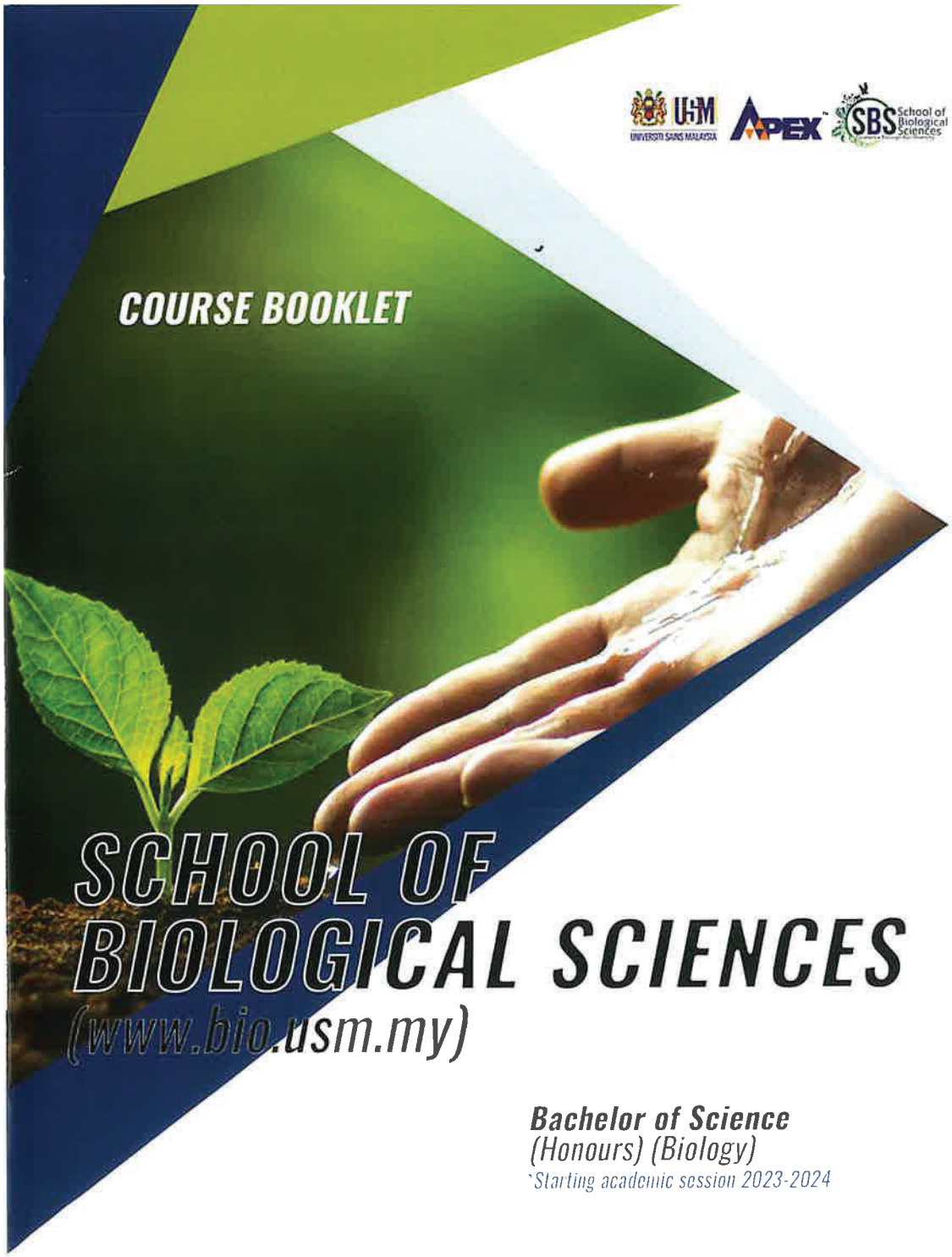


COURSE BOOKLET

SCHOOL OF BIOLOGICAL SCIENCES

(www.bio.usm.my)

Bachelor of Science
(Honours) (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 Microbiology or Animal and Plant Biodiversity leading to a Bachelor of Science (Honours) (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 common 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 recognized 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 Science (Honours) (Biology)

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, courses offered will focus on the microbial world, mainly bacteria, fungi, yeast and viruses. Topics will cover the history of 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 will also be part of the immunology course. Students will also be exposed 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 field of specialisation offers training in both basic and applied aspects of animal and plant biodiversity with the aim to equip students with up-to-date knowledge. The ultimate objective is to produce graduates who are knowledgeable, competent, skilled, visionary, highly ethical, responsible and trained in the field of Biological Sciences. These graduates are very important for the sustainable development of the country as well as the well -being of the people as a whole.



Students at level 200 and 300 will be exposed to a few taxa of animals and plants and the focus will be on the relationships based on their structures, development and functions. Students will be trained to use culture techniques of plants and to maintain numerous equipment. In addition, students will be exposed to studies on the physiology and development of both animals and plants as well as the basic principles of animal behavior. During the final year, students are allowed to choose courses that focus on the importance of plants in economics and the principles of interaction between animals and plants, as well as its uses and applications in other related disciplines. These specific courses are aimed at providing more detailed knowledge to enhance student understanding in the areas of taxonomy, biology, ecology and reproduction as well as the economic importance of each taxon

Curriculum and Graduation Structure

In order to qualify for the Bachelor of Science (Honours) (Biology) 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/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 of the University courses.

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

a. **Minor Structure**

Course Component		Course Code	Units
CORE	Basic • 39 units	T	77
	Required • 38 units		
ELECTIVE		E	17
MINOR		M	16
UNIVERSITY		U	18
		TOTAL	128

b. **Elective Structure**

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. Theese courses are compulsory for all students and must obtain a **minimum grade C.**

(i) *For Malaysian student*

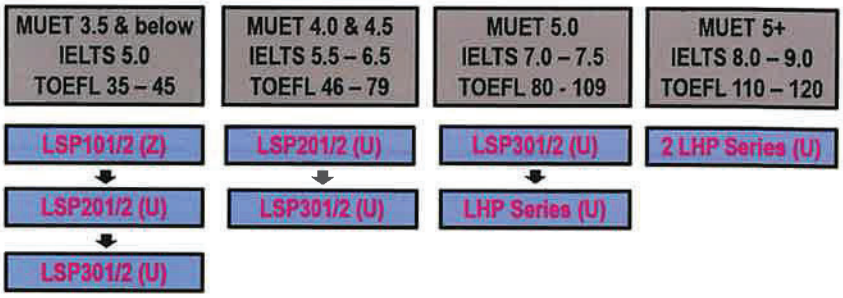
No.	Name of Course	No. of Units
1	Bahasa Malaysia IV (Malay Language) - Course code = *LKM400* (2 units)	2
2	English Language*	4
3	Appreciation Of Ethnics and Civilisition - Course code = *HFE224* (2 units)	2
4	Philosophy and Current Issues - Course code = *HFF225* (2 units)	2
5	Core Entrepreneurship - 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 (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 course 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)
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 (17 units under Elective structure)				
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		(S)
BOE 311/2	Scientific Communications	1		(S)
Elective (17 units under Minor structure or 33 units under Elective structure) Student **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 can be taken concurrently.

b. ANIMAL AND PLANT BIODIVERSITY

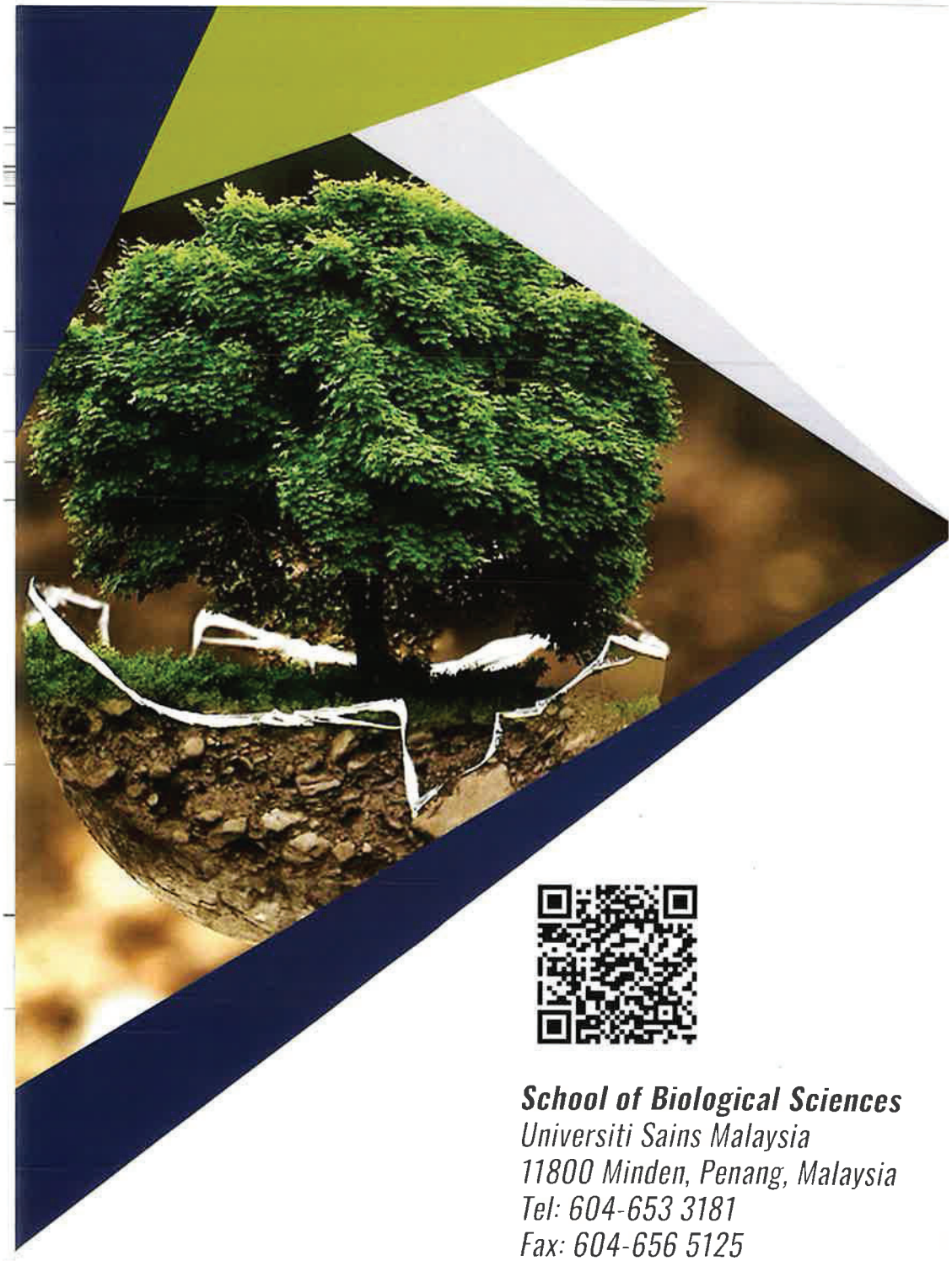
Course code	Course title	Semester	Course prerequisite	
Required Core - Level 200 = 17 Units				
BDT 204/3	Plant Tissue Culture	2	BOI 101/3	(S)
BDT 211/3	Plant Taxonomy and Phylogenetics	1	BOI 101/3	(S)
BDT 212/4	Plant Physiology and Development	2	BOI 101/3	(S)
BDT 223/4	Invertebrate and Vertebrate Zoology	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 course 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 (17 units under Elective structure)				
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		
Elective (17 units under Minor structure or 33 units under Elective structure) Student **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 can be taken concurrently.

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

Year	Sem	Basic Core (39 units)	Required Core (38 units)		Elective & Minor (17 units + 16 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			BOE 101/3		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	BOE 203/3	Minor/4	HFF 225/2	**15 & 16**
	2		BMT 222/3 BMT 223/3	BDT 204/3 BDT 212/4 BDT 225/3	BOE 202/3	Minor/4	University/2	**15 & 19**
3	1		BMT 300/4 BMT 314/3 BMT 315/3	BDT 300/4 BDT 316/3	BOE 311/2	Minor/4	University/2	**18**
	2		BMT 300/4 BMT 326/3 BMT 327/3	BDT 300/4 BDT 327/4	Elective/3	Minor/4	University/2	**17 & 19**
4	1		BMT 418/3 BMT 419/3	BDT 418/3 BDT 419/3	Elective/3		University/4	**13**
	2	BOI 420/12						**12**
TOTAL		**39**	**38**	**38**	**17**	**16**	**18**	



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