UNIVERSITI SAINS MALAYSIA

SCHOOL OF BIOLOGICAL SCIENCES

COURSE BOOKLET

Bachelor of Science in
Animal and Plant Biodiversity
with Honours

Bachelor of Science in
Microbiology
with Honours



ACADEMIC SESSION
2026/2027

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.

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

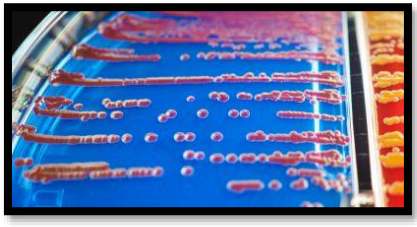
Centre of excellence for education and research in the field of biological sciences.

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.

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

1. Bachelor of Science in Microbiology with Honours



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.

2. Bachelor of Science in Animal and Plant Biodiversity with Honours



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.**

UNIVERSITY COURSE REQUIREMENTS			CREDIT TOTAL	
			Local Students	International Students
General Studies (MPU)				
U1	Local Students ▪ HFF226 (Philosophy and Current Challenges) (2 credits) ▪ SHE102 (Malaysian Nation -State Aspiration (2 credits) ▪ WAR122 (Integrity and Anti-Corruption) (2 credits) International Students of Science and Technology ▪ SHE103E (Malaysian Citra 1) (2 credits) ▪ Malay Language course (2 credits) ▪ WAR123E (Integrity and Anti-Corruption) (2 credits)		6	6
U2	Local Students ▪ LKM400 (Malay Language IV) (2 credits) ▪ English Language Course (2 credits)* International Students ▪ English Language Course (2 credits)*		4	2
U3	Local Students ▪ WUS101 (Core Entrepreneurship) (2 credits) International Students ▪ SHE104E (Malaysian Citra 2) (2 credits)		2	2
U4	Local Students Co-Curricular Courses*	International Students Co-Curricular Courses*	2	2
Options	Students can/have to choose any of the following: ▪ Co-curricular courses ▪ Skill courses/Foreign Language Courses/ Other courses offered by other schools		4	6
	CREDIT TOTAL		**18**	**18**

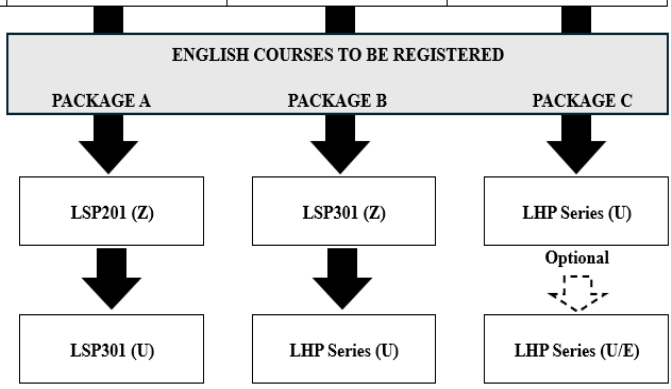
English Language Course

Local and International Students

All bachelor's degree students must accumulate two (2) units of type U from the English Language courses to fulfil the University requirement for graduation. However, students may be required to take an English Language course as a prerequisite (Z) first based on their English Language qualification and the determined package.

The following chart shows the English Language registration packages for students with MUET, IELTS, TOEFL iBT or PTE:

Type of Entry Qualification	Result		
MUET	3.5 & below	4.0 – 4.5	5.0 & above
IELTS	5.0 & below	5.5 – 6.5	7.0 & above
TOEFL iBT	40 & below	41 – 79	80 & above
PTE	47 & below	48 – 63	64 & above



Notes:

- Students shall refer to the list of English language courses prescribed by their respective schools, particularly for advanced-level courses that may be required by certain schools.
- Students with qualifications not listed in the chart above will take courses under Package A.
- To obtain units in English Language courses, students have to obtain a minimum grade 'C'.

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	Course Prerequisite	Total Units
1	1	KOT122/4	Organic Chemistry I		27
	1 or 2	BOI101/3	Organisms Biodiversity		
		BOI102/3	Ecology		
		BOI103/4	Principles of Biochemistry		
		BOI104/4	Genetics		
		BOI105/4	Biostatistics		
		BOI106/3	General Microbiology		
		BOI107/2	Practical of Biodiversity and Ecology	BOI101/3	
4	2	BOI420/12	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
- Total unit for Biology Course = 39 – 54

Students who do not register for a research project, with valid reason and approved by the Dean, must substitute the 8 units with BOE300/4 – 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 Chairman.

BACHELOR OF SCIENCE IN ANIMAL AND PLANT BIODIVERSITY WITH HONOURS

The Programme Educational Objective is to nurture:

PEO1	graduates who possess comprehensive knowledge, think critically and innovatively, and apply proficient technical skills to solve complex problems in the field of Animal and Plant Biodiversity.
PEO2	graduates who are capable of communicating effectively and working collaboratively in diverse settings
PEO3	graduates who are proficient in digital and numeracy skills and demonstrate responsibility and leadership in their careers.
PEO4	graduates who are committed to self-development, possess an entrepreneurial mindset, and uphold ethics and professionalism in their careers

The Programme Learning Outcomes (PLO) upon the completion of *Bachelor of Science in* A*nimal and Plant Biodiversity with Honours*, the students will be able to:

PLO1	acquire and demonstrate comprehensive knowledge and understanding of both fundamental and advanced concepts with the ability to integrate scientific principles, theoretical frameworks, and current developments in the field of Animal and Plant Biodiversity
PLO2	analyze and solve issues critically, creatively, and innovatively employing appropriate techniques, tools, and approaches in matters related to Animal and Plant Biodiversity
PLO3	demonstrate precision and competence in executing technical procedures and integrating practical skills in both laboratory and field environments within Animal and Plant Biodiversity
PLO4	demonstrates constructive interpersonal interactions when engaging with peers, professionals, and communities in addressing issues related to Animal and Plant Biodiversity
PLO5	acquire and apply effective communication skills across various contexts to convey information, ideas, and scientific knowledge in Animal and Plant Biodiversity
PLO6	demonstrate fundamental digital skills for career development by effectively utilizing digital tools, data analysis software, and online platforms to access, manage, and present scientific information across various domains of Animal and Plant Biodiversity
PLO7	demonstrate numeracy skills across various aspects of life by accurately interpreting, analyzing, and presenting scientific data using appropriate quantitative methods particularly in Animal and Plant Biodiversity
PLO8	demonstrate the values of responsibility, teamwork, and leadership when functioning both independently and collaboratively in organizational and personal planning contexts.
PLO9	effectively manage and evaluate current and emerging information, while recognizing the importance of lifelong learning in mastering knowledge and developing knowledge with a commitment for continuous self-improvement in a dynamic global context related to Animal and Plant Biodiversity
PL10	acquire the foundation of entrepreneurial knowledge and mindset for career development by identifying opportunities and solutions particularly in the context of Animal and Plant Biodiversity
PL11	consistently apply and uphold ethical principles, integrity, and professional values in understanding, evaluating, and conducting scientific practices within the field of Animal and Plant Biodiversity

Required core courses

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 17 Units				
BDT204/3	Plant Tissue Culture	1 & 2	BOI101/3	(S)
BDT211/3	Plant Taxonomy and Phylogenetics	1	BOI101/3	(S)
BDT212/4	Plant Physiology and Development	2	BOI101/3	(S)
BDT223/4	Invertebrate and Vertebrate Zoology	1	BOI101/3	(S)
BDT225/3	Principles of Animal Behavior	2	BOI101/3	(S)
Required Core - Level 300 = 15 Units				
BDT300/8 or *BOE300/4	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	
BDT316/3	Animal Physiology and Development	1	BOI101/3	(S)
BDT327/4	Genetics and Genomics of Plants and Animals	2	BOI101/3 BOI104/4	(S) (S)
Required Core - Level 400 = 6 Units				
BDT418/3	Economic Botany	1	BOI101/3	(S)
BDT419/3	Principles of Plant - Animal Interaction	1	BOI101/3	(S)
* Requires 4 more units from Elective courses				
Elective = 33 units				
BDE311/3	Ichthyology	1	BOI101/3	(S)
BDE312/3	Fisheries Management	2	BDE311/3	(S)
BDE411/3	Wildlife Conservation and Management	1	BST223/3	(S)
BSE311/3	Introduction to Geographical Information	1	BOI102/3 BST212/3	(S) (S)
BST212/3	Tropical Ecosystem	1	BOI102/3 BOI107/2	(S) (S)
BST223/3	Population and Community Ecology	2	BOI102/3	(S)
BST315/3	Invasive Species and Biosecurity	1	BOI107/2 BOI102/3	(S) (S)
BTE321/2	Animal Cell Culture Technology	2	BOI103/4	(S)
BOE101/3	Biological Instrumentation	1 & 2	BOI103/4	(C)
BOE202/3	Introduction to Bioinformatics	1 & 2	BOI104/3	(S)
BOE203/3	Microscopy and Histological Techniques	1 & 2		
BOE311/2	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 subjects to prerequisite requirement (16 units).				

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

(C) = Course can be taken concurrently.

BACHELOR OF SCIENCE IN MICROBIOLOGY WITH HONOURS

The Programme Educational Objective is to nurture:

PEO1	graduates who possess comprehensive knowledge, think critically and innovatively, and apply proficient technical skills to solve complex problems in the field of Microbiology.
PEO2	graduates who are capable of communicating effectively and working collaboratively in diverse settings.
PEO3	graduates who are proficient in digital and numeracy skills and demonstrate responsibility and leadership in their careers.
PEO4	graduates who are committed to self-development, possess an entrepreneurial mindset, and uphold ethics and professionalism in their careers.

The Programme Learning Outcomes (PLO) Upon the completion of *Bachelor of Science in Microbiology with Honours*, the students will be able to:

PLO1	acquire and demonstrate comprehensive knowledge and understanding of both fundamental and advanced concepts with the ability to integrate scientific principles, theoretical frameworks, and current developments in the field of Microbiology.
PLO2	analyze and solve issues critically, creatively, and innovatively employing appropriate techniques, tools, and approaches in matters related to Microbiology.
PLO3	demonstrate precision and competence in executing technical procedures and integrating practical skills in both laboratory and field environments within Microbiology.
PLO4	demonstrates constructive interpersonal interactions when engaging with peers, professionals, and communities in addressing issues related to Microbiology.
PLO5	acquire and apply effective communication skills across various contexts to convey information, ideas, and scientific knowledge in Microbiology.
PLO6	demonstrate fundamental digital skills for career development by effectively utilizing digital tools, data analysis software, and online platforms to access, manage, and present scientific information across various domains of Microbiology.
PLO7	demonstrate numeracy skills across various aspects of life by accurately interpreting, analyzing, and presenting scientific data using appropriate quantitative methods particularly in Microbiology.
PLO8	demonstrate the values of responsibility, teamwork, and leadership when functioning both independently and collaboratively in organizational and personal planning contexts.
PLO9	effectively manage and evaluate current and emerging information, while recognizing the importance of lifelong learning in mastering knowledge and developing knowledge with a commitment for continuous self-improvement in a dynamic global context related to Microbiology.
PL10	acquire the foundation of entrepreneurial knowledge and mindset for career development by identifying opportunities and solutions particularly in the context of Microbiology.
PL11	consistently apply and uphold ethical principles, integrity, and professional values in understanding, evaluating, and conducting scientific practices within the field of Microbiology.

Required core courses

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 12 Units				
BMT210/3	Microbial Physiology	1	BOI101/3 BOI103/4 BOI106/3	(S) (S) (S)
BMT211/3	Virology	1	BOI106/3	(S)
BMT222/3	Bacteriology	2	BOI106/3	(S)
BMT223/3	Immunology	2	BOI106/3	(S)
Required Core - Level 300 = 20 Units				
BMT300/8 or *BOE300/4	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	
BMT314/3	Mycology	1	BOI106/3	(S)
BMT315/3	Environmental Microbiology	1	BOI106/3	(S)
BMT326/3	Microbial Genetics	2	BOI104/4 BOI106/3	(S) (S)
BMT327/3	Soil Microbiology	2	BOI106/3	(S)
Required Core - Level 400 = 6 Units				
BMT418/3	Industrial and Food Microbiology	1	BOI103/4 BOI106/3	(S) (S)
BMT419/3	Medical Microbiology	1	BOI106/3	(S)
* Requires 4 more units from Elective courses				
Elective = 33 units				
BTT211/3	Techniques in Biotechnology	1 & 2	BOI103/4	(S)
BTT312/3	Fermentation Technology	1	BOI103/4	(S)
BTT313/3	Genomics	1	BOI104/4	(S)
BTT324/3	Biochemical Engineering	2	KOT122/4 BOI103/4	(S) (S)
BTT415/3	Genetic Engineering	1	BMT326/3	(S)
BTT416/3	Protein Structural Bioinformatics	1	BOI103/4	(S)
BOE101/3	Biological Instrumentation	1 & 2	BOI103/4	(C)
BOE202/3	Introduction to Bioinformatics	1 & 2	BOI104/3	(S)
BOE203/3	Microscopy and Histological Techniques	1 & 2		
BOE311/2	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 subjects 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	Required Core (36-39 units)		Elective & Open Elective (33 units)		University (18 units)	Total Units
		Animal and Plant Biodiversity (38 units)	Microbiology (38 units)				
1	1	BOI 101/3 BOI 102/3 BOI 103/4 BOI 107/2 KOT122/4	BOI 104/4 BOI 105/4 BOI 106/3 KOT122/4	ELECTIVE	OPEN ELECTIVE	WUS101/2 *(Local student)* SHE103E/2 *(International student)*	18 - 20
	2	BOI 104/4 BOI 105/4 BOI 106/3	BOI 101/3 BOI 102/3 BOI 103/4 BOI 107/2			WAR/2122/2 SHE102/2 } *(Local student)* SHE104E/2 WAR123E/2 } *(International student)*	18
2	1	BDT 211/3 BDT 223/4	BMT 210/3 BMT 211/3			HFF226/2 *(Local student)* LKM100/2 *(International student)* Co-Curriculum/ Option /Language subject (1-2 unit)	14 – 15
	2	BDT 204/3 BDT 212/4 BDT 225/3	BMT 222/3 BMT 223/3			ENGLISH/2 *(Local student)* LKM100/2 *(International student)* Co-Curriculum/ Option /Language subject (1-2 unit)	18
3	1	BDT 300/4 BDT 316/3	BMT 300/4 BMT 314/3 BMT 315/3			LKM400/2 *(Local student)* Co-Curriculum/ Option /Language subject (1-2 unit) Co-Curriculum/ Option /Language subject (1-2 unit)	18
	2	BDT 300/4 BDT 327/4	BMT 300/4 BMT 326/3 BMT 327/3			ENGLISH/2 *(International student)* Co-Curriculum/ Option /Language subject (1-2 unit) Co-Curriculum/ Option /Language subject (1-2 unit)	15 - 16
4	1	BDT 418/3 BDT 419/3	BMT 418/3 BMT 419/3			Co-Curriculum/ Option /Language subject (1-2 unit) Co-Curriculum/ Option /Language subject (1-2 unit)	14
	2	BOI420/12	BOI420/12				12
TOTAL		**77**	**77**	**17**	**16**	**18**	



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