

Department of Biotechnology

Doctor of Philosophy Program in Biotechnology (International Program)

Ph.D. (Biotechnology)

Option 1.1:

Total credits required: minimum 48 credits

(1) Major courses: minimum 7 Credits (audit)

- Seminar: 4 credits

01051697	Seminar	1,1,1,1
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- Major requirements: 3 credits

01051691	Advanced Research Methods in Agro-industry Biotechnology	3(3-0-6)
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(2) Thesis: minimum 48 credits

01051699	Thesis	1-48
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Option 2.1:

Total credits required: minimum 48 credits

(1) Major courses: minimum 12 credits

- Seminar: 4 credits

01051697	Seminar	1,1,1,1
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- Major requirements: 3 credits

01051691	Advanced Research Methods in Agro-industry Biotechnology	3(3-0-6)
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- Major electives: minimum 5 credits

Students are required to choose 600 level electives in biotechnology field at least 3 credits and 500 level elective from biotechnology field or related field. He/she must gain approval from advisory committee, Head of Department, and the Dean of the Graduate School.

01051521	Product Recovery Technology	3(3-0-6)
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01051522	Sucrose Chemistry and Technology	3(3-0-6)
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01051523	Advanced Starch Technology	3(3-0-6)
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01051525	Probiotics and Application in Agro-Industry	3(3-0-6)
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01051532	Computer Application for Bioprocess	3(3-0-6)
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01051562	Advanced Industrial Fermentation Processes	3(2-3-6)
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01051563	Immobilization of Biocatalysts	3(2-3-6)
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01051564	Biodegradation and Bioremediation	3(3-0-6)
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01051566	Genetic Engineering for Agriculture, Industry and Environment	3(3-0-6)
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01051621	Advanced Product Recovery Technology	3(3-0-6)
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01051631	Biosystems Engineering	3(3-0-6)
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01051661	Advanced Gene Technology	3(3-0-6)
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01051662	Advanced in Regulation and Control of Microbial Synthesis	3(3-0-6)
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01051696	Selected Topics in Biotechnology	1-3
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01051698	Special Problems	1-3
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(2) Thesis: minimum 36 credits

01051699	Thesis	1-36
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Course Description

01051521	Product Recovery Technology Separation of cell and biochemical compounds from the cell. Cell disintegration and clarification of the extract. Precipitation, chromatography method, aqueous two phase systems, reverse micelles, liquid membranes, and membrane technology.	3(3-0-6)
01051522	Sucrose Chemistry and Technology Physical and chemical characteristics of sucrose. Substitution of hydroxyl group in the molecule of sucrose. Production of subunits of sucrose alcohol, ester and the products resulted from the binding between metals and sucrose.	3(3-0-6)
01051523	Advanced Starch Technology Kinetics of starch molecule break-down. Process of starch production and chemical reactions in producing various subunits from starch including industrial utilization.	3(3-0-6)
01051525	Probiotics and Application in Agro-Industry Characteristics of probiotic microorganisms. Role of probiotics in gastrointestinal tract and health effects of probiotics. Inhibition properties against pathogen. Production of probiotics and stability. Encapsulation technology. Beneficial effect on human and animal health. Application of probiotic in agro-industry.	3(3-0-6)
01051532	Computer Application for Bioprocess Computer application in bioprocesses. Building of mathematical model for bioprocesses. Problems solving by computer. Computer control applied in production. Cases study.	3(3-0-6)
01051562	Advanced Industrial Fermentation Processes Advanced processes in order to increase the productivity of fermentation products. Combination of novel processes in the field of microbial genetic engineering and chemistry for the production of high value products from the low value raw material.	3(2-3-6)
01051563	Immobilization of Biocatalysts Types of biocatalysts, immobilization processes of biocatalysts. Characteristic and stability of immobilized enzyme and microbial cell. Types of bioreactor and application in agro-industry.	3(2-3-6)
01051564	Biodegradation and Bioremediation Principle of biodegradation and bioremediation for biological organic and xenobiotic materials in environment. Mechanisms of biodegradation of lignocellulose, aromatic compound, polymer, organic hazardous materials. Biodegradation improvement by genetic and protein engineering. Bioremediation techniques and case studies.	3(3-0-6)
01051566	Genetic Engineering for Agriculture, Industry and Environment Genetic engineering application to agriculture, industry and environment. Gene design for production control. Fermentation design and product recovery for genetic engineered and fused strain. Quality control of biological products. Gene manipulation of organism for agriculture, industry and environment.	3(3-0-6)
01051621	Advanced Product Recovery Technology Principle of protein isolation from microorganisms. Biocatalysts from microorganism resulting from DNA recombinants. Gel separation techniques, ion-exchange chromatography, electrophoresis including chromatographic techniques of industrial level.	3(3-0-6)
01051631	Biosystems Engineering Metabolic pathway engineering of cells. Modeling microbial responses in food and	3(3-0-6)

biosystems. Advanced process control and industrial automation of fermentation processes. Advanced cell cultivation engineering. Development of sustainable bioprocesses.

01051661	Advanced Gene Technology	3(3-0-6)
	Increasing the efficiency of mutation of microorganisms by building up localized mutation. DNA fusion into cell and DNA fate in chromosome. DNA probe technology. Evaluation of initial cell selection for industrial application. Bioinformatics for genomics, proteomics and metagenomics. Application to the biotechnological industry	
01051662	Advanced in Regulation and Control of Microbial Synthesis	3(3-0-6)
	Mechanism of controlling biochemical compound synthesis from microorganism by using gene systems. Induction of plasmolysis. Environmental factors related to the synthesis including translocation of chemical to the microbial cell. Applications in fermentation industry.	
01051691	Advanced Research Methods in Agro-industry Biotechnology	3(3-0-6)
	Advanced research in biotechnology in Agro-Industry and preparation of research proposal, computer application for data processing and retrievals, data analysis, article writing and presentation, group discussion. Paper preparation for presentation and publication.	
01051696	Selected Topics in Biotechnology	1-3
	Selected topics in Biotechnology at the doctoral degree level. Topics are subject to change each semester.	
01119697	Seminar	1
	Presentation and discussion on interesting topics in biotechnology at the doctoral degree level.	
01051698	Special Problems	1-3
	Study and research in biotechnology at the doctoral degree level and compile into a written report.	
02742699	Thesis	1-36
	Research at the doctoral degree level and compile into a thesis.	