



DOCTOR OF PHILOSOPHY PROGRAM IN BIOTECHNOLOGY

■ FACULTY OF SCIENCE

DOCTOR OF PHILOSOPHY PROGRAM IN BIOTECHNOLOGY

This doctoral program prepares professionals for positions of leadership responsibility in biotechnology. As a multidisciplinary program, representative prior degrees admitted include agriculture, biology, botany, genetic, biochemistry, microbiology, chemistry, and engineering. Networking with off campus practicing experts to serve as guest lecturers, coupled with linkages in research endeavors, enables the graduates to effectively function in diverse settings.

Our distinguished program places the emphasis on particular aspects in enzyme biotechnology, renewable resource technology, plant cell culture, and molecular biotechnology.



Objectives

The program has identified as desirable for graduates the following attributes:

- In-depth professional knowledge in Biotechnology.
- Analysis and Synthesis: ability to think clearly, systematically on one's own, ready to keep up with rapidly changing trends in the field.
- Communication: demonstration of communicative skills of a high level, including effective interpersonal interactions with teams.
- Ethics: striving continually and independently to secure further knowledge and understanding with appropriate ethical standards, with proper attitudes and responsible to the community and environment.
- Research expertise: advancing and applying research findings germane to Biotechnology.

Admission

In accordance with the Graduate School Rules and Regulations. The program committee reserves the rights to require more qualifications as deemed appropriate.

Medium of Instruction

Thai and English

Research Focus

- Enzyme Biotechnology
- Renewable Resource Technology
- Plant Cell Technology
- Molecular Biotechnology

Requirement for Graduation

In accordance with the Graduate School Rules and Regulations.



Doctor of Philosophy Program in Biotechnology

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Structure of the Program

1. Credit Requirements. *

Requirements	Option 1.1	Option 2.1	Option 2.2
Coursework	-	12	24
Core Courses	-	3	9
Electives	-	9	15
Required Non-credit Courses	7	7	7
Dissertation	48	36	48
Total	48	48	72

* Minimum credits required.

2. Core Courses

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Advanced Molecular Bioscience	-	-	-	-	275512	3
Instrumentation in Biotechnology	-	-	-	-	275572	3
Aspects in Biotechnology	-	-	275611	3	275611	3
Total	0	0	1	3	3	9

3. Electives

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Applications of Molecular Markers	-	-	110542	3	-	-
Advanced Enzyme Technology	-	-	110661	3	-	-
Bioprocess Design	-	-	110671	3	-	-
Advanced Gene Technology	-	-	275513	3	275513	3
Environmental Biotechnology	-	-	-	-	275541	3
Biotechnology for Waste and Wastewater Treatment	-	-	-	-	275543	3
Biodegradation and Bioremediation	-	-	-	-	275544	3
Renewable Resources Technology	-	-	-	-	275545	3
Plant Genetics Resources	-	-	-	-	275554	3
Advanced Plant Biotechnology	-	-	-	-	275555	3
Bioinformatics	-	-	-	-	275573	3
Molecular Systematics and Evolution	-	-	-	-	275574	3
Special Topics in Biotechnology	-	-	-	-	275581	3
Plant Biochemistry and Molecular Biology	-	-	275651	3	275651	3
Plant Metabolic Engineering	-	-	275652	3	275652	3
Molecular Biology of Parasites	-	-	275653	3	275653	3
Total	-	-	7	≥9	13	≥15

4. Required Non-credit Courses.

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Advanced Research Methodology in Science and Technology	275601	3	275601	3	275601	3
Seminar in Biotechnology I	275695	1	275695	1	275695	1
Seminar in Biotechnology II	275696	1	275696	1	275696	1
Seminar in Biotechnology III	275697	1	275697	1	275697	1
Seminar in Biotechnology IV	275968	1	275968	1	275968	1
Total		7		7		7

5. Dissertation Credit Requirements.

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Dissertation I, Type 1.1	275701	6	-	-	-	-
Dissertation II, Type 1.1	275702	8	-	-	-	-
Dissertation III, Type 1.1	572703	8	-	-	-	-
Dissertation IV, Type 1.1	275704	8	-	-	-	-
Dissertation V, Type 1.1	275705	9	-	-	-	-
Dissertation VI, Type 1.1	275706	9	-	-	-	-
Dissertation I, Type 2.1	-	-	275790	7	-	-
Dissertation II, Type 2.1	-	-	275791	9	-	-
Dissertation III, Type 2.1	-	-	275792	10	-	-
Dissertation IV, Type 2.1	-	-	275793	10	-	-
Dissertation I, Type 2.2	-	-	-	-	275794	5
Dissertation I, Type 2.2	-	-	-	-	275795	8
Dissertation I, Type 2.2	-	-	-	-	275796	8
Dissertation I, Type 2.2	-	-	-	-	275797	9
Dissertation I, Type 2.2	-	-	-	-	275798	9
Dissertation I, Type 2.2	-	-	-	-	275799	9
Total	6	48	4	36	6	48

Course Descriptions

110542 Applications of Molecular Markers 3(2-3-5)

DNA, principle of DNA markers, DNA marker technologies and their applications in genetics.

110661 Advanced Enzyme Technology 3(2-3-5)

A study of the following topics: chemical structure of enzymes; kinetics and mechanisms of enzyme action; industrial enzyme production and control; extraction and purification; immobilized enzyme techniques and properties; applications of enzymes in food industries; and environments, medicine, and bioassays.

110671 Bioprocess Design 3(2-3-5)

Systematic approaches to process design including selection of biocatalysts and raw materials, upstream and downstream unit operations, developing process flow diagrams, process analysis and simulation using software packages, and economic analysis of manufacturing processes.

275512 Advanced Molecular Bioscience 3(3-0-6)

Examination of structures and functions of organelles at the molecular level, cell metabolism, flow of genetic information, mutation, DNA repair, recombination, cell communication, cell-environment interaction, cancer, and the application of cell technologies.

275513 Advanced Gene Technology 3(2-3-6)

Principles and advanced principles used in recombinant DNA technology; DNA markers; the isolation of genes of interest; recombinant protein production; genetically modified organisms; gene therapy; and genome, transcriptome, and proteome analysis.

275541 Environmental Biology**3(2-3-6)**

Theories and practices in current advances in biotechnology emphasising ecology, investigation of various environments and the biochemical processes to apply in the management of pollution generated by industrial and agricultural sectors, and environmental conservation.

275543 Biotechnology for Waste and Wastewater Treatment 3(2-3-6)

The treatment of wastewater and solid waste in both organic and inorganic forms by applying biotechnological, biomechanical, and microbiological processes to obtain the highest level of efficiency.

275544 Biodegradation and Bioremediation**3(2-3-6)**

The principles of biodegradation processes of bio-material and synthetic material that cause contamination resulting from industrial, agricultural, and domestic activities; and various bioremediation techniques used to improve contaminated sites along with the monitoring and evaluation of these processes.

275545 Renewable Resource Technology**3(2-3-6)**

A study of the use of agricultural waste for producing gas and liquid fuel, chemical and biological processes, the value of energy produced by biomass, various forms of gas fuel production, butanol production, and alcohol production.

275554 Plant Genetics Resources**3(2-3-6)**

The principles of plant genetics resources, gene populations and biodiversity, and the conservation of threatened and endangered plant species including common varieties in Thailand.

275555 Advanced Plant Biotechnology**3(2-3-6)**

Advanced techniques of plant cell and tissue culture for micro-propagation, crop improvement, secondary metabolite production, gene transformation and genetic engineering techniques, and plant genome projects.

275572 Instrumentation in Biotechnology**3(2-3-6)**

The use and maintenance of essential biotechnological instruments as well as industrial biotechnology, and plant and animal technology.

275573 Bioinformatics**3(2-3-6)**

Computer programs and software, information technology, databases for DNA and RNA analysis, structures and functions of genes and proteins, and molecular evolution and systems.

275574 Molecular Systematics and Evolution**3(2-3-6)**

The classification of organisms using molecular data and mechanisms for evolution and phylogenetic relationships.

275581 Special Topics in Biotechnology**3(2-3-6)**

Study, analysis, and discussion of current topics of interest in biotechnology.

275601 Advanced Research Methodology in Science and Technology 3(3-0-6)

Research processes, characteristics and goals, determining the research problem, variables and hypotheses, data collection, advanced statistical analysis, proposal and research writing, research evaluation and application, research ethics, proper techniques and research methodology in science and technology specifically in biotechnology.

275611 Aspects in Biotechnology**3(3-0-6)**

A study of aspects in biotechnology disciplines especially the role of biotechnology in agriculture, industry, medicine, and the environment and the impacts of biotechnology on human life.

275651 Plant Biochemistry and Molecular Biology**3(3-0-6)**

Plant metabolic pathways and biosynthesis; plant cell structure; light reaction of photosynthesis and photosynthetic carbon assimilation; respiration; synthesis and mobilisation of storage and structural carbohydrates; nitrogen and sulfur metabolism; phloem transport; plant storage of proteins and lipid biosynthesis; structure, function, and types of secondary metabolites in plants; signals regulating the growth and development of plant organs; the genome of plant cells; protein biosynthesis; and plant gene technology.

275652 Plant Metabolic Engineering**3(3-0-6)**

This course includes: plant secondary metabolism, agrobacterium, natural metabolic engineers of plants, metabolic engineering of crop and medicinal plants, gene expression in plant biosynthetic pathways, plant molecular farming, and plant based medicine.

275653 Molecular Biology of Parasites**3(2-3-6)**

A study of the application of molecular biology techniques in the genetic engineering of parasites, DNA amplification, DNA analysis, and transformation of DNA.

275695 Seminar in Biotechnology 1**1(0-2-1)**

The first reading, discussion, and presentation of research topics in biotechnology for the purpose of studying the body of knowledge of the following topics: food development; agriculture and the use of biotechnology for standards determination and quality assurance of products in public health, medicine, the environment, clean energy production, and current techniques in biotechnology.

275696 Seminar in Biotechnology 2**1(0-2-1)**

The second reading, discussion and presentation of research topics in biotechnology for the purpose of studying the body of knowledge of the following topics: food development; agriculture and the use of biotechnology for standards determination and quality assurance of products in public health, medicine, the environment, clean energy production, and current techniques in biotechnology.

275697 Seminar in Biotechnology 3**1(0-2-1)**

The third reading, discussion and presentation of research topics in biotechnology for the purpose of studying the body of knowledge of the following topics: food development; agriculture and the use of biotechnology for standards determination and quality assurance of products in public health, medicine, the environment, clean energy production, and current techniques in biotechnology.

275698 Seminar in Biotechnology 4**1(0-2-1)**

The fourth reading, discussion and presentation of research topics in biotechnology for the purpose of studying the body of knowledge of the following topics: food development; agriculture and the use of biotechnology for standards determination and quality assurance of products in public health, medicine, the environment, clean energy production, and current techniques in biotechnology.

275701 Dissertation 1, Option 1.1**6Credits**

Examination of the body of knowledge of a topic of interest in the field of biotechnology in order to determine the concepts and frameworks for a dissertation proposal.

275702 Dissertation 2, Option 1.1**8Credits**

Conducting a preliminary investigation of the proposed research under the supervision of the dissertation advisory committee.

275703 Dissertation 3, Option 1.1**8Credits**

Conducting an ongoing preliminary investigation of the proposed research under the supervision of the dissertation advisory committee and submitting a dissertation proposal for discussion together with a progress report.

275704 Dissertation 4, Option 1.1**8Credits**

Continuing the research under the supervision of the dissertation advisory committee and submitting progress reports.

275705 Dissertation 5, Option 1.1**9Credits**

Continuing the research under the supervision of the dissertation advisory committee and preparing a draft research dissertation to be submitted for examination.

275706 Dissertation 6, Option 1.1**9Credits**

Analysing the research data and preparing for the writing of the dissertation under the guidance of the dissertation advisory committee, and upon examination making any necessary alterations of rectifications prior to submitting the finalized dissertation to the Graduate School.

275790 Dissertation 1, Option 2.1**7Credits**

Students will conduct a literature review of relevant journals and research articles in a topic of interest in the field of biotechnology and will determine the concepts and frameworks for a proposed thesis under the guidance of the thesis advisory committee.

275791 Dissertation 2, Option 2.1**9Credits**

Conducting ongoing research under the established frameworks and guidance of the dissertation advisory committee and presenting a progress report to the committee.

275792 Dissertation 3, Option 2.1**10 Credits**

Continuing the research under the guidance of the dissertation advisory committee, preparing a draft thesis proposal for examination, and submitting a progress report.

275793 Dissertation 4, Option 2.1**10 Credits**

Analysing the research data and preparing for the writing of the thesis under the guidance of the dissertation advisory committee, and upon examination making any necessary alterations of rectifications prior to submitting the finalised dissertation to the Graduate School.

275794 Dissertation 1, Option 2.2**5Credits**

Examining the body of knowledge of a topic of interest in the field of biotechnology in order to determine the concepts and frameworks for a dissertation proposal.

275795 Dissertation 2, Option 2.2**8Credits**

Acquiring additional data and undertaking planning for experimental design for the dissertation research under the guidance of the research advisory committee.

275796 Dissertation 3, Option 2.2**8Credits**

Designing experiments and conducting research towards the dissertation under the guidance of the dissertation advisory committee and also preparing a proposal for presentation to the committee for discussion.

275797 Dissertation 4, Option 2.2**9Credits**

Examination of the dissertation by the dissertation committee, continuance of the research under the guidance of the dissertation advisory committee, and submission a progress report.

275798 Dissertation 5, Option 2.2**9Credits**

Continuing the research under the guidance of the dissertation advisory committee, preparing manuscripts for publication and a draft research dissertation, and submitting them to the committee together with research progress reports.

275799 Dissertation 6, Option 2.2**9Credits**

Concluding the research, preparing to write a dissertation under the guidance of the dissertation advisory committee, undertaking a dissertation defense, and making any necessary alterations or modifications before submitting the completed dissertation to the Graduate School.