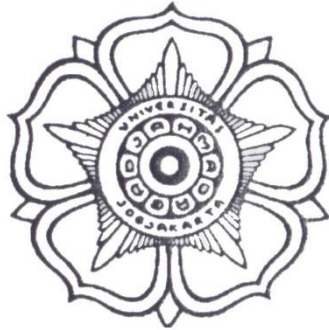


ACADEMIC HANDBOOK

STUDY PROGRAM OF MASTER IN BIOTECHNOLOGY



**GRADUATE SCHOOL
UNIVERSITAS GADJAH MADA
YOGYAKARTA
2021**

PREFACE

The Academic Guidebook for the Master in Biotechnology Study Program provides information on the implementation of postgraduate higher education in Biotechnology at the Graduate School of Universitas Gadjah Mada.

This Academic Guidebook also complements the 2017 Academic Guidebook of the Graduate School of Universitas Gadjah Mada, especially for specific matters regulated in the Masters in Biotechnology Study Program, Universitas Gadjah Mada.

This guidebook contains a brief history, vision, mission, goals, and competencies of graduates of the Master in Biotechnology Study Program. In addition, it describes the facility; organization; implementation of the learning process; administration; regulation; curriculum; teaching staff, and course descriptions.

Our appreciation goes out to the lecturers, the curriculum team, and the implementation team for producing this manual. We hope that this book will be beneficial to both students and other program participants in the Biotechnology master's program. We are constantly interested in reader feedback for improvement.

Yogyakarta, August 2021
Manager,

TABLE OF CONTENTS

INTRODUCTION	i
TABLE OF CONTENTS	ii
INTRODUCTION	1
BRIEF HISTORY	2
VISION, MISSION, OBJECTIVES AND COMPETENCE OF GRADUATES	4
FACILITY	6
ORGANIZATION	7
IMPLEMENTATION OF THE LEARNING PROCESS	10
ADMINISTRATION OF EDUCATION IMPLEMENTATION	12
ADDITIONAL RULES	17
CURRICULUM	17
TEACHING STAFF	22
BRIEF DESCRIPTION OF COURSE	24

INTRODUCTION

The Master in Biotechnology Study Program at UGM is one of the postgraduate education programs from the interdisciplinary study program. Based on the Decree of the Director General of Higher Education number: 27/DIKTI/Kep/1994 dated January 28, 1994, the study program has begun to conduct academic activities. The National Accreditation Board (BAN) has granted the Biotechnology study program accreditation with an A rating for the academic years 2021–2026.

The Master in Biotechnology Study Program refers to biotechnology as a multidisciplinary field encompassing a variety of fields of study, from fundamental natural science to applied biology in the fields of engineering, medicine, and agriculture with a focus on the use of molecular biology techniques to produce goods and services utilizing biological agents or their components.

Until now, the development of biotechnology has continued and is very rapid. The need for products and services from biotechnology in the fields of health, agro, industry, and the environment is increasing. Indonesia still needs to develop its human resources to master and use biotechnology expertise in these domains. For this reason, the Master in Biotechnology study program provides four interests (concentrations), including Health Biotechnology, Agro Biotechnology, Industrial Biotechnology, and Environmental Biotechnology. For implementation, the study program applies the Curriculum of 2018, a revised version of the 2013 Curriculum.

More than 450 Master in Biotechnology Study Program graduates since 1996 have found employment in both public and commercial organizations, and some have pursued Ph.D. studies at domestic and international universities.

BRIEF HISTORY

The Master in Biotechnology Study Program is one of the Study Programs under the Graduate School. This Study Program began with the establishment of the Inter-University Center (PAU) for Biotechnology at Universitas Gadjah Mada, a development project in the field of Indonesian Biotechnology under the Director General of Higher Education.

The UGM Inter-University Center for Biotechnology was established in 1985 based on the Decree of the Minister of Education and Culture of the Republic of Indonesia number: 909/D/T/1986 dated May 15, 1986, using World Bank XVII grants from 1986 to 1995, and is one of the three PAU Biotechnology in Indonesia. The subsequent funding was obtained from Hibah URGE IBRD Loan No: 3754-IND from 1994/1995 to 1998/1999.

Based on the experience of research activities and various educational and training activities, as well as because of the great interest of other universities in developing biotechnology in Indonesia, in 1994, the PAU Biotechnology, Gadjah Mada University proposed the implementation of the Biotechnology Study Program education at the master level. Since 1994 based on the Decree of the Directorate General of Higher Education number: 27/DIKTI/Kep/1994 dated January 28, 1994, the Master Program in Biotechnology has been established.

Based on the decision of the National Accreditation Board for Higher Education, Ministry of National Education, RI Results and Accreditation Ratings for Study Programs for Masters in Higher Education dated May 21, 2021, based on BAN-PT decision no. 3175/SK/BAN-PT/Ak-PPJ/M/V/2021 The UGM Biotechnology Study Program has been accredited with an A rating until 2026.

The Master in Biotechnology Study Program, UGM, was previously under the Research Center for Biotechnology management. However, based on the UGM Chancellor's Decree number: 25/P/SK/HKTL/2001 dated July 3, 2001, concerning Changes/Determination of Centers within the Universitas Gadjah

Mada, The PAU Biotechnology was renamed the Research Center for Biotechnology, with its operations concentrated on advancing interdisciplinary biotechnology research. Hence, the Master in Biotechnology Study Program, classified as a multidisciplinary study program, is managed under the Graduate School based on the Chancellor's Decree 89/P/SK/HT/2006. The Biotechnology Study Program involves more than 70 lecturers with varied knowledge from eleven faculties in UGM. The Research Center for Biotechnology UGM facilitates facilities and infrastructure for implementing the study program.

The Master in Biotechnology Study Program at UGM is located in the Inter-University Center Building (PAU Building), UGM South West Wing, with the address Jl. North Teknikas, Barek, Yogyakarta, telephone (274)902284 and (274)564305, Fax. (274)520842, email: biotek.sps@ugm.ac.id and website address <https://magisterbiotechnology.pasca.ugm.ac.id/>

VISION, MISSION, OBJECTIVES AND COMPETENCE OF GRADUATES

A. Vision

To be a pioneer of Biotechnology education at the master level in Indonesia certified by international standards, serving the interests of the nation and humanity inspired by the nation's cultural values based on Pancasila.

B. Mission

The missions of the Master in Biotechnology Study Program UGM are:

- a. To carry out an internationally recognized master's degree program in the field of biotechnology that promotes the successful career of the graduates for improving the nation's quality of life.
- b. To promote the advancement of Biotechnology research that supports education and the advancement of science,

technology, and the enrichment of the nation's culture.

- c. To carry out and pioneer collaborative programs at both national and international levels with educational, research, government, business, and community institutions

C. Objectives

The study program formulates its Program Education Objectives (PEO) which translates the graduate school's vision and mission of the university as well as Graduate School UGM to attain the 7th level of the Indonesian Qualification Framework (IQF) for the graduate program. The PEO of the master of the biotechnology study program is to provide:

1. graduates at the postgraduate level in biotechnology, which can develop and apply modern biotechnology principles to benefit humankind.
2. graduates who have competitive abilities so that they can continue to the next postgraduate level both at home and abroad
3. quality scientific publications in the fields of health, agro, environmental and industrial
4. biotechnology
5. technology in health, agro, environmental and industrial biotechnology.
6. cooperation in education and research with other educational institutions at home and abroad.
7. cooperation in the field of research with research institutions and industry at home and overseas

D. Target

The targets to be achieved are:

1. To develop Master of Biotechnology graduates who are able to use the concepts of modern biotechnology in order to give benefit to humanity.
2. To produce Master in Biotechnology graduates with a minimum GPA of 3.00 with a study period of two years so they can

compete to continue to the next postgraduate level at home and abroad.

3. Produce one scientific manuscript ready to be published at the national/international level in biotechnology, health, agriculture, environment, and industry by each educator every year.
4. Produce new technologies in health, agriculture, environmental and industrial biotechnology.
5. Increase cooperation in education and research with international collaboration.
6. Increase cooperation in research with institutions and industries engaged in biotechnology.

E. Graduate Competence and Ethics

Other competencies of graduates of the study program are:

1. Able to understand and be able to carry out moral and ethical considerations in biotechnology research and engineering.
2. Able to work together in teams to conduct research and work in biotechnology.
3. Be professional, fair, honest, objective, open, and anticipatory in dealing with problems in their capacity as professionals to avoid bias and partiality.
4. Have integrity in carrying out obligations as a biotechnology professional related to their respective fields.
5. Show mutual respect and respect in using and exploiting the intellectual works of others.
6. Have a sense of social responsibility to the community through educational efforts.

FACILITY

The process of teaching and learning activities is carried out in the South-West Wing of the UGM Inter-University Center Building, which consists of three floors. On the first floor, there are two lecture halls measuring 7.5 m × 12 m and 4 m × 3 m, a

Biochemistry laboratory (24 people capacity) which includes 2 staff rooms and 1 technician room, 2 research rooms, and a consumables warehouse. The second floor consists of an administration room, a teaching room, 3 management rooms, 1 meeting room (20 people), a dining room, a Microbiology laboratory room (capacity 24 people) in which there is 1 staff room, 1 tutorial room, 1 technician room, and 1 experimental animal room. On the third level, there is one coworking area (8 m x 11 m), one exam room (2.5 m x 4 m), and one lecture and seminar room (11 m x 12 m). The genetic engineering lab, which can accommodate 24 individuals, is located on the same level. The lab comprises one room for employees, one for research, and one for technicians. Finally, there are four greenhouses on the fourth floor.

All lecture and exam rooms have computer, LCD and internet facilities. The study program also offers a 360-degree camera, microphone, and other resources for the hybrid learning process. The laboratories are equipped with supporting equipment such as ultracentrifuge, refrigerated centrifuge, shaker incubator, water bath incubator, freeze drier, freezer – 80 °C, liquid nitrogen tank, nanodrop, PCR machines, q-PCR machine, photography room, electrophoresis both for DNA and Protein, sonicator, rotary evaporator, and other standard equipment. There are several laminar airflows (LAF) on each floor, and each LAF is dedicated for different purposes, including bacteria, fungi/yeast, and tissue cultures. In addition to the three laboratories of the Research Center, the Master in Biotechnology Study Program students can access and use the laboratory facilities of the eleven faculties that support the study program. This includes the UGM facilities, including the Integrated Research and Analysis Laboratory (Laboratorium Penelitian and Pengujian Terpadu/LPPT) and Agrotechnology Innovation Center (Pusat Inovasi Agroteknologi/ PIAT). Other facilities, such as library facilities, prayer rooms, health service units, sports and others, are provided by the Graduate School and Gadjah Mada University. For the sports facilities, it can be checked on the website (<https://www.ugm.ac.id/en/node/2302-student.facility>).

ORGANIZATION

Curriculum Team

The Curriculum Team is appointed and charged with responsibilities associated with developing the curriculum and ensuring that the subjects follow the science and technology update. This team consists of 11 (eleven) lecturers representing 11 (eleven) faculties supporting the Biotechnology Study Program at UGM.

Organizational Structure

The organizational structure of the UGM Biotechnology Masters Study Program is described based on:

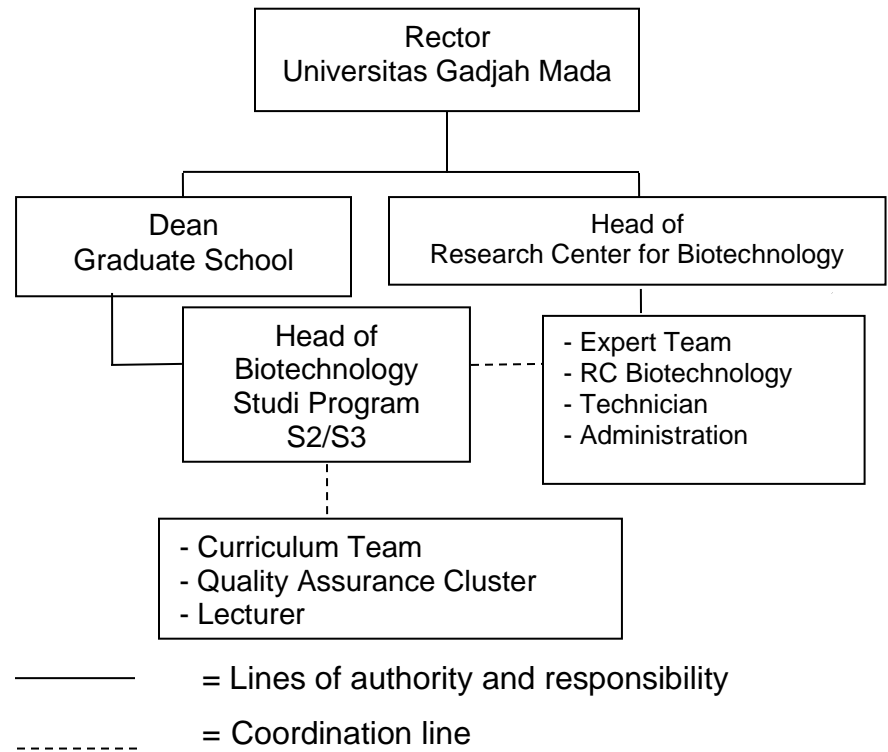


Figure 1. Organizational structure of the Master in Biotechnology Study Program, Universitas Gadjah Mada.

Rector, as a university leader responsible for directing and formulating policies for the execution of education and teaching, research, and community service, as well as fostering an academic community in the university environment he manages. The Vice Chancellor for Education, Research, and Community Service as well as the Director for Academic Administration help the Chancellor in carrying out his postgraduate school administration responsibilities.

The Dean of the Graduate School is responsible for directing and formulating policies for the implementation of education, teaching, research, and community service, as well as promoting the academic community within the Graduate School. The Dean is helped in carrying out his responsibilities by the Deputy Dean for Academic, Student Affairs, and Cooperation and the Deputy Dean for Finance, Assets, and Human Resources. Currently, the Graduate School supervises 26 inter-disciplinary study programs, including the UGM Master in Biotechnology Study Program.

Head of the Research Center for Biotechnology, responsible for directing the implementation of research or evaluation in the field of Biotechnology and providing facilities for the education and development of Biotechnology, including the Biotechnology Study Program.

Head of the Master in Biotechnology Study Program, responsible for overseeing the execution of education, teaching, and community service.

Lecturers, are lecturers of subjects presented in the curriculum 2018 of Master in Biotechnology Study Program. These lecturers are lecturers assigned by 11 Faculties within UGM in the Master in Biotechnology Study Program.

Educational staff, consisting of education and teaching staff, administrative and financial executives, laboratory technicians, and cleaning staff.

Laboratory, is a service unit that facilitates rooms, equipment, chemicals for practicum and research in the Research Center for Biotechnology UGM.

IMPLEMENTATION OF THE LEARNING PROCESS

The implementation of the learning process begins with student registration after being formally accepted in the Master in Biotechnology Study Program UGM and re-registration for students who have carried out previous lectures. Registration is done at the registration section of the UGM Academic Directorate (DA). Students who have registered and meet the requirements are entitled to attend lectures held in that semester. The courses provided include compulsory study programs, compulsory concentration courses, and elective courses. The number of study loads and the types of courses taken by students follow the academic regulations that apply to the Master in Biotechnology Study Program UGM.

Learning system

The learning system at the Master in Biotechnology Study Program is implemented using a semester credit system (SKS). In the credit system, planning, preparation and implementation of educational programs uses credit units as a benchmark for study load. The educational activities of the Master in Biotechnology Study Program are based on educational objectives, so the learning process is developed and determined by:

- a. Motivating and instilling curiosity (learning to know).
- b. Provide independent assignments and practicum (learning to do) to find and solve problems in the field of Biotechnology.
- c. Giving the task of presenting plans and research results (learning to be) to stimulate students to be able to express opinions and argue correctly in accordance with the rules in the field of biotechnology.

- d. Provide sufficient provision to cooperate with other related fields and adapt to their environment or life together to work together (learning to live together).

Study Load and Semester Credit Units

Student study load and teaching load for lecturers are stated in semester credit units (SKS). Explanation of SKS as contained in the 2017 Postgraduate Program Handbook.

EDUCATION IMPLEMENTATION ADMINISTRATION

Registration

Each student who is approved as a UGM Biotechnology student at the beginning of the academic year is required to register in order to achieve permanent status as a student for a certain amount of time in the Biotechnology Masters Study Program. The procedure for registration has been regulated by the University and the Graduate School. After getting a Student Identification Number (NIM), new students must register themselves to the academic administration in the Master in Biotechnology Study Program. The registration is intended so that students can determine the courses to be taken in the current semester.

Re-registration must be done by students at the beginning of each semester to extend their status as a student. The procedure for re-registration has been arranged by the University. Students can take a student card form at the Academic section of the Graduate School of UGM as a condition for paying tuition at a bank that has been appointed by the University Leader. After completing re-registration by acquiring a student card and evidence of tuition payment, students may obtain a Study Plan Card in person or online.

Universities and Graduate Schools provide written instructions in the form of Academic Guidebooks and other written instructions, including the Academic calendar and schedule of educational activities for that semester, to facilitate students' registration.

Academic Advisor

In the first semester, each student of the Master in Biotechnology Study Program receives academic guidance from the Head of study program to validate the study plan card (KRS). In semester II or III, after having a thesis supervisor, the student receives academic guidance from the thesis supervisor. The introduction of the possible thesis supervisor is done by the Head of study program at the end of the first semester.

The Master in Biotechnology Study Program held an orientation event for new students to be given an explanation of the mechanism of study at the Master in Biotechnology Study Program UGM and an overview of future careers for graduates. During the orientation period, an inaugural lecture was also held from experts in the field of Biotechnology, one of the speakers from the alumni of the biotechnology study program and attended by new students and lecturers.

Study Plan Card Filling

Registration of educational activities is carried out by students by filling out the KRS in accordance with the Academic Guidelines. Filling out the KRS form is done "online" through the Academic Information System (SIA) program. The KRS form is then validated to the Academic Section of the Graduate School. KRS collection by students must show proof of registration or a valid student card. When preparing a study plan, students must meet the Academic Supervisor, namely the Thesis Supervisor to obtain instructions, direction, and approval and ratification of subjects to be included in the KRS.

Procedure for Filling KRS

The procedure for filling out the KRS is regulated by the academic section of the Master in Biotechnology Study Program and Graduate School of UGM as follows:

1. Fill out KRS online through Simaster. The start time of filling is determined by the University and the Graduate School.

2. If the student is late from the specified time, the student will be penalized and must immediately report to the Study Program Manager.
3. In filling out the KRS, student must carefully check the course code and the number of credits as well as the schedule. If there is an error in writing the course code in the KRS, the KRS cannot be processed through the computer of the UGM Graduate School Academic Section and is the responsibility of the student concerned.
4. Credits must not be more than 20 credits. If there is an excess of SKS taken, the Head of Study Program has the right not to validate it.
5. The KRS that has been filled out and ratified by the Head of Study Program is submitted to the Study Program Teaching section to request a stamp of the Master in Biotechnology Study Program UGM.

Changing and Canceling Courses

1. Changing Courses

Students have the opportunity to change courses no later than one week after the course starts. This change must be with the approval of the Head of Study Program or Thesis Supervisor and the implementation method is the same as filling out the KRS. Changes in KRS are carried out with the following conditions:

- a. Due to modifications in the class schedule, the lecture hour is the same as for other courses.
- b. Error filling KRS
- c. The course is discontinued due to insufficient enrollment.

2. Cancellation of Study Plan

Courses that have been written in the KRS can be canceled because students feel they do not fit or are unable to complete them properly. Students are given the opportunity 2 weeks after the lecture runs to cancel the course with the approval of the Study Program Manager or Thesis Supervisor in the same way as filling out the KRS. The time for the cancellation of the course is carried out according to the academic calendar that has been determined by the Graduate School of UGM. Changes and cancellations of courses outside the specified time are not permitted.

Lectures and Practicum

After students register or re-register at the beginning of the semester, students are required to attend lectures, practicums and other activities according to their study plan. Lecture schedules and lectures are arranged and coordinated by the Manager of the Master in Biotechnology Study Program UGM.

The obligations of students in educational activities, especially lectures and practicums, are as follows:

1. Must attend lectures regularly, orderly and according to a predetermined schedule and are not allowed to take two or more courses at the same time.
2. Must fill out the attendance list at lecture time. Attendance at least 70%. Students whose attendance in lectures is less than 70% are not allowed to take the exam.
3. Must have a respectful appearance while attending lectures.

Practicum requires a special room and laboratory equipment, therefore, the implementation and rules of the practicum are regulated by the person in charge of the practicum from each laboratory and coordinated by the person in charge of the Laboratory of the Research Center for Biotechnology UGM. Some provisions that generally apply:

1. Must follow the practicum regularly according to a predetermined schedule in an orderly manner.
2. Must fill out the attendance list. Absence must not be more than 30% and the absence must be completed by following the relevant practicum program in the current semester. For those whose attendance is less than 70% or incomplete to attend the given practicum program, they are not allowed to take the practicum exam (response).
3. Must have a respectable appearance, wear a practicum coat, and follow laboratory work safety procedures.
4. Eating, drinking and smoking are not allowed in the laboratory.
5. Obligatory to follow the applicable regulations in each laboratory.

Thesis

Thesis is a scientific paper including the findings of original study, not a collection, citation, or literature review. The thesis topic may be derived from required or elective courses of interest, as outlined in the curriculum, and must be in line with the supervisor's area of science expertise.

The thesis work in the Master in Biotechnology Study Program aims to enable students at the end of their studies to be able to:

1. Mastering the scientific basis and knowledge and methodologies of certain fields of expertise,
2. so that they are able to find, understand, explain, formulate solutions and master the application in their expertise.
3. Mastering the scientific basis so as to be able to think, behave and act as a scientist.
4. Following the development of knowledge and technology according to their field in the form of a scientific work.

To take a thesis, students must take all compulsory courses, especially proposal development, and elective courses that support their thesis. To take the thesis exam, students must have taken all compulsory courses and compulsory concentration and several choices with a number of credits between 32 to 42, no D or E scores, GPA > 3. The thesis exam is carried out after students meet the criteria set out in the regulations separately.

ADDITIONAL RULES

Matters not listed in this guide will be specifically regulated.

CURRICULUM

The 2018 curriculum of the Master in Biotechnology Study Program consists of 40 – 50 credits with the following division: Implementation of program activities is regulated in a curriculum that can be completed in less than 4 semesters, with the following division: (a) Semester I: 10 credits of compulsory study program courses and 6 - 10 credits and elective courses, (b) Semester II: 9 credits of compulsory subjects and 6-11 credits of compulsory interest and/or elective courses, (c) semester III: 8 credits of theses.

Compulsory Courses

This course is a course that supports the deepening of knowledge and expertise in biotechnology and is given at the level of advanced science (advanced courses). The number of semester credit units (credits) for compulsory subjects is 19 or 17/2 credits, consisting of: Cell Biology (2/0), Molecular Physiology (2/0), Molecular Genetics (2/0), Bioinformatics, gene and protein analysis (2/0), Good research practice (2/0), Genetic engineering (2/0), Cell propagation (2/0), Molecular detection (0/2), Career in biotechnology (2/0), Proposal development (2/0)

Interest Compulsory Courses

Compulsory interest courses are mandatory for every biotechnology master's degree student who has chosen an area of interest, namely:

Health Biotechnology Interest (6 sks)

Molecular Diagnostics	2/0
Gene Therapy Technology	2/0
Preventive Health Biotechnology	2/0

Interest in Agro Biotechnology (6)

Plant and animal microbial associations	3/0
GMO plant and animal technology	3/0

Industrial Biotechnology Interest (6)

Biochemical Engineering	3/0
<i>Transport Phenomena in Bioprocess</i>	3/0

Environmental Biotechnology Interest (6 sks)

Environmental Biotechnology	3/0
Environmental Toxicology	3/0

Distribution of Courses Each Semester and Tutoring

Team

Semester I:

Courses	Code	Credits	Lectures
Mandatory			
Cell Biology	SPSBT-6101	2/0	Dr. Rarastoeti Pratiwi * Dr. Endah Retnaningrum Prof. Dr. Endang Semiarti
Molecular Physiology	SPSBT-6102	2/0	Prof. Dr. Sukarti Moeljopawiro* D9+6 r. M. Saifur Rochman Prof. Dr. Sunarti
Molecular Genetics	SPSBT-6103	2/0	Prof. Dr. Triwibowo Yuwono * Prof. Dr. Sujadi Dr. Ir. Donny Widiyanto
Karier bioteknologi (<i>Career in biotechnology</i>)	SPSBT-6104	1/0	Pengelola
<i>Good research practice</i>	SPSBT-6105	2/0	Prof. Dr. Sukarti M * Prof. Dr. Sutaryo, SpA(K) Dr. Dini Wahyu Kartika Sari

Elective Courses Semester I

Subject Concentration Mandatory	Code	Credits	Lectures
Virology	SPSBT-7103	2/0	Prof. Dr. Ir. Susanto* Dr. dr. Abu Tholib Aman M. Saifudin Hakim, dr.,Ph.D
Fish Health of Biotechnology	SPSBT-7110	2/0	Dr. Ir. Triyanto* Dr. Ir. Murwantoko Dr. Noer Kasanah
Microbiome	SPSBT-7112	2/0	Dr. Ir. Jaka Widada* Dr. Ir. Donny Widiyanto Dr. M.Saifur Rohman
Nanobiotechnology	SPSBT-7111	2/0	Dr.rer.nat Ronny Martien* Prof. Dr. Akhmad Kharis Nugroho Dr. Rini Kuswahyuning Dr. Adhyatmika

Soil Biotechnology and Biological Fertilizer	SPSBT-7109	2/0	Dr. Ir. Ngadiman* Dr. Ir. Jaka Widada. MP.
Secondary Metabolic Biosynthesis	SPSBT-7105	2/0	Prof. Dr. Ratna Asmah Susidarti* Dr.rer.nat Yosi Bayu Murti
Biomolecular Analysis	SPSBT-7102	2/0	Prof. Dr. Chairil Anwar* Dr. Tri Joko Raharjo, M.Si. Dr. biol.hom. Nastiti Wijayanti
Phytoalexins and Resistance	SPSBT-7107	2/0	Prof. Dr. Ir. SM. Widyasturi* Prof. Dr. Ir Christanti, M.Sc. Prof. Dr. Subagus Wahyuono Ani Widiastuti, SP., MP., Ph.D.
Immunology	SPSBT-7101	2/0	Prof. Dr. dr. Marseryawan HNES Dr. Rarastoeti Pratiwi, M.Sc Prof. Dr. dr. Sofia Mubarika
Plant Protection Biotechnology	SPSBT-7106	2/0	Prof. Dr. Ir. Susanto* Prof. Dr. Ir. Siti Subandiyah Dr. Alan Soffan, SP., M.Sc.
Enzymology	SPSBT-7104	2/0	Prof. Dr. Ir. Irfan D. Prijambada* Prof. Dr. Ir. Eni Harmayani Dr. rer.nat Lucia Dhiantika Witasari
Biodiversity & Biosafety	SPSBT-7108	2/0	Prof. Dr. Ir. Y. Andi Trisyono* Dr. Rina Sri Kasiamdari Dr. Ir. Ngadiman

Semester II

Courses	Code	Credits	Lectures
Mandatory			
Genetic Engineering	SPSBT-6201	2/0	Prof. Dr. Widya Asmara* Prof. Dr. Sismindari Prof. dr. Tri Wibawa, Ph.D.
Cell propagation	SPSBT-6202	2/0	Dr. Ir. Nurcahyanto* Prof. Dr. Endang Semiarti Prof. Dr. Wayan T. Artama
Molecular Detection	SPSBT6203	0/2	Dr. Ir. Donny Widiyanto * Dr. Widodo Dr. Yekti Asih Purwestri
Bioinformatics on gene and protein analysis	SPSBT-6204	2/0	Dr. Ir. Jaka Widada* dr. Luthfan Lazuardi, Ph.D Dr. M. Saifur Rohman
Proposal development	SPSBT-6205	0/2	Pengelola Prodi

Subject Concentration Mandatory	Code	Credits	Lectures
Health Biotechnology			
Molecular Diagnostics	SPSBT-6240	2/0	Dr. dr. Abu Tholib Aman* Dr. dr. Med. Suwarso Prof. Dr. dr. Sofia Mubarika
Gene Therapy Technology	SPSBT-6241	2/0	Prof. dr. Tri Wibawa, Ph.D* Prof. Dr. Abdul Salam M. Sofro Dr. dr. Agus Surono, Ph.D. Prof. Dr. Mustofa
Preventive Health Biotechnology	SPSBT-6242	2/0	Prof. Dr. drh. Widya Asmara* Prof. Dr. dr. Marsetyawan Prof. dr. Tri Wibawa, PhD.

<i>Transport Phenomena in Bioprocess</i>	SPSBT-6246	3/0	Dr. Ria Millati* Dr. Ir. Aswati Mindaryani
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Subject Concentration Mandatory	Code	Cre dits	Lectures
Environmental Biotechnology			
Environmental Biotechnology: (environmental microbiology, bioremediation and biodegradation)	SPSBT6247	3/0	Prof. Dr. Irfan D. P* Dr. Ir. Sarto Nur Akbar A., Ph.D.
Environmental Toxicology	SPSBT-6248	3/0	Prof. Dr. Endang Tri Wahyuni* Dr. rer.nat.Andhika Puspito N

Subject Concentration Mandatory	Code	Credits	Lectures
Agro Biotechnology			
Plant, animal and microbial associations	SPSBT-6243	3/0	Prof. Dr. Liesmira Yusiati* Dr. Ir. Sri Wedhastri Dr. Ir. Triyanto Dr. Ir. Chusnul Hanim
Plant and animal transgenic technology	SPSBT-6244	3/0	Prof. Dr. Endang Semiarti* Dr. Ir. Taryono Dr. Ir. Murwantoko Dr. drh.Asmarani Kusumawati

Elective Courses Semester II

Subject Concentration Mandatory	Code	Credits	Lectures
Marine Biotechnology	SPSBT-6240	2/0	Dr. Ir. Alim Isnansetyo, M.Sc.* Indah Istiqomah, M.Si., Ph.D Ratih Ida Adharini, M.Si., Ph.D
Fermentation Technology	SPSBT-7203	2/0	D. Ir. M. Nur Cahyanto* Dr. Ir. Chusnul Hidayat
Oncology	SPSBT-7201	2/0	Prof. Dr. Edy Meiyanto* Dr. dr. Totok Utoro, Sp.PA(K) Prof. Dr. dr. Sofia Mubarika Dr. Muthi' Ikawati
Omics: From Genomes to Biomes	SPSBT-7208	2/0	Dr. Widodo* Dr. Tri Rini Nuringtyas Dr. Tutik Dwi Wahyuningsih
Immunochemistry	SPSBT-7202	2/0	Dr. Rarastoeti Pratiwi* Dr. drh. Asmarani Kusumawati Prof. Dr. drh. R. Wasito

Subject Concentration Mandatory	Code	Credits	Lectures
Industrial Biotechnology			
Biochemical engineering	SPSBT-6245	3/0	Dr. Ir. Nurcahyanto* Dr. Ir. Chusnul Hidayat Dr. Wiratni

Biotechentrepreneurship	SPSBT-7211	2/0	Dr. Ir. Wiwik Eko Widayati* Dr. Ir. Donny Widiyanto
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TEACHING STAFF

No	Nama Dosen	Asal Fakultas
1	Abdul Salam M. Sofro, dr., M.Sc., PhD., Prof	Universitas YARSI Jakarta
2	Abu Tholib Aman, dr, M.Sc., Ph.D., SpMK	Faculty of Medicine, Public Health and Nursing UGM
3	Adhyatmika, Apt, M.Biotech., Dr.	Faculty of Pharmacy UGM
4	Agus Suroono. dr., Ph.D., Sp.THT.	Faculty of Medicine, Public Health and Nursing UGM
5	Ahmad Suparmin, S.P., M.Agr., Ph.D.	Faculty of Agriculture UGM
6	Akhmad Kharis Nugroho, Apt., M.Si., Dr., Prof.	Faculty of Pharmacy UGM
7	Alim Isnansetyo, Ir.,M.Sc., Dr.	Faculty of Agriculture UGM
8	Alan Soffan, SP., M.Sc., Dr.	Faculty of Agriculture UGM
9	Asmarani Kusumawati, Drh. MP., Ph.D	Faculty of Veterinary Medicine UGM
10	Aswati Mindaryani, Ir. M.Sc., Ph.D.	Faculty of Engineering UGM
11	Andhika Puspita Nugroho, MS., Dr.rer.nat	Faculty of Biology UGM
12	Ani Widiastuti, S.P., M.P., Ph.D	Faculty of Agriculture UGM
13	Chairil Anwar, Drs., DR. Prof.	Faculty Of Mathematics And Natural Science UGM
14	Christanti Sumardiyono, Ir., SU., Dr., Prof	Faculty of Agriculture UGM
15	Chusnul Hidayat, Ir., Ph.D	Faculty of Agricultural Technology UGM
16	Chusnul Hanim, Ir., M.Si., Dr.	Faculty of Animal Science UGM
17	Dini Wahyu Kartika Sari, S.Pi, M.Si., Dr,	Faculty of Agriculture UGM
18	Donny Widiyanto, Ir., Ph.D	Faculty of Agriculture UGM
19	Edy Meiyanto, Apt., MSi, Ph.D., Prof.	Faculty of Pharmacy UGM
20	Endah Retnaningrum, Ph.D., M.Eng	Faculty of Biology UGM
21	Endang Semiarti, Dra., MSc., Ph.D Prof.	Faculty of Biology UGM
22	Endang Tri Wahyuni, Ph.D., Prof.	Faculty Of Mathematics And Natural Science UGM
23	Eni Harmayani, Ir., MSc., Ph.D., Prof.	Faculty of Agricultural Technology UGM
24	Irfan D. Prijambada, Ir., MEng., Ph.D., Prof.	Faculty of Agriculture UGM
25	Indah Istiqomah, S.Pi., M.Si., Ph.D.	Faculty of Agriculture UGM
26	Jaka Widada. Ir., MP., Ph.D.	Faculty of Agriculture UGM
27	Lies Mira Yusiati, Ir., M.Sc., Dr. Prof.	Faculty of Animal Science UGM
28	Lucia Dhiantika W, Apt, M.Biotech., Dr.rer.nat	Faculty of Agricultural Technology UGM
29	Luthfan Lazuardi, dr., Ph.D.	Faculty of Medicine, Public Health and Nursing UGM
30	Marsetyawan HNE S., dr., MSc., Ph.D., Prof.	Faculty of Medicine, Public Health and Nursing UGM
31	Murwantoko, Ir., M.Si., Dr	Faculty of Agriculture UGM
32	Mustofa, Apt., M.Kes., Dr., Prof.	Faculty of Medicine, Public Health and Nursing UGM
33	Muthi' Ikawati, Apt., M.Sc., Dr	Faculty of Pharmacy UGM

34	M. Nur Cahyanto, Ir., MSc., Ph.D.	Faculty of Agricultural Technology UGM
35	M. Saifur Rochman, SP., M.Si., M.Eng., Ph.D.	Faculty of Agriculture UGM
36	M. Saifudin Hakim, dr., M.Sc., Ph.D.	Faculty of Medicine, Public Health and Nursing UGM
37	Nastiti Wijayanti, S.Si., M.Si., Dr.biol.hom.	Faculty of Biology UGM
38	Nur Akbar Arofathulloh, S.P., M.Biotech., Ph.D.	Faculty of Agriculture UGM
39	Noer Kasanah, S.Si., M.Si., Apt., Ph.D	Faculty of Agriculture UGM
40	Ngadiman., Ir., MSi., Ph.D.	Faculty of Agriculture UGM
41	R. Wasito, drh. MSc.,Ph.D., Prof	Faculty of Veterinary Medicine UGM
42	Rarastoeti Pratiwi, dra., MSc., Ph.D.	Faculty of Biology UGM
43	Ratna Asmah Susidarti, Apt., MSi, Ph.D.	Faculty of Pharmacy UGM
44	Ratih Ida Adharini, S.Pi., M.Si., Dr..	Faculty of Agriculture UGM
45	Ria Millati, ST., MT., Dr.	Faculty of Agricultural Technology UGM
46	Rina Sri Kasiamdari, S.Si., MSc., Ph.D	Faculty of Biology UGM
47	Rina Kuswahyuning, Apt., M.Si., Dr.	Faculty of Pharmacy UGM
48	Rony Martien, M.Si., Dr.rer.nat	Faculty of Pharmacy UGM
49	Sarto, Ir., M.Sc., Dr.	Faculty of Engineering UGM
50	Sismindari, Apt., SU., Ph.D., Prof.	Faculty of Pharmacy UGM
51	Siti Subandiyah, Ir., M.Agr.Sc., Ph.D., Prof.	Faculty of Agriculture UGM
52	SM Widyastuti, Ir, MSc., Ph.D., Prof	Faculty of Forestry UGM
53	Sofia Mubarika, dr., M.Med.Sc., Ph.D. Prof.	Faculty of Medicine, Public Health and Nursing UGM
54	Subagus Wahyuono, Apt., M.Sc., Dr. Prof.	Faculty of Pharmacy UGM
55	Sudjadi, Apt., MS., Ph.D. Prof.	Faculty of Pharmacy UGM
56	Sukarti Moeljopawiro, M.App.Sc., Ph.D., Prof.	Faculty of Biology UGM
57	Sunarti, M.Kes., Dr.	Faculty of Medicine, Public Health and Nursing UGM
58	Susanto Somowiyarjo, Ir., M.Sc., Ph.D. Prof.	Faculty of Agriculture UGM
59	Sutaryo, dr., Dr., Sp.A (K), Prof.	Faculty of Medicine, Public Health and Nursing UGM
60	Suwarso, dr., DR Med. SpPK (K)	Faculty of Medicine, Public Health and Nursing UGM
61	Sri Wedhastri, Ir., MS., Dr.	Faculty of Agriculture UGM
62	Taryono, Ir., MSc., Ph.D.	Faculty of Agriculture UGM
63	Totok Utoro, dr., Ph.D., SpPA	Faculty of Medicine, Public Health and Nursing UGM
64	Tutik Dwi Wahyuningtyas, S.Si., M.Sc., Ph.D.	Faculty Of Mathematics And Natural Science UGM
65	Tri Joko Raharjo, Drs., M.Si., Ph.D	Faculty Of Mathematics And Natural Science UGM
66	Triyanto, Ir., M.Si., Dr.	Faculty of Agriculture UGM
67	Triwibowo Yuwono, Ir., Ph.D., Prof.	Faculty of Agriculture UGM
68	Tri Wibawa, dr., Ph.D., Sp.MK., Prof.	Faculty of Medicine, Public Health and Nursing UGM
69	Tri Rini Nuringtyas, S.Si., M.Sc., Ph.D.	Faculty of Biology UGM
70	Wayan T. Artama, drh., Dr. Prof.	Faculty of Veterinary Medicine UGM
71	Widodo, SP., M.Sc., Ph.D	Faculty of Animal Science UGM

72	Widya Asmara, drh., SU., Ph.D. Prof.	Faculty of Veterinary Medicine UGM
73	Wiratni Budhijanto ST., MT., Ph.D.	Faculty of Engineering UGM
74	Wiwik Eko Widayati, Ir., MS., Dr.	The Graduate School UGM
75	Y. Andi Trisyono, Ir., MSc., Ph.D, Prof.	Faculty of Agriculture UGM
76	Yekti Asih Purwestri, M.Si., Dr.	Faculty of Biology UGM
77	Yosi Bayu Murti, Apt, M.Si., Dr.rer.nat	Faculty of Pharmacy UGM

BRIEF DESCRIPTION OF BIOTECHNOLOGY MASTER STUDY PROGRAM COURSE

Compulsory Course

Biology cell

Code : SPSBT-6101

Credits : 2/0

This course discusses prokaryotic, eukaryotic, and virus cells, as well as cell structure and biotechnology. The subcellular structures discussed include the chromatin and the nucleus; biological membranes; mitochondria and chloroplasts; cytoskeleton; prokaryotic and plant cell walls; hormone systems and mediators in animals and plants; extracellular matrix; nerve cell interactions; muscle contraction; the body's defense system; differentiation and development; cell cycle and cell death.

Molecular Physiology

Code : SPSBT-6102

Credits : 2/0

This course discusses the understanding and further understanding on biochemical processes in living things and discusses the structure and function of nucleic acids, proteins, as well as kinetic and enzyme control aspects, molecular mechanisms of hormone action, bioenergetics, carbon metabolism, nitrogen and photosynthesis.

Molecular Genetics

Code : SPSBT-6103

Credits : 2/0

This course discusses the organization of genetic material, nucleic acids as genetic material, the structure and function of DNA and

RNA, as well as DNA replication, gene structure, transcription and translation to their regulation, and transfer of genetic material.

Bioinformatics: Gene and Protein Analysis

Code : SPSBT-6204

Credits : 2/0

This course discusses bioinformatics and the internet; NCBI data model; the genbank sequence database; submission of DNA sequences to the database; database structure, genome mapping and database; information obtained from biological databases; sequence alignment and database search; analysis and creation of multiple proteins; estimation method using both DNA and protein sequences; Expressed sequence tags (Ests); assembly method and sequence completion; phylogenetic analysis; genome comparison analysis; genome analysis on a large scale; use of perl for biological analysis facilities.

Good Research Practice

Code : SPSBT-6105

Credits : 2/0

This course discusses the definition, typology of research, identification and formulation of problems, how to formulate problems and their sources, formulating hypotheses, and making proposals. The method of scientific writing includes: title, content and function of abstract, introduction, literature review, working method, method of presenting research data and discussion. Functions and requirements of tables and graphs, bibliography and appendices. How to make oral and poster presentations and use transparencies and slides. In addition, this course also discusses the scientific basis in upholding the scientific philosophy of several philosophical schools, the basis for upholding the principles of truth in science, ethical philosophy in research and development of science and biosafety.

Genetic Engineering

Code : SPSBT-6201

Credits : 2/0

This course discusses cloning strategies through the genomic library, cDNA and Polymerase Chain Reaction approaches, including vector selection, use of restriction enzymes, modification enzymes, ligation and transformation techniques. Transformant screening and clone identification were carried out by complementation and hybridization. Mapping of gene localization, expression of foreign genes and their regulation in prokaryotic and eukaryotic systems; in vitro expression technology (IVET). This course also discusses DNA sequencing techniques, directed mutations and their applications in protein engineering and analysis of pathogenic factors. This course discusses the manufacture of transgenic plants and animals; applications of genetic engineering in the production of commercial biological materials and the widespread use of DNA technology.

Cell Propagation

Code : SPS BT-6202

Credits : 2/0

This course discusses bioreactors; cell culture of microbes, plants and animals; cell culture technology and downstream processing.

Molecular Detection

Code : SPSBT-6203

Credits : 0/2

This course is in the form of assistance and practicum on DNA/RNA isolation and purification, DNA manipulation, DNA/RNA amplification, DNA detection, protein analysis, immunology and chromatography techniques.

Carrier in Biotechnology

Code : SPSBT-6104

Credits: 1/0

This course provides insight into the world of work in the field of biotechnology that will be provided by practitioners and researchers from the fields of pharmaceutical, food and environmental biotechnology, as well as marketing experts for biotechnology products.

Proposal Development

Kode : SPSBT-6205

Credits: 0/2

This course contains the preparation of research proposals for theses to the presentation of proposals under the guidance of the thesis supervisor and coordination by the manager.

Compulsory Concentration Courses

Health Biotechnology Concentration

Molecular Diagnostics

Code : SPSBT-6240

Credits: 2/0

This course discusses various types of PCR techniques for diagnosis; Allele-competitive oligopriming and oligonucleotide ligation assays for the diagnosis of genetic diseases or disorders; enzymatic and chemical methods to identify genetic variation; mutation detection by SSCP and heteroduplex analysis; gel electrophoresis technique, two-dimensional gene scanning; detection of genomic duplication and deletion, DNA microarrays and the human genome as well as genetic testing in biomedical applications; pharmacogenetics and pharmacogenomics and their applications; molecular diagnostics and comparative genomics in clinical microbiology; genetic preimplantation diagnosis; use of locus-specific databases in molecular diagnosis.

Gene Therapy Technology

Code : SPSBT-6241

Credits: 2/0

This course discusses the introduction to molecular medicine and gene therapy; cell nucleus transplantation; stem cells; new developments in molecular genetic medicine; use of mouse and vector models for gene therapy; gene targeting; gene therapy for various disorders and diseases.

Preventive Health Biotechnology

Code : SPSBT-6242

Credits : 2/0

This course discusses Overview: the concept of self and nonself; antigens and antibodies; the immune response and its evolution; immunogenic tolerance; hypersensitivity; humoral immunity and cell mediation; antigen-antibody reactions; complement fixation, agglutination, immunoelectrophoresis, immunofluorescence, ELISA, and RIA; immunogenetics: blood group, antigens in transplantation, HLA and related diseases; active and passive immunization; sun unit and recombinant vaccines; monoclonal antibodies, antibody synthesis and production.

Agro Biotechnology Concentration

Association of plant and animal microbes

Code : SPSBT-6243

Credit : 3/0

This course discusses plant-bacteria associations; survey, molecular phylogeny, genomics and benefits; rhizobium-legume symbiosis, nitrogen fixing bacteria in non-legumes, epiphytic and endophytic bacteria; rhizosphere bacteria; pathogenic bacteria in plants; bacterial-animal associations; ruminant microbes; animal product microbiology;

GMO Technology

Code : SPSBT-6244

Credit : 3/0

This course discusses livestock and transgenic plants; detection, expression and control of gene transfer; embryonic stem cells for cultured species; core transfer in the production of transgenic animals; gene transfer in poultry; expression of insulin and growth hormone-producing genes in animal muscle tissue; the use of bacterial genes for the biochemical modification of pets; production of milk-producing transgenic cows containing recombinant protein; comparison of traditional crosses and transgenesis in fish; ethics and protection of livestock and transgenic plants; the future of transgenic livestock; various types of transgenic plants.

Industrial Biotechnology Concentration

Biochemical Engineering

Code : SPSBT-6245

Credit : 3/0

This course discusses the introduction of industrial microbiology; dissolved oxygen measurement and mixing; gas and liquid systems (aeration and agitation); control of the fermentation process; growth kinetics; bioreactor design; downstream process (down stream); immobilization of microbial cells for the production of organic acids and ethanol; material and elemental balance; application of the fermentation process; citric acid production; production of antibiotics; scale up bioprocess; single cell proteins; sterilization; membrane separation process; advanced downstream processes in biotechnology.

Transport Phenomenon in Bioprocess

Code : SPSBT-6246

Credit : 3/0

This course discusses bioprocess development, material and energy balance, fluid flow and mixing, heat and mass transfer, operational units, homologous and heterogeneous reactions, reactor engineering; host-vector interaction on Escherichia coli, parameters affecting productivity of recombinant E. coli cultivation, modeling and control of anaerobic effluent treatment, reactor design for cell and organ factories, systems in bioprocess control.

Environmental Biotechnology Concentration

Environmental Biotechnology

Code : SPSBT-6247

Credit : 3/0

This course discusses the introduction of environmental biotechnology; microbes and metabolism; biological intervention; pollution and pollution control; contaminated land and bioremediation; aerobes and effluents; phytotechnology and photosynthesis; biotechnology and waste; genetic manipulation; integrated environmental biotechnology.

Environmental Toxicology

Code : SPSBT-6248

Credit : 3/0

This course discusses the concepts and definitions of environmental toxicology; pathways and kinetics of toxic substance uptake; approach methodology; factors causing toxicity; metal and inorganic compounds and organic compounds; ionizing radiation; risk assessment; recovery, rehabilitation and reclamation; toxicological control; overall perspective.

Elective courses

Immunology

Code : SPSBT-7101

Credits : 2/0

This course discusses the basic concepts of the immune system and immunity as well as components in the immune system, cellular and molecular structures and effector functions of humoral and cellular immunity components, recognition of antigens and immunogens, interactions of components of the immune system both cellular, molecular and through other soluble factors such as cytokines, / lymphokines in the treatment of antigens, genomes related to the immune system, MHC, general immunological techniques including immunoglobulin isolation, lymphocyte isolation and hybridoma technology

Biomolecular Analysis

Code : SPSBT-7102

Credits : 2/0

This course discusses separation methods covering the basic principles of chromatography (general), gas chromatography (KG), high performance liquid chromatography (HPLC), capillary electrophoresis (CE), instrumentation and application of KG, HPLC and CE for biomolecular analysis. Spectroscopic identification methods include the basic principles of spectroscopy (general), infrared (IR) spectrometry, nuclear magnetic spectrometry (NMR), and mass spectrometry (MS). Overview of IR, NMR, and MS instrumentation and interpretation of IR, NMR, and MS spectra for structural analysis of biomolecular compounds.

Virology

Code : SPSBT-7103

Credits : 2/0

This course discusses the history of the discovery of viruses, the nature of viruses as a threshold of life, the role of viruses in life (as pathogens, biological control agents, and as tools in molecular biology research), virus properties, differences between viruses and other pathogens, viral cycles, transmission. , nomenclature and classification, as well as the prospects for future virus research. In particular, some viruses that cause disease in humans, animals and plants will be discussed.

Oncology

Code : SPSBT-7201

Credits : 2/0

This course discusses cancer from cellular, molecular, genetic and immunological aspects, general understanding of cancer, cancer incidence, including: cytogenesis, oncogenesis, and carcinogenesis, environmental and cancer relationships and cancer biotechnology aspects.

Immunochemistry

Code : SPSBT-7202

Credits : (2 /0)

This course discusses the application of advanced immunochemical techniques in disease detection and control, especially in relation to improving the quality of human health, livestock and livestock products, crops and food. The discussion focuses on modern methods of using monoclonal antibodies, immunocytochemistry, Ag ELISA, Fluorescent Antibody Technique, latex agglutination, immunoprecipitation and Western Blotting or the use of DNA/RNA; In situ hybridization

Enzymology

Code : SPSBT-7104

Credits : 2/0

This course discusses enzymes as protein iocatalysts, isolation and purification of enzymes, structure and specificity of enzymes, enzyme kinetics, enzyme mechanism of action and control of enzyme activity. Furthermore, this course also discusses enzymes in biotechnology and fermentation, clinical aspects of enzymology include determination of enzymes for diagnosis, enzyme deficiency in clinics, utilization of enzymes in measurement

Secondary Metabolite Biosynthesis

Code : SPSBT-7105

Credits : 2/0

This course discusses the biosynthesis of secondary metabolites. The discussion of the biosynthetic pathway will be focused on the acylpolymalonate, mevalonate, shikimate pathways and their control.

Fermentation Technology

Code : SPSBT-7203

Credits : 2/1

This course discusses topics related to the theory of the implementation of the fermentation process from the preparation of basic ingredients to product downloads. The fermentation process is intended to produce cell biomass products, metabolites, enzymes and biochemical products with topics discussed including preparation of basic materials, preparation of microorganisms, sterilization of fermenter operations, fermentation kinetics, aeration, agitation, process control, separation and purification of fermented products.

Protein Engineering

Code : SPSBT-7204

Credits : 2/0

Protein Engineering course discusses the basic concepts, approach strategies and applications of protein engineering. Materials that will be discussed in lectures include protein engineering concepts, the things that underlie protein engineering, protein structure and function, engineering and strategic approaches in protein engineering, protein engineering applications and the use of informatics technology in protein engineering.

Plant Protection Biotechnology

Code : SPSBT-7106

Credits :(2/0)

This course discusses the basics of plant health management, application of biotechnology techniques, considerations in biotechnology innovation, some examples of the application of biotechnology in problem analysis (determination of key pest development of plant health management methods, monitoring and evaluation of plant health management techniques and challenges of biotechnology in this field in this field). In particular, the status of the presence of pest-resistant transgenic plants with the example of transgenic cotton will be discussed.

Phytoalexins and Resistance

Code : SPSBT-7107

Credits : 2 /0

This course discusses the theories and concepts of phytoalexins, elicitors, biosynthesis and accumulation, isolation and characterization, toxicology, degradation, metabolism, and

detoxification of phytoalexins, the role of phytoalexins in the mechanism of resistance to pathogens, phytoalexins as basic ingredients of drugs.

Diversity and Biosafety

Code : SPSBT-7108

Credits : 2/0

This course discusses biodiversity as biological resources and genetic resources to develop modern biotechnology, rationale and considerations in securing the use of biotechnology products related to the release of genetically modified organisms (GMOs) in closed and open environments. , as well as aspects of benefits and risks to human health and the living environment. This course will also discuss legal aspects related to Intellectual Property Rights (HaKI), Intellectual Property Rights, (IPR) including: patent issues stability of new inventions research results, filing for patents (HaKI) in Indonesia and issues related to the development of international law regarding patents.

Soil Biotechnology and Biofertilizer

Code : SPSBT - 7109

Credits : 2/0

This course is intended to provide an understanding of the interrelationships between

Elective courses can also be taken from other study programs at UGM