UNIVERSITI SAINS MALAYSIA

SBS School of Biological Sciences

SCHOOL OF BIOLOGICAL SCIENCES

COURSE BOOKLET



Bachelor of Science in Microbiology/ Animal and Plant Biodiversity with Honours

Academic session
2025 - 2026

Introduction

We are committed to excellence in research and teaching, driven by a team of research-active members with diverse academic and professional backgrounds. We offer exciting opportunities to students over a wide variety of topics related to Biological Sciences. In the first year, students gain essential fundamental knowledge in key areas such as ecosystems, biodiversity, plant and animal biology as well as microbial and cellular processes. Towards the end of the first year, students may choose to specialise in either Microbiology or Animal and Plant Biodiversity. In four (4) years, upon successful completion of courses in the respective programme, these pathways earn the student the award of :

- a Bachelor of Science in Microbiology with Honours, or
- a Bachelor of Science in Animal and Plant Biodiversity with Honours.

Students are required to undergo an internship programme in the final semester of their programme. This six (6)-month internship programme provides students with invaluable industry and corporate experience, with the possibility of future employment. Students graduating from the School of Biological Sciences will be equipped with the following knowledge:

a. Diversity of life forms and the reasons for this.
b. Intricate relationships between life forms and their environments.
c. Role of all life forms in maintaining the delicate balance of ou ecosystem.
d. Good Laboratory Practices (GLP) and usage of standard and advanced laboratory equipment.
e. Ability to design and implement scientific experiments.
f. Ability to write reports and produce scientific presentations.

The knowledge acquired by the students will enable them to make informed and educated decisions concerning the current global environmental issues such as pollution, environmental deterioration, biodiversity loss, deforestation, global warming and climate change. Students develop innovative skills and gain the ability generate and test new ideas. This essential knowledge aids students to excel in any career path they choose. The School of Biological Sciences is proud to produce students who can think holistically to live in harmony with nature and ensure a sustainable future.

Vision

Centre of excellence for education and research in the field of biological sciences.

Mission

1. To provide quality and innovative teaching and learning for its degree programme.
2. To achieve research excellence.
3. To establish and enhance collaboration with industries for education input and research.
4. To serve the society and country by providing the latest knowledge and technology.

The objectives of programmes are:

PEO1:
To produce graduates who are knowledgeable and understand the basic concepts in Biological Sciences.

PEO2:
To prepare graduates who are proficient in the analysis, synthesis, and evaluation of biological research data and information objectively.

PEO3:
To produce graduates who understand and adhere to professional practices and ethical responsibilities.

PEO4:
To produce graduates who possess and practice the spirit of cooperation and teamwork in the implementation and coordination of projects related to biological disciplines.

PROGRAMME LEARNING OUTCOMES (PLO)

Upon the completion of Bachelor of Science in Animal and Plant Biodiversity with Honours or Microbiology with Honours, the students will be able to:

PLO1	Knowledge and Understanding	acquire knowledge and understanding of basic and advanced concepts in the field of *Microbiology/ Animal and Plant Biodiversity.*
PLO2	Cognitive Skills	identify and solve issues and problems critically, creatively, and innovatively (thinking skills and scientific approach) in matters related to *Microbiology/ Animal and Plant Biodiversity.*
PLO3	Practical Skills	demonstrate extensive technical skills in the field of Biological Sciences (technical skills, practical skills, and psychomotor).
PLO4	Interpersonal Skills	demonstrate a sense of responsibility and master of social skills in matters related to *Microbiology/ Animal and Plant Biodiversity.*
PLO5	Communication Skills	acquire effective communication skills in all areas of life (communication skills) to convey information about *Microbiology/ Animal and Plant Biodiversity.*
PLO6	Digital Skills	demonstrate the basics of digital skills for career development (Digital Skills) that cover all aspects of *Microbiology/ Animal and Plant Biodiversity.*
PLO7	Numeracy Skills	demonstrate numeracy skills in all aspects of life (Numeracy), especially in areas related to *Microbiology/ Animal and Plant Biodiversity.*
PLO8	Leadership, Autonomy and Responsibility	function effectively as an individual and in a team with the ability to lead (Leadership Skills) in any organization as well as private planning.
PLO9	Personal Skills	manage current information and recognize the importance of lifelong learning (Lifelong Education and Information Management) in mastering knowledge and developing knowledge related to *Microbiology/ Animal and Plant Biodiversity.*
PLO10	Entrepreneurial Skills	acquire the foundation of entrepreneurial knowledge for career development (Management and Entrepreneurship Skills) in the development and business of entrepreneurship related to the field of *Microbiology/ Animal and Plant Biodiversity.*
PLO11	Ethics and Professionalism	understand and manage the industry related to Biological Sciences professionally and ethically (Professionalism, Values, Attitude, and Ethics).

Bachelor of Science in Microbiology / Animal and Plant Biodiversity with Honours

There are two (2) areas of specialisation/major:-



Microbiology: The Microbiology programme is designed to equip students with knowledge on metabolism, growth, genetics, regulation in microorganisms and the various situation where microorganisms are important to humans and other life forms. In the early part of the programme, the courses offered will focus on the microbial world, mainly bacteria, fungi, yeast and viruses. Topics will cover the history and the development of microbiology, the status of microorganisms in the world of living things and the diversity of microorganisms based on their morphology, fine structures, physiology, biochemistry and growth. Topics including basic methods in the maintenance of microorganisms, cultivation, isolation, enumeration and methods in sterilisation will also be part of the programme.

Subsequently, students will be exposed in detail on various groups of microorganisms and immunology. This will then be followed by discussion on microbial classification and aspects related to microbial physiology, biochemistry and genetics. The characteristics of antigens and human immunological response systems are in an integral part of the immunology course. Students will be introduced to several applied courses in microbiology which will enable them to understand the role of microorganisms in the field of industrial & food microbiology, agriculture, medicine and environment



Animal and Plant Biodiversity: This specialisation offers comprehensive training in both basic and applied aspects of biodiversity, equipping students with up-to-date scientific knowledge in biological sciences. The ultimate goal is to produce graduates who are knowledgeable, competent, skilled, visionary, ethical, and responsible, ready to contribute meaningfully to the sustainable development of the nation and the well-being of society.

Students are introduced to a diverse range of animal and plant taxa, focusing on the relationships among organisms based on their structure, development, and function. Training includes plant culture techniques, the use and maintenance of scientific equipment, and foundational studies in physiology, development, and animal behavior.

Students may choose specialized courses that explore the economic importance of plants, and the principles of animal-plant interactions, with applications across various disciplines. These advanced courses deepen students' understanding of taxonomy, biology, ecology, reproduction, and the practical significance of each group of organisms.

Graduates of this program are well-prepared for careers in biodiversity research, conservation, education, environmental consultancy, and beyond—or to pursue further studies in biological and environmental sciences.

Curriculum and Graduation Structure

In order to qualify for the Bachelor of Science in Microbiology / Animal and Plant Biodiversity with Honours students are required to fulfill the following requirements:

1. Accumulate a total of **128** units.
2. Fulfill all credit requirements for each course component (Core, Elective and University).
3. Obtain a minimum CGPA of 2.00 for the Core courses.
4. Obtain a minimum CGPA of 2.00 for the programme.
5. Obtain a minimum grade C for all of the University courses.

Course Component		Course Code	Units
CORE	Basic • 39 units	T	77
	Required • 38 units		
ELECTIVE		E	33
UNIVERSITY		U	18
		TOTAL	128

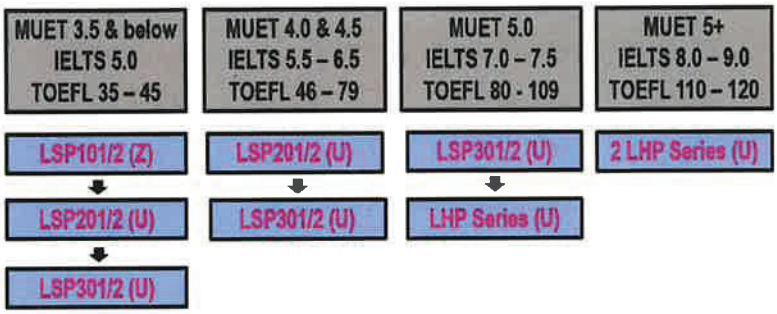
University requirements (18 units)

Students are required to complete a total of 18 units of the following courses for University requirements. These courses are compulsory for all students and must obtain a **minimum grade C**.

<table>
<tr><th colspan="3" rowspan="2">UNIVERSITY COURSE REQUIREMENTS</th><th colspan="2">CREDIT TOTAL</th></tr>
<tr><th>Local Students</th><th>International Students</th></tr>
<tr><td colspan="3">General Studies (MPU)</td><td></td><td></td></tr>
<tr><td>U1</td><td colspan="2">Local Students
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ HFE224 (Appreciation of Ethics and Civilisations) (2 credits)
▪ LKM400 (Malay Language IV) (2 credits)
International Students of Science and Technology
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ Malay Language course (2 credits)</td><td rowspan="2">6</td><td rowspan="2">4</td></tr>
<tr><td>International Students of Arts
(program with Malay Language as the medium of instruction)
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ LKM100 (Malay Language I) (Z)
▪ LKM200 (Malay Language II) (U) (2 credits)</td><td>International Students of Arts
(program with English Language as the medium of instruction)
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ LKM100 (Malay Language I) (U) (2 credits)</td></tr>
<tr><td>U2 (Local students)
AND
U3 (International students)</td><td colspan="2">Local Students
▪ WUS101 (Core Entrepreneurship) (2 credits)
▪ English Language Courses (4 credits)
International Students
▪ SEA205E (Malaysian Studies) (4 credits)
▪ English Language Courses (4 credits)</td><td>6</td><td>8</td></tr>
<tr><td>U4</td><td>Local Students
WAR122 (Integrity and Anti-Corruption Course) / Co-Curricular Courses*</td><td>International Students
Co-Curricular Courses*</td><td>2</td><td>2</td></tr>
<tr><td>Options</td><td colspan="2">Students can/have to choose any of the following:
▪ Co-curricular courses
▪ Skill courses/Foreign Language Courses/ Other courses offered by other schools</td><td>1-8</td><td>1-8</td></tr>
<tr><td></td><td colspan="2">CREDIT TOTAL</td><td>15-22</td><td>15-22</td></tr>
</table>

*Note:

The English courses reouired are based on MUET/IELTS/TOEFL results Please refer to the list of courses below-



Core courses (77 units)

The Core Courses component is made up of courses of 100, 200, 300 and 400 levels. The courses include Basic Core courses *Teras Asas* and required Core courses *Teras Wajib*. Courses in the Basic Core and required Core groups are compulsory where students must attain passing grades.

Basic core courses (39 units)

All undergraduate students must enrol and attain passing grades for these courses and must obtain a total of **39 units**. The courses are as follows:-

Year	Semester	Course Code	Course Title	Total Units
1	1	KOT 122/4	Organic Chemistry I	27
	1 or 2	BOI 101/3	Organisms Biodiversity	
		BOI 102/3	Ecology	
		BOI 103/4	Principles of Biochemistry	
		BOI 104/4	Genetics	
		BOI 105/4	Biostatistics	
		BOI 106/3	General Microbiology	
		BOI107/2	Practical of Biodiversity and Ecology	
4	2	BOI 420/12	Industrial Training	12

Required core courses (38 units)

Required Core courses are those courses offered at Levels 200, 300, and 400 that have been identified according to each specialisation programme, namely **Microbiology, Animal and Plant Biodiversity.** Students must enrol in all required core courses that are listed in their respective field of specialisation.

Research Project (8 units)

All Biology students are required to register for a research project of 8 units which spans over two semesters. At the end of the second semester, a thesis based on the existing regulations and format must be submitted for examination.

Before a student is allowed to register for the research project in their respective field of specialisation, the student must have achieved these **minimum cumulative unit requirement**.

- Total overall unit = 45 – 77 units
- Total unit for Biology courses = 39 – 54 units

Students who do not register for a research project, with valid reason and approved by the Dean, must substitute the 8 units with BOE 300/4 – Critical Review In Biology (which carries 4 units), while the remaining 4 units are fulfilled by taking elective courses that are suitable with his/her field of specialisation and approved by the Programme Manager.

Required core courses for each field of specialization

a. MICROBIOLOGY

Course code	Course title	Semester	Course prerequisite	
Required Core - Level 200 = 12 Units				
BMT 210/3	Microbial Physiology	1	BOI 101/3 BOI 103/4 BOI 106/3	(S) (S) (S)
BMT 211/3	Virology	1	BOI 106/3	(S)
BMT 222/3	Bacteriology	2	BOI 106/3	(S)
BMT 223/3	Immunology	2	BOI 106/3	(S)
Required Core - Level 300 = 20 Units				
BMT 300/8 or *BOE 300/4	Research Project in Microbiology Critical Review in Biology	1 & 2 1 & 2	Must have achieved :- i. Total overall unit = 45-77 units ii. Total unit for Biology courses = 39-54 units	
BMT 314/3	Mycology	1	BOI 106/3	(S)
BMT 315/3	Environmental Microbiology	1	BOI 106/3	(S)
BMT 326/3	Microbial Genetics	2	BOI 104/4 BOI 106/3	(S) (S)
BMT 327/3	Soil Microbiology	2	BOI 106/3	(S)
Required Core - Level 400 = 6 Units				
BMT 418/3	Industrial and Food Microbiology	1	BOI 103/4 BOI 106/3	(S) (S)
BMT 419/3	Medical Microbiology	1	BOI 106/3	(S)
* requires 4 more units from Elective courses				
Elective = 33 units				
BTT 211/3	Techniques in Biotechnology	1 & 2	BOI 103/4	(S)
BTT 312/3	Fermentation Technology	1	BOI 103/4	(S)
BTT 313/3	Genomics	1	BOI 104/4	(S)
BTT 324/3	Biochemical Engineering	2	KOT 122/4 BOI 103/4	(S) (S)
BTT 415/3	Genetic Engineering	1	BMT 326/3	(S)
BTT 416/3	Protein Structural Bioinformatics	1	BOI 103/4	(S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(C)
BOE 202/3	Introduction to Bioinformatics	1 & 2	BOI 104/3	(S)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 311/2	Scientific Communications	1 & 2		

Students can choose elective courses from: -

i) Major package (33 units); or

ii) Major package (17 units) and courses other than major package (16 units); or

iii) Major package (17 units) and package courses from other school subject to prerequisite requirement (16 units).

(S) = Course must be taken in sequential order.

(C) = Course can be taken concurrently.

b. ANIMAL AND PLANT BIODIVERSITY

Course code	Course title	Semester	Course prerequisite	
Required Core - Level 200 = 17 Units				
BDT 204/3	Plant Tissue Culture	2	BOI 101/3	(S)
BDT 211/3	Plant Taxonomy and Phylogenetics	1	BOI 101/3	(S)
BDT 212/4	Plant Physiology and Development	2	BOI 101/3	(S)
BDT 223/4	Invertebrate and Vertebrate Zoology	1	BOI 101/3	(S)
BDT 225/3	Principles of Animal Behaviour	2	BOI 101/3	(S)
Required Core - Level 300 = 15 Units				
BDT 300/8 or *BOE 300/4	Research Project in Animal and Plant Biodiversity Critical Review in Biology	1 & 2 1 & 2	Must have achieved :- i. Total overall unit = 45-77 units ii. Total unit for Biology courses = 39-54 units	
BDT 316/3	Animal Physiology and Development	1	BOI 101/3	(S)
BDT 327/4	Genetics and Genomics of Plants and Animals	2	BOI 101/3 BOI 104/4	(S) (S)
Required Core - Level 400 = 6 Units				
BDT 418/3	Economic Botany	1	BOI 101/3	(S)
BDT 419/3	Principles of Plant - Animal Interaction	1	BOI 101/3	(S)
* requires 4 more units from Elective courses				
Elective = 33 units				
BDE 311/3	Ichthyology	1	BOI 101/3	(S)
BDE 312/3	Fisheries Management	2	BDE 311/3	(S)
BDE 411/3	Wildlife Conservation and Management	1	BST 223/3	(S)
BSE 311/3	Introduction to Geographical Information	1	BOI 102/3 BST 212/3	(S) (S)
BST 212/3	Tropical Ecosystem	1	BOI 102/3 BOI 107/2	(S) (S)
BST 223/3	Population and Community Ecology	2	BOI 102/3	(S)
BST 315/3	Invasive Species and Biosecurity	1	BOI 107/2 BOI 102/3	(S) (S)
BTE 321/2	Animal Cell Culture Technology	2	BOI 103/4	(S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(C)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 202/3	Introduction to Bioinformatics	1 & 2	BOI 104/3	(S)
BOE 311/2	Scientific Communications	1 & 2		

Students can choose elective courses from: -

i) Major package (33 units); or

ii) Major package (17 units) and courses other than major package (16 units); or

iii) Major package (17 units) and package courses from other school subject to prerequisite requirement (16 units).

(S) = Course must be taken in sequential order.

(C) = Course can be taken concurrently.

Proposed Curriculum Structure, Bachelor of Science in Microbiology / Animal and Plant Biodiversity with Honours

Year	Sem	Basic Core (39 units)	Required Core (38 units)		Elective (33 units)		University (18 units)	TOTAL
			Microbiology (38 units)	Animal and Plant Biodiversity (38 units)				
1	1	BOI 101/3 BOI 102/3 BOI 103/4 BOI 107/2			ELECTIVE	OPEN ELECTIVE	WUS 101/2	17
	2	BOI 104/4 BOI 105/4 BOI 106/3 KOT 122/4					University/2 HFE 224/2	19
2	1		BMT 210/3 BMT 211/3	BDT 211/3 BDT 223/4			HFF 225/2	15 & 16
	2		BMT 222/3 BMT 223/3	BDT 204/3 BDT 212/4 BDT 225/3			University/2	15 & 19
3	1		BMT 300/4 BMT 314/3 BMT 315/3	BDT 300/4 BDT 316/3			University/2	18
	2		BMT 300/4 BMT 326/3 BMT 327/3	BDT 300/4 BDT 327/4			University/2	17 & 19
4	1		BMT 418/3 BMT 419/3	BDT 418/3 BDT 419/3			University/4	13
	2	BOI 420/12						12
TOTAL		39	38	38	17	16	18	

School of Biological Sciences
Universiti Sains Malaysia
11800Minden, Penang, Malaysia

Tel : 604-6533181 / 3503
Website : http://bio.usm.my