COURSE BOOKLET

SCHOOL OF BIOLOGICAL SCIENCES

(www.bio.usm.my)

Bachelor of Applied Science
(Honours) (Applied Biology)

`Starting academic session 2023-2024

Introduction

Excellence in research and teaching is our aspiration, which is driven by research-active staff from diverse academic and research backgrounds. We offer exciting opportunities to students over a wide variety of topics related to Biological Sciences. Students are exposed to essential fundamental knowledge on the ecosystem, biodiversity, plants, animals, microbial and cellular processes in the first year. Towards the end of the first year, students can choose to specialise in either Agrobiology, Entomology and Parasitology, Biotechnology or Environmental Biology leading to a Bachelor of Applied Science (Honours) (Applied Biology) degree in four (4) years. Students are also required to take an internship programme in the last semester of their 4th year. This six (6) months internship programme will provide students with valuable industry and corporate exposures.

Students graduating from the School of Biological Sciences will be equipped with the following knowledge:

1. The diversity of life forms and the reasons for this.
2. The intricate relationships between life forms and their environments.
3. Role of all life forms in maintaining the delicate balance of our ecosystem.
4. Good Laboratory Practices and usage of standard and advanced laboratory equipment.
5. Ability to design and implement scientific experiments.
6. Ability to write reports and make scientific presentations.

The knowledge acquired by the students will enable them to make wise decisions with respect to the current global environmental issues such as pollution, environmental deterioration, biodiversity loss, deforestation, global warming and climate change. In addition, the students also develop innovative skills and are able to generate and test new ideas. Students with this essential knowledge will excel in any career path that they choose. The School of Biological Sciences is proud to produce students who can think holistically to ensure a sustainable tomorrow.

Our programmes are recognised internationally by the Royal Society of Biology, United Kingdom (https://www.rsb.org.uk/) starting from the Academic Session of 2019/2020 to 2023/2024.

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 entire 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.

Bachelor of Applied Science (Honours)(Applied Biology)

There are four (4) areas of specialisation/major:-



Agrobiology: The Agrobiology programme encompasses the use of modern biological techniques in the agricultural output system. The main objective of this programme is to explore various approaches in the agriculture system to ensure optimum and economical plant health and yield. Students learn basic entomology and roles of insects in agricultural systems, and an introduction to plant pathology centred on an understanding of plant diseases, disease mechanisms and pathogen interactions. Students are also equipped with basic knowledge in insect pest management strategies to gain an insight into the development of plant disease control methods and management strategies. The ultimate goal of the program is to be able to handle problems related to plant productivity in the development of agriculture-based industry in the country.



Entomology and Parasitology: Even in the midst of modernization, many tropical and temperature countries continue to be affected by vector-borne diseases like malaria, filariasis, dengue/haemorrhagic dengue and other diseases. These issues have brought a high rate of illness and mortality to many tropical nations. The field of Entomology and Parasitology was initiated with the objective of increasing the knowledge and understanding of the biology of insect vectors such as mosquitoes and houseflies and their relationships with the disease parasites or pathogens that they transmit. In this thrust area, students are exposed to the structure and function, life history, ecology and vector and parasite behaviour that will assist in the understanding of disease epidemiology as well as various management strategies. In addition, students specializing in the field will also learn the biology, ecology, behaviour and management of important urban and industrial insect pests such as cockroaches, pest ants, termites, bed bugs and stored product insects that are most relevant to the pest management industries.



Biotechnology: Biotechnology, an area of applied biology, involves the practical application of cells or their components in the manufacturing and service industries. Biotechnology is multidisciplinary, involving the integration of knowledge from microbiology, biochemistry, genetics, molecular and structural biology, chemistry as well as chemical and process engineering. The programme offered aims to provide students with a sound understanding of cellular biology involving microbiology, biochemistry, genetics, molecular biology and some chemical engineering principles. The programme begins with core courses in the sciences, especially biology, to build a strong foundation, followed by an introduction to the various techniques employed in the biotechnological industries and several critical aspects of microbiology. This is followed by several advanced topics of biotechnology that cover animal and plant cell culture, enzyme technology, chemical engineering principles, bioinformatics, structural biology and an in-depth treatment of genetic engineering.



Environmental Biology: This field of specialisation is structured to strengthen the knowledge and understanding of various concepts of ecology, function and interaction between abiotic and biotic components of various ecosystems. This programme will give a broad understanding of the diversity, the structure and function of tropical ecosystems, the importance of environmental protection, and the conservation of natural resources. Students will also gain valuable exposure to various methods to manage and conserve natural resources.

Curriculum and Graduation Structure

In order to qualify for the Bachelor of Applied Science (Honours) (Applied Biology), students are required to fulfil the following requirements:

1. Accumulate a total of **126-129** units.
2. Fulfil all credit requirements for each course component (Core, Elective/Minor 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 University courses.

There are two (2) types of study mode for students to choose from, Minor structure or Elective structure:-

a. **Minor Structure**

Course component		Course code	Minimum no. of units required
CORE	Basic • 39 units	T	75 – 78
	Required • 36 – 39 units		
ELECTIVE		E	17
MINOR		M	16
UNIVERSITY		U	18
		TOTAL	126 – 129

b. **Elective Structure**

Course component		Course code	Minimum no. of units required
CORE	Basic • 39 units	T	75 – 78
	Required • 36 – 39 units		
ELECTIVE		E	33
UNIVERSITY		U	18
		TOTAL	126 – 129

University requirements (18 units)

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

(i) *For Malaysian student*

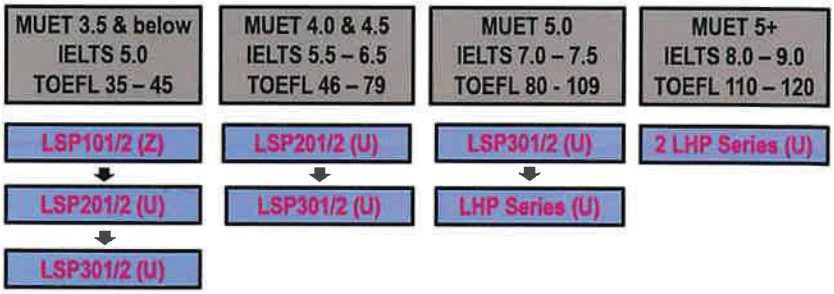
No.	Name of Course	No. of Units
1	Bahasa Malaysia IV (Malay Language) - Course code = *LKM400* (2 units)	2
2	English Language*	4
3	Appreciation Of Ethnics and Civilisition - Course code = *HFE224* (2 units)	2
4	Philosophy and Current Issues - Course code = *HFF225* (2 units)	2
5	Core Entrepreneurship - Course code = *WUS101* (2 units)	2
6	Intergrity and Anti-Corruption Course - Course code = WAR122 (2 units)	2
7	Option / Co-curriculum / Skills Courses	4
TOTAL :		**18**

(ii) *For international student*

No.	Name of Course	No. of Units
1	Bahasa Malaysia I (Malay Language) - Course code = *LKM100* (2 units)	2
2	English Language*	4
3	Malaysian Studies - Course code = *SEA205E* (4 units)	4
4	Philosophy and Current Issues - Course code = *HFF225* (2 units)	2
5	Co-curriculum (Compulsory – 2 units)	2
6	Option / Skills Courses	4
TOTAL :		**18**

* Note:

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



Core courses (75 – 78 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 (36 - 39 units)

Required Core courses are those courses offered at Levels 200, 300, and 400 that have been identified according to each specialisation programme, namely **Agrobiology**, **Entomology and Parasitology**, **Biotechnology** and **Environmental Biology.** Students must enrol in all the 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. AGROBIOLOGY

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 19 Units				
BDT 204/3	Plant Tisssue Culture	2	BOI 101/3	(S)
BDT 212/4	Plant Physiology and Development	2	BOI 101/3	(S)
BET 212/4	Insect Biology and Systematics	1	BOI 101/3	(S)
BGT 211/3	Plant Pathology	1	BOI 101/3	(S)
BGT 212/2	Practical In Plant Pathology	1	BGT 211/3	(C)
BGT 213/3	Soil Science and Environment	1	BOI 102/3	(S)
Required Core - Level 300 = 15 Units				
BGT 300/8 or *BOE 300/4	Research Project in Agrobiology Critical Review in Biology	1 & 2 1 & 2	Must have achieved:- i.Total overall unit = 45-77 units ii. Total unit for Biology course 39 – 54 units	
BGT 314/4	Tropical Plant Disease Management	1	BGT 211/3 BGT 212/2	(S)
BGT 325/3	Horticultural Science	2	BDT 212/4	(S)
Required Core - Level 400 = 5 Units				
BGT 416/3	Agriculture, Forest and Stored Product Pests	1	BET 212/4	(S)
BGT 417/2	Plant Breeding	1	BDT 204/3	(S)
* requires 4 more units from Elective courses				

Elective = 17 Units				
BDT 327/4	Genetics and Genomics of Plant and Animal	2	BOI 101/4 BOI 104/4	(S)
BDT 418/3	Economy Botany	1	BOI 101/4	(S)
BET 419/3	Integrated Pest Management	1	BET 212/3	(S)
BGE 416/3	Biology of Vertebrate Pest Animals	1	BOI 101/4	(S)
BMT 327/3	Soil Microbiology	2	BOI 106/3	(S)
BMT 314/3	Mycology	1	BOI 106/3	(S)
BST 418/4	Sustainable Aquaculture	1	BOI 102/3	(S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(S)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 202/3	Introduction to Bioinformatics	1 & 2	BOI 104/4	(S)
BOE 311/2	Scientific Communications	1		
Elective (17 units under Minor structure or 33 units under Elective structure) - Students **MUST** choose among the listed courses to complete a total of 17 or 33 units for Elective.				

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

b. ENTOMOLOGY AND PARASITOLOGY

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 14 Units				
BET 211/4	Introductory Parasitology	1	BOI 101/3	(S)
BET 212/4	Insect Biology and Systematics	1	BOI 101/3	(S)
BET 223/3	Insect Ecology	2	BOI 101/3	(S)
BET 224/3	Insect Physiology and Biochemistry	2	BET 212/4	(S)
Required Core - Level 300 = 18 Units				
BGT 300/8 or *BOE 300/4	Research Project in Entomology & Parasitology Critical Review in Biology	1 & 2 1 & 2	Must have achieved:- i.Total overall unit = 45-77 units ii. Total unit for Biology course 39 – 54 units	
BET 315/4	Medical and Urban Entomology	1	BET 212/4	(S)
BET 326/3	Pesticide Science	2	BET 212/4	(S)
BET 327/3	Medical and Veterinary Protozoology	2	BET 211/4	(S)
Required Core - Level 400 = 6 Units				
BET 418/3	Medical and Veterinary Helminthology	1	BET 211/4	(S)
BET 419/3	Integrated Pest Management	1	BET 212/3	(S)
* requires 4 more units from Elective courses				

Elective = 17 Units				
BDT 223/4	Invertebrate & Vertebrate Biology	1	BOI 101/3	(S)
BEE 414/3	Parasite of Aquatic Animals	1	BET 211/4	(S)
BGT 416/3	Agriculture, Forest and Store Product Pests	1	BET 212/4	(S)
BMT 223/3	Immunology	2	BOI 106/3	(S)
BSE 311/3	Introduction to Geographical Information Systems (GIS)	1	BOI 102/3 BST 212/3	(S)
BST 212/3	Tropical Ecosystem	1	BOI 102/3 BOI 107/2	(S) (S)
BST 315/3	Invasive Species and Biosecurity	1	BOI 102/3 BOI 107/2	(S)
BTT 211/3	Techniques in Biotechnology	1 & 2	BOI 103/4	(S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(S)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 202/3	Introduction to Bioinformatics	1 & 2	BOI 104/4	(S)
BOE 311/2	Scientific Communication	1		(S)
Elective (17 units under Minor structure or 33 units under Elective structure) - Students **MUST** choose among the listed courses to complete a total of 17 or 33 units for Elective.				

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

c. **BIOTECHNOLOGY**

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 12 Units				
BDT 204/3	Plant Tissue Culture	2	BOI 101/3	(S)
BMT 210/3	Microbial Physiology	1	BOI 101/3 BOI 103/4 BOI 106/3	(S) (S) (S)
BMT 223/3	Immunology	2	BOI 106/3	(S)
BTT 211/3	Techniques In Biotechnology	1 & 2	BOI 103/4	(S)
Required Core - Level 300 = 20 Units				
BMT 326/3	Microbial Genetics	2	BOI 104/4 BOI 106/3	(S)
BTT 300/8 or *BOE 300/4	Research Project in Biotechnology Critical Review in Biology	1 & 2 1 & 2	Must have achieved:- i. Total overall unit = 45-77 units ii. Total unit for Biology course 39 – 54 units	
BTT 312/3	Fermentation Technology	1	BOI 103/4	(S)
BTT 313/3	Genomics	1	BOI 104/3	(S)
BTT 324/3	Biochemical Engineering	2	KOT 122/4 BOI 103/4	(S) (S)
Required Core - Level 400 = 6 Units				
BTT 415/3	Genetic Engineering	1	BMT 326/3	(S)
BTT 416/3	Protein Structural Bioinformatics	1	BOI 103/4	(S)
* requires 4 more units from Elective courses				

Elective = 17 Units				
BMT 211/3	Virology	1	BOI 106/3	(S)
BMT 222/3	Bacteriology	2	BOI 106/3	(S)
BMT 314/3	Mycology	1	BOI 106/3	(S)
BMT 315/3	Environmental Microbiology	1	BOI 106/3	(S)
BMT 327/3	Soil Microbiology	2	BOI 106/3	(S)
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)
BTE 321/2	Animal Cell Culture Technology	2	BOI 103/4	(S)
BTE 412/3	Introduction to Nanobiotechnology	1	BOI 103/4 KOT 122/4	(S) (S)
BDT 212/4	Plant Physiology and Development	2	BOI 101/3	(S)
BDT 327/4	Genetics and Genomics of Plants and Animals	2	BOI 101/3 BOI 104/4	(S) (S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(S)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 202/3	Introduction to Bioinformatics	1 & 2	BOI 104/4	(S)
BOE 311/2	Scientific Communication	1		
Elective (17 units under Minor structure or 33 units under Elective structure) - Students must choose among listed course to complete a total of 17 or 33 units for Electives.				

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

d. ENVIRONMENTAL BIOLOGY

Course Code	Course Title	Semester	Course Prerequisite	
Required Core - Level 200 = 12 Units				
BST 211/3	Limnology and Oceanography	1	BOI 102/3 BOI 107/2	(S)
BST 212/3	Tropical Ecosystem	1	BOI 102/3 BOI 107/2	(S)
BST 223/3	Population and Community Ecology	2	BOI 102/3	(S)
BST 224/3	Environmental Pollution	2	BOI 102/3	(S)
Required Core - Level 300 = 17 Units				
BST 300/8 or *BOE 300/4	Research Project in Environmental Biology- Critical Review in Biology	1 & 2 1 & 2	Must have achieved:- i. Total overall unit = 45-77 units ii. Total unit for Biology course 39 – 54 units	
BST 315/3	Invasive Species and Biosecurity	1	BOI 102/3 BOI 107/2	(S) (S)
BST 326/3	Environmental Management	2	BST 224/3	(S)
BST 327/3	Climate Change in the Tropics	2	BOI 102/3	(S)
Required Core - Level 400 = 7 Units				
BST 418/4	Sustainable Aquaculture	1	BOI 102/3	(S)
BST 419/3	Sustainable Management of Natural Resources	1	BOI 102/3 BST 212/3	(S) (S)
* requires 4 more units from Elective courses				

Elective = 17 Units				
BDE 311/3	Ichthyology	1	BOI 101/3	(S)
BDE 312/3	Fisheries Managemengt	2	BDE 311/3	(S)
BDE 411/3	Wildlife Conservation and Management	1	BST 223/3	(S)
BET 211/4	Introductory Parasitology	1	BOI 101/3	(S)
BGT 213/3	Soil Science and Environment	1	BOI 102/3	(S)
BSE 311/3	Introduction to Geographical Information	1	BOI 102/3 BST 212/3	(S) (S)
BOE 101/3	Biological Instrumentation	1 & 2	BOI 103/4	(S)
BOE 203/3	Microscopy and Histological Techniques	1 & 2		
BOE 202/3	Introduction to Bioinformatic	1 & 2	BOI 104/3	(S)
BOE 311/2	Scientific Communications	1		
Elective (17 units under Minor structure or 33 units under Elective structure) - Students must choose among listed course to complete a total of 17 or 33 units for Electives.				

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

Proposed Curriculum Structure, Bachelor of Applied Science (Honours) (Applied Biology)

Year	Sem	Basic Core (39 units)	Required Core (36-39 units)				Elective & Minor (17 units + 16 units)		University (18 units)	TOTAL
			Agrobiology (39 units)	Entomology & Parasitology (38 units)	Biotechnology (38 units)	Environmental Biology (36 units)				
1	1	BOI 104/4 BOI 105/4 BOI 106/3 KOT 122/4							WUS 101/2	17
	2	BOI 101/3 BOI 102/3 BOI 103/4 BOI 107/2					BOE 101/3		University/2 HFE 224/2	19
2	1		BET 212/4 BGT 211/3 BGT 212/2 BGT 213/3	BET 211/4 BET 212/4	BMT 210/3 BTT 211/3	BST 211/3 BST 212/3	BOE 202/3	Minor/4	HFF 225/2	15-21
	2		BDT 204/3 BDT 212/4	BET 223/3 BET 224/3	BMT 223/3 BDT 204/3	BST 223/3 BST 224/3	BOE 203/3	Minor/4	University/2	15-16
3	1		BGT 300/4 BGT 314/4	BET 300/4 BET 315/4	BTT 300/4 BTT 312/3 BTT 313/3	BST 300/4 BST 315/3	BOE 311/2	Minor/4	University/2	15-18
	2		BGT 300/4 BGT 325/3	BET 300/4 BET 326/3 BET 327/3	BTT 300/4 BMT 326/3 BTT 324/3	BST 300/4 BST 326/3 BST 327/3	Elective/3	Minor/4	University/2	16-19
4	1		BGT 416/3 BGT 417/2	BET 418/3 BET 419/3	BTT 415/3 BTT 416/3	BST 418/4 -BST 419/3	Elective/3		University/4	12-14
	2	BOI 420/12								12
TOTAL		**39**	**39**	**38**	**38**	**36**	**17**	**16**	**18**	



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