UNIVERSITAS GADJAH MADA
GRADUATE SCHOOL

2021

Academic Handbook

STUDY PROGRAM DOCTOR IN BIOTECHNOLOGY

Foreword

The Academic Guidelines of the Doctoral Program in Biotechnology serve as a comprehensive reference for the implementation of postgraduate education in the field of biotechnology at Universitas Gadjah Mada. This document complements the Academic Handbook of the Graduate School of Universitas Gadjah Mada (2018) and provides more detailed information specific to the Doctoral Program in Biotechnology.

This handbook outlines the program's historical background, vision and mission, educational objectives, graduate profiles, and learning outcomes. It also describes the academic organization, available facilities, teaching and learning processes, academic administration and regulations, curriculum structure, teaching staff, and course descriptions.

The Doctoral Program in Biotechnology is designed to develop researchers and scholars with advanced competence, independence, and integrity in biotechnology. The program adopts an interdisciplinary and research-oriented approach, integrating knowledge and methodologies from agricultural, environmental, industrial, and medical biotechnology. Supported by 11 faculties within Universitas Gadjah Mada, the program provides a robust academic environment that encourages innovation and collaboration across disciplines to address global and national challenges through biotechnology.

The preparation of this handbook is the result of collaboration among the Program Management Team and faculty members involved in the Doctoral Program in Biotechnology. We extend our sincere appreciation to all contributors for their commitment and effort in finalizing this document. It is our hope that the information contained herein will be useful for students, academic staff, and other stakeholders in supporting the effective implementation of doctoral education in biotechnology.

We welcome constructive feedback and suggestions for future improvements to ensure the continuous enhancement of the quality and relevance of the program.

Yogyakarta, August 2021

Program coordinator

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INTRODUCTION

The Doctoral Program in Biotechnology, Universitas Gadjah Mada, is a multidisciplinary study program that involves expertise and teaching staff from various faculties within the university that are related to biotechnology. Since its establishment, the program has undergone three accreditation cycles. In the most recent cycle in 2021, based on the decree of the National Accreditation Board for Higher Education (BAN-PT) No. 13382/SK/BAN-PT/Akred-PMT/D/XII/2021, the program was awarded an "Excellent" accreditation status, valid from 15 December 2021 until 15 December 2026.

Recent global conditions, such as the COVID-19 pandemic and climate change, have accelerated the advancement and application of biotechnology across sectors. The demand for biotechnology-based products and services—particularly in health, agriculture, industry, and the environment—continues to rise. Indonesia, in particular, needs to strengthen its human resources capable of mastering and applying biotechnology in these five areas. To address this need, the Doctoral Program in Biotechnology UGM has developed five concentrations (areas of specialization): Medical Biotechnology, Industrial Biotechnology, Agricultural Biotechnology, Environmental Biotechnology and Biomedical Engineering. These concentrations are designed to foster scientific innovation and to contribute to solving national and global challenges through biotechnology.

To enhance the competence of its graduates, the Doctoral Program in Biotechnology has established collaborative partnerships with various governmental and private institutions, both nationally and internationally. The program actively provides diverse opportunities for students, including double-degree programs, collaborative research, joint supervision, community engagement, workshops, and scientific seminars.

HISTORICAL BACKGROUND

The Doctoral Program in Biotechnology is one of the study programs under the Graduate School of Universitas Gadjah Mada. Its establishment originated from the founding of the Inter-University Center (PAU) for Biotechnology, a national initiative supported by the Directorate General of Higher Education to advance biotechnology development in Indonesia.

The PAU for Biotechnology UGM was established in 1985, based on the Decree of the Minister of Education and Culture of the Republic of Indonesia No. 909/D/T/1986 dated 15 May

1986, with financial support from the World Bank XVII project (1986–1995). It was one of three PAU Biotechnology Centers in Indonesia. Subsequent funding was obtained through the URGE Grant (IBRD Loan No. 3754-IND) from the 1994/1995 to 1998/1999 fiscal years.

Drawing on its experience in research and education, and responding to growing interest from other universities in developing biotechnology in Indonesia, the PAU for Biotechnology UGM proposed the establishment of a Doctoral Program in Biotechnology in 1995. Initially, this program was offered as a specialization within the Doctoral Program in Mathematics and Natural Sciences (MIPA).

Following the Rector's Decree No. 25/P/SK/HKTL/2001 on the reorganization of university centers into study centers, the PAU for Biotechnology was officially transformed into the Biotechnology Study Center (Pusat Studi Bioteknologi UGM). The doctoral program was subsequently formalized as an independent program in 2003, under the Graduate School, based on Decree No. 01/J01.4/OT/SK/3 issued by the Director of the Graduate Program.

In 2006, through Rector's Decree No. 89/P/SK/HT/2006, the Doctoral Program in Biotechnology was officially categorized as a multidisciplinary program managed by the Graduate School. The program's legal foundation was further strengthened by Rector's Decree No. 525/P/SK/HT/2008, issued on 21 November 2008, concerning the restructuring and reauthorization of academic programs at Universitas Gadjah Mada. Its operational permit was renewed twice—through Rector's Decree No. 791/P/SK/HT/2013 and No. 605/P/SK/HT/2015—and remained valid until 20 November 2017.

Since its inception, the Doctoral Program in Biotechnology has undergone three rounds of accreditation by BAN-PT. Based on BAN-PT Decree No. 018/BAN-PT/Ak-X/S3/XI/2011, issued on 18 November 2011, the program was accredited with an "A" (Excellent) rating, which it consistently maintained through subsequent evaluations until 2016. In the most recent accreditation cycle (2021), the program once again achieved the "Excellent" accreditation status under Decree No. 13382/SK/BAN-PT/Akred-PMT/D/XII/2021.

The Doctoral Program in Biotechnology is housed in the Inter-University Center for Postgraduate Studies Building, South-West Wing, Universitas Gadjah Mada, located at Jl. Teknika Utara, Barek, Yogyakarta. Contact information:

Phone: (0274) 902284, (0274) 564305

Fax: (0274) 520842

Email: biotech.sps@ugm.ac.id

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VISION, MISSION, OBJECTIVES, AND GRADUATE COMPETENCIES

A. Vision

The Doctoral Program in Biotechnology, Graduate School of Universitas Gadjah Mada, envisions becoming a pioneer of internationally recognized doctoral education in biotechnology in Indonesia, dedicated to serving the interests of the nation and humanity, inspired by cultural values and grounded in Pancasila.

B. Mission

The missions of the Doctoral Program in Biotechnology are as follows:

1. To deliver internationally recognized doctoral education in biotechnology that supports the successful careers of graduates and contributes to improving the quality of life of the nation.
2. To advance biotechnology research that strengthens education and enriches scientific, technological, and cultural development.
3. To establish and expand national and international collaborations with educational institutions, research organizations, government bodies, industries, and communities.Tujuan Program Studi

C. Objectives

The objectives of the Doctoral Program in Biotechnology are to:

1. Realize the vision and mission of the program through excellent academic implementation.
2. Produce highly qualified educators and researchers in biotechnology who are competitive at both the national and international levels.
3. Cultivate graduates with academic integrity, moral values, and ethical responsibility in conducting biotechnology research and innovation.

D. Graduate Profiles

Graduates of the Doctoral Program in Biotechnology are expected to possess advanced expertise and leadership qualities in biotechnology, enabling them to contribute to the development of science, technology, and innovation. The graduate profiles of the program are as follows:

1. Higher Education Academic Staff

Scholars and educators who possess a comprehensive understanding of biotechnology and are capable of delivering higher education and conducting advanced research in line with the latest scientific developments.

2. Biotechnology Researchers

   Researchers who are able to design and conduct high-level research in biotechnology, analyze complex biological systems, and provide innovative solutions to challenges in health, agriculture, industry, and the environment.

3. Biotechnology Entrepreneurs

   Professionals who apply their scientific knowledge and technological skills to develop biotechnological products and services that contribute to social welfare and sustainable economic growth

E. Core Competencies

Graduates of the Doctoral Program in Biotechnology are expected to achieve the following core competencies:

1. Demonstrate a strong understanding of academic integrity, including the concepts of plagiarism, its consequences, and effective strategies for prevention.
2. Master the philosophical foundations and scientific principles of molecular and cellular biology, molecular and cellular engineering, interactions among cells, tissues, organs, and organisms with their environments, as well as the analysis of biomass and biomolecules.
3. Graduates are also expected to understand the concepts of cell, tissue, and organ propagation for large-scale biotechnology production at an advanced level.
4. Understand the regulations and ethical considerations related to the use of genetically modified organisms and microorganisms for both research and commercial purposes.
5. Be capable of advancing and expanding scientific knowledge and producing innovative biotechnological products by designing, executing, and developing research methods that integrate laboratory instruments and software tools to improve human quality of life.

F. Supporting Competencies

In addition to core competencies, graduates are expected to demonstrate the following supporting competencies:

1. Communicate scientific ideas, concepts, and research findings effectively, both orally and in writing, to the international scientific community as well as to the general public.
2. Apply their research outcomes to develop technological innovations that can be utilized for the benefit of society.
3. Function as principal investigators or research leaders capable of initiating, managing, and supervising biotechnological research projects with scientific rigor and ethical responsibility.

G. Facilities

The teaching and learning activities of the Doctoral Program in Biotechnology are conducted in the Inter-University Center Building, South-West Wing, Universitas Gadjah Mada. The building consists of four floors, each designed to support academic and research activities with modern facilities and infrastructure.

First Floor

The first floor consists of:

1. One lecture room (capacity: 30 persons)
2. One examination room
3. Biochemistry Laboratory (capacity: 25 persons) which also includes two collaborative research rooms shared with the One Health program
4. One technician room
5. Three researcher offices
6. One storage room for consumable materials

Second Floor

The second floor includes:

1. The administrative office and academic affairs office
2. Four program management offices
3. One meeting room (capacity: 20 persons)

4. A bioinformatics analysis computer room
5. A collaborative workspace with the Nara Institute of Science and Technology (NAIST), Japan, which also serves as a bioinformatics support room
6. A dining area
7. A Microbiology Laboratory (capacity: 24 persons) equipped with a discussion room, two researcher offices, and a culture room

Third Floor

The third floor consists of:

1. Two co-working spaces for master's and doctoral students
2. A musholla (prayer room)
3. Two lecture and seminar rooms (capacity: 15 and 60 persons)
4. A Genetic Engineering Laboratory (capacity: 24 persons), comprising one staff room, one discussion room, two culture rooms, one researcher office, and one workshop room

Fourth Floor

The fourth floor contains four greenhouse units (kasa houses) that support agricultural biotechnology research, particularly for the cultivation, maintenance, and experimental treatment of plants.

General Facilities

All lecture rooms are equipped with computers, LCD projectors, air conditioning, sound systems, and internet access. The laboratories are furnished with essential and advanced research instruments, including: thermocyclers, centrifuges, refrigerated centrifuges, shaker incubators, −80°C freezers, liquid nitrogen tanks, laminar air flow cabinets, NanoDrop spectrophotometers, qPCR machines, freeze dryers, fermentors, ELISA readers, electrophoresis units, water baths, and other standard laboratory equipment.

Additional facilities such as libraries, prayer rooms, health service units, and sports facilities are provided by the Graduate School and Universitas Gadjah Mada to support the academic and non-academic needs of students.

Supporting Research Facilities

Doctoral students also have access to a wide range of university-managed research laboratories located in the supporting faculties of the Biotechnology Program. These include:

1. Agrotropical Learning Center (AGLC)
2. Animal Science Learning Center (ASLC)
3. Integrated Laboratory for Testing and Research (LPPT)
4. Integrated Forest Farming Learning Center (IFFLC)
5. Advanced Pharmaceutical Sciences Learning Center (APSLC)
6. These facilities enhance interdisciplinary collaboration and provide students with access to high-standard laboratories, analytical services, and research environments for advanced biotechnology studies.

ORGANISATION

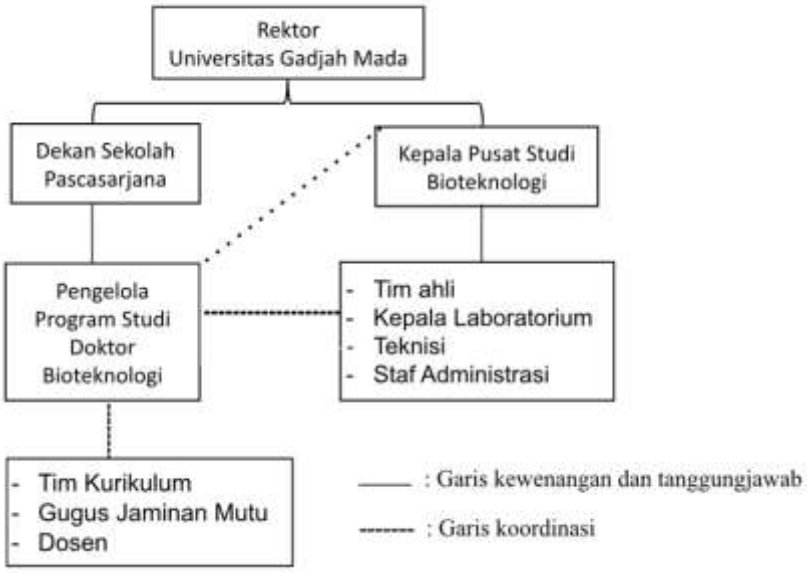

Figure 1. Organizational Structure of the Doctoral Program in Biotechnology

The Rector, serves as the chief executive officer of the university and is responsible for leading and formulating policies related to the implementation of education, research, and community service, as well as for fostering the academic community within the university. In carrying out the management and supervision of the Graduate School, the Rector is assisted by the Vice Rector for

Education, Research, and Community Service, and the Director for Academic Administration Affairs.

The Dean of the Graduate School, responsible for leading and formulating policies concerning the implementation of education, teaching, research, and community service, as well as for fostering the academic community within the Graduate School. In carrying out these duties, the Dean is assisted by the Vice Dean for Academic, Student Affairs, and Collaboration, and the Vice Dean for Finance, Assets, and Human Resources. At present, the Graduate School of Universitas Gadjah Mada oversees 13 multidisciplinary study programs, including the Doctoral Program in Biotechnology.

Head of the Biotechnology Study Center, responsible for leading the implementation of research and studies in the field of biotechnology. The Study Center also provides facilities to support education and the development of biotechnology, including activities under the Biotechnology Study Programs.

The Program Management Team of the Doctoral Program in Biotechnology, responsible for leading and managing the implementation of education, teaching, and community service within the Doctoral Program in Biotechnology at Universitas Gadjah Mada. The team oversees academic activities, ensures compliance with university regulations, and supports the continuous improvement of academic quality and program outcomes.

Curriculum Team, consists of representatives from the 11 supporting faculties of the Biotechnology Program. This team is responsible for designing, evaluating, and revising the curriculum in accordance with advancements in scientific knowledge, technological development, and the evolving needs of stakeholders and the job market.

The Academic Staff, are lecturers who deliver the courses offered in the 2021 curriculum of the Doctoral Program in Biotechnology. They come from the 11 supporting faculties within Universitas Gadjah Mada and meet the academic qualifications required to teach at the doctoral level. These lecturers contribute to teaching, research supervision, and academic guidance, ensuring that the program maintains its multidisciplinary strength.

The Administrative and Supporting Staff, personnel responsible for the execution of educational and teaching activities, administrative and financial management, laboratory technical assistance, and maintenance services. They play a vital role in supporting the operational and academic processes of the Doctoral Program in Biotechnology.

The Laboratories, serve as service units that provide space, equipment, and chemical materials for practical sessions and research activities within the Biotechnology Study Center of Universitas Gadjah Mada. These laboratories support both educational and research functions, ensuring that students and faculty members have access to high-quality facilities for experimental and applied biotechnology research.

LEARNING PROCESS IMPLEMENTATION

The learning process in the Doctoral Program in Biotechnology begins with the registration of newly admitted students and the re-registration of continuing students. Registration is carried out through the Registration Division of the Directorate of Academic Affairs (DA) Universitas Gadjah Mada, in accordance with the applicable university regulations.

Students who have completed registration and fulfilled the necessary requirements are entitled to participate in the academic activities offered during that semester. The courses provided include compulsory courses and elective courses that support the dissertation. The total study load and the selection of courses must comply with the academic regulations governing the Doctoral Program in Biotechnology at Universitas Gadjah Mada.

Learning System

The learning system of the Doctoral Program in Biotechnology follows the Semester Credit System (Sistem Kredit Semester – SKS). The learning process is conducted in accordance with the Doctoral Program Handbook of the Graduate School (2020), and consists of the following components:

a. Coursework
b. Preparation of the dissertation proposal
c. Dissertation research
d. Presentation of dissertation research findings

e. Preparation of scientific articles for publication

f. Dissertation writing

Study Load and Semester Credit System

The study load of students and the teaching load of lecturers in the Doctoral Program in Biotechnology are expressed in Semester Credit Units (Satuan Kredit Semester – SKS). Throughout the duration of study, doctoral students are required to complete a minimum of 46 SKS for the regular track and 44 SKS for the by-research track.

The definition and calculation of SKS follow the provisions stated in the Doctoral Program Handbook of the Graduate School (2020). One SKS is equivalent to 45 hours of academic activities, which may include direct classroom sessions, structured individual or group assignments, independent study, laboratory work, or other academic engagements. This regulation is in accordance with Article 27 of the Rector's Regulation No. 23 of 2024 on Education, which governs the credit equivalence and academic workload standards at Universitas Gadjah Mada.

EDUCATIONAL ADMINISTRATION

Study Registration

Study registration is the administrative process undertaken by newly admitted students at the beginning of the academic year to obtain official student status within the Doctoral Program in Biotechnology, Universitas Gadjah Mada. This process is regulated by both the University and the Graduate School.

After receiving a Student Identification Number (NIM), new students are required to report to the Academic Affairs Office of the Doctoral Program in Biotechnology to register for the courses they will take during the current semester. This registration ensures that each student is formally enrolled and recognized as an active participant in the academic activities of the program. All students must also re-register at the beginning of every semester to maintain their active student status. The re-registration procedure, including schedules and specific instructions, is determined and announced each semester by the Universitas Gadjah Mada Directorate of Academic Affairs. Detailed information can be accessed via the Directorate's official website: https://akademik.ugm.ac.id/category/herregistrasi/

Supervisory Committee (Promoter Team)

The Supervisory Committee (Promoter Team) is appointed by the Dean of the Graduate School of Universitas Gadjah Mada. The committee members are proposed by the doctoral program based on the student's research interest and alignment with the expertise required for the dissertation topic.

Upon assignment, the prospective supervisory committee convenes a meeting with the Head of the Doctoral Program to determine the supporting coursework that the student must undertake. The agreement from this meeting is documented in the Minutes of the Supervisory Committee Meeting.

The Supervisory Committee is responsible for:

1. Providing academic supervision in research, including preparation of the research proposal, implementation of research, and dissertation writing;
2. Ensuring that the scope, academic weight, and execution of the research meet the required standards and are completed on time;
3. Ensuring that students fulfill the publication requirements stipulated by the program; and
4. Supervising a number of students in accordance with the applicable regulations.

Academic Administration and Learning Activities

A. Study Plan Card (KRS) Completion

The registration of academic activities is conducted by students through the completion of the Study Plan Card (Kartu Rencana Studi – KRS) in accordance with the Academic Guidelines. KRS completion is carried out online via the Simaster system. Students can fill in the KRS after uploading proof of registration and a valid student card on Simaster. When preparing the study plan, students are required to consult with their Academic Advisor or Dissertation Supervisor to obtain guidance, direction, approval, and endorsement of their KRS**.**

B. Procedures for KRS Completion

The procedures for completing the KRS are regulated by the Academic Division of the Doctoral Program in Biotechnology and the Graduate School of Universitas Gadjah Mada as follows:

1. KRS is completed online via Simaster. The schedule for KRS completion is determined by the University and the Graduate School.
2. Students who fail to complete their KRS within the specified period will be subject to sanctions and must report immediately to the Program Management Team.
3. Course codes and schedules must be entered carefully. Any error in course coding will prevent the KRS from being processed by the Academic Office and will be the sole responsibility of the student.
4. The total course load may not exceed 20 SKS (credit units). If the student registers for more than the allowed number of credits, the Program Management Team reserves the right to reject or not approve the KRS.
5. The KRS, once approved and signed by the Program Management Team, must be submitted to the Academic Affairs Office of the Doctoral Program in Biotechnology for official stamping and record-keeping.

C. Course Modification and Withdrawal

Course Modification

Students are permitted to modify their course selection no later than one week after the semester begins. Any modification must be approved by the Program Management Team or the Dissertation Supervisor and must follow the same procedure as the KRS completion process.
Course modification is allowed under the following conditions:

a. Schedule conflict with another course due to timetable changes.
b. Input errors during KRS completion.
c. Courses initially offered are not conducted in the current semester.

Course Withdrawal

Students may withdraw from a course if they find it unsuitable or are unable to complete it satisfactorily. Course withdrawal is permitted within two weeks after the start of the semester, with approval from the Program Management Team or Dissertation Supervisor. The procedure follows the same process as KRS completion.The course withdrawal period follows the academic calendar of the Graduate School, and any changes made beyond the allowed period will not be approved.

Lecture Activities

After completing registration or re-registration at the beginning of each semester, students are required to attend all lectures and participate in other academic activities in accordance with their approved study plan. The schedule and implementation of lectures are organized and coordinated by the Program Management Team of the Doctoral Program in Biotechnology, Universitas Gadjah Mada.

Student obligations during lectures are as follows:

1. Students must attend classes regularly, in an orderly manner, and according to the official schedule. Attendance in two or more concurrent classes is not permitted.
2. Students must sign the attendance list for every class session. A minimum attendance rate of 70% is required to be eligible to sit for examinations. Students who do not meet this requirement are not allowed to participate in exams.
3. Students are expected to maintain a respectful and professional appearance and behavior throughout all academic activities.

Implementation of Lectures

The implementation of lectures in the Doctoral Program in Biotechnology follows the Semester Credit System (SKS) as regulated by the university. One SKS is equivalent to 45 hours of academic activity per semester, which is distributed across approximately 14 to 20 weeks of scheduled learning.

Each SKS consists of a combination of:

a. Direct instructional time (synchronous learning), which may be conducted on-site (luring) or online (daring) depending on the course design and agreement between the teaching team and the program;
b. Structured assignments, undertaken individually or in groups, to deepen understanding or apply specific concepts; and
c. Independent study, during which students engage in reading, data analysis, laboratory preparation, literature review, or other academic activities relevant to the course.

The structure and delivery of courses may involve team teaching, especially for subjects requiring multidisciplinary perspectives. The composition of teaching teams is determined during

meetings between the Supervisory Committee (Promoter Team) and the Head of the Doctoral Program, ensuring alignment between coursework and each student's dissertation topic.
Lectures may be delivered in various formats depending on learning objectives, including:

a. Lectures and discussions
b. Case-based learning (CBL)
c. Laboratory-based or practicum sessions
d. Seminars or scientific presentations
e. Guest lectures delivered by national or international experts

To ensure quality and consistency, all courses are delivered in accordance with the Module Handbook, which outlines the learning outcomes, content, assessment methods, teaching strategies, and weekly breakdown of learning activities. Students may access the Module Handbook through the official website of the Doctoral Program in Biotechnology.

Course schedules, assigned instructors, and teaching formats are coordinated and published by the Program Management Team prior to the start of each semester. Any changes in modality, scheduling, or teaching personnel must follow academic regulations and be communicated to students through the official academic channels of the program.

Research Monitoring

Monitoring is a structured activity carried out to track, evaluate, and ensure the progress of doctoral students' research in biotechnology. The purpose of this process is to verify that research activities are conducted in accordance with the approved proposal, timeline, and research objectives.

Monitoring is conducted at the end of every semester under the supervision of the Head of the Doctoral Program. Additionally, an annual monitoring seminar is held during the Biotech Camp, where students present their research progress before the Quality Assurance Team. If necessary, additional research progress monitoring sessions involving the Supervisory Committee and the Head of the Doctoral Program may be arranged, depending on research needs and urgency.

Dissertation

The dissertation is a scholarly work based on independent research that demonstrates originality, scientific rigor, and a significant contribution to the field of biotechnology. It is not a compilation, collection of citations, or a literature review. The dissertation must be based on original research conducted under the supervision of the Supervisory Committee (Promoter Team). The dissertation may be written in Indonesian or English, with the approval of the Supervisory Committee and the endorsement of the Dean of the Graduate School, and must follow the format and writing standards outlined in the Guidelines for Research Proposal and Dissertation Writing, Doctoral Program, Graduate School (2020).

To begin dissertation research, students must have completed all compulsory courses and elective courses that support their research topic. Upon completion of coursework, doctoral students are required to take the Comprehensive or Dissertation Proposal Examination, which evaluates their research plan and readiness to proceed to the dissertation phase.

Throughout their study period, doctoral students must also:

1. Participate in at least two international seminars to disseminate their dissertation research findings; and
2. Publish their dissertation-related research in reputable international journals, with the following minimum requirements:
3. One publication for students in the regular track; andTwo publications for students in the by-research track.
4. To be eligible for the Closed (Internal) Examination, students must have completed all compulsory courses and relevant supporting elective courses with a minimum cumulative GPA of 3.25, and must not have obtained any grades of D or E. In addition, students are required to have participated in at least two international seminars to present and disseminate the results of their dissertation research.
5. Students whose dissertation work demonstrates outstanding scientific achievement and impact may be recommended to proceed to the Open (Public) Examination, which serves as part of the program's academic promotion and recognition of excellence.

CURRICULUM

The 2021 Curriculum of the Doctoral Program in Biotechnology consists of 46 credits (SKS) for the regular track and 44 credits (SKS) for the by-research track, as detailed below. The program is designed to be completed within six semesters.

Regular Track

For the regular track, the learning activities are organized as follows:

1. Semester I: 8 credits of compulsory courses specific to the doctoral program;
2. Semesters I–II: 4–10 credits of elective courses that support the dissertation. Students in the by-research track may also take elective courses if necessary;
3. Semesters III–VI: 34 credits dedicated to the dissertation, which includes the following components:
4. Comprehensive/Proposal Examination
5. Dissertation research
6. Presentation of research results in two international seminars
7. At least one scientific publication in an international Scopus-indexed journal

By-Research Track

For the by-research track, the curriculum structure differs slightly from the regular track. Students are only required to complete:

1. 6 credits of compulsory courses, consisting of Scientific Research Methodology and Selected Topics (Capita Selecta).
2. They are not required to take elective courses supporting the dissertation.
3. The dissertation research begins from Semester II through Semester VI, with a total of 38 credits. The components of the dissertation process are similar to those in the regular track, except that students in the by-research track are required to produce two international publications as part of their graduation requirements.

Compulsory courses

No.	Code	Courses	Credits for reguler	Credits for by research
1	SPSBT213101	Scientific Research Methodology	3	3
2	SPSBT213102	Selective Topics in Biotechnology	3	3
3	SPSBT213103	Bioinformatics and Data Analysis in Biotechnology	2	-
4	SPSBT213104	Disertation	34	38

Elective courses

No.	Kode	Nama Mata Kuliah	Jumlah SKS
1	SPSBT213201	Advanced Bioinformatics	2
2	SPSBT213202	Advanced Molecular Biology and its analysis	2
3	SPSBT213203	Advanced Immunology	2
4	SPSBT213204	Molecular Immunology	2
5	SPSBT213205	Molecular Genetics	2
6	SPSBT213206	Enzyme Engineering	2
7	SPSBT213207	Genetic Engineering	2
9	SPSBT213202	Molecular Physiology	2
10	SPSBT213208	Phytochemistry	2
11	SPSBT213209	Analysis and Elucidation of Metabolite Structure	2
12	SPSBT213210	Secondary metabolites and the analysis	2
13	SPSBT213211	Biology of Tropical Diseases	2
15	SPSBT213213	Medical Microbiology	2
16	SPSBT213214	*ONE HEALTH*	2
17	SPSBT213215	Virology	2
18	SPSBT213216	*Antimicrobial Resistance*	3
19	SPSBT213217	Lactic Acid Bacteria and applications	2
20	SPSBT213218	Bacteriology of Plant Pathogens	2
21	SPSBT213219	Molecular Biology of Yeast	2

22	SPSBT213220	Microbial Genetics	2
23	SPSBT213221	*Gut Microbiome*	2
24	SPSBT213222	Molecular Microbiology	2
25	SPSBT213223	Molecular Biology of Streptomyces	2

Curriculum Study Plan

Study Plan for Regular Program (SP-DBiotech)

No.	Course Code	Course		Credit			ECTS
				Theory	Practice	Total	
SEMESTER I							**14.4**
1	SPSBT-213101	Scientific Research Methodology	Required	3	0	3	5.4
2	SPSBT-213102	Selective Topics in Biotechnology	Required	3	0	3	5.4
3	SPSBT-213103	Bioinformatics and Data Analysis	Required	2	0	2	3.6
SEMESTER II							**3.6**
4	SPSBT-213xxx	Elective Course 1	Required	2	0	2	3.6
5	SPSBT-213xxx	Elective Course 2	Opsional	2	0	2	3.6
6	SPSBT-213xxx	Elective Course 3	Opsional	2	0	2	3.6
SEMESTER III					34	34	**33.8**
7	SPSBT-213104	Dissertation (Proposal and Research)	Required				33.8
SEMESTER IV							**33.8**
8	SPSBT-213104	Dissertation (Research and Seminar I)	Required				33.8
SEMESTER V							**33.8**
9	SPSBT-213104	Dissertation (Research, Seminar II and Publication)	Required				33.8
SEMESTER VI							**33.8**
10	SPSBT-213104	Dissertation (Research and Defense)	Required				33.8

Study Plan for By Research Program (SP-DBiotech)

No.	Course Code	Course	Credit			ECTS
			Theory	Practice	Total	
SEMESTER I						**10.8**

1	SPSBT-213101	Scientific Research Methodology	Required	3	0	3	5.4
2	SPSBT-213102	Selective Topics in Biotechnology	Required	3	0	3	5.4
SEMESTER II							**37.4**
3	SPSBT-213xxx	Elective Course 1	Opsional	2	0	2	3.6
4	SPSBT-213xxx	Elective Course 2	Opsional	2	0	2	3.6
5	SPSBT-213xxx	Elective Course 3	Opsional	2	0	2	3.6
6	SPSBT-213104	Dissertation (Proposal and Research)	Required	0			33.8
SEMESTER III							**33.8**
7	SPSBT-213104	Dissertation (Proposal and Seminar I)	Required	0			33.8
SEMESTER IV							**33.8**
8	SPSBT-213104	Dissertation (Research and Publication I)	Required	0	38	38	33.8
SEMESTER V							**33.8**
9	SPSBT-213104	Dissertation (Research, Seminar II and Publication II)	Required	0			33.8
SEMESTER VI							**33.8**
10	SPSBT-213104	Dissertation (Research and Defense)	Required	0			33.8

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Scientific Research Methodology SPSBT-213101 (3 SKS/5.4 ECTS) **A1, A2, G1, G2, S1**	Elective course 1 SPSBT-213xxx (2 SKS/3.6 ECTS) **K1–K3, G1–G3, S1–S2**	Dissertation (Proposal and Research) SPSBT-213104 (33.8 ECTS) **A1, A2, G1, G2, S1**	Dissertation (Research and Seminar I) SPSBT-213104 (33.8 ECTS) **K1, K2, G2, S1**	Dissertation (Research, Seminar II and Publication) SPSBT-213104 (33.8 ECTS) **A1, G2, G3, S2**	Dissertation (Research and Defense) SPSBT-213104 (33.8 ECTS) **A2, K3, G3, S2**
Selective Topics in Biotechnology	Elective course 2 (optional)				

SPSBT-213102 (3 SKS/ 5.4 ECTS) **K1, K2, K3, G3**	SPSBT-213xxx (2 SKS/3.6 ECTS) **K1–K3, G1–G3, S1–S2**				
Bioinformatics and Data Analysis in Biotechnology SPSBT-213103 (2 SKS/3.6 ECTS) **K2, G2, S1**	Elective course 3 (optional) SPSBT-213xxx (2 SKS/3.6 ECTS) **K1–K3, G1–G3, S1–S2**				
14.4 ECTS	**3.6 ECTS**	**33.8 ECTS**	**33.8 ECTS**	**33.8 ECTS**	**33.8 ECTS**
Total : 156,8 ECTS					

Regular Track

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Scientific Research Methodology SPSBT-213101 (3 SKS/5.4 ECTS) **K1, G1, A1**	Elective course 1 SPSBT-213xxx (2 SKS/3.6 ECTS) K1, K2, G2, A2	Dissertation (Research and seminar I) SPSBT-213104 (33.8 ECTS) **A2, G2, G3, S1**	Dissertation (Research and Publication I SPSBT-213104 (33.8 ECTS) **A2, G2, G3, S2**	Dissertation (Research, Seminar II, and Publication II SPSBT-213104 (33.8 ECTS) **A2, G2, G3, S2**	Dissertation (Research and Defense) SPSBT-213104 (33.8 ECTS) **A1, A2, G3, S2**
Selective Topics in Biotechnology SPSBT-213102 (3 SKS/5.4 ECTS) **K2, S1, A2**	Elective course 2 (optional) SPSBT-213xxx (2 SKS 3.6 ECTS) **A2, K1, K2, G2**				
	Elective course 3 SPSBT-213xxx (2 SKS/3.6 ECTS) (optional) **A1, G1, S1, S2**				

	Dissertation (Proposal and research) SPSBT-213104 (33.8 ECTS) **A1, G1, S1, S2**				
10.8 ECTS	**37.4 ECTS**	**33.8 ETCS**	**33.8 ETCS**	**33.8 ETCS**	**33.8 ETCS**
183.6 ECTS					

By Research Track

Gambar 2. Curriculum Roadmap of the Doctoral Program in Biotechnology (2021)

LECTURER AND PROMOTOR

Promoters and co-promoters may be selected from among the academic staff of the 11 supporting faculties of the Biotechnology Study Program, provided that they meet the academic and administrative requirements to be appointed as supervisors at the doctoral level.

The following list represents the lecturers and supervisory team members who currently serve as promoters and co-promoters in the Doctoral Program in Biotechnology. However, this list is not exhaustive and may be expanded in accordance with academic needs, student research topics, and faculty availability.

Appointments of promoters and co-promoters are made based on:

a. Alignment of expertise with the student's dissertation topic;
b. Research experience and supervisory track record;
c. Eligibility and qualification requirements as stipulated by the Graduate School; and
d. Recommendations from the Program Management Team, followed by approval from the Dean of the Graduate School.
e. The assignment of promoters and co-promoters is finalized through a formal academic meeting involving the Study Program and the Supervisory Committee, and is documented in the Minutes of Meeting (Berita Acara) for supervisory assignment.

No	Name	Faculties
1	Prof. dr. Sofia Mubarika Harjana, M.Med.Sc., Ph.D.	Faculty of Medicine, Public Health, and Nursing

No	Name	Faculties
2	Prof. Ir. Irfan Dwidya Prijambada, M.Eng., Ph.D.	Faculty of Agriculture
3	Prof. Ir. Triwibowo Yuwono, Ph.D.	Faculty of Agriculture
4	Prof. Dr. drh. Wayan Tunas Artama	Faculty of Veterinary
5	Prof. dr. Ir. Tri Wibawa, Ph.D., Sp.MK(K)	Faculty of Medicine, Public Health, and Nursing
6	Prof. Widodo, S.P., M.Sc., Ph.D.	Faculty of Animal Science
7	Prof. Ir. Donny Widianto, Ph.D.	Faculty of Agriculture
8	Prof. Dr. Abdul Rohman, S.F., M.Si., Apt.	Faculty of Pharmacy
9	Prof. Dr. Mustofa, Apt., M.Kes.	Faculty of Medicine, Public Health, and Nursing
10	Prof. drh. Widya Asmara, SU., Ph.D.	Faculty of Veterinary
11	Prof. Dr. Yekti Asih Purwestri, S.Si., M.Si.	Faculty of Biology
12	Prof. Dr. Ir. Siti Subandiyah, M.Agr.Sc.	Faculty of Agriculture
13	Prof. Dr. Ir. Eni Harmayani, M.Sc.	Faculty of Agriculture Technology
14	Prof. Dr. Rarastoeti Pratiwi, M.Sc.	Faculty of Biology
15	Prof. Dr. Ir. Nurliyani, M.S., IPM	Faculty of Animal Science
16	Prof. Dr. Tri Joko, S.P., M.Sc.	Faculty of Agriculture
17	Prof. Dr. Ir. Zuprizal, DEA., IPU.,ASEAN Eng.	Faculty of Animal Science
18	Prof. Wiratni, S.T., M.T., Ph.D.	Faculty of Engineering
19	Prof. Tri Joko Raharjo, S.Si., M.Si., Ph.D.	Faculty of Medicine, Public Health, and Nursing
20	Prof. Dr. Ir. Murwantoko, M.Si.	Faculty of Agriculture
21	Prof. Dr. apt. Agung Endro Nugroho, S.Si., M.Si.	Faculty of Pharmacy
22	Prof. Dr.rer.nat. apt. Raden Rara Endang Lukitaningsih, S.Si., M.Si.	Faculty of Pharmacy
23	Prof. Dr. apt. Arief Nurrochmad, M.Si., M.Sc.	Faculty of Pharmacy
24	Prof. Dra. Tutik Dwi Wahyuningsih, M.Si., Ph.D.	Faculty of Mathematics and Natural Sciences

No	Name	Faculties
25	Dewi Kartikawati Paramita, S.Si., M.Si., Ph.D	Faculty of Medicine, Public Health, and Nursing
26	Ir. Jaka Widada, M.P., Ph.D.	Faculty of Agriculture
27	Dr. Ir. Arif Wibowo, M.Agr.Sc.	Faculty of Agriculture
28	Respati Tri Swasono, S.Si., M.Phil., Ph.D	Faculty of Mathematics and Natural Sciences
29	Dr. Biol.hom. Nastiti Wijayanti, M.Si.	Faculty of Biology
30	Dr.rer.nat. apt. Yosi Bayu Murti, S.Si., M.Si.	Faculty of Pharmacy
31	Dr. Sylvia Utami Tunjung Pratiwi, S.Si., M.Si.	Faculty of Pharmacy
32	Dr. Riris Istighfari Jenie, M.Si., Apt.	Faculty of Pharmacy
33	Dr. Ir. Muhammad Nur Cahyanto, M.Sc.	Faculty of Agricultural Technology
34	Dr. Tri Rini Nuringtyas, S.Si., M.Sc.	Faculty of Biology
35	Dr.rer.nat. Ronny Martien, M.Si.	Faculty of Pharmacy
36	Muhammad Saifur Rohman, S.P., M.Si., M.Eng., Ph.D.	Faculty of Agriculture
38	Dr. Dini Wahyu Kartika Sari, M.Si	Faculty of Agriculture

SHORT COURSE DESCRIPTIONS

Scientific Research Methodology (3 SKS / 5.4 ECTS)

This course equips students with a strong foundation in scientific concepts relevant to life sciences and biotechnology. It introduces the basic and advanced principles of molecular biology, current developments in biotechnology research, and methodologies used in quantitative and qualitative inquiry. Students learn essential skills in data analysis and interpretation, understand research ethics and publication ethics, and develop the ability to apply theoretical and methodological frameworks in scientific writing. The course also trains students to write effectively for various audiences, engage in critical thinking, and revise their work based on scholarly standards.

Selected Topics in Biotechnology (3 SKS / 5.4 ECTS)

This course provides an in-depth exploration of scientific knowledge directly related to each student's dissertation topic. Through guided reading, discussion, and conceptual analysis, students

identify gaps in existing knowledge, refine their research questions, and develop a clear understanding of the theoretical and scientific framework surrounding their research area. By the end of the course, students possess a comprehensive background that supports the preparation and justification of their dissertation proposal.

Bioinformatics and Biotechnology Data Analysis (3 SKS / 5.4 ECTS)

This course introduces students to the principles and applications of bioinformatics in biotechnology. It covers biological databases, NCBI data models, DNA and protein sequence retrieval, genome mapping, and the use of GenBank. Students practice sequence analysis, including EST processing, sequence assembly, large-scale genomic analysis, and database management. The course also trains students to use computational tools such as Perl and other scripting languages to facilitate biological data analysis and interpretation.

Advanced Molecular Biology (2 SKS / 3.6 ECTS)

This course examines the organization and function of genetic material, including DNA and RNA structure, DNA replication, gene structure, transcription, translation, and regulatory mechanisms in molecular biology. It also discusses genetic transfer processes and the molecular interactions that control gene expression.

Advanced Immunology (2 SKS / 3.6 ECTS)

This course provides advanced understanding of the immune system, including cellular and molecular components, humoral and cellular immunity, antigen recognition, and immune effector mechanisms. Students explore cytokines, MHC, immune genomics, and immune system interactions. The course also introduces immunological techniques such as immunoglobulin isolation, lymphocyte isolation, and hybridoma technology.

Enzyme Engineering (2 SKS / 3.6 ECTS)

This course covers enzyme fundamentals, including enzyme function, mechanism, classification, production, extraction, purification, and kinetic analysis with emphasis on enzyme inhibition. Industrial applications of enzymes and their use in biosensors are included to help students understand the role of enzymes in biotechnological processes.

Metabolite Analysis and Structural Elucidation (2 SKS / 3.6 ECTS)

This course provides training in the structural elucidation of organic compounds through the interpretation of UV, IR, NMR, and MS spectra. Students develop the ability to analyze spectral data systematically and identify structural features of organic molecules relevant to biotechnology and natural product studies.

Secondary Metabolites and Their Analysis (2 SKS / 3.6 ECTS)

This course explores the biosynthesis pathways of secondary metabolites, with emphasis on the acetate, shikimate, and mevalonate pathways. Students learn the enzymatic steps, regulatory mechanisms, and biochemical significance of secondary metabolite formation in plants and microorganisms.

Molecular Biology of Yeast (2 SKS / 3.6 ECTS)

This course examines the genetic organization and molecular processes in yeast, including DNA replication, gene transcription, translation, and regulatory mechanisms. The course highlights yeast as a model organism for biotechnology research.

Gut Microbiome (2 SKS / 3.6 ECTS)

This course introduces students to microbiome science, covering basic definitions, microbial origins, host–microbiome relationships, and microbiome impacts on health and agriculture. Applications in biotechnology are emphasized, along with bioethical considerations for microbiome research. The course also discusses OMIC technologies, microbiome engineering, and basic computational approaches for microbiome modeling.

Molecular Biology of Streptomyces (2 SKS / 3.6 ECTS)

This course focuses on Streptomyces genetics and its regulation, discussing DNA replication, gene expression, transcriptional control, and pathways involved in secondary metabolite production. The organism's importance in antibiotic and bioactive compound discovery is highlighted.

Fish Nutrition (2 SKS / 3.6 ECTS)

This course explains nutrient requirements in fish, including protein, lipid, carbohydrate, vitamin, and mineral metabolism. It covers nutrient selection for aquaculture species, effects of nutrient deficiency or excess, and the formulation of nutritionally balanced fish feed.

Host–Plant and Pathogen Interaction (2 SKS / 3.6 ECTS)

This course discusses plant health management, biotechnology-based approaches for disease control, pest identification, plant pathology monitoring, and evaluation of plant health interventions. It also addresses transgenic pest-resistant crops, with examples such as Bt cotton.

Biochemical Signaling Systems (2 SKS / 3.6 ECTS)

This course focuses on phytoalexins and elicitors, including their biosynthesis, accumulation, isolation, characterization, toxicity, metabolism, and detoxification. The role of phytoalexins in plant defense and their potential applications in drug discovery are examined.

Fermentation Kinetics (2 SKS / 3.6 ECTS)

This course covers the theoretical and practical aspects of fermentation processes, from substrate preparation to product recovery. Students study biomass formation, metabolite and enzyme production, and biochemical processes involved in industrial fermentation, including bioethanol production.