R	R	R		R
PYID 699	Dissertation	36 (0-108-0)	M	M	M	M	M
PYID 799	Dissertation	48 (0-144-0)	M	M	M	M	M

I = ELO is introduced & assessed
R = ELO is reinforced & assessed
P = ELO is practiced & assessed
M = Level of Mastery is assessed