Transforming Higher Education
for a Sustainable Tomorrow

SCHOOL OF INDUSTRIAL TECHNOLOGY 2024/2025

UNIVERSITI SAINS MALAYSIA

SCHOOL OF INDUSTRIAL TECHNOLOGY

BACHELOR OF TECHNOLOGY WITH HONOURS

2024/2025

www.usm.my

Bachelor of Technology

Academic Session 2024/2025

USM Vision

Transforming Higher Education for a Sustainable Tomorrow

USM Mission

USM is a pioneering, transdisciplinary research intensive university that empowers future talent and enables the bottom billion to transform their socio-economic well-being

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ACADEMIC CALENDAR - ACADEMIC SESSION 2024/2025

FOR ALL SCHOOLS (EXCEPT FOR SCHOOL OF MEDICAL SCIENCES AND SCHOOL OF DENTAL SCIENCES)

Main Campus : Registration for New Student 04 - 06 October 2024) / **Orientation Week (07 - 12 October 2024)
Engineering Campus : Registration for New Student (06 October 2024) / **Orientation Week (07 - 12 October 2024)
Health Campus : Registration for New Student (05 October 2024) /Orientation Week (06 - 12 October 2024)**

SEM	WEEKS	ACTIVITY	DATE	REMARKS
ONE	1	Teaching & Learning (T&L 7 Weeks)	Monday, 14.10.2024 - Sunday, 20.10.2024	
	2		Monday, 21.10.2024 - Sunday, 27.10.2024	
	3		Monday, 28.10.2024 - Sunday, 03.11.2024	31.10.2024, Thursday - Hari Deepavali**
	4		Monday, 04.11.2024 - Sunday, 10.11.2024	
	5		Monday, 11.11.2024 - Sunday, 17.11.2024	
	6		Monday, 18.11.2024 - Sunday, 24.11.2024	
	7		Monday, 25.11.2024 - Sunday, 01.12.2024	
	8	Mid Semester Break (1 Week)	Monday, 02.12.2024 - Sunday, 08.12.2024	
	9	Teaching & Learning (T&L 7 Weeks)	Monday, 09.12.2024 - Sunday, 15.12.2024	
	10		Monday, 16.12.2024 - Sunday, 22.12.2024	
	11		Monday, 23.12.2024 - Sunday, 29.12.2024	25.12.2024, Wednesday - Christmas Day
	12		Monday, 30.12.2024 - Sunday, 05.01.2025	01.01.2025, Wednesday - New Year of 2025
	13		Monday, 06.01.2025 - Sunday, 12.01.2025	
	14		Monday, 13.01.2025 - Sunday, 19.01.2025	
	15		Monday, 20.01.2025 - Sunday, 26.01.2025	
	16	Revision Week (1 Week)	Monday, 27.01.2025 - Sunday, 02.02.2025	29 & 30.01.2025, Wednesday & Thursday - Chinese New Year
	17	Examination (3 Weeks)	Monday, 03.02.2025 - Sunday, 09.02.2025	
	18		Monday, 10.02.2025 - Sunday, 16.02.2025	11.02.2025, Tuesday - Thaipusam
	19		Monday, 17.02.2025 - Sunday, 23.02.2025	
	20	Mid Semester Break / Industrial Training (4 Weeks)	Monday, 24.02.2025 - Sunday, 02.03.2025	01.03.2025, Saturday - Awal Ramadhan
	21		Monday, 03.03.2025 - Sunday, 09.03.2025	
	22		Monday, 10.03.2025 - Sunday, 16.03.2025	
	23		Monday, 17.03.2025 - Sunday, 23.03.2025	17.03.2025, Monday - Nuzul Al-Quran
TWO	24/1	Teaching & Learning (T&L 7 Weeks)	Monday, 24.03.2025 - Sunday, 30.03.2025	
	25/2		Monday, 31.03.2025 - Sunday, 06.04.2025	31.03.2025 & 01.04.2025, Monday & Tuesday - Eid al-Fitr**
	26/3		Monday, 07.04.2025 - Sunday, 13.04.2025	
	27/4		Monday, 14.04.2025 - Sunday, 20.04.2025	
	28/5		Monday, 21.04.2025 - Sunday, 27.04.2025	
	29/6		Monday, 28.04.2025 - Sunday, 04.05.2025	01.05.2025, Thursday - Labour Day
	30/7		Monday, 05.05.2025 - Sunday, 11.05.2025	
	31/8	Mid Semester Break (1 Week)	Monday, 12.05.2025 - Sunday, 18.05.2025	12.05.2025, Monday - Wesak Day
	32/9	Teaching & Learning (T&L 7 Weeks)	Monday, 19.05.2025 - Sunday, 25.05.2025	
	33/10		Monday, 26.05.2025 - Sunday, 01.06.2025	30 & 31.05.2025, Friday & Saturday - Pesta Kaamatan 01 & 02.06.2025, Sunday & Monday - Hari Gawai
	34/11		Monday, 02.06.2025 - Sunday, 08.06.2025	02.06.2025, Monday - Yang di-Pertuan Agong's Birthday 06.06.2025, Friday - Eid al-Adha**
	35/12		Monday, 09.06.2025 - Sunday, 15.06.2025	
	36/13		Monday, 16.06.2025 - Sunday, 22.06.2025	
	37/14		Monday, 23.06.2025 - Sunday, 29.06.2025	27.06.2025, Friday - Awal Muharram
	38/15		Monday, 30.06.2025 - Sunday, 06.07.2025	
	39/16	Revision Week (1 Week)	Monday, 07.07.2025 - Sunday, 13.07.2025	07.07.2025, Isnin - Georgetown World Heritage City Day 12.07.2025, Saturday - Penang Governor's Birthday
	40/17	**Examination (2 Weeks) / Examination (3 Weeks)	Monday, 14.07.2025 - Sunday, 20.07.2025	
	41/18		Monday, 21.07.2025 - Sunday, 27.07.2025	
	42/19		Monday, 28.07.2025 - Sunday, 03.08.2025	
COURSES DURING LONG BREAK / SEMESTER BREAK	43/20	Long Semester Break / Industrial Training (9/10 Weeks)	Monday, 04.08.2025 - Sunday, 10.08.2025	
	44/21		Monday, 11.08.2025 - Sunday, 17.08.2025	
	45/22		Monday, 18.08.2025 - Sunday, 24.08.2025	
	46/23		Monday, 25.08.2025 - Sunday, 31.08.2025	31.08.2025, Sunday - National Day
	47/24	*T&L / Examination	Monday, 01.09.2025 - Sunday, 07.09.2025	
	48/25		Monday, 08.09.2025 - Sunday, 14.09.2025	
	49/26		Monday, 15.09.2025 - Sunday, 21.09.2025	16.09.2025, Tuesday - Malaysia Day
	50/27		Monday, 22.09.2025 - Sunday, 28.09.2025	
	51/28		Monday, 29.09.2025 - Sunday, 05.10.2025	29 & 30.09.2025, Monday & Tuesday - Sultan of Kelantan's Birthday (Kelantan)

**This Academic Calendar is subject to change

SENAT KE-267 (23 MEI 2024)

1.0 INTRODUCTION

This handbook is especially prepared for the undergraduate technology students of Universiti Sains Malaysia who will commence their first-year studies in the academic year 2024/2025. This handbook contains concise information that will prove useful in helping students understand the university's system of study as well as to adopt oneself to university life here.

Information in this handbook covers various aspects such as the programme structure of the Bachelor of Technology degree, the academic system, types of courses, student status, examination/evaluation systems, information on the school facilities, list and synopsis of courses, reference materials and academic staff list. This information would give a clear picture to the students for them to plan their academic studies, understand the field of studies that they are following and adapt themselves to the teaching and learning environment of the university.

1.1 History

The School of Industrial Technology commenced with the establishment of the School of Applied Sciences in 1973. The school offered the Bachelor of Applied Science programmes in Electronic Science and Technology, Food Science and Technology, and Polymer Science and Technology.

In 1984, the name of the school was changed to the School of Engineering Sciences and Industrial Technology. Hence, the curricula were amended to Bachelor of Engineering (B. Eng) and Bachelor of Technology (B. Tech) to meet the requirement of engineering and industrial technology courses.

The school was later split into the School of Electrical and Electronic Engineering, the School of Materials and Mineral Resources Engineering and the School of Industrial Technology during the 1986/1987 Academic Session. The former two (2) schools were moved to the USM Campus in Tronoh, Perak while the School of Industrial Technology remained in the main campus, Penang.

In Academic Session 1986/1987 the School of Industrial Technology offered Bachelor of Technology programmes in Food Technology, Polymer Science and Technology, Quality Control & Instrumentation, and Wood, Paper and Coatings Technology. The Environment Technology programme was later introduced in 1999/2000 Academic Session.

In the 2001/2002 Academic Session, Polymer Technology and Quality Control & Instrumentation programmes were upgraded into the Polymer Engineering and the Mechatronic Engineering programme respectively, thus were relocated at the USM Engineering Campus in Sri Ampangan, Nibong Tebal.

To fulfil demands by industries, Wood, Paper and Coatings Technology programme was renamed Bioresource, Paper and Coatings Technology programme in 2002/2003. In 2020/2021 Academic Session, Bioresource, Paper and Coatings Technology programme was renamed to Bioresource Technology programme. The Bioprocess Technology programme was introduced in 2008/2009 Academic Session. In the following years, Bioprocess Technology programme was renamed into Bioprocess Engineering Technology in 2022/2023 Academic Session.

1.2 Vision and Mission of the School

The Vision

"World class centre in technological innovation for a sustainable tomorrow"

The Mission

- To be the prime education provider of technologists that are competent, capable of independent thinking, possess communication and analytical skills and able to fulfil the needs in various industries and socio-economic development
- To pursue cutting-edge research in the fields of Food Technology, Bioresource, Environment Technology and Bioprocess Engineering Technology
- To contribute to the well-being of the community through sustainability-led dynamic transdisciplinary academic programmes, research innovation, teamwork and continuous improvement.

1.3 Bachelor's Degree Programmes

The School of Industrial Technology offers the following he BeBbachelor's degree programmes:

- Bachelor of Food Technology with Honours
- Bachelor of Bioresource Technology with Honours
- Bachelor of Environmental Technology with Honours
- Bachelor of Bioprocess Engineering Technology with Honours

Acceptance to any of the above programmes is subjected to selection and entry qualification. Most of the first-year courses consist of basic science courses in Chemistry, Mathematics, Physics and Computer. From level 200, all students are required to for courses relevant to their respective programmes up to level 300 (Bioresource and Environmental Technologies) or 400 (Food Technology and Bioprocess Engineering Technology) whereby they are required to conduct one final year research project.

Students are also required to undergo industrial training in various industries relevant to their study programme for 12 weeks (Food, Environmental and Bioresource Technologies) and 24 weeks (Bioprocess Engineering Technology). This training is aimed at exposing the students to actual working practice and atmosphere of the industry.

1.4 Programme Educational Goal and Objectives

1.4.1 Bachelor of Food Technology with Honours

The goal of the Bachelor of Food Technology with Honours degree

programme is to produce graduates who have specialized expertise, solid knowledge, critical thinking, creative, research skills in the field of Food Technology to meet the employable needs of the country in various related industries or agencies and graduates and able to lead the community for sustainable national development.

Therefore, the Bachelor of Food Technology with Honours degree programme is designed to produce graduates:

- who are competent, creative, innovative and capable of solving problems in Food Technology on the global and society level for sustainable development.
- who can communicate and work in interdisciplinary teams effectively in the Food Technology field.
- who have leadership skills, a positive attitude, and professional ethics in the Food Technology field.
- who can contribute to society's well-being and the sustainability of the environment.
- who have an interest in entrepreneurship and constantly strive to acquire new knowledge through research, continuing education and/or professional development activities.

1.4.2 Bachelor of Bioresource Technology with Honours

The goal of the Bachelor of Bioresource Technology with Honours degree programme is to produce graduates who have specialized expertise, solid knowledge, critical thinking, creative, research skills in the field of Bioresource Technology to meet the employable needs of the country in various related industries or agencies and graduates and able to lead the community for sustainable national development.

Therefore, the Bachelor of Bioresource Technology with Honours degree programme is designed to produce graduates:

- who are competent, creative, innovative and capable of solving problems in Bioresource Technology on the global and society level for sustainable development.
- who can communicate and work in interdisciplinary teams effectively in the Bioresource Technology field.
- who have leadership skills, a positive attitude, and professional ethics in the Bioresource Technology field.
- who can contribute to society's well-being and the sustainability of the environment.

- who have an interest in entrepreneurship and constantly strive to acquire new knowledge through research, continuing education and/or professional development activities.

1.4.3 Bachelor of Environmental Technology with Honours

The goal of the Bachelor of Environmental Technology with Honours degree programme is to produce graduates who have specialized expertise, solid knowledge, critical thinking, creative, research skills in the field of Environmental Technology to meet the employable needs of the country in various related industries or agencies and graduates and able to lead the community for sustainable national development.

Therefore, the Bachelor of Environmental Technology with Honours degree programme is designed to produce graduates:

- who are competent, creative, innovative and capable of solving problems in Environmental Technology on the global and society level for sustainable development.
- who can communicate and work in interdisciplinary teams effectively in the Environmental Technology field.
- who have leadership skills, a positive attitude, and professional ethics in the Environmental Technology field.
- who can contribute to society's well-being and the sustainability of the environment.
- who have an interest in entrepreneurship and constantly strive to acquire new knowledge through research, continuing education and/or professional development activities.

1.4.4 Bachelor of Bioprocess Engineering Technology with Honours

The goal of Bachelor of Bioprocess Engineering Technology with Honours degree programme is to produce graduates who have specialized expertise in Bioprocess Engineering Technology field to meet the employment needs of the country for various related industries / agencies.

Therefore, the Bachelor of Bioprocess Engineering Technology with Honours degree programme is designed to produce graduates who:

- are competent, creative, innovative and capable of solving problems related to Bioprocess Engineering Technology at the global and society levels at the context of sustainable development.
- have high leadership qualities and communication skills in addition to active involvement in engineering technology processes independently and in teams of different disciplines.

- graduates with professional and ethical qualities.
- constantly strive to acquire new knowledge through research, continuing education and/or professional development activities.

1.5 Programme Learning Outcomes

1.5.1 Bachelor of Food Technology with Honours

At the end of the programme, students will be able to:

1. Acquire the advanced and comprehensive theoretical and technical knowledge and skills in the area of Food Technology specialised (Knowledge).
2. Apply extensive technical skills in the area of Food Technology specialisation (Practical Skills)
3. Identify and resolve issues and problems in a critical, creative, and innovative manner in the area of Food Technology specialisation (Cognitive Skills)
4. Acquire the skill to communicate effectively in a well-structured manner to a diversity of audiences (Communication Skill)
5. Display a sense of responsibility and master social skills in diverse learning and working communities locally and internationally (Interpersonal Skills)
6. Understand and manage to make decision in a professional and ethical manner within the varied social and professional environment and practice (Ethics and Professionalism)
7. Manage current information and recognise the importance of life-long learning (Personal Skills)
8. Acquire entrepreneurial knowledge base for career development (Entrepreneurship Skills)
9. Function effectively as an individual and in a team with the ability to lead within broad organizational scales. (Leadership, Autonomy and Responsibility)
10. Demonstrate basic digital skills and technological application for living, learning and working in a society (Digital Skill)
11. Demonstrate numeracy skills in all aspects of life (Numeracy Skill)

1.5.2 Bachelor of Bioresource Technology with Honours

At the end of the programme, students will be able to:

1. Acquire the advanced and comprehensive theoretical and technical knowledge and skills in the area of Bioresource Technology specialised (Knowledge).

2. Apply extensive technical skills in the area of Bioresource Technology specialisation (Practical Skills)
3. Identify and resolve issues and problems in a critical, creative, and innovative manner in the area of Bioresource Technology specialisation (Cognitive Skills)
4. Acquire the skill to communicate effectively in a well-structured manner to a diversity of audiences (Communication Skill)
5. Display a sense of responsibility and master social skills in diverse learning and working communities locally and internationally (Interpersonal Skills)
6. Understand and manage to make decision in a professional and ethical manner within the varied social and professional environment and practice (Ethics and Professionalism)
7. Manage current information and recognise the importance of lifelong learning (Personal Skills)
8. Acquire entrepreneurial knowledge base for career development (Entrepreneurship Skills)
9. Function effectively as an individual and in a team with the ability to lead within broad organizational scales. (Leadership, Autonomy and Responsibility)
10. Demonstrate basic digital skills and technological application for living, learning and working in a society (Digital Skills)
11. Demonstrate numeracy skills in all aspects of life (Numeracy Skills)

1.5.3 Bachelor of Environmental Technology with Honours

At the end of the programme, students will be able to:

1. Acquire the advanced and comprehensive theoretical and technical knowledge and skills in the area of Environmental Technology specialised (Knowledge).
2. Apply extensive technical skills in the area of Environmental Technology specialisation (Practical Skills)
3. Identify and resolve issues and problems in a critical, creative, and innovative manner in the area of Environmental Technology specialisation (Cognitive Skills)
4. Acquire the skill to communicate effectively in a well-structured manner to a diversity of audiences (Communication Skill)
5. Display a sense of responsibility and master social skills in diverse learning and working communities locally and internationally (Interpersonal Skills)

6. Understand and manage to make decision in a professional and ethical manner within the varied social and professional environment and practice (Ethics and Professionalism)
7. Manage current information and recognise the importance of lifelong learning (Personal Skills)
8. Acquire entrepreneurial knowledge base for career development (Entrepreneurship Skills)
9. Function effectively as an individual and in a team with the ability to lead within broad organizational scales. (Leadership, Autonomy and Responsibility)
10. Demonstrate basic digital skills and technological application for living, learning and working in a society (Digital Skills)
11. Demonstrate numeracy skills in all aspects of life (Numeracy Skills)

1.5.4 Bachelor of Bioprocess Engineering Technology with Honours

At the end of the programme, students will be able to:

- apply knowledge related to mathematics, science and fundamentals of bioprocess engineering to defined and applied bioprocess engineering technology procedures, processes, systems or methodologies. (Knowledge)
- identify, formulate, research literature reviews and analyze broadly defined engineering related problems reaching proven conclusions using analytical tools appropriate to Bioprocess Engineering Technology. (Problem analysis)
- design solutions to problems related to Bioprocess Engineering Technology to meet the specific needs of public health and safety, culture, society and environment. (Design/ development of solutions)
- investigate problems using appropriate research knowledge and methods. (Investigation)
- produce, select and apply the use of modern technological equipment that is appropriate and essential for Bioprocess Engineering Technology activities based on an understanding of the limits of the activity. (Modern Tool Usage)
- apply reasoning based on contextual knowledge to assess issues related to society, health, safety, law and culture and responsibilities related to the professional practice of Bioprocess Engineering Technology (The Engineer and Society)

- professionally assess the impact of solutions by Bioprocess Engineering Technology on society, environmental contexts and sustainability development. (Environment and Sustainability)
- apply principles ethically and committed to professional ethics and the responsibilities and norms of Bioprocess Engineering Technology practice. (Ethics)
- function effectively as an individual, and as a member or leader in a diverse and multidisciplinary team (Individual and Teamwork)
- communicate effectively on Bioprocess Engineering Technology activities with the community of engineering technologists and society at large. (Communications)
- demonstrate knowledge and understanding related to engineering and management principles while being able to apply these criteria to tasks, as a member and leader in a team, to manage projects and in environments involving various disciplines. (Project Management and Finance)
- recognize needs and have the preparation and ability to engage in the lifelong learning process independently as technology shifts to a broader context. (Lifelong Learning)

1.6 Applications of Soft Skills

The tables below provide the matrix for the application of soft skills in the respective programmes.

a. Bachelor of Food Technology with Honours

No	Code	Course	CS – Communication skill	CTPS – Critical Thinking and Problem Solving	TS – Teamwork	LL – Lifelong Learning and Information Management	KK – Entrepreneurship Skill	EM – Professional Ethics and Moral	LS – Leadership Skill
UNIVERSITY COURSE									
1	WUS101/2	Core Entrepreneurship	/		/			/	
2	WAR122/2	Integrity and Anti Corruption Course							
3	HFE224/2	Appreciation of Ethics and Civilisations			/			/	
4	HFF225/2	Philosophy and Current Issues		/				/	
5	LKM400/2	Bahasa Malaysia IV	/	/				/	
6	LSP101/2	Progressive English	/	/					
7	LSP201/2	General English 1	/	/					
8	LSP301/2	General English 2	/	/					
9	LHP411/2	Effective Writing	/	/					
10		Co-curriculum/ Other language/ Skill /Option courses		/	/	/		/	
CORE COURSE									
1	IMK103/2	Introduction to Food Science and Technology		/				/	
2	IMK114/3	Introduction to Food Physics		/					
3	IUK108/4	Statistics with Computer Applications		/					
4	IUK191/4	Mathematics 1		/					
5	IUK107/4	Chemistry for Technologist		/					

6	IMA116/2	Persuasive Oral Presentation for Food Technology	/	/					
7	IMA117/2	Basic Scientific Communication for Food Technology	/	/					
8	IMG103/3	Food Chemistry	/						
9	IMG111/3	Food Microbiology I		/					
10	IMK106/3	Introduction to Food Engineering		/					
11	IMG203/3	Chemical Food Analysis	/	/					
12	IMG222/3	Food Microbiology II		/					
13	IMK225/3	Unit Operation in Food Processing		/					
14	IMK227/3	Biochemistry		/					
15	IMG204/3	Instrumental Food Analysis	/	/					
16	IMG223/4	Food Processing Technology of Animal-Based Products		/	/				
17	IMG324/4	Food Processing Technology of Plant-Based Products		/					
18	IMG329/3	Sensory Science		/					
19	IMK316/3	Food Quality Management and Food Regulations		/	/	/			
20	IMK327/3	Human Nutrition		/					
21	IMA325/3	Food Product Development	/	/	/		/		/
22	IMK326/3	Food Safety		/					/
23	IMA422/4	Food Technology Research Project	/	/		/		/	
24	IMA423/6	Food Industrial Training	/	/		/		/	

ELECTIVE COURSE									
1	IMK113/3	Management of Halal Food		/					
2	KAT145/4	Analytical Chemistry I		/					
3	IBK104/3	Fundamentals of Bioprocess Technology	/	/					
4	IMK221/3	Food Ingredients	/	/					
5	KFT233/4	Physical Chemistry I		/					
6	IMK209/2	Physical Properties of Food		/					
7	IMK226/3	Post Harvest Technology of Fruits and Vegetables		/					
8	IMK228/2	Primary Products Technology		/					
9	IUK208/3	Experimental Design with Computer Applications		/					
10	IBK316/3	Food Bioprocess Technology	/	/					
11	IBG214/4	Enzyme Technology	/	/					
12	IMG328/3	Food Packaging		/					
13	IMK320/3	Functional Foods		/		/			
14	IMK410/3	Food Borne Pathogens		/		/			
15	IMK424/2	Food Defence		/	/				
16	IMK425/2	Food Structure	/	/					
17	IUK190/3	Occupational Safety and Health Coordinator		/				/	
18	IUK292/3	Ergonomics and Ergonomic Trained Person		/				/	

b. Bachelor of Bioresource Technology with Honours

No	Code	Course	CS – Communication skill	CTPS – Critical Thinking and Problem Solving	TS – Teamwork	LL – Lifelong Learning and Information Management	KK – Entrepreneurship Skill	EM – Professional Ethics and Moral	LS – Leadership Skill
UNIVERSITY COURSE									
1	WUS101/2	Core Entrepreneurship	/	/			/	/	
2	WAR122/2	Integrity and Anti Corruption Course							
3	HFE 224/2	Appreciation of Ethics and Civilisations		/				/	
4	HFF 225/2	Philosophy and Current Issues		/				/	
5	LKM400/2	Bahasa Malaysia IV	/	/				/	
6	LSP201/2	General English 1	/	/					
7	LSP301/2	General English 2	/	/					
8		Co-curriculum/ Other language/ Skill /Option courses		/	/	/		/	
CORE COURSE									
1	IWK100/2	Bioresource as Industrial Raw Materials	/	/					
2	IWK101/4	Basic Coatings Technology	/	/					
3	IWK102/4	Basic Bioresource Science and Technology	/	/					
4	IWK103/4	Pulp Production and Paper Recycling	/	/	/				
5	IWK105/4	Bioresource Based Products		/			/		
6	IUK108/4	Statistics with Computer Applications		/					
7	IUK191/4	Mathematics 1		/					
8	IUK102/3	Basic Chemical Process		/					

9	IWK201/4	Raw Materials and Coatings Chemistry	/	/		/			
10	IWK203/4	Stock Preparation and Papermaking	/	/					
11	IWK205/3	Additives and Paper Properties	/	/	/				
12	IWA281/2	Coatings Technology Laboratory I		/	/	/			
13	IWA282/2	Bioresource Technology Laboratory I		/	/	/			
14	IWA283/2	Paper Technology Laboratory I		/	/	/			
15	IWK301/3	Coatings Process and Equipment	/	/					
16	IWK308/3	Mechanics of Structural Materials		/				/	
17	IWA381/2	Coatings Technology Laboratory II		/		/			/
18	IWA382/2	Bioresource Technology Laboratory II		/		/			/
19	IWA383/2	Paper Technology Laboratory II		/		/		/	/
20	IWA313/8	Bioresource, Paper and Coatings Technology Research Project	/	/		/		/	
21	IWA404/6	Bioresource, Paper and Coatings Technology Industrial Training	/	/				/	
ELECTIVE COURSE									
1	KAT245/4	Analytical Chemistry I	/	/					
2	IBK212/2	Renewable Biomass		/		/			
3	IEK108/3	Process Fluid Mechanics		/					
4	IEK115/3	Environment, Safety and Health		/				/	
5	IUK107/4	Chemistry for Technologist		/					
6	IEK212/3	Process Heat Transfer		/					
7	IUK208/3	Experimental Design with Computer Applications		/					

8	IUK291/4	Mathematics II		/					
9	IWK204/3	Bioresource, Paper and Coatings Product Development	/	/			/		
10	IEK217/3	Environmental Management	/	/					
11	IWK304/3	Furniture Manufacturing	/				/		
12	IWK305/2	Advanced Technology of Coatings	/	/		/			
13	IWK306/2	Fibre and Lignocellulosic Composite		/		/			
14	IWK307/2	Advanced Paper Technology - Instrumental Analysis For Pulp and Paper	/	/		/			

c. Bachelor of Environmental Technology with Honours

No	Code	Course	CS – Communication skill	CTPS – Critical Thinking and Problem Solving	TS – Teamwork	LL – Lifelong Learning and Information Management	KK – Entrepreneurship Skill	EM – Professional Ethics and Moral	LS – Leadership Skill
UNIVERSITY COURSE									
1	WUS101/2	Core Entrepreneurship	/	/			/	/	
2	WAR122/2	Integrity and Anti Corruption Course							
3	HFE224/2	Appreciation of Ethics and Civilisations		/				/	
4	HFF225/2	Philosophy and Current Issues		/				/	
5	LKM400/2	Bahasa Malaysia IV	/	/				/	
6	LSP201/2	General English 1	/	/					
7	LSP301/2	General English 2	/	/					
8		Co-curriculum/ Other language/ Skill /Option courses							

CORE COURSE									
1	IEA101/4	Introduction to Environmental Science and Technol-		/					
2	IUK102/3	Basic Chemical Process		/					
3	IEA123/2	Internet of Things for Environmental Monitoring towards Artificial Intelligence	/	/					
4	IUK191/4	Mathematics I		/					
5	IUK108/4	Statistics with Computer Applications		/					
6	IEK108/3	Process Fluid Mechanics		/					
7	IEK115/3	Environment, Safety and Health Legislation		/				/	
8	IEA221/2	MATLAB Applications in Industry		/					
9	IEK214/4	Heat Transfer and Applications		/	/				
10	IEK218/3	Treatment and Management of Solid Wastes	/	/					
11	IEK205/3	Air Pollution Control Technology		/	/				
12	IEK211/3	Equipment Design for Water Treatment	/	/					
13	IEK215/4	Mass Transfer and Separation		/	/				
14	IEK219/3	Treatment and Management of Scheduled Wastes		/					/
15	IEA322/2	Computer-Aided Design (CAD) Drawing							
16	IEA300/2	Environmental Technology Laboratory	/	/					/
17	IEA404/6	Environmental Technology Industrial Training	/	/		/		/	
18	IEA313/8	Environmental Technology Research Project	/	/		/		/	
19	IEK307/3	Noise and Vibration Control Technology		/		/			

20	IEK308/3	Industrial Wastewater Treatment Plant Design	/	/	/				/
21	IEK309/3	Chemical Fate and Transport in the Environment	/	/					
ELECTIVE COURSE									
1	IBG111/3	Industrial Microbiology	/	/					
2	IEA112/4	Society and Environment Project	/	/					
3	IUK190/3	Occupational Safety and Health Coordinator		/				/	
4	IUK107/4	Chemistry for Technologist		/					
5	BOI102/3	Ecology		/					
6	IEA202/2	Environmental Bioindicators	/						
7	IEK217/3	Environmental Management	/	/					
8	IUK208/3	Experimental Design with Computer Applications		/					
9	IUK292/3	Ergonomics and Ergonomic Trained Person		/				/	
10	IUK291/4	Mathematics II		/					
11	IEG301/3	Environmental Forensics		/		/			
12	IEA311/3	Environmental Micro biology	/	/					
13	IEA315/3	Indoor Environment	/	/	/				
14	IEA333/3	Environmental Product Designing Process		/			/		
15	IEA314/3	Environmental Audit and Risk Assessment		/				/	

d. Bachelor of Bioprocess Engineering Technology with Honours

No	Code	Course	CS – Communication	CTPS – Critical Thinking and Problem Solving	TS – Teamwork	LL – Lifelong Learning and	KK – Entrepreneurship Skill	EM – Professional Ethics and	LS – Leadership Skill
UNIVERSITY COURSE									
1	WUS101/2	Core Entrepreneurship	/	/			/	/	
2	WAR122/2	Integrity and Anti Corruption Course							
3	SHE101/2	Ethnic Relations		/	/				
4	HTU223/2	Islamic and Asian Civilisations		/					
5	LKM400/2	Bahasa Malaysia IV	/	/				/	
6	LSP101/2	Progressive English	/	/					
7	LSP201/2	General English 1	/	/					
8	LSP301/2	General English 2	/	/					
9		Co-curriculum/ Other language/ Skill /Option courses		/	/	/		/	
CORE COURSE									
1	IUK102/3	Basic Chemical Process Calculations		/					
2	IUK108/4	Statistics with Computer Applications		/					
3	IUK191/4	Mathematics I		/					
4	IUK291/4	Mathematics II		/					
5	IBA104/3	Practical for Technologists	/	/					
6	IBK104/3	Fundamentals of Bioprocess Technology	/	/					
7	IEK108/3	Process Fluid Mechanics		/					

8	IBG111/3	Industrial Microbiology	/	/					
9	IBG112/3	Bioanalysis I	/	/					
10	IMK227/3	Biochemistry	/						
11	IEK212/3	Process Heat Transfer		/					
12	IEA216/3	Computer Applications in Industry		/					
13	IBG205/3	DNA and Metabolite Technology	/	/					
14	IBG207/3	Cell and Tissue Culture Technology		/					
15	IEK213/3	Mass Transfer and Separation Processes		/					
16	IBG211/3	Bioanalysis II	/	/					
17	IBG216/4	Bioreactor design, calculation & operation	/	/					
18	IBG214/4	Enzyme Technology	/	/					
19	IBA312/3	Bioprocess and Society	/	/	/				
20	IBK314/3	Downstream Process Technology		/	/				
21	IBG307/3	Bioprocess Optimization and Simulation	/	/		/			
22	IBA319/4	Advanced Practical in Bioreactor System	/	/					
23	IBG319/4	Bioproduct Design and Development	/	/	/	/	/		/
24	IBA306/8	Bioprocess Technology Research Project	/	/				/	/
25	IBA407/4	Practical in Downstream Processing	/	/					
26	IBA406/12	Bioprocess Technology Industrial Training	/	/	/			/	/

ELECTIVE COURSE									
1	IEA112/4	Society and Environment Project	/	/					
2	IEK115/3	Environmental, Safety and Health Regulation		/				/	
3	IMK113/3	Management of Halal Food	/		/				
4	IMK221/3	Food Ingredients	/	/					
5	IBK212/2	Renewable Biomass		/		/			
6	IBK215/2	Introduction to OMICs Technology	/	/					
7	IBK218/2	Bioprocess Instrumentation and Measurement	/	/					
8	IEK219/3	Treatment and Management of Scheduled Waste		/				/	
9	IUK208/3	Experimental Design with Computer Applications		/					
10	IEK217/3	Environmental Management	/	/					
11	IBK315/2	Bioinformatics		/					
12	IBK316/3	Food Bioprocess Technology	/	/					
13	IBK317/3	Mathematical Physiology		/		/			
14	IBK318/3	Pharmacogenomics		/				/	
15	IMK316/3	Food Quality Management and Food Regulations	/	/		/			
16	IMK326/3	Food Safety	/	/		/			
17	IBK412/3	Environmental Bioprocess Technology		/				/	
18	IBK413/3	Protein Engineering		/					
19	IBK411/3	Quality Assurance and Safety of Bioprocess Products	/	/				/	

1.7 Programme Profile

The Bachelor of Technology encompasses all aspects of science and technology in the relevant discipline. The programme covers theoretical and scientific foundations as well as various extensive applications in industry. The curriculum of the programme emphasizes problem-based learning concepts in particular through practical/project/training-based courses that are integrated throughout the years and emphasises as well as inculcates a research orientation to the students.

In the first year, students are taught the basics of science and technology in the respective programme such as Introduction to Food Science and Technology (Food Technology), Basic Bioresource Science and Technology (Bioresource Technology), Introduction to Environment Science and Technology (Environmental Technology) and Fundamentals of Bioprocess Technology (Bioprocess Engineering Technology), in addition to learning of general chemistry, physics, mathematics and unit operations.

The following year of study offers an integrated and a wide range of courses that focus on a variety of areas in the respective technology programmes; Food Technology, Bioresource Technology, Environment Technology and Bioprocess Technology.

Students will be assigned to various organisations for a full-time industrial training for a period of 12 weeks.

In the final year, students are required to complete a 2-semesters research project under the supervision of one academic staff.

1.8 Type of Programmes

The degree is offered through one programmes namely:

(i) Bachelor of Technology with Elective

Under this programme students choose several elective courses to widen their specialisation area and their knowledge in industrial technology.

All students must choose Bachelor of Technology with Elective programme at the beginning of the second semester of Year I.

1.9 Programme Requirements

Environmental Technology and Bioresource Technology (3 ½ year programme)

Type of Courses	Course Code Classification	Number of Units Normal programme
School Requirements		
• Core Courses	T	72
• Elective Courses	E	30
University Requirements	U	18
Minimum Total Unit Requirement		**120**

Food Technology (4 year programme)

Type of Courses	Course Code Classification	Number of Units Normal programme
School Requirements		
• Core Courses	T	78
• Elective Courses	E	33
University Requirements	U	20
Minimum Total Unit Requirement		**131**

Bioprocess Engineering Technology (4 year programme)

Type of Courses	Course Code Classification	Number of Units Normal programme
School Requirements		
• Core Courses	T	100
• Elective Courses	E	20
University Requirements	U	20
Minimum Total Unit Requirement		**140**

1.10 Type of Courses

Courses offered in the Bachelor of Technology degree programme as shown in the above table (in Section 1.9) are categorised as follows:

(a) Core Courses (Course Code Classification - T)

Core courses consist of Technology Specialised courses are a set of compulsory courses for a particular area of specialisation that must be taken and passed.

(b) Elective Courses (Course Code Classification - E)

Elective courses consist of courses that students can choose from to strengthen their Technology specialisation courses. Elective courses must be taken by students with Elective.

(c) University Courses/Option (Course Code Classification - U)

All students must take a number of courses to fulfil the University requirements. Further information on the University Courses/Options is given in Section 3 and specific requirements for students of the School of Industrial Technology are given in Section 4.2.

(e) Special Courses (Course Code Type - Z)

Special Courses are pre-requisite courses that must be taken and passed with at least 'C' grade before a less qualified student is allowed to take a higher level course. LSP101/2- Preparatory English is one of such courses in this category.

(f) Audit Courses (Course Code Type - Y)

In principle, the university allows students to register for any courses on an audit basis for the purpose of enhancing the students' knowledge in specific fields during the duration of their study. However, the units of any such audit courses will not be taken into consideration for graduation purposes.

The registration procedures for courses on an audit basis are as follows:

(i) Students can register for courses on an audit basis for the purpose of augmenting his/her knowledge in specific fields. Registration for the said course must be done within the course registration period.

(ii) Only students of active status are allowed to register for courses on an audit basis.

(iii) Courses registered for on an audit basis are designated as code 'Y' courses. This designation will be indicated on the relevant academic transcript. A space at the bottom of the academic transcript will be reserved for listing the courses registered for on an audit basis.

(iv) Courses registered for on an audit basis will not be taken into consideration in determining the minimum and maximum units of courses registered for.

(v) Students must fulfil all course requirements. Students, who register for courses on an audit basis, are not obligated to sit for any examinations pertaining to that course. A grade 'R' will be awarded irrespective as to whether the student had or had not sat for the examination.

1.11 Graduation Requirements

Students must fulfil the following requirements to graduate:

(a) Fulfil the minimum required (7 or 8 semesters) of the residential requirement for the programme of study and has not exceeded the maximum period of study (12 or 14 semesters).

(b) Fulfil all credit requirements of the courses for the programme of study required units such as the requirements for each component (Core, Elective and University courses/Option).

(c) Obtained a CGPA of 2.00 and above for Core components.

(d) Obtained a CGPA of 2.00 and above for the programme.

(e) Achieved a minimum of 'C' grade or a grade point of 2.00 for Bahasa Malaysia, English Language (4 units), TITAS, Ethnic Relations and Core Entrepreneurship.

1.12 Academic Year Status

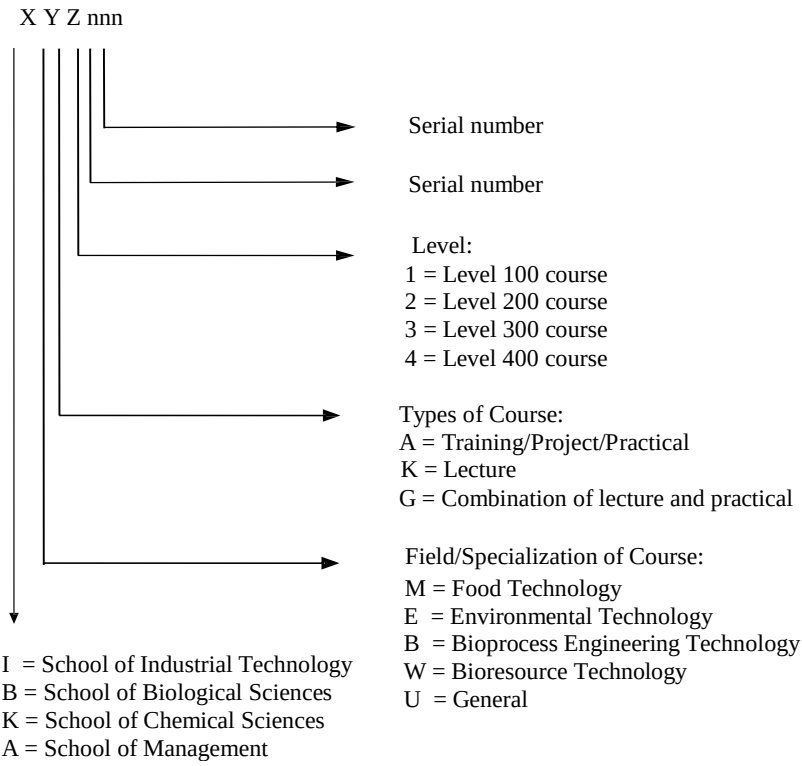
Based on the unit system, the student's academic status is not defined by the number of years the student has spent in the university. Instead students are classified as First Year student, Second Year and so on based on the total unit accumulated. The academic year status for Bachelor of Industrial Technology programme is as follows:

Major	Graduation Credit	Year Status			
		I	II	III	Final
Environmental (Elective) **Bioresource (Elective)**	120	0 - 34	35 - 70	71 - 104	105 - graduation credit

Major	Graduation Credit	Year Status			
		I	II	III	Final
Food (Elective)	131	0 - 35	36 - 72	73 - 109	110 - graduation credit
Bioproses (Elective)	140	0 - 46	47 - 85	86 - 121	122 - graduation credit

1.13 Course Coding

Each course has a course code, which is made up of 3 letters and 3 numbers. Its explanation for the School of Industrial Technology is as follows:



2.0 ACADEMIC SYSTEM AND GENERAL INFORMATION

2.1 Course Registration Activity

Registration of courses is an important activity during the period of study at the university. It is the first step for the students to sit for the examination at the end of each semester. Signing up for the right courses each semester will help to facilitate the graduation process based on the stipulated duration of study.

2.1.1 Course Registration Secretariat for the Bachelor's Degree and Diploma Programmes

Student Data and Records Unit
Academic Management Division
Registry
Level 1, Chancellory Building

Tel. No.	:	04-653 2925/2924/2923
Fax No.	:	04-657 4641
E-Mail	:	sdrp@usm.my
Website	:	http://bpa.usm.my/index.php/ms/

2.1.2 Course Registration Platform

1. E-Registration

E-Registration is a platform for online course registration. The registration is done directly through the Campus Online portal**.** Course registration exercise for both semesters begins after the release of Official examination results of every semester

The online registration for Long Vacation Semester (KSCP) begins officially after the release of the 2nd semester examination result.

The date of the E-Registration will be announced to the students via email during the revision week of every semester and details of the activity will be displayed in the USM's official website.

All courses are allowed to be registered through E-Registration,

except for co-curriculum courses. The registration of co-curriculum courses is managed by the Director of the Centre for Co-Curriculum Programme at the Main Campus or the Coordinator of the Co-Curriculum Programme at the Engineering Campus and the Coordinator of the Co-Curriculum Programme at the Health Campus.

Students are required to preregister their co-curriculum courses before the actual E-Registration activity. They are allowed to follow the respective course once the preregistration is approved. The list of the co-curriculum courses taken will be included in their course registration data.

Access to *E-Daftar* System

a. *E-Daftar* System can be accessed through the Campus Online portal **(https://campusonline.usm.my)**.

b. Students need to use their USM E-mail ID and password to access their profile page, which includes the *E-Daftar* menu.

c. Students need to print the course registration confirmation slip upon completion of the registration process or after updating the course registration list (add/ drop) within the *E-Daftar* period.

2. Course Registration Activity at the School

Registration activities conducted at the Schools/Centres are applicable to students who are academically active and under Probation (P1/P2) status. Students who encounter difficulties in registering their courses during the E-Registration period are allowed to register the courses at their respective school/centre during the official period of course registration.

The official period for registration begins on the first day of the new semester until 3rd week. Registration during 4th - 6th week of the official academic calendar is considered as late registration. Hence, a penalty of RM50.00 per registration will be imposed unless justifications for the late registration are provided by the students. The Examination and Graduation Unit, Academic Management Section (Registrar Department) will manage students' late registration.

2.1.3 Course Registration General Information

1. Several information that can be referred by the students pertaining to the registration activity:

   a. The website of the respective School, for the updated information of the courses offered or course registration procedure.

   b. List the courses to be registered and number of units (unit value) for each course (refer to Students Handbook for Study Programme).

Academic Status	PNG	Minimum Units	Maximum Units
Active	2.00 & Above	9	25
P1	1.99 & Below	9	12
P2		9	10

   c. Students with arrears are not allowed to register any courses. You may only register courses after paying off your arrears.

2. Type of course codes during registration:

   T = Core courses
   E = Elective courses
   M= Minor courses
   U = University courses

   } Grade and number of units obtained from these courses are considered for graduation

   Two (2) other course codes are:

   Y = audit courses
   Z = prerequisite courses

   } Grade and number of units obtained are not considered for graduation

3. Academic Advisor's advice and approval are necessary.

4. Students are not allowed to register or resit any course with grade 'C' and above.

5. Medical, Dentistry and Pharmacy students are not allowed to register or resit any course with grade 'B-' and above.

2.1.4 Information/Document Given to All Students through Campus Online Portal (https://campusonline.usm.my)

1. The information of the Academic Advisor.
2. Academic information such as academic status, GPA value, CGPA value and year of study.
3. Cangred and Course Registration Form.
4. List of courses offered by all Schools/Centres.
5. Teaching and Learning Timetable for all Schools/Centres/Units from the three campuses.
6. List of pre-registered courses which have been added into the students' course registration record (if any).
7. Reminders about the University course registration policies/general requisites.

2.1.5 Registration of Language and Co-Curricular Courses

1. Registration of Language courses through *E-Daftar* is allowed.

    a. However, if any problem arises, registration for language courses can still be carried out/updated during the official period of OCR at the office of the School of Languages, Literacies and Translation.

    b. All approval/registration/dropping/adding of language courses is under the responsibility and administration of the School of Languages, Literacies and Translation.

c. Any problems related to the registration of language courses can be referred to the School of Languages, Literacies and Translation. The contact details are as follows:

General Office	: 04-653 4542	for Main
Malay Language Programme Chairperson	: 04-653 3974	Campus
English Language Programme Chairperson	: 04-653 3406	students
Foreign Language Programme Chairperson	: 04-653 3396	

Engineering Campus Programme Chairperson: 04-599 5400/5430

: 04-599 5402/5407

Health Campus Programme Chairperson : 09-767 1262

2. Registration of **co-curricular courses through *E-Daftar*** is not allowed.

   a. Registration for co-curricular courses is either done through pre-registration before the semester begins or during the first/second week of the semester. Co-curricular courses will be included in the students' course registration account prior to the *E-Daftar* activity if their pre-registration application is successful.

   b. All approval/registration/dropping/adding of co-curricular courses is under the responsibility and administration of:

      Director of the Centre for Co-Curricular Programme, Main Campus (04-653 5242/5248)

      Deputy Director of the Centre for Co-Curricular Programme, Engineering Campus (04-599 5097/6308)

      Deputy Director of the Centre for Co-Curricular Programme, Health Campus (09-767 2371/6625)

3. **Dropping of Language and Co-Curricular courses, if necessary, must be made within the first week**. After the first week, a fine of RM50.00 will be imposed for each course.

2.1.6 Registration of 'Audit' Courses (Y code)

Registration for the 'Audit' course (Y code) **is not allowed on the *E-Daftar***. It can be done during the official period of OCR at the School or Centre involved.

Students who are interested must complete the course registration form which can be printed from the Campus Online Portal or obtained directly from the School. Approval from the lecturers of the courses and the Dean/ Deputy Dean (Academic) of the respective school is required.

Registration of 'Audit' courses (Y code) is not included in the calculation of the total registered workload units. Grades obtained from 'Audit' courses are not considered in the calculation of CGPA and total units for graduation.

2.1.7 Registration of Prerequisite Courses (Z code)

Registration of Prerequisite courses (Z code) is included in the total registered workload (units). Grades obtained from the Prerequisite courses are not considered in the calculation of CGPA and units for graduation.

2.1.8 Late Course Registration and Late Course Addition

Late course registration and addition are only allowed during the first and up to the third week with approval from the Dean. Application to add a course after the third week will not be considered, except for special cases approved by the University. A RM50.00 fine will be imposed on students if reasons given for late registration are not accepted by the University or School.

2.1.9 Dropping of Courses

Dropping of courses is allowed until the **end of the sixth week**.

For this purpose, students must meet the requirements set by the University as follows:

1. Students who intend to drop any course are required to fill in the dropping of course form. The form needs to be signed by the lecturer of the course involved and the Dean/Deputy Dean (Academic, Career International Affairs) of the School. The form has to be submitted to the general office of the School/Centre which offers that particular course.

2. Students who wish to drop language courses must obtain the signature and stamp of the Dean/Deputy Dean (Academic, Career and International Affairs) of the School of Languages, Literacies and Translation.

3. Students who wish to drop the Co-Curricular courses must obtain the approval of the Director/Coordinator of the Co-Curricular Programme.

4. The option for dropping courses cannot be misused. Lecturers have the right not to approve the course that the student wishes to drop if the student is not serious, such as poor attendance record at lectures, tutorials and practical, as well as poor performance in coursework. The student will be barred from sitting for the examination and will be given grade 'X' and is not allowed to repeat the course during the *Courses during the Long Vacation* (KSCP) period.

2.1.10 Course Registration Confirmation Slip

The course registration confirmation slip that has been printed/obtained after registering the course should be checked carefully to ensure there are no errors, especially the code type of the registered courses.

Any data errors for course registration must be corrected immediately whether during the period of *E-Daftar* (for students with active status only) or during the registration period at the Schools.

2.1.11 Revising and Updating Data/Information/ of Students' Personal and Academic Records

Students may check their personal and academic information through the Campus Online portal.

Students are advised to regularly check the information displayed on this website.

1. Student may update their correspondence address, telephone number and personal email through the Campus Online portal.

2. The office of the Student Data and Records Unit must be notified of any application for updating the personal data such as the spelling of names, identification card number, passport number and address (permanent address and correspondence address).

3. The office of the Student Data and Records Unit must be notified of any application for correction of academic data such as information on major, minor, MUET result and the course code (besides data on the examination results).

2.1.12 Academic Advisor

Each School will appoint an Academic Advisor for every student. Academic Advisors will advise their students under their responsibility on academic matters.

2.2 Interpretation of Unit/Credit/Course

2.2.1 Unit

Each course is given a value, which is called a **UNIT**. The unit is determined by the scope of its syllabus and the workload for the students. In general, a unit is defined as follows:

Type of Course	Definition of Unit
Theory	1 unit is equivalent to 1 contact hour per week for 13 – 14 weeks in one semester
Practical/Laboratory/ Language Proficiency	1 unit is equivalent to 1.5 contact hours per week for 13 – 14 hours in one semester
Industrial Training/ Teaching Practice	1 unit is equivalent to 2 weeks of training

Based on the requirements of Malaysian Qualifications Framework (MQF):

One unit is equivalent to 40 hours of student learning time

[1 unit = 40 hours of Student Learning Time (SLT)]

2.2.2 Accumulated Credit Unit

Units registered and passed are known as credits. To graduate, students must accumulate the total number of credits stipulated for the programme concerned.

2.3 Examination System

Examinations are held at the end of every semester. Students have to sit for the examination of the courses they have registered for except for courses with 100% coursework. Students are required to settle all due fees and fulfil the standing requirements for lectures/tutorials/practical and other requirements before being allowed to sit for the examination of the courses they have registered for. Course evaluation will be based on the two components of coursework and final examinations. Coursework evaluation includes tests, essays, projects, assignments and participation in tutorials. The examination can be held face to face or online.

2.3.1 Duration of Examination

Evaluated Courses	Examination Duration
2 units	1 hour for coursework of more than 40%
2 units	2 hours for coursework of 40% and below
3 units or more	2 hours for coursework of more than 40%
3 units or more	3 hours for coursework of 40% and below

2.3.2 Barring from Examination

Students will be barred from sitting for the final examination if they do not fulfil at least 70% of the course requirements, such as absence from lectures and tutorials, and have not completed/fulfilled the required components of coursework. A grade 'X' would be awarded for a course for which a student is barred. Students will not be allowed to repeat the course during the *Courses During the Long Vacation* (KSCP) period.

2.3.3 Examination Special Needs

Students with Disabilities (OKU) who require special needs while sitting for exams can inform the School to get special permission to sit for exams in the Quarantine Room at the Examination Operations Office.

If a student falls ill during the exam, the student is only allowed to continue the exam in the exam hall or quarantine room or Pusat Sejahtera (subject to the approval of the Pusat Sejahtera Director).

Students who fall ill on the day of the exam and do not attend the exam must submit a medical certificate (from a government hospital/clinic or panel clinic/USM clinic) to the exam secretariat via email exam@usm.my within 48 hours after the end of the examination.

2.3.4 Grade Point Average System

Students' academic achievement for registered courses will be graded as follows:

Alphabetic Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
Grade Points	4.00	3.67	3.33	3.00	2.67	2.33	2.00	1.67	1.33	1.00	0.67	0

Students who obtained a grade 'C-' and below for particular course would be given a chance to improve their grades by repeating the course during the KSCP (see below) or normal semester. Students

who obtained a grade 'C' and above for a particular course are not allowed to repeat the course whether during KSCP or normal semester.

The achievement of students in any semester is based on Grade Point Average (GPA) achieved from all the registered courses in a particular semester. GPA is the indicator to determine the academic performance of students in any semester.

CGPA is the Cumulative Grade Point Average accumulated by a student from one semester to another during the years of study.

The formula to compute GPA and CGPA is as follows:

$$\text{Grade Point Average} = \frac{\sum_{i=1}^{n} U_i M_i}{\sum_{i=1}^{n} U_i}$$

where:

n	=	Number of courses taken
U_i	=	Course units for course i
M_i	=	Grade point for course i

Example of calculation for GPA and CGPA:

	Course	Unit	Grade Point (GP)	Grade (G)	Total GP
Semester I	ABC XX1	4	3.00	B	12.00
	ABC XX2	4	2.33	C+	9.32
	BCD XX3	3	1.67	C-	5.01
	CDE XX4	4	2.00	C	8.00
	EFG XX5	3	1.33	D+	3.99
	EFG XX6	2	2.67	B-	5.34
		20			43.66

GPA = $\frac{43.66}{20}$ = 2.18

	Course	Unit	Grade Point (GP)	Grade (G)	Total GP
Semester II	ABC XX7	3	1.00	D	3.00
	ABB XX8	4	2.33	C+	9.32
	BBC XX9	4	2.00	C	8.00
	BCB X10	4	2.67	B-	10.68
	XYZ XX1	3	3.33	B+	9.99
		18			40.99

GPA = $\frac{40.99}{18}$ = 2.28

CGPA = $\frac{\text{Total Accumulated GP}}{\text{Total Accumulated Unit}} = \frac{43.66 + 40.99}{20 + 18} = \frac{84.65}{38} = 2.23$

From the above examples, the CGPA is calculated as the total grade point accumulated for all the registered courses and divided by the total number of the registered units.

2.3.5 Courses During the Long Vacation *(Kursus Semasa Cuti Panjang)* (KSCP)

KSCP is offered to students who have taken a course earlier and obtained a grade of 'C-', 'D+', 'D', 'D-', 'F' and 'DK' only. Students who obtained a grade 'X' or 'F*' are not allowed to take the course during KSCP.

The purpose of KSCP is to:

1. Give an opportunity to students who are facing time constraints for graduation.

2. Assist students who need to accumulate a few more credits for graduation.

3. Assist probationary students to enhance their academic status.

4. Assist students who need to repeat a prerequisite course, which is not offered in the following semester.

However, this opportunity is only given to students who are taking courses that they have attempted before and achieved a grade as stipulated above, provided that the course is being offered. Priority is given to final year students. Usually, formal lectures are not held, and teaching is via tutorials.

The duration of KSCP is 3 weeks, i.e. 2 weeks of tutorial and 1 week of examination, all held during the long vacation. The KSCP schedule is available on the University's Academic Calendar.

<u>The Implementation of KSCP</u>

1. Students are allowed to register for a maximum of 3 courses and the total number of units registered must not exceed 10.
2. Marks/grades for coursework are taken from the highest marks/the best grades obtained in a particular course in the normal semester before KSCP. The final overall grade is determined as follows:

Final Grade = The best coursework marks or grade +

Marks or grade for KSCP examination

3. GPA calculation involves the **LATEST** grades (obtained in KSCP) and also involves courses taken in the second semester and those repeated in KSCP. If the GPA during KSCP as calculated above is 2.00 or better, the academic status will be active, even though the academic status for the second semester was probation status. However, if the GPA for KSCP (as calculated above) is 1.99 or below, the academic status will remain as probation status for the second semester.

4. Graduating students (those who have fulfilled the graduation requirements) in the second semester are not allowed to register for KSCP.

2.3.6 Academic Status

Active Status: Any student who achieves a GPA of 2.00 and above for any examination in a semester will be recognised as ACTIVE and be allowed to pursue his/her studies for the following semester.

Probation Status: A probation status is given to any student who achieves a GPA of 1.99 and below. A student who is under probation status for three consecutive semesters (P1, P2, FO) will not be allowed to pursue his/her studies at the university. On the other hand, if the CGPA is 2.00 and above, the student concerned will be allowed to pursue his/her studies and will remain at P2 status.

2.3.7 Penalty for not attending the examination

Students who do not attend the examination for any of the courses they have registered for must provide Medical Certificates to the Principal Assistant Registrar, Examination and Graduation Unit, Academic Management Division by email exam@usm.my within 48 hours (for full-time students) and 7 days (for Distance Learning Education programme students) after the examination being held. The reasons provided will be considered by the Examination Board of the School/Centre and endorsed by the University Examination Board as below:

1. For reasons accepted by the University Examination Board, students will be granted a DK grade (with permission). DK grade will be granted to the students if they submit Medical Certificates

(from hospital/government clinic or panel clinic/USM clinic) or submit any reason that can be accepted by the University Examination Board. DK grade will be exempted from the GPA/CGPA calculations of the student.

2. Candidates who fail to sit for the examination without any reason will be granted an F* grade.

2.3.8 Termination of Candidature

Without any prejudice to the above regulations, **the University Examination Council has the absolute right to terminate any student's studies if he/she does not fulfil the accumulated minimum credits.**

The University Examination Council has the right to terminate any student's studies due to certain reasons (a student who has not registered for the courses, has not attended the examination without valid reasons), as well as medical reasons can be disqualified from pursuing his/her studies.

2.3.9 Examination Results

Full results (with grade) will be announced by the University through the Campus Online portal (campusonline.usm.my) after the School Examination Council meeting which is approximately one month after the final examination.

Students can print their official semester results document namely 'SEMGRED' through the Campus Online portal (campusonline.usm.my) on the same day/date of the results announcement.

Examination results for students with outstanding debts will be withheld until the student clears the outstanding debts.

2.3.10 Re-checking of Examination Result

Students can apply for the rechecking of their examination result for the course/s taken during the semester. The application form can be obtained from BPA official website. The appeal form must be submitted along with a copy of the official receipt / e-payment statement amounting to RM25.00 for each examination paper. The appeal period is two (2) weeks after the official result is announced.

The rechecking process is only to ensure that all answers in the scripts have been marked and consistently graded and the calculation of marks awarded are correct. The answer script of the course will not be reevaluated.

The school will confirm any changes in the students' examination results. If there are any changes in the grades or marks, students may request a refund of RM25.00. The Examination and Graduation Unit will make amendments to the results of the course and students can check their updated status in the respective Campus Online portals.

2.4 Unit Exemption

2.4.1 Unit Exemption

Unit exemption is defined as the total number of units given to students who are pursuing their studies in USM that are exempted from the graduation requirements. Students only need to accumulate the remaining units for graduation purposes. Only passes or course grades accumulated or acquired in USM will be included in the calculation of the Cumulative Grade Point Average (CGPA) for graduation purposes.

2.4.2 Regulations and Implementation of Unit Exemption

(i) Diploma holders from recognised Public and Private Institutions of Higher Learning:

a. Unit exemption may only be granted for courses taken at diploma level including courses under the General Studies Component (MPU) such as Philosophy and Current Issues and Appreciation of Ethics and Civilisations.

However, unit exemptions are not permitted for Language courses under the U1 Group of the General Studies Component (MPU).

b. Courses for unit exemption may be combined (in two or more combinations) in order to obtain exemption of one course at degree level. However, if the School would like to approve only one course at the diploma level for unit exemption of one course at degree level, the course at diploma level must be equivalent to the degree course and have the same number of or more units.

c. Courses taken during employment (in-service) for diploma holders cannot be considered for unit exemption.

d. The minimum achievement at the diploma level that can be considered for unit exemption is a minimum grade 'C' or 2.0 or equivalent.

e. The total number of semesters exempted should not exceed two semesters.

f. **In order to obtain unit exemption for industrial training**, a student must have continuous work experience for at least two years in the area. If a student has undergone industrial training during the period of diploma-level study, the student must have work experience for at least one year. The students are also required to produce a report on the level and type of work performed. Industrial training unit exemption cannot be considered for semester exemption as the industrial training is carried out during the long vacation in USM.

(ii) <u>USM Supervised IPTS (Private Institutions of Higher Learning) /External Diploma Graduates</u>:

a. Students from USM supervised IPTS/External Diploma graduates are given unit exemption as stipulated by the specific programme of study. **Normally, unit exemption in this cat-**

egory is given as a block according to the agreement between USM (through the School that offers the programme) with the IPTS.

b. **Students from recognised local or foreign IPTA** (Public Institutions of Higher Learning)/IPTS who are studying at the Bachelor's Degree level may apply to study in this university and if successful, may be considered for unit exemption, subject to the following conditions:

[1] Courses taken in the previous IPT are equivalent (at least 80% of the course must be the same) to the courses offered in USM.

[2] Students taking courses at the Advanced Diploma level in IPT that are recognised to be equivalent to the Bachelor's Degree course in USM may be considered for unit exemption as in Section 2.5.

[3] The total maximum unit exemption allowed should not exceed 30% of the total unit requirement for graduation.

2.4.3 Total Number of Exempted Semesters

Semester exemption is based on the total units exempted as below:

Total Units Exempted	Total Semesters Exempted
8 and below	None
9 – 32	1
33 to 1/3 of the total units for graduation	2

2.4.4 Application Procedure for Unit Exemption

Any student who would like to apply for unit exemption is required to complete the Unit Exemption Application Form which can be obtained

from the Examination and Graduation Section or the respective Schools.

The form must be approved by the Dean of the School prior to submission to the Examination and Graduation Section for consideration and approval.

2.5 Credit Transfer

Credit transfer is defined as the recognition of the total number of credits obtained by USM students taking courses in other IPTAs (Public Institution of Higher Learning) within the period of study at USM and is combined with credits obtained at USM to fulfil the unit requirements for his/her programme of study. The transferred examination results or grades obtained in courses taken at other IPTAs will be taken into consideration in the Cumulative Grade Point Average (CGPA) calculation.

1. Category of Students Who Can Be Considered for Credit Transfer

USM full-time Bachelor Degree level students who would like to attend specific Bachelor Degree level courses at other IPTAs.

USM full-time diploma level students who would like to attend specific diploma level courses at other IPTAs.

2. Specific Conditions

a. Basic and Core Courses

Credit transfer can only be considered for credits obtained from other courses in other IPTAs that are equivalent (at least 80% of the content is the same) with the courses offered by the programme.

Courses that can be transferred are only courses that have the same number of units or more. For equivalent courses but with less number of units, credit transfers can be approved by combining a few courses. Credits transferred are the same as the course units offered in USM. The average grade of the combined courses will be taken into account in the CGPA calculation.

b. Elective or Option Courses

Students may take any appropriate courses in other IPTAs subject to permission from the School as well as the approval of the IPTAs.

The transferred credits are credits obtained from courses at other IPTAs. No course equivalence condition is required.

c. Minor Courses

For credit transfer of minor courses, the School should adhere to either condition (i) or (ii), and take into account the programme requirement.

3. General Conditions

a. The total maximum units transferred should not exceed one-third of the total number of units for the programme.

b. Credit transfer from other IPTAs can be considered only once for each IPTA.

c. The examination results obtained by a student who has taken courses at other IPTAs will be taken into account for graduation purposes. Grades obtained for each course will be combined with the grades obtained at USM for CGPA calculation.

d. Students who have applied and are approved for credit transfer are not allowed to cancel the approval after the examination result is obtained.

e. Students are required to register for courses at other IPTAs with not less than the total minimum units as well as not exceeding the maximum units as stipulated in their programme of study. However, for specific cases (e.g. students on an extended semester and only require a few units for graduation), the Dean may allow such students to register less than the minimum units and the semester will not be considered for the residential requirement. In this case, the CGPA calculation will be similar to that requirement of the KSCP.

f. USM students attending courses at other IPTAs who have failed in any courses will be allowed to re-sit the examinations of the courses if there is such a provision in that IPTA.

g. If the method of calculation of examination marks in the other IPTAs is not the same as in USM, grade conversions will be carried out according to the existing scales.

h. USM students who have registered for courses at other IPTAs but have decided to return to study in USM must adhere to the existing course registration conditions of USM.

2.5.1 Application Procedure for Attending Courses/Credit Transfer

USM students who would like to apply to attend courses/credit transfer at other IPTAs should apply using the Credit Transfer Application Form.

The application form should be submitted for the Dean's approval for the programme of study at least three months before the application is submitted to other IPTAs for consideration.

2.6 Academic Integrity

"Integrity without knowledge is weak and useless. Knowledge without integrity is dangerous and dreadful." - Samuel Johnson

Academic honesty in academic is important because it is the main pillar in ensuring that manners and ethics with regards to higher education integrity are preserved.

Universiti Sains Malaysia encourages its students to respect and ensure that any matter relating to academic integrity are well-preserved. Universiti Sains Malaysia always encourages its students to ensure that manners, ethics and integrity would be essential in academics while focusing on their studies in Universiti Sains Malaysia.

The following are practices or acts that are considered as conducts of lack of integrity in academics:

1. Cheating

Cheating in the context of academic include copying during examination, usage of information without authorization or in a dishonest manner. There are numerous ways and methods of cheating which include among others:

a. Copying answers from others during tests or exams.

b. Any suspicious action that can be described as cheating or an attempt to cheat in an exam.

c. Using unauthorized materials or devices without authorization such as hand-written notes or any smart electronic device during test or exam.

d. Asking or allowing another student to take a test or exam on behalf and vice-versa.

e. Sharing answers in assignments or projects.

f. Purposely tampering with the marks/grade given in any course work, and then re-submit it for remarking/regrading.

g. Give the command, to force, persuade, deceive or threaten others to conduct research, writing, programming or any task for a student's personal gain.

h. Submitting any identical or similar work in more than one course without consulting or prior permission from the lecturers concerned.

2. Plagiarism

The reputation of an academic institution depends on the ability to achieve and sustain academic excellence through the exercise of academic integrity. Academic integrity is based on honesty, trust, fairness, respect, and responsibility, which form the basis of academic work.

One aspect of the loss of academic integrity is due to plagiarism, which is the act of presenting published and unpublished ideas, writings, works or inventions of others in written or other medium, as one's own original intellectual endeavours without any clear acknowledgement of or reference to the author of the source.

POLICY ON PLAGIARISM OF UNIVERSITI SAINS MALAYSIA

University Sains Malaysia Policy on Plagiarism describes the University's strong commitment to uphold academic integrity in relation to plagiarism. It will come into effect when there is an infringement of academic conduct relating to plagiarism.

This policy acts as a guideline to educate and prevent plagiarism and can be used as the guideline if the University's staff and students violate any rules and regulations of the University.

The policy applies to all students, former students, staff and former staff which include fellows, post-doctorates, visiting scholars, as well as academic, non-academic, research, contract and temporary staff who study, serve or have served, or have graduated from the University.

Plagiarism is defined as the act of presenting, quoting, copying, paraphrasing or passing off of ideas, images, processes, works, data, own words or those of other people or sources without proper acknowledgement, reference or quotation of the original source(s). The acts of plagiarism include, but are not limited to, the following:

a. Quoting verbatim (word-for-word replication of) works of other people.

b. Paraphrasing another person's work by changing some of the words, or the order of the words, without due acknowledgement of the source(s).

c. Submitting another person's work in whole or part as one's own.

d. Auto-plagiarising or self-plagiarising (one's own work or previous work) that has already been submitted for assessment or for any other academic award and pass it as a new creation without citing the original content.

e. Insufficient or misleading referencing of the source(s) that would enable the reader to check whether any particular work has indeed been cited accurately and/or fairly and thus to identify the original writer's particular contribution in the work submitted.

The University will take action on every report and offence relating to plagiarism and if the student is found guilty, the student can be charged by the university according to the Students Disciplinary Rules.

3. Fabrication

Fabrication refers to a process of invention, adaptation or copying with the intention of cheating. This is an act of deceiving other people. Fabrication is somewhat related to matters which have been 'created' or altered.

Invention or task outcome or academic work without acknowledgement, alteration, falsification or misleading use of data, information or citation in any academic work constitutes fabrication. Fabricated information neither represents the student's own effort nor the truth concerning a particular investigation or study and thus violates the principle of truth in knowledge. Some examples are:

a. Creating or exchanging data or results, or using someone else's results, in an experiment, assignment or research.

b. Citing sources that are not actually used or referred to.

c. Listing with intent, incorrect or fictitious references.

d. Forging signatures of authorization in any academic record or other university documents.

e. Developing a set of false data.

4. Collusion

Collusion refers to the cooperation in committing or to commit or to do work with negative intentions. Some examples of collusion include:

a. Paying, bribing or allowing someone else to do an assignment, test/exam, project or research for you.

b. Doing or assisting others in an assignment, test/exam, project or research for something in return.

c. Permitting your work to be submitted as the work of others.

d. Providing material, information or sources to others knowing that such aids could be used in any dishonest act.

5. Other violations relating to academic integrity

a. Late to lecture, tutorial, class or other forms of teaching modes relating to their courses.

b. Sending or submitting late any assignment relating to their courses.

c. Hire someone else to do the assignment or thesis.

d. Carrying out business by providing service to write assignment or thesis of the students.

e. Any other violations that USM deemed as violating academic integrity.

2.6.1 Consequences of Violating Academic Integrity

Students are responsible in protecting and upholding academic integrity in USM.

If in any specific event a student or students would encounter any incident that denotes academic dishonesty, the student(s) need to submit a report to the relevant lecturer. The lecturer is then responsible to investigate and substantiate the violation and report the matter to the Dean of the School.

1. If any violation of academic integrity is considered as not of a serious nature, the Dean of the School may take administrative action on the students.

2. However, if the violation is deemed serious by the School, this matter shall be brought to the attention of the Secretariat of University Student Disciplinary Committee (Academic Cases) at Legal Office, Level 2, Building E42, Chancellory II, Universiti Sains Malaysia for further disciplinary action as specified in the disciplinary procedures.

3. If a student is caught copying or cheating during examination, the Investigation Committee of *Copying/Cheating in Examination* will pursue the matter according to the University's procedures.

If the investigation found that there is a case, the student(s) will be brought to the Student's Disciplinary Committee of the University. In this matter, the rule on conduct during the examination shall be applied.

4. Any student who has been found guilty in the Student's Disciplinary Committee (Academic Cases) may be graded as fail or grade "F" in the said subject tried.

5. Rule 48 in the Kaedah-Kaedah Universiti Sains Malaysia (Discipline of Students) 1999 provides that a student who commits a disciplinary offence and is found guilty of the offence shall be liable to any one or any appropriate combination of two or more of the following punishments as follows:

   a. a warning;

   b. a fine not exceeding Ringgit Malaysia Two Hundred (RM200.00);

   c. exclusion from any specific part or parts of the University for a specified period;

   d. suspension from being a student of the University for a specified period;

   e. expulsion from the University.

2.7 USM Mentor Programme

The Mentor Programme acts as a support aid that involves staff undergoing special training as consultants and guides to the USM community who would like to share their feelings and any psychosocial issues that could affect their social activities. This programme helps individuals to manage psychosocial issues in a more effective manner, which will eventually improve their well-being in order to achieve a better quality of life.

Objectives

1. To serve as a co-operation and mutual assistance mechanism for dealing with stress, psychosocial problems and many more in order to ensure the well-being of the USM community.

2. To inculcate the spirit of unity and the concept of helping one another by appointing a well-trained mentor as a social agent who promotes a caring society for USM.

3. To produce more volunteers to assist those who need help.

4. To prevent damage in any psychosocial aspect before they reach a critical stage.

2.8 Student Exchange Programme

2.8.1 Study Abroad Scheme

The student exchange programme is an opportunity for USM students to study for one or two semesters abroad at any USM partner institutions. Ideally, students are encouraged to participate in the exchange programme within their third to fifth semester (3 year degree programme) and within the third to seventh semester (4 year degree programme).

USM students who wish to follow the SBLN programme must discuss their academic plans with the Dean or Deputy Dean of their respective Schools and also with the International Mobility & Collaboration Centre (IMCC) (to ensure that credits obtained from the external higher education institution can be transferred as part of the credit accumulation for graduation).

Any student who follows the SBLN programme and violates any disciplinary act in the external higher education institution, can be penalised in accordance with the University (Discipline of Students) Rules if the matter is referred to USM.

For further information, please visit www.imcc.usm.my or contact the International Mobility and Collaboration Centre (IMCC) at +604 – 653 2777/2774.

2.8.2 Student Exchange Programme in Local Higher Education Institutions (RPPIPT)

This is a programme that allows students of Higher Learning Institutions to do an exchange programme for a semester among the higher

institutions themselves. Students can choose any relevant courses and apply for credit transfers.

USM students who want to participate in RPPIPT have to discuss their academic plans with the Dean or Deputy Dean of their respective Schools and the Division of Academic and International (to ensure that credits obtained from the higher education institution in Malaysia can be transferred as part of the credit accumulation for graduation).

Any student who participates in RPPIPT and violates any of the institution's disciplinary rules can be penalised according to the University (Discipline of Students) Rules if the matter is referred to USM.

For further information, please contact the Academic & International Division at +604 – 653 3126.

2.9 Ownership of Students' Dissertation/Research Project/Thesis and University's Intellectual Property

The copyright of a dissertation/research project/thesis belongs to the student. However, as a condition for the conferment of a degree, the student gives this right unconditionally, directly but not exclusively, and free of royalties to the university to use the contents of the work/thesis for teaching, research and promotion purposes. In addition, the student gives non-exclusive rights to the University to keep, use, reproduce, display and distribute copies of the original thesis with the rights to publish for future research and the archives.

3.0 UNIVERSITY COURSE REQUIREMENTS

3.1 Summary of University Course Requirements

Students are required to take 15-22 credits for the following University courses/options for University needs:

<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"><u>Local Students</u>
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ HFE224 (Appreciation of Ethics and Civilisations) (2 credits)
▪ LKM400 (Malay Language IV) (2 credits)
<u>International Students of Science and Technology</u>
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ Malay Language course (2 credits)</td><td>6</td><td rowspan="2">4</td></tr>
<tr><td colspan="2"><u>International Students of Arts</u> (program with Malay Language as the medium of instruction)
▪ HFF225 (Philosophy and Current Issues) (2 credits)
▪ LKM100 (Malay Language I) (Z)
▪ LKM200 (Malay Language 2) (U) (2 credits)</td><td><u>International Students of Arts</u> (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"><u>Local Students</u>
▪ WUS101 (Core Entrepreneurship) (2 credits)
▪ English Language Courses (4 credits)
<u>International Students</u>
▪ SEA205E (Malaysian Studies) (4 credits)
▪ English Language Courses (4 credits)</td><td>6</td><td>8</td></tr>
<tr><td>U4</td><td><u>Local Students</u>
WAR122 (Integrity and Anti-Corruption Course) / Co-Curricular Courses*</td><td><u>International Students</u>
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>

* Students from the School of Educational Studies are required to choose one (1) Co-Curricular Packaged Course (Uniformed Course).

* Students from the School of Dental Sciences are required to register for three (3) credits of courses in the U4 group. Further information can be obtained from the Academic Office, School of Dental Sciences.

3.2 General Studies Components (MPU) (14 credits)

General studies is one of the strategies and initiatives planned for the purpose of Shift 1, which is Holistic, Entrepreneurial and Balanced Graduates. Malaysia Education Blueprint 2015-2025 (Higher Education) or PPPM (PT) outlines 10 shifts to achieve the aspirations of the nation's higher education system and student aspirations.

General studies are divided into four groups as follows:

1. U1: appreciation of philosophy, values and history;
2. U2: the mastery of soft skills;
3. U3: expansion of the knowledge of Malaysia and its history; and
4. U4: practical community management skills such as community service and co-curriculum.

A. U1 Group

Local Students

All Malaysian students are required to take and pass the following courses. In order to graduate, the minimum passing grade required is Grade C.

(i) HFF225 (Philosophy and Current Issues) (2 credits)

The course synopsis is as follows:

This course covers the relation between philosophy and the National Education Philosophy and Rukun Negara. Philosophy is used as a tool to refine the culture of thought in life through the art and methods of thinking as well as through our understanding of the concept of the human person. Key topics in philosophy, namely epistemology, metaphysics, and ethics, are discussed in the context of current issues. Emphasis is given to philosophy as the basis for intercultural dialogue and fostering common values. At the end of this course, students will be able to see the disciplines of knowledge as a comprehensive and integrated body of knowledge.

(ii) HFE224 (Appreciation of Ethics and Civilisations) (2 credits)

The course synopsis is as follows:

This course prepares students to appreciate the ethics and civilisation that existed in the multiple ethnic society in Malaysia to strengthen their critical and analytical thinking in handling a more challenging life. The content of this course focuses on appreciating ethics and civilisation according to the Malaysian mould. Students will be exposed to the dynamics of the concept of ethics and civilisation that gave strength to the formation of a Malaysian nation based on the timeline of its historical evolution from the precolonial to the postcolonial era. Understanding the formation of the ethical and civilisation is discussed to increase their civil ethical appreciation towards strengthening the concept of national and Malaysian nation. Civilisation in the Malaysian mould needs to be analysed and debated in academic activity with reference to the Federal Constitution as the base for integration and a vehicle for ethics and civilisation. The development of national unity is too much influenced by globalisation and the development of information technology and complex communication. Therefore, the appreciation of ethics and civilisation has given rise to socially responsible behaviour and moved at the level of individual, community, society and nation. Therefore, the change that is happening in the society and direct economic development has brought new challenges to the strengthening of ethics and civilisation in Malaysia. Finally, High Impact Educational Practices is carried out during teaching and learning to learn the course in-depth.

(iii) LKM400/2 (Malay Language IV)

In order to graduate, the minimum passing grade required is Grade C. Entry requirements for Bahasa Malaysia are as follows:

No	Qualification	Grade	Entry Level	Type	Credit	Status
1	(a) SPM/MCE/SC (or equivalent qualification) (b) STPM/HSC (or equivalent qualification)	1 - 6 P/S	LKM400	U	2	Graduation Requirement

Note:

To obtain credits for **Malay Language** courses, a minimum of grade C is required. Students may seek advice from the School of Languages, Literacies and Translation if they have a different Bahasa Malaysia qualification from the above.

International Students

All international students are required to take and pass the following courses. In order to graduate, the minimum passing grade required is Grade C.

(i) HFF225 (Philosophy and Current Issues) (2 credits)

The course synopsis is as follows:

This course covers the relation between philosophy and the National Education Philosophy and Rukun Negara. Philosophy is used as a tool to refine the culture of thought in life through the art and methods of thinking as well as through our understanding of the concept of the human person. Key topics in philosophy, namely epistemology, metaphysics, and ethics, are discussed in the context of current issues. Emphasis is given to philosophy as the basis for intercultural dialogue and fostering common values. At the end of this course, students will be able to see the disciplines of knowledge as a comprehensive and integrated body of knowledge.

(ii) Malay Language Course (2 credits)

All international students are required to take and pass the Malay Language course. In order to graduate, the minimum passing grade required is Grade C. Malay Language course requirements by academic programme are as follows:

(i) International students pursuing a Bachelor's Degree in Arts (*program with Malay Language as the medium of instruction)* are required to take the following courses:

Code	Type	Credit
LKM100	Z	2
LKM200	U	2

(ii) International students pursuing a Bachelor's Degree in Arts (*program with English Language as the medium of instruction*) are required to take the following course:

Code	Type	Credit
LKM100	U	2

(iii) International students pursuing Bachelor's Degrees in Science and Technology are required to take the following course:

Code	Type	Credit
LKM100	U	2

B. U2 or U3 Group

Local Students

WUS101 (Core Entrepreneurship) (2 credits)

All students are required to take and pass the WUS101/2 (Core Entrepreneurship) course. In order to graduate, the minimum passing grade required is Grade C. The following is the synopsis of the course:

This course provides basic exposure to students on entrepreneurship and business fields, with emphasis on the implementation of the learning aspects while experiencing the process of executing business projects on campus. The main learning outcome is the assimilation of culture and entrepreneurship work ethics in their everyday life. This initiative is made to open the minds and arouse the spirit of entrepreneurship among target groups that possess the potential to become successful entrepreneurs.

For more information, please refer to the Centre for Co-Curricular Programme website.

International Students

SEA205E (Malaysian Studies) (4 credits)

All international students are required to take and pass the SEA205E/4 (Malaysian Studies) course. In order to graduate, the minimum passing grade required is Grade C. The following is the synopsis of the course:

This course discusses Malaysia from the perspectives of history, politics, social, culture and economics. It looks at the relations between the country's history and its politics, the formation of a plural society that has since become its important characteristics, as well as issues related to development in Malaysia. Students will also be exposed to contemporary issues in Malaysia such as the marginalized groups, popular culture, issues related to health and wellbeing, as well as looking at Malaysia from the global context.

Local and International Students

All Bachelor's degree students must take four (4) units from the English Language courses to fulfil the University requirement for graduation.

(a) Entry Requirements for English Language Courses (for students with MUET)

The following table shows the entry requirements for the English language courses offered by the School of Languages, Literacies and Translation.

No.	MUET qualification/ Pre-requisite course	Band / Grade	English Language Course	Course Type
1.	MUET **or**;	2.0 / 2.5 / 3.0 / 3.5	LSP101 (2 credits)	Pre-requisite/ Type Z
	Discretion of the Dean of SoLLaT			
2.	MUET **or**;	4 .0 / 4.5	LSP201 (2 credits)	Compulsory/ Type U
	LSP101 / LMT100 **or**;	A - C		

	Discretion of the Dean of SoLLaT			
3.	MUET **or**;	5.0	LSP301 (2 credits)	Compulsory/ Type U
	LSP201 / LSP300**or**;	A – C		
	Discretion of the Dean of SoLLaT			
4.	MUET **or**;	5+	LHP410/411/412/458/459 (2 credits)	Compulsory/Option / Type U
	LSP301/401/402/403/404 **or**;	A - C		
	Discretion of the Dean of SoLLaT			

(b) Entry Requirements for English Language Courses (for students with TOEFL or IELTS)

The following table shows the entry requirements for the English language courses offered by the School of Languages, Literacies and Translation.

No.	TOEFL (Internet Based Test)	IELTS	English Language Course	Course Type
1.	35 – 45	5.0	LSP101 (2 credits)	Pre-requisite / Type Z
2.	46 – 79	5.5 – 6.5	LSP201 (2 credits)	Compulsory/ Type U
3.	80 - 109	7.0 – 7.5	LSP301 (2 credits)	Compulsory/ Type U
4.	110 - 120	8.0 – 9.0	LHP Series	Compulsory/ Option/ Type U

Note:

- Students are required to refer to the list of English language courses required by their respective schools.

- Students may seek advice from the School of Languages, Literacies and Translation if they have a different English language qualification from the above.

- In order to obtain units in English Language courses, students have to pass with a minimum grade 'C'.

- Students with Bands 5+ in MUET must accumulate the 4 credits of English from the courses in the advanced level (LHP410/411/412/458/459).

- Students with Bands 2.0/2.5/3.0/3.5 in MUET may re-sit MUET to improve their score to Band 4.0 OR take the LSP101 course and pass with a minimum grade C before they can register for the LSP201 course.

(c) English Language Course

English courses offered as university courses are as follows:

No.	Code/Unit	Course Title
1.	LSP101/2	Progressive English
2.	LSP201/2	General English I
3.	LSP301/2	General English II
4.	LHP410/2	Effective Reading
5.	LHP411/2	Effective Writing
6.	LHP412/2	Effective Oral Presentation
7.	LHP458/2	English for Translation (offered in Semester 2 only)
8.	LHP459/2	English for Interpretation (offered in Semester 1 only)

C. U4 Group

i. Integrity and Anti-Corruption Course (WAR122)

Local students are required to register the Integrity and Anti-Corruption Course during their studies to complete the minimum requirement of two (2) credits in the MPU4 structure as a graduation requirement. The minimum passing grade required is Grade C.

ii. Co-Curricular Packaged Course (Uniform)

Students of the School of Educational Studies are required to register one (1) Co-Curricular Packaged Course (Uniformed Course) during the study period to fulfil the needs of the school. The minimum passing grade required is Grade C.

3.3 Options (1 – 8 credits)

A. Co-curricular course

Students can choose Co-Curricular Courses as an Option to complete the total number of University Course credits according to the requirements of their respective schools.

Co-curriculum courses are grouped by Core and are available in packages and without packages. Students are required to complete all phases of the course package if they registered the Co-Curricular Packaged Course. The minimum passing grade required is Grade C.

The details of the list of Co-Curricular Courses offered are as follows:

(i) Core of Volunteerism (6 - 10 credits)

All courses offered under this core are the uniformed courses offered in the following packages:

PALAPES Army	PALAPES Navy	PALAPES Air Force	SUKSIS (Students' Police Volunteers)
WTD103/3	WTL103/3	WTU103/3	WPD101/2
WTD203/3	WTL203/3	WTU203/3	WPD201/2
WTD304/4	WTL304/4	WTU304/4	WPD301/2

SISPA (Siswa Siswi Pertahanan Awam Malaysia)	St John Ambulance	Red Crescent Emergency Aid Team
WPA103/2	WJA102/2	WBM102/2
WPA203/2	WJA202/2	WBM202/2
WPA303/2	WJA302/2	WBM302/2

For more information, please refer to the Centre for Co-Curricular Programme website.

(ii) Core of Sports (1 - 3 credits)

The courses offered are as follows:

Packaged Courses (3 Credits, 3 Semesters) (Students are required to complete all levels)	
Karate	**Taekwondo**
WSC108/1	WSC115/1
WSC208/1	WSC215/1
WSC308/1	WSC315/1
Non Packaged Courses (1 Credit)	
WSC105/1 –Volley Ball	WSC124/1 - Sepak Takraw
WSC110/1 - Archery	WSC 125/1- Futsal
WSC111/1 - Table Tennis	WSC 126/1 - Netball
WSC112/1 - Swimming	WSC127/1 - Event Management 1
WSC113/1 - Aerobics	WSC227/1 - Event Management 2
WSC114/1 - Squash	WSC128/1 - Petanque
WSC116/1 - Tennis	WSC130/1 - Orienteering
WSC119/1 - Badminton	WSC131/1 - Woodball

For more information, please refer to the Centre for Co-Curricular Programme website.

(iii) Core of Culture (1 – 6 credits)

The courses offered are as follows:

Packaged Courses (6 Credits, 3 Academic Sessions) (Students are required to complete all levels)
Seni Silat Cekak Malaysia
WCC123/2
WCC223/2

WCC323/2	
Non-Packaged Courses (1 Credit)	
WCC105/1 - Gamelan	WCC116/1 - Traditional Dance
WCC107/1 - Guitar	WCC117/1 - Modern Theatre
WCC109/1 - Choir	WCC118/1 - Malay Shadow Play
WCC115/1 - Modern Dance	WCC124/1 - Musical Kompang

For more information, please refer to the Centre for Co-Curricular Programme website.

(iv) Core of Innovation and Initiative (1 - 2 credits)

The courses offered are as follows:

Non-Packaged Courses (1 Credit)	
WCC103/1 - Painting	WCC128/1 - Embroidery and Beads Sequin Art
WCC110/1 - Handcrafting	WCC130/1 - Digital SLR Photography Art
WCC120/1 - Canting Batik	WCC 131/1 - Editing Digital Photography Art
WCC121/1 - Calligraphic Art	WCC132/1 - The Art of Ceramic
WCC122/1 - Cullinary Arts	WCC133/1 - Decoupage Arts
WCC125/1 - Traditional of Kite Art	
Non-Packaged Courses (2 Credits)	
WLF103 - Climate Change Resilience	WMU102/2 - Makers@USM Level 1
WLF104 - Digital Financial Literacy	WMU112/2 – Artificial Intelligence Literacy
WLF105 - Grit in You	WMU122/2 - Data Science Literacy

For more information, please refer to the Centre for Co-Curricular Programme website.

(v) Core of Community Service (4 credits)

The courses offered are as follows:

Packaged Courses (4 Credits) **(Students are required to complete all levels)**	
WKM102/2 - Community Service 1	WKM202/2 - Community Service 2
Non-Packaged Courses (2 Credits)	
WSK102/2 - Volunteerism Science	

For more information, please refer to the Centre for Co-Curricular Programme website.

(vi) Core of Public Speaking (2 credits)

The courses offered are as follows:

Non-Packaged Courses (2 Credits)
WEC102/2 - Public Speaking in Malay Language
WEC103E/2 - Public Speaking in English Language

For more information, please refer to the Centre for Co-Curricular Programme website.

(vii) Core of Sustainability (2 credits)

The courses offered are as follows:

Non-Packaged Courses (2 Credits)
WSU101/2 - Sustainability of Issues, Challenges and Prospects

For more information, please refer to the Centre for Co-Curricular Programme website.

B. Skill / Foreign Language Courses / Courses offered by other schools

Students can choose the following courses as an option:

(i) WSU 101 (Sustainability: Issues, Challenges & Prospects) (2 credits)

The following is the synopsis of the course:

This course introduces and exposes the concept of sustainable development to students. The course aims to ensure future generation capabilities to meet their needs in the future are not affected, especially in the era of challenging globalization and the rapid development of information technology at present. Sustainable development models and case studies are also discussed.

The minimum passing grade required is Grade C. For more information, please refer to the Centre for Co-Curricular Programme website.

(ii) HTV201 (Thinking Techniques) (2 credits)

The following is the synopsis of the course:

This course introduces students to various creative thinking such as styles and thinking tools that can broaden their understanding of creativity and improve problem-solving skills. Students are trained to select and apply the best techniques to solve specific problems. So this course helps students to learn to think effectively in order to make the most effective decisions in both their studies and daily life.

(iii) SHE101 (Ethnic Relations) (2 credits)

The following is the synopsis of the course:

This course is an introduction to ethnic relations in Malaysia. This course is designed with 3 main objectives: (1) to introduce students to the basic concepts and the practices of social accord in Malaysia, (2) to reinforce basic understanding of challenges and problems in a multi-ethnic society, and (3) to provide an understanding and awareness in managing the complexity of ethnic relations in Malaysia. At the end of this course, it is hoped that students will be able to identify and apply the skills to issues associated with ethnic relations in Malaysia.

(iv) Other options/skill courses as recommended or required by the respective schools (if any)

(v) English language course

The following courses may be taken as a university course to fulfil the compulsory English language requirements (or for students with MUET Band 5+) or as a skill/option course:

No	Code/Kredit	Course Title
1.	LHP410/2	Effective Reading
2.	LHP411/2	Effective Writing
3.	LHP412/2	Effective Oral Presentation
4.	LHP458/2	English for Translation (offered in Semester 2 only)
5.	LHP459/2	English for Interpretation (offered in Semester 1 only)

(vi) Foreign Language Courses

The foreign language courses offered by the School of Languages, Literacies and Translation can be taken by students as option or compulsory courses to fulfil the number of units required for graduation. Students are not allowed to register for more than one foreign language course per semester. They must complete at least two levels of a foreign language course before they are allowed to register for another foreign language course. However, students are not required to complete all four levels of one particular foreign language course. The foreign language courses offered are as follows:

Arabic	Chinese	Japanese	German	Spanish
LAA100/2	LAC100/2	LAJ100/2	LAG100/2	LAE100/2
LAA200/2	LAC200/2	LAJ200/2	LAG200/2	LAE200/2
LAA300/2	LAC300/2	LAJ300/2	LAG300/2	LAE300/2
LAA400/2	LAC400/2	LAJ400/2	LAG400/2	LAE400/2

French	Thai	Tamil	Korean
LAP100/2	LAS100/2	LAT100/2	LAK100/2
LAP200/2	LAS200/2	LAT200/2	LAK200/2
LAP300/2	LAS300/2	LAT300/2	LAK300/2
LAP400/2	LAS400/2		

4.0 SCHOOL REQUIREMENTS

4.1 Programmes in the School of Industrial Technology

4.1.1 Environmental Technology

This programme, spread over three and a half years, is gaining popularity. Its importance needs no introduction since environmental problems are re-ported and discussed globally daily. This programme is designed to enable our graduates to respond directly to the various environmental challenges upon entering the workforce.

Courses include chemical engineering unit operations, water and industrial wastewater treatment, including the design of treatment plants, solid and scheduled waste management, environmental management, environmen-tal safety, law and legislation, and air and noise pollution. Students will al-so learn to appreciate the complex social, environmental, and economic sustainability issues.

The curriculum is based on a solid foundation in chemical process engineering for applications in environment-related processes. The elective courses offered are aligned with our holistic and multidisciplinary educational approach.

4.1.2 Food Technology

This program is the earliest program offered by School of Industrial Technology. This program has undergone continual curriculum evolution since it was offered and managed to obtain an approval as an accredited undergraduate food science program by the US Institute of Food Technologists (IFT) from 2015 until present. Food Technology Program covers all the 11 standards set by the US IFT i.e., food chemistry, food microbiology, food safety, food engineering and food processing, sensory science, quality assurance, food laws and regulations, data and statistical analysis, critical thinking and problem solving, food science communication, professionalism and leadership.

The curriculum is designed in such a way to train and produce competent graduate equipped with the 21st century skills to serve and to lead food industries as well as the government sectors. Courses in the curriculum for Food Technology program are spread over four years of study, which emphasize the logical sequence of related course while ensuring that teaching – learning activities are equally distributed throughout the study period. Students have opportunities to advance knowledge and acquire lifelong

learning skills beyond the four-wall through a variety of experiential education sub-programs such as Asean International Mobility for Students (AIMS), the biennial MIFT National Food Science and Technology Competition, short-term certificate programs, etc.

4.1.3 Bioresource Technology

This programme offers a comprehensive curriculum, which covers the basic and applied aspects of bioresource (wood and non-wood biomass) in the production of various bio-based products. Coatings technology for bioresource-based products is also highly emphasized. Students will learn about macro to nano scales fibre science and technology, bioplastic, pulp and paper production and testing, paper recycling, fundamentals of resins and biocomposites, paint, and product design while gain practical skills through hands-on classes and internship programme. The program is also designed to equip graduates with soft skills such as effective communication, interpersonal relation skills and critical thinking to help them actualize their intellectual capacity, which would in turn enhance their employability in a variety of related industries.

The curriculum of Bioresource Technology covers three stages of study, which emphasize on relevant course sequence, besides ensuring that teaching learning is distributed evenly throughout the whole period of study.

4.1.4 Bioprocess Engineering Technology

Bioprocess Engineering Technology (a four-year program) is the subdiscipline within Biotechnology and Chemical Engineering that combines living matter, in the form of organisms or enzymes, with nutrients under specific optimal conditions to make the desired product. The discipline is responsible for translating discoveries of life sciences into practical and industrial products processes and techniques that can serve the need of the society. The stages involved in Bioprocess Engineering Technology includes the preparation stage *vis-à-vis* the raw materials, substrates and media, the conversion state, biocatalysts, downstream processing, volume production, purification and final product processing. Graduates from this programme will also have the knowledge and skill to understand the fundamental bioprocess research and relate it to the industrial scale. This program is provisionally accredited by Board of Engineer Malaysia (BEM).

The Bioprocess Engineering Technology curriculum is spread over four years of studies, with great emphasis placed on the logical sequence of related courses and at the same time, ensuring that the teaching-learning activities are equally distributed throughout the study period.

4.2 List of Courses According to Semester

4.2.1 Environmental Technology

COURSE TYPE	LEVEL 100 (2024/2025)				LEVEL 200 (2025/2026)				LEVEL 300(2026/2027)				LEVEL 400 (2027/2028)		TOTAL UNIT
	SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1	SEMESTER 2	
CORE (T)	IEA101/4 IUK102/3 IUK108/4 IUK191/4	SEMESTER BREAK	IEK115/3 IEK108/3 IEA123/2	SESSION BREAK	IEK214/4 IEA221/2 IEK218/3	SEMESTER BREAK	IEK215/4 IEK205/3 IEK219/3 IEK211/3	SESSION BREAK	IEA313/8 IEA300/2 IEK307/3 IEA322/2	SEMESTER BREAK	IEK309/3 IEA313/8 IEK308/3	SESSION BREAK	IEA404/6	SEMESTER BREAK	72
	15		8		9		13		11		10		6		
ELECTIVE (E)	BOI102/3 IUK190/3		IBG111/3 IEA112/4 IUK291/4		IUK107/4 IEA202/2 IBK212/2		IEK217/3 IUK208/3 IUK292/3		IEA315/3 IEA333/3		IEA314/3 IEA311/3 IEG301/3				30
	6		11		8		9		6		9				
UNIVERSITY (U)	WUS101/2 Ko-K/1		WSU101/2 Ko-K/Skill Courses/ Foreign Languages Courses/Option/2 Ko-K/1 WAR122/2		HFF225/2 LKM400/2 LSP101/2 or LSP201/2		HFE224/2		LSP201/2 atau LSP301/2		LSP301/2 atau LHP411/2				18
	3		5		2		2				4				
TOTAL MINIMUM CREDIT FOR GRADUATION															120

LEVEL 100

IEA101/4 Introduction to Environmental Science and Technology

IEA123/2 Internet of Things for Environmental Monitoring towards Artificial Intelligence

IUK102/3 Basic Chemical Process Calculations

IUK108/4 Statistics with Computer Applications

IUK190/3 Occupational Safety and Health Coordinator

IUK191/4 Mathematics I

IUK291/4 Mathematics II

IEK115/3 Environment, Safety and Health Legislation

IEK108/3 Process Fluid Mechanics

IBG111/3 Industrial Microbiology

IEA112/4 Society and Environment Project

WUS101/2 Core Entrepreneurship

WSU101/2 Sustainability: Issues, Challenges and Prospect

WAR122/2 Integrity and Anti-Corruption

LEVEL 200

IEK215/4 Mass Transfer and Separation

IEA221/2 MATLAB Applications in Industry

IEK218/3 Treatment and Management of Solid Wastes

IEK205/3 Air Pollution Control Technology

IEK219/3 Treatment and Management of Scheduled Wastes

IEK211/3 Equipment Design for Water Treatment

IUK107/4 Chemistry for Technologist
IEA202/2 Environmental Bioindicators

IEK217/3 Environmental Management

IUK208/3 Experimental Design with Computer Applications

IUK292/3 Ergonomics and Ergonomic Trained Person

IBK212/2 Renewable Biomass

HFE224/2 Appreciation of Ethics and Civilisations

HFF225/2 Philosophy and Current Issues

LMT100/2 Preparatory English

LSP101/2 Progressive English

LSP201/2 General English 1

LKM400/2 Bahasa Malaysia IV

LEVEL 300

IEK307/3 Noise and Vibration Control Technology

IEK308/3 Industrial Wastewater Treatment Plant Design

IEK309/3 Chemical Fate and Transport in the Environment

IEA311/3 Environmental Microbiology

IEA314/3 Environmental Audit and Risk Assessment

IEA313/8 Environmental Technology Research Project

IEA322/2 Computer-Aided Design (CAD) Drawing and Application

IEG301/3 Environmental Forensics

IEA315/3 Indoor and Built Environment

IEA333/3 Environmental Product Designing Process

LHP411/2 Effective Writing

LEVEL 400

IEA404/6 Environmental Technology Industrial Training

4.2.2 Food Technology

COURSE TYPE	LEVEL 100 (2024/2025)				LEVEL 200 (2025/2026)				LEVEL 300 (2026/2027)				LEVEL 400 (2027/2028)				TOTAL UNIT
	SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		
CORE (T)	IMK103/2 IMK114/3 IUK107/4 IUK108/4/4 IUK191/4	SEMESTER BREAK	IMA116/2 IMA117/2 IMG103/3 IMG111/3 IMK106/3	SESSION BREAK	IMG203/3 IMG222/3 IMK225/3 IMK227/3	SEMESTER BREAK	IMG204/3 IMG223/4	SESSION BREAK	IMG324/4 IMG329/3 IMK316/3 IMK327/3	SEMESTER BREAK	IMA325/3 IMK326/3	SESSION BREAK	IMA422/4	SEMESTER BREAK	IMA423/6*	**78**
	17		13		12		7		13		6		4		6	
ELECTIVE (E)			IMK113/3 KAT245/4		IBK104/3 IMK221/3 KFT233/4		IMK209/2 IMK226/3 IMK228/2 IUK208/3		IBK316/3		IBG214/4 IMG328/3 IMK320/3 IUK292/3		IMK410/3 IMK424/2 IMK425/2 IUK190/3			**33**
			7		10		10		3		13		10			
UNIVERSITY (U)	WUS101/2 Ko-K/Skill Courses/ Foreign Languages/ Option/1-2		LKM400/2 Ko-K/Skill Courses/ Foreign Languages Courses/Option/1-2 WAR122/2		HFF225/2 LSP101/2 or LSP201/2		HFE224/2 WSU101/2 LSP201/2 or LSP301/2		HTV201/2 LSP301/2 or LHP411/2		LHP411/2		Ko-K/Skill Courses/ Foreign Languages/ Option/1-2			**20**
	3-4		3-4		4		6		4		2		1-2			
TOTAL MINIMUM CREDIT FOR GRADUATION																**131**

LEVEL 100

IMA116/2 Persuasive Oral Presentation for Food Technology

IMA117/2 Basic Scientific Communication for Food Technology

IMG103/3 Food Chemistry

IMG111/3 Food Microbiology I

IMK103/2 Introduction to Food Science and Technology

IMK114/3 Introduction to Food Physics

IMK106/3 Introduction to Food Engineering

IUK108/4 Statistics with Computer Applications

IUK191/4 Mathematics I

IUK107/4 Chemistry For Technologist

KAT145/4 Analytical Chemistry I

IBK104/3 Fundamentals of Bioprocess Technology

IMK113/3 Management of Halal Food

LSP101/2 Progressive English

WSU101/2 Sustainability: Issues, Challenges and Prospect

WUS101/2 Core Entrepreneurship

WAR122/2 Integrity and Anti-Corruption

LEVEL 200

IMG203/3 Chemical Food Analysis

IMG222/3 Food Microbiology II

IMK225/3 Unit Operation in Food Processing

IMK227/3 Biochemistry

IMG204/3 Instrumental Food Analysis

IMG223/4 Processing Technology of Animal-Based Food Products

IBG214/4 Enzyme Technology

IMK209/2 Physical Properties of Food

IMK221/3 Food Ingredients

IMK226/3 Post Harvest Technology of Fruits and Vegetables

IMK228/2 Primary Products Technology

IUK208/3 Experimental Design with Computer Applications

KFT233/4 Physical Chemistry I

HFF225/2 Philosophy and Current Issues

HFE224/2 Appreciation of Ethics and Civilisations

HTV201/2 Thinking Techniques

LEVEL 300

IMA325/3 Food Product Development

IMG324/4 Food Processing Technology of Plant-Based Products

IMG329/3 Sensory Science

IMK316/3 Food Quality Management and Food Regulations

IMK326/3 Food Safety

IMK327/3 Human Nutrition

IBK316/3 Food Bioprocess Technology

IMG328/3 Food Packaging

IMK320/3 Functional Foods

IUK292/3 Ergonomics and Ergonomic Trained Person

LSP301/2 General English 2

LEVEL 400

IMA422/4 Food Technology Research Project

IMA423/6 Food Industrial Training

IMK410/3 Food Borne Pathogens

IMK424/2 Food Defense

IMK425/2 Food Structure

IUK190/3 Occupational Safety and Health Coordinator

LHP411/2 Effective Writing

4.2.3 Bioresource Technology

COURSE TYPE	LEVEL 100 (2024/2025)				LEVEL 200 (2025/2026)				LEVEL 300 (2026/2027)				LEVEL 400 (2027/2028)			TOTAL UNIT
	SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2	
CORE (T)	IWK100/2 IWK102/4 IUK191/4 IUK102/3		IWK101/4 IWK103/4 IWK105/4		IWK201/4 IWK203/4 IWA281/2 IWA282/2 IUK108/4		IWK205/3 IWA283/2		IWK301/3 IWA382/2 IWA383/2 IWA313/8**		IWK308/3 IWA381/2 IWA313/8**		IWA404/6*			72
	13		12		16		5		11		9		6			
ELECTIVE (E)	IUK107/4	SEMESTER BREAK	IEK115/3 IUK291/4	SESSION BREAK	IBK212/2	SEMESTER BREAK	IWK204/3 IUK208/3 IEK108/3 KAT245/4 IEK217/3	SESSION BREAK	IWK304/3 IWK307/2 IEK212/3	SEMESTER BREAK	IWK305/2 IWK306/2	SESSION BREAK		SEMESTER BREAK		30
	4		7		2		16		8		4					
UNIVERSITY (U)	WUS101/2 LKM400/2 or Ko-K/1- 2		WSU101/2 LKM400/2 Ko-K/Skill Courses/ Foreign Languages Courses/Option/2 WAR122/2		HFF225/2 HTV201/2		LSP101//2 or LSP201/2 HFE224/2		LSP201/2 or LSP301/2		LSP301/2					18
	3- 4		8		4		4		2		2					
TOTAL MINIMUM CREDIT FOR GRADUATION																120

* Students must register for this course online during their internship

** Course is offered over 2 semesters (unit counted per semester is 4).

LEVEL 100

IWK100/2 Bioresource as Industrial Raw Materials

IWK102/4 Basic Bioresource Science and Technology

IUK191/4 Mathematics I

IUK102/3 Basic Chemical Process Calculations

IWK101/4 Basic Coatings Technology

IWK103/4 Pulp Production and Paper Recycling

IWK105/4 Bioresource Based Products

IUK107/4 Chemistry for Technologist

IEK115/3 Environment Safety and Health Legislation

IUK291/4 Mathematics II

WUS101/2 Core Entrepreneurship

LKM400/2 Bahasa Malaysia IV

WSU101/2 Sustainability: Issues, Challenges and Prospect

WAR122/2 Integrity and Anti-Corruption

LEVEL 200

IWK201/4 Raw Materials and Coatings Chemistry

IWK203/4 Stock Preparation and Papermaking

IWA281/2 Coatings Technology Laboratory I

IWA282/2 Bioresource Technology Laboratory I

IUK108/4 Statistics with Computer Applications

IWK205/3 Additives and Paper Properties

IWA283/2 Paper Technology Laboratory I

IWK204/3 Bioresource, Paper and Coatings Product Development

IUK208/3 Experimental Design with Computer Applications

IBK212/2 Renewable Biomass

IEK108/3 Process Fluid Mechanics

KAT245/4 Analytical Chemistry I

IEK217/3 Environmental Management

HFF225/2 Philosophy and Current Issues

HTV201/2 Thinking Techniques

HFE224/2 Appreciation of Ethics and Civilisations

LSP101/2 Progressive English

LSP201/2 General English 1

LEVEL 300

IWK301/3 Coatings Process and Equipment

IWA382/2 Bioresource Technology Laboratory II

IWA383/2 Paper Technology Laboratory II

IWA313/8 Bioresource, Paper and Coatings Technology Research Project

IWK304/3 Furniture Manufacturing

IWK307/2 Advanced Paper Technology - Instrumental Analysis For Pulp and Paper

IWA381/2 Coatings Technology II

IWK308/3 Mechanics of Structural Materials

IWK305/2 Advanced Technology of Coatings

IWK306/2 Fibre and Lignocellulosic Composite

IEK212/3 Process Heat Transfer

LSP201/2 General English 1

LSP301/2 General English 2

LEVEL 400

IWA404/6 Bioresource, Paper and Coatings Technology Industrial Training

4.2.4 Bioprocess Engineering Technology

COURSE TYPE	LEVEL 100 (2024/2025)				LEVEL 200 (2025/2026)				LEVEL 300(2026/2027)				LEVEL 400 (2027/2028)				TOTAL UNIT
	SEMESTER 1	SEMESTER BREAK	SEMESTER 2	SESSION BREAK	SEMESTER 1	SEMESTER BREAK	SEMESTER 2	SESSION BREAK	SEMESTER 1	SEMESTER BREAK	SEMESTER 2	SESSION BREAK	SEMESTER 1	SEMESTER BREAK	SEMESTER 2		
CORE (T)	IUK102/3 IBK104/3 IMK227/3 IUK108/4 IUK191/4 17		IEK108/3 IBG112/3 IBG111/3 IBA104/3 IBG205/3 IUK291/4 19		IEK212/3 IBG211/3 IBG214/4 IEA216/3 13		IBG216/4 IEK213/3 IBG207/3 10		IBA312/3 IBK314/3 IBG307/3 IBA319/4 13		IBA306/8** IBG319/4 8		IBA306/8** IBA407/4 8		IBA406/12 12		100
ELECTIVE (E)	0		0		IMK221/3 IBK218/2 IBK215/2 IBK212/2 4		IEA112/4 IEK115/3 IUK208/3 IMK113/3 5		IBK316/3 IBK317/3 IBK412/3 IBK315/2 5		IMK 326/3 IBK318/3 IEK217/3 IEK219/3 3		IMK316/3 IBK 413/3 IBK411/3 3		0		20
UNIVERSITY (U)	WUS101/2 LKM400/2 Ko-K/1-2 4		WSU101/2 Ko-K/1-2 WAR122/2 4		HFF225/2 2		LSP101/2 or LSP201/2 HFE224/2 4		LSP201/2 or LSP301/2 4		LSP301/2 2		0		0		**20**
																TOTAL MINIMUM CREDIT FOR GRADUATION	**140**

Students must register for this course online during their internship

** Course is offered over 2 semesters (unit counted per semester is 4).

LEVEL 100

IUK102/3 Basic Chemical Process Calculations

IBK104/3 Fundamentals of Bioprocess Technology

IBA104/3 Practical for Technologists

IUK191/4 Mathematics I

IEK108/3 Process Fluid Mechanics

IBG112/3 Bioanalysis I

IBG111/3 Industrial Microbiology

IMK227/3 Biochemistry

IBG205/3 DNA and Metabolite Technology

IUK108/4 Statistic with Computer Applications

WUS101/2 Core Entrepreneurship

LKM400/2 Bahasa Malaysia IV

SHE101/2 Ethnic Relations

WSU101/2 Sustainability: Issues, Challenges and Prospect

WAR122/2 Integrity and Anti-Corruption

LEVEL 200

IEK212/3 Process Heat Transfer

IBG211/3 Bioanalysis II

IBG214/4 Enzyme Technology

IEA216/3 Computer Applications in Industry

IMK221/3 Food Ingredients

IBK212/2 Renewable Biomass

IBK215/2 Introduction to OMICs Technology

IBK218/2 Bioprocess Instrumentation and Control

IBG216/4 (Bioreactor design, calculation and operation

IBG207/3 Cell and Tissue Culture Technology

IEK213/3 Mass Transfer and Separation Processes

IUK208/3 Experimental Design with Computer Applications

IEA112/4 Society and Environment Project

IEK115/3 Environmental, Safety and Health Regulation

IMK113/3 Management of Halal Food

HFF225/2 Philosophy and Current Issue

HFE224/2 Appreciation of Ethics and Civilizations

LSP101/2 Progressive English

LSP201/2 General English 1

LEVEL 300

IBA312/3 Bioprocess and Society

IBK314/3 Downstream Process Technology

IBG307/3 Bioprocess Optimization and Simulation

IBK315/2 Bioinformatics

IBA319/4 Advanced Practical in Bioreactor System

IBK316/3 Food Bioprocess Technology

IBK317/3 Mathematical Physiology

IBK412/3 Environmental Bioprocess Technology

IBA306/8 Bioprocess Technology Research Project**

IBG319/4 Bioproduct Design and Development

IMK326/3 Food Safety

IBK318/3 Pharmacogenomics

IEK217/3 Environmental Management

IEK219/3 Treatment and Management of Scheduled Waste

LSP301/2 General English 2

LEVEL 400

IBA306/8 Bioprocess Technology Research Project**

IBK411/3 Quality Assurance and Safety of Bioprocess Products

IBA407/4 Practical in Downstream Processing

IBK413/3 Protein Engineering

IBA406/12 Bioprocess Technology Industrial Training*

IMK316/3 Food Quality Management and Food Regulations

4.3 University Courses Registration Guideline

Please note that the offering semesters for compulsory University courses (Type U) for students of the School of Industrial Technology are as follows:

Courses	Course Name	Semester
HFE224/2	Appreciation of Ethics and	II (year 2)
WUS101/2	Core Entrepreneurship	I (year 1)
HFF225/2	Philosophy and Current Issues-	I (year 2)
LKM400/2	Bahasa Malaysia IV	I & II (any year)
LSP201/2	General English 1	I & II (any year)
LSP301/2	General English 2	I & II (any year)

Students are encouraged to register the following courses as optional courses (Type U).

Courses	Course Name	Semester
HTV201/2	Thinking Techniques	I (any year)
WSU101/2	Sustainability: Issues, Challenges and Prospect	I & II (any year)

4.4 Industrial Training

Industrial training is a course in the form of supervised practical training at a related industry or organisation in Malaysia or abroad for 12 weeks, evaluated before awarded a degree of Bachelor of Technology.

- Synopsis
  This course involves placement of students to undertake internship at industries. During the internship, students are able to gain an insight into industrial practices and appreciate how principles of science, technology and management are applied in the actual workplace.

- Objectives
  The objectives of this training programme are:

  - To expose students to "real" working situations and the problems normally encountered by an organization/industry;
  - To expose students to the latest technology and current knowledge of market;
  - To expose students to specific practices in their respective fields;
  - To improvise students' knowledge, skills (especially soft skills) and experience with the organization;
  - To produce competent graduates;
  - To increase employment opportunities; and

- To enhance the networking between University (in general) and the School (specifically) with the industry.

- Learning Outcomes:
  At the end of the course, student should be able to:
  - Asses and propose alternative solutions for the problems encountered at the training/work place;
  - Apply with appropriate supervision the academic theory, knowledge and skill relevant to the training/work place;
  - Improve effective interaction and communication skill with various levels of staff.
  - Practice team work with professional and etiquette characteristics.

- Length and Period of Training

  12 weeks during normal semester as follows:

  - *Food Technology:* 8^{th} *semester*
  - *Environment Technology:* 5^{th} *semester*
  - *Bioresource Technology:* 7^{th} *semester*

  24 weeks during normal semester as follows:

  - *Bioprocess Engineering Technology* 8^{th} *semester*

- Implementation of Training
  Students are expected to obtain a full-time placement at an organisation which can provide appropriate Industrial Training experience in the respective field of specialisation. Learning is achieved through the supervision process, practical work (including projects) and independent learning.

- Evaluation Method
  This course is evaluated as pass or fail. In order to pass the course, students must:

  - Receive a positive evaluation from the USM lecturer assigned to do the evaluation.
  - Receive a positive evaluation from the supervisor in the organisation where the student is trained.
  - Write and submit a comprehensive and appropriate report.
  - Present a seminar regarding the findings/experience gained during training.

- Types of Training

  Candidates undergo Industrial Training for a period of 12 weeks (Food, Environmental and Bioresource), 24 weeks (Bioprocess) during normal semester as allotted by the respective programme. The experience gained from the training varies from one organisation to another, but the experience usually has the following attributes:

  - Exposure to daily work environment; including organisational structure, functions, regulation and work material/resource.
  - Participation in group work involving research and development activities, product quality improvement, production efficiency and quality system management.
  - Enhancement of oral and written communication skill through documentation preparation and oral/multimedia presentation activities.
  - Development of manpower skills such as leadership, cooperation, and independence.
  - Opportunity to practice elements of courses taken during their study.
  - Opportunity to perform research and development activities.

  An organisation would normally be allowed to recruit trainees only if they have the capability to provide an appropriate work environment suitable for a trainee who is a candidate for the Bachelor of Technology.

  Currently, there are hundreds of organisations in Peninsular Malaysia, Sabah, Sarawak and Singapore that are capable and ready to recruit USM Industrial Technology trainees.

  The organisations cover all socio-economic spectrums and include:
  - Multinational corporations.
  - Academic and research institution.
  - Government and semi-government bodies.
  - Factories.

4.5 Undergraduate Final Year Research Project

All final year students must carry out an individual research project for 2 semesters under a supervision of an academic staff from the respective programme as a requirement to graduate in Bachelor of Technology in specific technological area (Food, Bioprocess, Environmental or Bioresource).

Synopsis :

This course will introduce the student problems relating to their respective technological fields. Through research, the student will be tasked to solve the problem. Lecturers will supervise the students in carrying out the literature search, laboratory work, and dissertation writing. The student will also attend a series of lectures on research philosophy, experimental design, scientific thinking, laboratory safety, thesis writing, viva voce presentation.

Objectives :

- To give an opportunity to students to carry out an in-depth study of their respective specialisation area.
- To enhance student's competence in research and product development using theories and hands-on knowledge that they have learnt prior to the final year.
- To give students an intellectual challenge to their abilities to learn new topics without formal classes and to further develop their abilities in literature searching, report writing, verbal presentation, project planning and time management.

Learning Outcomes :
At the end of the course, student should be able to:

- Study and provide alternative solution to solve problems in their respective technological field.
- Lead and conduct research project ethically.
- Manipulate tools, measure response changes and synthesize experimental data.
- Organize research findings in the form of dissertation.
- Present and defend the research results clearly and confidently during viva voce.

Length and Period of the Project :
This project is implemented in the final 2-semesters of study for every programme.

Choosing Project Title :
Titles of projects will be issued during the first week of the first of the 2-semesters. Students are advised to see lecturers to get more information on the project they have chosen. Each student will be supervised by an academic staff.

Project Dissertation
Projects are usually carried out individually. The dissertation format will be elaborated by the Coordinator of each programme.

Evaluation :
Student will be evaluated based the dissertation, viva voce and feedback from supervisor.

5.0 MINOR PROGRAMMES

All students that choose to do Industrial Technology with Minor programme must choose one minor programme and commence their minor study in the second semester of the first year of their studies. These students must complete 20 units of the courses in the minor package.

Among the minor programmes offered are:

School	Minor Package	Code
School of Biological Sciences	Biology	0B01
School of Physics	Physics	0Z01
School of Chemical Sciences	Chemistry	0K01
School of Mathematical Sciences	Mathematics	0M01
School of Humanities	English Language Malay Linguistics Geography Literature Islamic Studies History Japanese Studies Philosophy & Civilisations Translation and Interpretation	0H01 0H02 0H03 0H04 0H05 0H06 0H11 0H15 0H14
School of Languages, Literacies & Translation	Japanese Language Studies Chinese Language Studies Communicational Arabic	0L01 0L02 0L06
School of Art	Fine Arts Performing Arts Music Drama and Theatre Communi-cational Graphics Acting and Directing Music Technology	0H07 0H08 0H09 0H10 0H12 0H13 0V01
School of Communication	Communication Studies Science and Environment Journalism	0Y05 0Y06
School of Management	Management	0A03
Centre for Global Archaeological Research	Archaeology	0U01
School of Social Sciences	Anthropology and Sociology Economics Social Development and Administration Political Science Development Planning and Management	0S01 0S02 0S04 0S05 0S07

	Industrial Relation Public Policy and Administration In- ternational Relation South-East Asian Studies Psy- chology	0S08 0S09 0S10 0S11 0S12

The following minor programmes are popular among students of the School of Industrial Technology:

(a) Management (0A03)

No.	Code/Units/Course Title	Title Semester
1.	AKW103/4 - Introduction to Management	I & II
2.	AKW104/4 - Accounting and Finance	I & II
3.	AKP201/4 - Marketing	I & II
4.	AKP202/4 - Organisational Behaviour	I & II
5.	AKP302/4 - Operation Management	I & II

Courses 1 and 2 are compulsory and pre-requisites to other courses.

(b) Economics (0S04)

No.	Code/Units/Course Title
1.	SKE109/3 - Principles to Economics Issues (*Compulsory*) – Sem. II
2.	SEW101/3 - Microeconomics (*Compulsory*) – Sem. II
3.	SEW10/3 - Macroeconomics I (*Compulsory*) – Sem. II
4.	**Choose any 3 course - (11 credits)** SEU226/4 - Labour Economics
5.	SEU228/4 - Malaysian Economy
6.	SEU333/3 - Industrial Organisation
7.	SEU334/3- Money, Banking and Financial Markets
8.	SEU336E/3 - Environmental and Natural Resources Economics
9.	SEU339E/3 – Economic Planning And Project Analysis

(c) Psychology (0S12)

No.	Code/Units/Course Title
1.	STU231/4 - Foundations in Psychology (*Compulsory*)
2.	**Choose any 3 courses - (12 credits)** STU241/4 - Health Psychology
3.	STU242/4 - Social Psychology
4.	STU243/4 - Developmental Psychology
5.	STU244/4 - Abnormal Psychology
6.	STU337/4 – Counselling

(d) Communication Studies (0Y05)

No.	Code/Units/Course Title
1.	**A. Compulsory (9 credits)** i) Compulsory **choose any 1 course (3 credits)** YKT101/3 - Introduction to Human Communication
2.	YKT102/3 - Introduction to Mass Communication
3.	YKT104/3 - Introduction to Communication Studies
4.	**ii) Choose any 2 courses - (6 credits)** YKT218/3 - Communication Theory I
5.	YKT220/3- Communication Theory 2
6.	YBP201/3- Communication for Sustainable Development
7.	**B. Choose (11 credits)** YFP324/3 - Cinema Studies
8.	YFP321/3 – Television Studies
9.	YBP224/3 - Public Relations
10.	YBP326/3 - Corporate Communication
11.	YBP300/3 – Integrated Marketing Communication
12.	YWP223/3 - Feature Writing
13.	YKT221/3 - Media Laws and Ethics
14	YWP315/3 – Media dan Gender

(e) Islamic Studies (0H05)

No.	Code/Units/Course Title
1.	**Package A (12 credits)** HIA101/4 – Introduction to Islamic Studies (*Compulsory* Grade C)
2.	HIU123/4 – The Islamic Creed : Concept and Realisation
3.	HIS213/4 – Sources and Principles of Islamic Laws
4.	**Package B (8 credits)** HIS224/4 – The Islamic Family Institution
5.	HIU226/4 – Akhlaq and Islamic Spiritual
6.	HIS311/4 – Zakat dan Wakaf
7.	HIS315/4 – Mu'amalat:Concept and Application
8.	HIU321/4 – Al-Quran, Tauhid dan Sains

For students wishing to register for minor programme, please make sure that time-tabling and course scheduling allows you to graduate in the stipulated period. See Minor Programmes Handbook for further information on Minor Specialisations.

6.0 FACILITIES

6.1 Laboratory Facilities for Undergraduate Teaching

No.	Laboratory No.	Laboratory Name	Course Conducted	Lab Assistant in-charge
1	019	Food Processing Lab	IMG223 IMG324 IMG328	Mohd. Firdaus
2	031	Paper Processing Lab	IWA383 IWA283	Mazlan
3	042	Unit Operations Lab	IEK214 IEK215	Noraida/Alfenddi
4	056	Furniture Workshop	IWK304	Basrul
5	114	CAI/Computer Lab	IEA216	Muhammad Khairi
6	137	Food Technology Equipment Lab	IMG204	Abdul Rahim
7	A203	Microbial Agent and Strain Improvement (MASI) Lab	IBA104 IBG111 IBG205 IBG207 IBG214 IBG215	Najmah
8	A204	Bioanalysis and Biocatal-ysis (BB) Lab	IBG112 IBG211 IBA319 IBA407	Azmaizan
9	206	Microbiology Lab	IMG111 IMG222	Abdul Ghoni
10	233	Food Biochemistry Lab	IMG103 IMG203	Abdul Rahim
11	243	Liquid Chromatography Lab	IBG211 IMG204	Abdul Rahim/ Norita
12	250	Food Sensory Analysis Lab	IMG329	Najmah
13	255	Food Analysis Lab	IMG203	Norita
14	262	Water Analysis Lab 1	IEA101 IEG301	Noraida/Alfenddi
15	306	Bioresource Lab 1	IWA282 IWA382	Azhar
16	340	Coating Lab 1	IWA281 IWA381	Shamsul
17	352	Paper Lab 1	IWA383 IWA283	Noorhasni/ Mazlan

6.2 Laboratory Support Facility

No.	Laboratory No.	Laboratory Name	Service	Person in-charge
1	048	Centre of Technical Facility	Maintenance/ Repair	Zahidil Aswad
2	056	Furniture Workshop	Furniture workshop	Basrul
3	172	Lab Management Office	Service	Jeffiz Ezuer/ Mohd Syukri

6.3 Computer Laboratory and Research Laboratory

No.	Labora-tory	Laboratory Name	Purpose	Lab Assistant in-charge
1	019/025	Food Processing Lab	Teaching and Research	Mohd. Firdaus
2	031B	Mechanical Test Lab	Teaching and Research	Munir
3	031C	Mechanical Test Lab	Research	Munir
4	114	CAI/Computer Lab	Teaching and Computing Facil-ity	Muhammad Khairi
5	119	Microbiology Lab	PG Research	Alfenddi
6	131	Super Critical & Special Instrument	PG Research	Alfenddi
7	133	Environmental Technology Research Lab	Research	Alfenddi
8	137	Food Technology Equipment Lab	Teaching and Research	Abdul Rahim
9	140	Vermitech Lab	Research	Jeffiz
10	144	Sewage Lab	Research	Jeffiz
11	148	Environmental Technology Lab	Teaching and Research	Jeffiz
12	154	Env.Tech Instrumental Lab	PG Research	Mohd Syukri
13	210/213	Food Technology Research Lab I	Teaching and PG Research	Abdul Ghoni

14	215	Food Technology Research Lab II	PG Research	Abdul Ghoni
15	225	Food Technology Research Lab III	PG Research	Norita
16	225A	Spectroscopy Lab	Elemental Analysis Lab	Khairul Azhar
17	229	Paper Research Lab	PG Research	Mazlan
18	232	Food Technology Research Lab I	PG Research	Abdul Rahim
19	233	Food Biochemistry Lab	Teaching and Research	Abdul Rahim
20	243	Liquid Chromatography Lab	Teaching and Research	Abdul Rahim/ Norita/ Azmaizan
21	255	Food Analysis Lab	Teaching and Research	Norita
22	262A	Water Analysis Lab 1	Teaching and Research	Alfenddi
23	262B	Water Analysis Lab 2	Teaching and Research	Alfenddi
24	306	Bioresource Lab 1	Teaching and Research	Azhar
25	307	Density Profiler Lab	Teaching and Research	Mohd Syukri
26	308	Bioresource Lab 1	Teaching and Research	Azhar
27	317	Paper Lab 2	Teaching and Research	Noorhasni
28	320	BPC Research Lab I	PG Research	Azhar
29	329	Ibn Hayyan Lab	Research	Khairul Azhar
30	331	Coating Lab 3	PG Research	Shamsul
31	333	Coating Lab 2	Thermal Analysis Lab	Noraida
32	337	UV Machine Lab	PG Research	Noraida
33	340	Coating Lab 1	Teaching and Research	Shamsul
34	345	BPC Research Lab II	PG Research	Shamsul
35	348	Lignocellulosic Polymer Composite Lab	PG Research	Shamsul

36	350	Weather Station Lab	PG Research	Noraida
37	352	Paper Lab 1	Teaching and Research	Noorhasni
38	A001	Pilot Scale Lab	PG Research	Azmaizan
39	A202	Bioprocess Technology Lab	Teaching and Research	Azmaizan/Najmah
40	A307	PRHO Research Lab	PG Research	Najmah
41	A309	Integrated Bioprocessing Research Lab	PG Research	Azmaizan
42	A407a	Fermentation, Microbiol-ogy, Microalgae, Enzyme (FeMEs) Lab	PG Research	Azmaizan
43	A408a	ProCeDa Lab	PG Research	Najmah
44	A409a	Bioprocess Technology Lab	Research/ Instrument	Najmah

- Undergraduate students will have practical classes and final year research projects in laboratories assigned as teaching and research laboratories

- PG research laboratories are dedicated to postgraduate students.

6.4 Centralized Laboratory

No.	Laboratory No.	Laboratory Name	Purpose	Officer In-Charge
1	047	Microscope Laboratory	Teaching and Research	Munir & Mohd Syukri
2	225A	Elemental Analysis Laboratory	Teaching and Research	Khairul Azhar/ Mohd Syukri
3	243	Liquid Chromatography Laboratory	Teaching and Research	Azmaizan
4	329	Gas Chromatography Laboratory	Teaching and Research	Khairul Azhar/ Mohd Syukri
5	333	Thermal Analysis Laboratory	Teaching and Research	Noraida / Shamsul

6.5 Other Facilities

In addition, the School also provides the following facilities:

- A Student Corner at the School foyer
- Muslim Prayer Rooms (Surau) (Room 302A/B/ A607)
- A Seminar Room (Room 171)
- Conference Room (Ground floor of the School)
- Cuckoo Water Machines (Level 1 & Level 3)
- Student Lockers (available at the respective division)
- A mini garden
- Wireless network "Wi-Fi" throughout USM campus
- Postgraduates Rooms – Environmental Technology (Room 049 & 350)
- Postgraduates Room – Food Technology (Room 221)
- Postgraduates Room – Bio-Resource, Paper and Coating Technology (Room 319)
- Postgraduate Space (Room A605)
- ePlas Multipurpose Classroom (A601)

7.0 GENERAL INFORMATION

7.1 Industry-Community Advisory Panel (ICAP)

In consonance with USM's overall efforts towards building a closer working framework with community and industry, each School has set-up its own ***Industry Community Advisory Panel*** (ICAP) which is considered both timely and useful in enhancing institutional competitiveness. The Panel, comprising selected academic staff and senior executives from the private sector, is intended to serve as a forum for promoting academia-industry interaction which can encompass advice on curriculum and training matters to better dove-tail with industry expectations and relevance, introducing best practices for possible adoption, consider practical approaches to address contemporary problems and issues of concern to both parties and discuss various implementation aspects pertaining to the matter. Thus, the overall objectives of the formation of ICAP is to enhance collaboration between the School of Industrial Technology and the relevant industry partners in the areas of teaching and learning, consultancy services, continuing education, R&D, facilities and so forth. List of ICAP members are as follows:-

1 **Mr. Ahmad Fer-Rouse bin Ahmad Khairuddin**
Senior General Manager
MSM Holdings Bhd.
(FGV Group)
Level 44, Menara Felda,
Platinum Park, No.11,
Persiaran KLCC, 50088,
Kuala Lumpur, Malaysia.

2 **Dr Mohamed Zairul bin Datuk Mohd Yunus**
Founder & CEO Group of Company
SAMZ Holding (M) Sdn Bhd
Jalan Desa Kundang 2,
Taman Desa Kundang,
48020 Rawang, Selangor.

3 **Mr. Othman bin Md Yusoff**
Chairman of Nestlé Halal Committee/ Head of Halal Affairs for Nestlé Malaysia
Nestlé Manufacturing (Malaysia) Sdn.Bhd
Shah Alam Complex,
Jalan Playar 15/1,
40700 Shah Alam, Selangor

4 **Dr. Pun Meng Yan**
Deputy Managing Director
Operation and R&D
Texchem Polymers S/B
No 1465, Mukim 11
Lorang Perusahaan Maju 6
Prai Industrial Estate,Phase 4
13600 Prai, Pulau Pinang

5 **Mr Chin Shou Pei**
Managing Director
RTC Idustrial Coating S/B.
Onfinitive Specialty
S/B. And Radiant Train-
ing Center S/B
18 & 20, Jln Perniagaan
Vorteks 5,
Pusat Perniagaan Vorteks
14100 Simpang Ampat
Pulau Pinang.

6 **Mr. Narendran Maniam**
Chief Executive Officer
IndahWater Konsortium S/B
Level 12,
Indah Water Konsortium S/B
No 44, Jalan Dungun
50490, Kuala Lumpur

7.2 Student Affairs

Student Affairs Section (under the purview of Deputy Dean of Academic, Students and Alumni) will provide assistance, advice and additional services other than those directly related to academic matters to all students of the School of Industrial Technology. All academic related matters should be referred to the respective programme chairperson or Deputy Dean (Academic, Students and Alumni).

The types of assistance, advice and services rendered by the Student Affairs Section are:

- To coordinate activities by the student society (Society of Industrial Technology, USM).
- To coordinate social and sports activities between staff and students.
- To function as an official communication channel between staff and students.
- To facilitate the mentor-mentee system, leave application, scholarship/loans application/ extension, etc.
- To facilitate student participation in various programmes organised by the University's Student Affairs Section.
- To facilitate student's application for an exchange study programme.

7.2.1 Committee of Academic Staff-Student Activity

This committee acts as an official communication channel between the students and the staff of the School of Industrial Technology. The objectives of the committee are as follows:

- To plan and carry out activities that inculcate close relationship between main administrative staff and student representatives.
- To plan and carry out activities that will help new students to familiarise themselves with the new learning environment.
- To function as a forum to discuss problems faced by students.
- The committee, which is headed by the Deputy Dean of Academic, Students and Alumni consists of Programme Chairmen, Executive Secretary (for Deputy Deans), Student Council Representative, President and Executive Members of the Society of Industrial Technology and student representatives from each year and each programme. The committee members meet at least once per semester.

7.2.2 Academic Advisor

Each student will be assigned to an academic advisor who is an academic staff of the School. Student is recommended to discuss with the respective academic advisor for planning of study and selection of courses prior to course registration activity. Student is also encouraged to seek advice from the advisor pertaining to other academic-related matters.

7.2.3 Mentor-Mentee System and Counselling Service

The Mentor System was initiated to counsel and assist probation students (mentee) in facing and overcoming their academic problems. The functions of the Mentor System are:

- To assist students placed on probationary status to overcome their academic problems as well as other related academic matters.

- To help such students face the academic challenges and subsequently overcome them.

- To provide guidance to students on effective learning strategies.

The mentors are appointed among the academic staff of the School who provide assistance and guidance to students mainly in the academic matters. However, the School has established an open mentor system whereby probation students are free to see any of the mentors. Nevertheless, probation students are recommended to dis-

cuss academic- related problems with mentor from their own programme.

The mentors appointed are as listed below:

1. Prof. Dr. Azhar Mat Easa (Food Technology)
2. Assoc. Prof. Dr. Cheng Lai Hoong (Food Technology)
3. Dr. Nur Izzaati Saharudin (Bioresource Technology)
4. Ts. Chm. Dr. Mohamad Shazeli Bin Che Zain (Bioresourc Technology)
5. Ts. Dr. Mohd Hafiidz Jaafar (Environmental Technology)
6. Dr. Widad Fadhullah (Environmental Technology)
7. Dr. Siti Baidurah Yusoff (Bioprocess Engineering Technology)
8. Mdm. Wan Zafira Ezza Wan Zakaria (Bioprocess Engineering Technology)

Probation student will be given a mentor-mentee card that must be brought along to the discussion session with the mentor.

Although the Mentor System is primarily intended for probation students, student with an active status but require guidance or are having difficulties in their studies is also encouraged to consult the mentors.

Mentees that are deemed to require additional advice or counselling, the mentor shall refer such cases to the Deputy Dean (Academic, Students and Alumni) or Counselling Unit or any other relevant authority.

7.3 Society of Industrial Technology

This Society is also known as 'Persatuan Teknologi Industri, PTI'. PTI was specially established by the students for the students of the School of Industrial Technology. PTI provides a channel between the students with the School and the University. PTI also provides platform for students to carry out activities such as factory visits, sport carnival, community services peer counselling, convocation expo and TI-nite. All students of the School are members of the Society.

7.4 Prizes and Awards

Prizes and awards are divided into two categories, at the School level and at the University level.

7.4.1 Certificate of Dean's List

Certificate of Dean's List and Special Certificate of Dean's List are awarded every semester to students who obtained a GPA of 3.50 to 3.66 and GPA of 3.67 to 4.00, respectively, and acquired at least 12 credits for courses with grade points for a particular semester.

7.4.2 University Level

The following are the awards presented to excellent students:

- Chancellor's Gold Medal Award: Best final year student in all fields – awarded by the Chancellor
- Royal Education Award: Best students (Bumiputera and Non-Bumiputera) in all fields – awarded by Majlis Raja-Raja Malaysia
- USM Gold Medal Award: Best final year student from the School – awarded by USM
- USM Gold Medal Award: Best female final year in all fields – awarded by Persatuan Wanita USM
- USM Gold Medal Award: Best student with different abilities – awarded by M.K. Baskaran Nair.
- USM Gold Medal Awards : Best final year students in the field of Food Technology, Environmental Technology, Bioprocess Technology and Bioresource Technology – awarded by Tan Sri KH *Outsmart Foundation.*

Prizes are also awarded by USM to the best students with total GPA (semester I and II) of more than 3.5 for Year I, II and III students from the School of Industrial Technology.

7.5 Research and Higher Degree Programmes

The research areas of the School of Industrial Technology can be divided into four major specialisations that reflect the available programmes within the School. Detail information pertaining to research thrust area can be obtained from the graduate studies brochure at the School.

Postgraduate programmes leading to MSc and PhD in the School of Industrial Technology are open to candidates who have obtained a good

honours degree. The degree can be pursued through research in the research specialisation and thrust area under the supervision of at least one academic staff of the School. A candidate is required to complete a thesis in a stipulated time period. Usually, candidates for a MSc programme complete their thesis in 12-18 months and for a PhD programme in 30-40 months.

Detail information about postgraduate study is available at the Institute of Postgraduate Studies (http://www.ips.usm.my/).

8.0 LIST AND DESCRIPTION OF COURSES

8.1 SCHOOL OF INDUSTRIAL TECHNOLOGY

8.1.1 ENVIRONMENTAL TECHNOLOGY

IEA112/4 Society and Environment Project

This course introduces students to the community and the environment through the interdisciplinary discipline of natural sciences with socio-political sciences and links environmental-ecological, social and economic aspects toward achieving sustainable societies. Students will be exposed to the concept of capitalism encompassing the world's economic-political system in line with the environmental-ecological crisis. Students will be encouraged to discuss and articulate their views on the interests of various conflicting parties, for example between government, corporate and non-governmental environmental activists. Students will also propose and implement appropriate, individual and group social projects on the exploitation of natural resources and waste generation by the industrial community.

IEA101/4 Introduction to Environmental Science and Technology

This course introduces environmental science as a basis to Environmental Technology. This course will focus on the introduction of application-related technology to address the problems of global pollution. Students are exposed to the fundamentals of environmental chemistry, environmental microbiology and some basic analyses of environmental pollution (water, air and soil), including field and laboratory work.

IEA123/2 Internet of Things for Environmental Monitoring towards Artificial Intelligence

This course introduces Internet of Things (IoT) in environmental monitoring. Students will learn the development of IoT technology. Students will also use Python to program IoT protocols and produce one IoT device for environmental monitoring.

IEK108/3 Process Fluid Mechanics s IUK102/3

This course introduces students to the concept of fluid statics, incompressible and compressible fluid flow as well as flow across submerged bodies. Students will also be exposed to the topics of metering, separation, mixing and pumping. Other topics include Fanning friction factor, pumping power and cost, as well as flow rate calculations.

IEK115/3 Environment, Safety and Health Legislation

This course exposes the student to the concept of environmental, occupational safety and health management based on two main acts, Environmental Quality Act 1974 and the Occupational Safety and Health Act 1994. This course uses a case study learning approach.

IBG111/3 Industrial Microbiology

Discusses the involvement of microorganisms in industrial processes, specifically in the production of various product materials including enzymes, food, beverages, fuels, pharmaceutics, organic solvents, cell biomass and also clean technology that is used for waste treatment and pollution control. Emphasis will be given on the determination of important industrial microorganism, selection and isolation methods, maintenance, storage, improvement of industrial microorganisms and the involvement of microorganisms in various industries. Relevant practical classes will also be conducted.

IEA202/2 Environmental Bioindicators s IEA101/4

This course provides an understanding of the concept of using biological indicators in ecosystems. The use of this biological indicator is based on the tolerance or existence of an organism in the terrestrial and aquatic ecosystem as a first step of detecting environmental changes.

IEA221/2 MATLAB Applications in Industry s IUK102/3

The course introduces the student to MATLAB in industry and the field of environmental technology. The course comprises two parts: MATLAB and Simulink. The programming part focuses on computer programming. The student will be instructed on commands, function concepts, statistical tools, and the programming flowchart. The Simulink part will expose the student to simulation in the industry.

IEK205/3 Air Pollution Control Technology

This course exposes students to industrial air pollution problems and control methods. Among the items studied are air quality management, air pollution control devices, meteorological aspects and air pollution dispersion modelling.

IEK211/3 Equipment Design for Water Treatment

This course provides exposure on water resources, water characterization and drinking water standards. This course also explains the water demand, water reticulation system, equipment design of water treatment and water distribution system.

IEK214/3 Heat Transfer and Applications s IUK102/3

This course introduces the student to the fundamental principles of heat transmission by conduction, convection, radiation, and evaporation. This course will also discuss on the applications of these principles to the solution of industrial heat transfer problems and the design calculations for industrial heat exchanger equipment.

IEK215/3 Mass Transfer and Separation s IUK102/3

This course introduces the students to the concepts and principles of mass transfer and separation processes. Additionally, unit operations such as distillation, absorption, adsorption, humidification, filtration, centrifugation and drying will be discussed.

IEK217/3 Environmental Management

This course exposes the students to the concept of planning, implementation and management of the environment through systematic methods. The methods mainly discussed in this course are the Environmental Manage-

ment System in line with the international standard ISO 14001 and Environmental Impact Assessment (EIA) along with Environmental Management Plan (EMP). Furthermore, students will learn other methods such as environmental performance evaluation, environmental labelling and Life Cycle Assessment (LCA).

IEK218/3 Treatment and Management of Solid Wastes

This course introduces treatment and management of solid waste. This course also exposes the students to the legislation, characterization, generation, collection, transport, disposal, solid waste process and leachate treatment. Concepts related to landfill design will also be discussed.

IEK219/3 Treatment and Management of Scheduled Wastes

This course covers treatment and management of scheduled waste according to Environmental Quality (Scheduled Wastes) Regulation 2005. The management of scheduled wastes, from its generation until its disposal, is discussed. Environmental pollution prevention and minimization will also be elaborated. Physical, chemical, and biological treatments of scheduled waste will be summarized.

IEA300/2 Environmental Technology Laboratory

This course exposes the students to various treatment and measuring methods in noise, air, water, solid wastes and wastewater treatment through experiments.

IEA311/3 Environmental Microbiology

This course provides a general introduction to the diverse roles of microorganisms in natural and artificial environments. It will cover topics including cellular architecture, energetics and growth, evolution and gene flow, population and community dynamics, water and soil microbiology, biogeochemical cycling and microorganisms.

IEA313/8 Environmental Technology Research Project

This course will introduce the student problems relating to Environmental Technology. Through research, the student will be tasked to solve the problem. Lecturers will supervise the students in carrying out the literature search, laboratory work, and dissertation writing. The student will also at-

tend a series of lectures on research philosophy, experimental design, scientific thinking, laboratory safety, thesis writing, Viva Voce presentation.

Course Prerequisites:
(i) Students must also have to take all core courses of levels 100 and 200.
(ii) Students have collected at least 40 credit units of core courses.

IEA322/2 Computer-Aided Design (CAD) Drawing and Application

Introduction to computer-aided design (CAD) drawing, important elements in engineering drawing; 2-D drawing by using the CAD software; application of CAD drawings to create engineering drawings related to technology.

IEA333/3 Environmental Product Designing Process

The course is designed to focus on the designing stage in a product development process. Emphasis is given to research and analysis, problem identification and problem-solving, idea development involving design concepts and criteria, and related technical requirements. The student will apply their skills and technical knowledge to formulate design solutions.

IEG301/3 Environmental Forensics s IUK108/4

This course provides basic knowledge in environmental forensics by emphasizing the use of the relevant methods which are suitable to solve key environmental pollution questions. These methods include chemical and DNA fingerprinting techniques. Chemical fingerprinting techniques to be discussed are mass spectrometry, trace metal analysis and stable isotopes analysis of light elements whereas the DNA fingerprinting technique covers methods of DNA extraction and detection of toxin encoding gene. In addition, multivariate statistical methods will be taught to the students in order to recognize patterns of data and thus obtaining the best information and interpretation from the analyses carried out. At the end of this course, students should know how to organize information and data from various sources in order to tackle the challenges in environmental forensics using critical and logical thinking.

IEK307/3 Noise and Vibration Control Technology

This course exposes the student to the physical principles of sound, noise and vibration. The student will be taught data collection and analysis techniques. This course will also expose the student to suggest solutions of noise and vibration problems from the aspect of technology and legislation.

IEK308/3 Industrial Wastewater Treatment Plant Design

In this course, students will be given a project to design a wastewater treatment plant. Students are required to integrate the relevant unit operations, taking into account the main objective of meeting the current environmental legislations. Basic and methods of treatment (physical, chemical, and biological) will be discussed.

IEA315/3 Indoor and Built Environment

This course explains basic terms, parameters, effects (good and poor) of indoor environment and its relationship with humans, building energy consumption and the environment. Students will learn methods of planning, management and indoor environmental control technology of indoor environment in order to achieve healthy working and living conditions of indoor spaces. In addition, legislations, regulations, standards and guidelines at national and international levels on indoor environment will be discussed.

IEK309/3 Chemical Fate and Transport in the Environment

The course involves the study of the transport and fate of chemical substances within the three environmental geospheres: water, air and solids. Course objectives are to introduce and evaluate current methods or models for materials transport from an environmental entry site to the various geospheres so that the environmental exposure can be estimated.

IEA314/3 Environmental Audit and Risk Assessment

In this course, the basic principles of environmental auditing will be discussed. Students will learn how to plan, prepare, conduct an environmental audit and to write an audit report. Also, students will be exposed to the topics of the energy audit, waste audit, occupational safety and health audit, qualification and registration process of auditors as well as risk assessment.

IEA404/6 Environmental Technology Industrial Training

This course involves placement of student to undertake internship at industries. During the internship, students are able to gain an insight into industrial practices and appreciate how principles of science, technology and management are applied in the actual workplace.

Course Prerequisites:
Students have completed four semesters of study, regardless of the accumulated units.

8.1.2 FOOD TECHNOLOGY

IMA116/2 Persuasive Oral Presentation for Food Technology
s IMK 103

The course is a basic requirement for a modern food technologist. It will include preparation and presentation of informative and persuasive speeches. Other topics include: selection and organization of material, methods of securing interest and attention, and the elements of delivery. The course will use food products as materials for presentation assignments.

IMA117/2 Basic Scientific Communication for Food Technology
s IMK 103

This course teaches students to read, extract and write research-based articles for professional communication of food sciences. The learning outcomes are designed to incorporate the overarching skills of critical thinking, effective communication, and the understanding of food science written communications.

IMG103/3 Food Chemistry

This course discussed the structure-function relationship of major food constituents such as water, carbohydrate, lipid, protein, vitamins, minerals and pigments. This course also will cover the effect of processing and preservation on the functional properties of the said constituents.

IMG111/3 Food Microbiology I

The course begins with an introduction to the field and history of microbiology. Topics to be discussed include the structure and function of prokaryotic and eukaryotic cells, microbial classification, physiology, genetics, microbial control by physical and chemical methods. Practical components include microscopy, culturing techniques, isolation, microbial identification and calculation.

IMK103/2 Introduction to Food Science and Technology

The course gives a comprehensive overview of food science and technology. The course introduces basic concepts relating to food composition, food deterioration, food safety, and food processing. Topics covered include food processing and preservation techniques, chemical and biochemical changes, food spoilage and safety, food regulations, and nutritional aspects. Ethical issues in food science and technology are briefly covered.

IMK106/3 Introduction to Food Engineering

This course introduces the fundamental of engineering principles and theory in food processing unit operations. This course covers introduction to the significance of food engineering in food processing operation, units and dimensions, basic thermodynamics, material and energy balance, heat and mass transfer, fluid flow and kinetics of chemical reactions.

IMK113/3 Management of Halal Food

This course introduces the basics of Islamic law related to halal food and food sources. The course also explains the methods of halal slaughter and halal food processing aspect. In addition, this course explains the standards related to halal products, halal management system, certification process, enforcement and related legislation. Current issues related to the misuse of the halal logo and halal food adulteration were also discussed.

IMK114/3 Introduction to Food Physics

This course covers basic Physics such as units and dimensions, vectors, Newton's Laws, work and energy, mass and density, geometric properties of foods, particle size and distribution, fluxes and also thermal, optical, acoustical and radioactivity properties. Examples of case studies and problems involving Physics in food systems will be discussed.

IBK104/3 Fundamentals of Bioprocess Technology

This course encompasses the definition of Bioprocess Technology, discussions of similarities and differences with the disciplines of Bioprocess Engineering and Biotechnology. The course also describes the existence of disciplines of Bioprocess Technology, a string of history of penicillin discovery, bioprocessing advantages over chemical processing, various bioprocessing products and basic knowledge as bioprocess technologists (cell diversity as catalyst agent, cell growth requirements, cell composition, enzymes and metabolic pathways). The diversification of cell growth reactors, monitoring and measurement of kinetic growth, multiple stages of

processing of bioprocess product, Bioprocess Technology application in the treatment of animal and plant cell waste and culture. Students are also exposed to research areas in Bioprocess Technology.

IMG203/3 Chemical Food Analysis p IMG 103/3

This course introduces the basic principles and procedures commonly used for food analysis. Protocol for sampling, analysis and data analysis to achieve valid measurement is emphasized. This course covers topics on proximate analysis for major food components and other minor components. Practical training for related experimental procedures will also be conducted.

IMG204/3 Instrumental Food Analysis p IMG 103/3

This course introduces the principles and applications of instrumental methods in food analysis. It covers spectrochemical analysis methods, chromatographic methods, thermal analysis, and electrophoresis methods. In this course, instrumentation aspects and practical considerations for qualitative and quantitative analysis such as sample preparation and sources of error will be discussed.

IMG222/3 Food Microbiology II p IMG 111/3

This course covers factors (intrinsic, extrinsic and implicit) responsible for the selection of specific spoilage organism of different food commodities; microbiology of various food commodities, indicator organisms microbiological criteria and sampling plans. Various foodborne pathogens are also discussed. The laboratory component of this course covers microbiological examination of foods for both indicator and pathogenic organisms.

IMG223/4 Processing Technology of Animal Based - Food Products p IMG 103/3

This course discusses the structure and composition of animal-based products. This course will also discuss the biochemical changes during postharvest and their effects on product quality. Processing technologies of animal-based products will be discussed. The effects of processing on product quality will also be reviewed.

IMK209/2 Physical Properties of Food

This course covers the study of the principles and measurement of various physical properties of foods that are important in handling, preparing, processing, preserving, packaging, storing and distribution of foods. The application of the underlying physical principles in food formulation and production will also be discussed.

IMK221/3 Food Ingredients

This course covers aspects of food ingredients and additives usually used in food products. Different categories of these ingredients and additives will be discussed based on their specific functional properties. Examples will be given such as chemical and trade name, E-number, properties, toxicology and suitable level of usage in food.

IMK225/3 Unit Operation in Food Processing p IMK106/3

This course exposed the students to the main topics in food process engineering operations. Topics covered include thermal processing, refrigeration, freezing, evaporation, drying, physical separation, size reduction, mixing, and non-thermal processing. Topic on food industry waste and wastewater treatment will also be discussed.

IMK226/3 Post Harvest Technology of Fruits and Vegetables

This is an advanced course of learning wherein, various aspects covering the "farm to table" theme will be discussed. The studying theme will include understanding post-harvest physiology and biochemical changes in fruits and vegetables, handling, transportation, and preservation/storage of the fresh harvest with emphasis laid on safety and quality evaluation.

IMK227/3 Biochemistry

This course includes acid-bass chemistry, structural and function of organelles cells, bio-energetic of cells (enzyme and kinetic, resistance and regulations, various metabolic roads). This course also includes replication transcription, DNA translation, gene expression and biochemical applications in the industry.

IMK228/2 Primary Products Technology

This course covers the chemistry and technology of two important commodities in Malaysia, namely, starch (with emphasis on sago starch) and commercial oils/fats (with emphasis on oil palm). Applications of relevant chemical and physical principles in food formulation and processing will be discussed.

IMA325/3 Food Product Development

This course covers main factors such as market survey, marketing strategy, development process, consumer behaviour and others in new food product development and also outlines methodologies for their management. Students will be required to work in groups to develop a prototype food product, to present a final report and to exhibit the final product to the public.

IBG214/4 Enzyme Technology

This course covers properties and characteristics of enzyme, mode of reaction, reaction specificity. Source of enzyme, purification and characterization. Factors affecting enzyme reaction: temperature, pH, enzyme concentration, substrate concentration, end-product concentration, activator, inhibitor. Quantitation of enzyme reaction, enzyme kinetics. Enzyme immobilization techniques; immobilization mechanism; advantage and disadvantage of immobilized enzyme. Application of enzyme in food and non-food industries: milk industry, detergent.

IMG324/4 Processing Technology of Plant - Based Food Products

This course provides an overview of various aspects and technologies involved in producing plant-based food products. This course will focus on the importance of various ingredients and processing steps on product safety and quality.

IMG328/3 Food Packaging

This course is designed to help students identify and consider major requirements of packages for a range of food products that require shelf life extension. The key focus in this subject is on knowledge and application of the properties of commonly used packaging materials such as paper, plastic, metal and glass. The physical and chemical properties of these food packaging materials are studied in relation to their use in food-packaging applications. This coupled with an understanding of the compatibility requirements of food products and container which form the basis for the choice and selection of packaging material for a specific product.

Modern food packaging practices related to meats, beverages, fruits, vegetables, bakery products, and snack foods will also be covered in this course. This course comprises of 2 units of lectures and 1 unit of laboratory work on related topics.

IMG329/3 Sensory Science p IUK 108/4

This course introduce methodology used in sensory evaluation of food product. Students will be exposed to the ability of humans to use their senses to evaluate the quality attributes of food product using sensory evaluation methods such as analytical and affective methods. This course will also cover the use of relevant statistics in analysing sensorial evaluation data.

IMK316/3 Food Quality Management and Food Regulations

This course introduces quality management system that is widely practiced in the food industry. This course covers food assurance, control, evaluation and audit. The course is made complete with basic exposure to food laws and regulation.

IMK320/3 Functional Foods

This course covers the science, technology, regulatory aspects, and product design and development of functional foods (foods rendering health benefits). Students will be taught in detail on various aspects relevant to plant- and animal-based functional foods and their economic importance.

IMK326/3 Food Safety p IMG 111/3, p IMG 222/3

This course focuses on practices that will ensure production, processing and preparation of safe foods. Topics covered are type of contaminants, types of soils and their interaction with contact surfaces; various cleaning operations; election, application and safety of detergents and sanitizers; Code of Food Hygiene; Food safety management tools such as GMPs/GAPs/SSOP/HACCP, risk management, food toxicology and food allergens will also be covered in this course.

IMK327/3 Human Nutrition

This course discusses the sources of nutrient in food, functions of nutrient in metabolic processes, nutritional deficiencies and its relationship to health. This course will also introduce the fundamental of nutritional status assessment, energy requirements, and nutrition and disease.

IBK316/3 Food Bioprocess Technology

This course covers the processing of food commodities (plants and animals) via the usage of enzymes, tissue cultures and microorganisms, with the aim of increasing quality and the production of value-added products. The production of food ingredients and additives, as well as food processing aids through bioprocessing will also be discussed (e.g. probiotics, enzymes, monosodium glutamate) The use of foods from genetically modified microbial sources will also be studied and issues on regulation and acceptance of the community/ masses will also be discussed.

IMA422/4 Food Research Project

This course will introduce the student problems relating to Food Technology. Through research, the student will be tasked to solve the problem. Lecturers will supervise the students in carrying out research proposal writing, literature search, laboratory work, thesis/dissertation writing, and viva voce. The student will also attend a series of lectures on experimental design, laboratory safety, thesis/dissertation, presentation etc.

IMA423/6 Food Technology Industrial Training

This course involves placement of students to undertake internship at industries. During the internship, students are able to gain an insight into industrial practices and appreciate how principles of science, technology and management are applied in the actual workplace.

IMK410/3 Food Borne Pathogens p IMG 111/3, p IMG 222/3

The course covers incidence, trends, epidemiology, nature of illness, growth characteristics and current detection, prevention and control methods of both traditional and emerging food borne pathogens (bacteria and their toxins, viruses and parasites). Outbreaks of recent foodborne illness and their investigations will also be discussed.

IMK424/2 Food Defence

This course highlights the importance of ensuring the right food defense plans are in place. Topics covered include vulnerability assessments and mitigation strategies. This information will be useful in building a food defense plan. Students will be exposed to the requirements, guidelines, and tools to develop a food defense plan.

IMK425/2 Food Structure

This course relates food structure with molecular composition, processing and macroscopic properties. It involves food structure stability, techniques of analyzing food structure i.e. rheological and physical proper-ties, microscopic imaging and relationship between structure and senses. Students will design and conduct their own projects to ehance their un-derstanding of food structure.

8.1.3 BIORESOURCE TECHNOLOGY

IWK100/2 Bioresource as Industrial Raw Materials

This course introduces students to the various types of lignocellulose materials from the forest and agricultural wastes. The lignocellulose as a source of energy will be introduced. The resources from the non wood lignocellulose fibres as raw materials for pulp and paper, biocomposites (thermoplastic, thermoset and elastomer), and others applications.

IWK101/4 Basic Coatings Technology

This course comprises of the introduction to the basics of polymer science, chemistry of addition polymerization by free radical initiators, ionic and etc. It also discusses on the chemistry for condensation polymerization and copolymerization. Industrial polymerization techniques include bulk, solution, emulsion, suspension and etc. Polymer solution and dispersion rheology encompasses basic concept, rheology parameter measurement, basic concept on polymer structure; crystalline, semi-crystalline and amorphous polymer behaviour.

IWK102/4 Basic Bioresource Science and Technology

This course is a basic introduction to wood anatomy – fibre, vessel, parencyma. Wood cell ultrastructure – cell wall organization, microfibril. Physical property and mechanical property of wood. Natural resistance of bioresource, degradation, wood destructive agents and preservation. Wood drying – kiln and air-drying process, degradation from drying and ways to reduce degradation.

IWK103/4 Pulp Production and Paper Recycling

By the designated topics, this course covers biomass features and processing for pulp production, pulping systems, bioresource and chemical recovery, principles and types of bleaching technology, sources of second-

ary fibres and paper recycling technology. Additional topics on economical impact and responsible management are embedded in the related sections.

IWK105/4 Bioresource Based Products s IWK102/4

This course teaches the students on wood composites and wood chemical technologies. Wood composites technology deals with comparing the efficiency between wood composites and bulk wood. Students will be exposed to the technologies of producing ply woods, particle boards, fibre boards, laminated veneer woods, parallel strand woods, and other wood composites – properties, processing and utilization. Wood chemical technology will include chemicals obtained from trees and lignocellulose; thermal modification; charcoal and activated carbon; wood gas, and chemical modification.

IWA281/2 Coatings Technology Laboratory I s IWK101/4

This practical course teaches students to prepare polymeric resins for coating applications. Unsaturated polyester, epoxy, polyvinyl acetate and polymethyl methacrylate are prepared based on laboratory manual provided. Basic resin and final products properties are also studied. Application of each resin in the coating industry are exposed to students.

IWA282/2 Bioresource Technology Laboratory I s IWK102/4

This is a laboratory course that analyse bioresource structure and anatomical organisation of bioresource. Students will learn how to measure physical properties of bioresource such as moisture content, shrinkage and swelling and density. Student will be doing and measure the strength of the bioresource – bending, compression, tensile, shear, impact, MOR and MOE. The students will determine the chemical composition of bioresource. This include the extractive, cellulose, hemicelulose and lignin.

IWA283/2 Paper Technology Laboratory I s IWK103/4

This practical course exposes students to various kinds of pulping methods such as kraft, soda and mechanical. Students are also required to run pulp beating and handsheet papermaking process; also pulp and paper properties testing.

IWK201/4 Raw Materials and Coatings Chemistry s IWK101/4

This course teaches students the various components of materials needed to prepare coating products such as paints and adhesives. Specific raw materials used for each component are identified. The preparation, properties and functions of raw materials are discussed. Coating chemistry is also touched in this course to increase knowledge in the field of coati

IWK203/4 Stock Preparation and Paper Making s IWK103/4

This course begins with stock preparation that covers the processes of pulp disintegration, beating, wet-end additives, stock blending and metering. Including the secondary fibre processes such as repulping, screening, cleaning and deinking. For papermaking, it consists of approach flow system, paper formation, pressing, drying, calendaring and reeling processes.

IWK204/3 Bioresource, Paper and Coatings Product Development

This course discusses the steps involved in product development. Focus is given on product design criteria, material selection and processing methods to produce the product. Students are also exposed to the assembly method and machining of product components, the various types of materials used and their properties in making products.

IWK205/3 Additives and Paper Properties s IWK203/4

This course emphasizes the importance of fibre properties on paper properties, analyses and measurement techniques of various paper properties. Besides, this course also introduces various additives used in papermaking including sizing agents, dry and wet strength additives, fillers, retention aids, surface sizing, dyes and pigments.

IBK212/2 Renewable Biomass

This theoretical course will expose students to various type of renewable biomass materials that can be used as substrate in the production of different bioprocess products. Focus is emphasized on the importance of this renewable biomass in human life for decades to come. On the other hand, to various methods and technologies that involves in biomass conversion to value-added product such as chemical, biochemical and thermochemical method will be introduced to the students.

IWA313/8 Bioresource, Paper and Coatings Technology Research Project

This course will introduce the student problems relating to Technology. Through research, the student will be tasked to solve the problem. Lecturers will supervise the students in carrying out the literature search, laboratory work, and dissertation writing. The student will also attend a series of lectures on research philosophy, experimental design, scientific thinking, laboratory safety, thesis writing, Viva Voce presentation.

Course Prerequisites:
(i) Student must take all core courses of level 100 and 200.
(ii) Student must also collect at least 40 credit units of core courses.

IWA381/2 Coatings Technology Laboratory II s IWA281/2

This course is related to the synthesis of alkyd resin and pigment for paint formulation, dyeing and preparation of rubber-based adhesive. Students are taught to apply their theoretical knowledge to practical application. This course also trains students to analyse and discuss critically on the various experiments which they have performed.

IWA382/2 Bioresource Technology Laboratory II s IWA282/2

This practical course enables students to analyse and understand the mechanical, physical and thermal characterization of fibers raw materials include thermosets and thermoplastics matrices. Chemical modification of lignocellulosic (wood and plant fibers) will be prepared and analysed. Production of conventional biocomposites, thermoplastics and thermosets composites will be produced and characterized.

IWA383/2 Paper Technology Laboratory II s IWA283/2

This course exposes the students to experiments concerning the pulp bleaching process, involving the chemical calculation and the resultant pulp and paper properties analysis, determination of paper (physical, mechanical and optical) properties and starch content of commercial paper products, and effects of pH and beating on recycled paper properties.

IWK301/3 Coatings Process and Equipment s IWK201/4

This course deals with coatings, which covers resin technology in details. Individual component used in coating material and its formulation will be explained. Selected coating processes will be explained too. Standard test-

ing methods will be elaborated to evaluate the performance of coating material. Furthermore, colour systems and pigment dispersion will be explained too.

IWK304/3 Furniture Manufacturing s IWK102/4

This course is a combination of theory and practical on basic knowledge related to the production of furniture. The focus will be on planning, designing, processing steps, types of machines and jointing used in furniture production, finishing processes, and introducing some aspects of ergonomic pertaining to furniture manufacturing.

IWK305/2 Advanced Technology of Coatings s IWK201/4

This course describes the advanced technology used in the coating industry. Particular emphasis is placed on release coating technology, pressure-sensitive adhesive technology, coating technology through radiation curing (ultraviolet (UV) and electron beam (EB). The principles, materials and equipment used, and quality tests for each technology are explained to the students.

IWK306/2 Fibre and Lignocellulosic Composite

This course is about the fundamental of natural fibres and polymer as raw materials in bioresource based technology. Students also learn about the processes, properties, application, and current technology in advanced biocomposites and nanobiocomposites technology.

IWK307/2 Advanced Paper Technology - Instrumental Analysis for Pulp and Paper

This course exposes students to the various instrumental techniques for analysis of materials related to the papermaking industry. The criteria, application and capacity of an instrumental technique are covered to prepare learners for situations requiring their skills to diagnose and trouble-shoot the problem. The course supports students' higher-order thinking skills through exposure to several case studies.

IWK308/3 Mechanics of Structural Materials s IUK191/4

This course focuses on topics of material strength, mechanical testing and fracture mechanics of a material. Particular emphasis is given to bending properties of various types of beam, such as straight beam and curved beam. These include the deflection of a beam, shearing force and bending moment of a beam.

IWA404/6 Bioresource, Paper and Coatings Technology Industrial Training

This course involves placement of students to undertake internship at industries. During the internship, students are able to gain an insight into industrial practices and appreciate how principles of science, technology and management are applied in the actual workplace.

Course Prerequisite:
Students have completed four semesters of study, regardless of the accumulated units.

8.1.4 BIOPROCESS ENGINEERING TECHNOLOGY

IBA104/3 Practical for Technologists

This course emphasizes on the various biological cells and fundamental techniques in cell biology. Practical components include various fundamental techniques such as microscopy, microbial growth medium, culturing techniques, staining and differentiation of cells, antimicrobial activities and DNA extraction from cells.

Learning Outcomes
At the end of the course, the students will be able to:

- Exhibiting the ability to recognize and handle various techniques in cell biology.
- Apply the techniques and principles of microbiology in growth, culturing and analyses of cell biology.
- Report via oral and written forms confidently and effectively on various techniques of cell biology.

IBK104/3 Fundamentals of Bioprocess Technology

This course encompasses the definition of Bioprocess Technology, discussions of similarities and differences with the disciplines of Bioprocess Engineering and Biotechnology. The course also describes the existence of disciplines of Bioprocess Technology, a string of history of penicillin discovery, bioprocessing advantages over chemical processing, various bioprocessing products and basic knowledge as bioprocess technologists (cell diversity as catalyst agent, cell growth requirements, cell composition, enzymes and metabolic pathways). The diversification of cell growth reactors, monitoring and measurement of kinetic growth, multiple

stages of processing of bioprocess product, Bioprocess Technology application in the treatment of animal and plant cell waste and culture. Students are also exposed to research areas in Bioprocess Technology.

Learning Outcomes

At the end of the course, the students will be able to:

- Demonstrate the fundamental principles of bioprocess technology and relate engineering knowledge with bioprocess technology.
- Describe the processing stages involved in the production of bioprocess products.

Present an example of bioprocess product and its processing stages.

IBG111/3 Industrial Microbiology s IBG102/3

Discusses the involvement of microorganisms in industrial processes, specifically in the production of various product materials including enzymes, food beverages, fuels, pharmaceutics, organic solvents, cell biomass and also clean technology that is used for waste treatment and pollution control. Emphasis will be given on the determination of important industrial microorganism, selection and isolation methods, maintenance, storage, improvement of industrial microorganism and the involvement of microorganisms in various industries. Relevant practical classes will also be conducted.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain basic concept on microbiology and its application theoretically and technically.
- Show ability to follow the standard protocol in analyzing bioprocess product.
- Relate the role of microorganisms dan it usage in various industries including food, pharmaceutical, chemicals, agriculture, mining and waste processing.
- Present and explain in written the results from practical sessions.

IBG112/3 Bioanalysis I

This course covers the principals and analytical methods (quantitative and qualitative) to analyze bioprocess product, such as carbohydrates, protein,

amino acids, and lipids. Laboratory practice related to the topic are conducted.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain the principle and analytical method (quantitative and qualitative) applied during analyzing bioprocess products.
- Conduct standard protocols in analyzing bioprocess products.
- Relate the selection of analytical methods that are appropriate for bioprocess products.
- Write laboratory report in concise and accurate manner to explain chemical analysis performed during the laboratory session.

IBG205/3 DNA and Metabolite Technology

The importance of gene cloning and genetically modified organism, genetic materials; chromosome, DNA, cloning vector; plasmid, cosmid, bacteriophage, DNA replication, protein synthesis, gene controlling, basic techniques in molecular genetics, gene cloning, metabolite production via recombinant DNA technology; bioethanol, use of glycerol, application of recombinant DNA technology in various industries; food, pharmaceutical, agriculture.

Learning Outcomes

At the end of the course, the students will be able to:

- Show capability to follow standard protocol in DNA recombinant technology
- Relate the DNA recombinant technology on the metabolite production
- Explain clearly and write confidently the use of DNA recombinant technology in metabolite production.

IBG207/3 Cell and Tissue Culture Technology

This course covers theoretical and practical knowledge on plant, insect and animal cell and tissue culture technology and its application in bioprocess technology fields. The course provides detailed information such as research methodology, current findings as well as advantages and disadvantages of three different types of cell culture systems. The topics covered in this course include media preparation, sterile techniques, aseptic handling, initiation and routine maintenance of cells in culture, common contaminants of plant and animal cell culture, and understanding of some

of the applications of cell culture technology. This course also covers the fundamental biology of stem cells and its applications including the integration of gene therapy, chemical approach, extracellular matrices and the latest reprogramming technology related to stem cells.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain the types, potentials, basic biology and media diversity for plant and tissue culture of plants, insects, animals and stem cell.
- Demonstrate the ability to culture and analyze the growth of different types of cells and tissues
- Explain orally and in writing clearly, effectively and confidently regarding the use of cell and tissue culture technology in related industries.

IBG211/3 Bioanalysis II

This course covers the principals and methods of analytical instrumentation using spectroscopy analysis (UV/VIS spectrometry, Luminescence spectrometry, FTIR spectrometry, MS), chromatography (TLC, HPLC, GC, Gel Permeation Chromatography (GPC)), thermogravimetric analysis, thermal analysis (DSC, DTA), electrophoresis, polarimetry, and x-ray diffraction. Laboratory practise related to the topic are conducted.

Learning Outcomes

At the end of the course, the students will be able to:

- Conduct standard protocols in analyzing bioprocess products.
- Relate the principle and selection of analytical methods that are appropriate for bioprocess products.
- Write laboratory report in concise and accurate manner to explain chemical analysis performed during the laboratory session.

IBG214/4 Enzyme Technology

This course covers properties and characteristics of enzyme, mode of reaction, reaction specificity. Source of enzyme, purification and characterization. Factors affecting enzyme reaction: temperature, pH, enzyme concentration, substrate concentration, end-product concentration, activator, inhibitor. Quantitation of enzyme reaction, enzyme kinetics. Enzyme im-

mobilization techniques; immobilization mechanism; advantage and disadvantage of immobilized enzyme. Application of enzyme in food and non-food industries: milk industry, detergent.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain on the basic knowledge of enzymes and its reactions.
- Display the ability to conduct experiments related to enzymes
- Relate the basic knowledge of enzyme characteristics to the suitable purification or immobilization techniques
- Report and present confidently on enzyme related experiments.

IBG216/4 Bioreactor Design, Calculation and Operation

s IBG111/3

This course gives emphasis to the bioreactor design and operation, aeration and agitation, mode and types of fermentation. This course is also a combination of lectures and practical to focus on the skills of the students to operate various types of bioreactor types and operation.

Learning Outcomes

At the end of the course, the students will be able to:

- Identify the structure and function of the bioreactor.
- Install and operate the bioreactor from different bioreactor components
- Relate the principles, types and modes of fermentation, considering the design and operation of the bioreactor.
- Present orally and in writing assignment and practical class reports on bioreactor and operation.

IBK212/2 Renewable Biomass

This theoretical course will expose students to various type of renewable biomass materials that can be used as substrate in the production of different bioprocess products. Focus is emphasized on the importance of this renewable biomass in human life for decades to come. On the other hand, to various methods and technologies that involves in biomass conversion to value-added product such as chemical, biochemical and thermochemical method will be introduced to the students.

Learning Outcomes

At the end of the course, the students will be able to:

- Characterize and identify the main chemical composition in different renewable biomass
- Analyze the utilization of biomass component as feedstock and evaluate the complex technologies in producing bioprocess products
- Accept and evaluate new idea in renewable biomass utilization verbally through sustainable lifelong learning process.

IBK215/2 Introduction to OMICs Technology s IBG205/3, s IMK227/3

This course is offered to expose the students to various disciplines in OMICS Technology that are widely used to understand and identify the dynamic functions and interactions between genes and proteins. The main topics involved in this course are Genomics, Transcriptomics, Proteomics, Metabolomics, Epigenomics and common techniques for each discipline. In addition, students will learn the applications of these technologies which include biomarker discovery, identification of signaling molecules associated with cell growth, cell death, cellular metabolism and early detection of cancer.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain the field principles in Omics Technology and related techniques.
- Relate the disciplines in Omics Technology and its use in understanding physiological and pathological processes.
- Present techniques and applications of Omics Technology in the production of diagnostic products.

IBK216/2 Bioprocess Instrumentation and Measurement

This course covers the theory and criteria for measurement tools used in biological systems, design of complete measurement system including signal adjustment and component recording. Students are also exposed to the comparison between measurements in the physical and biological systems. This course also includes the mathematical description and identification of biological systems, interactions between biological and engineering systems, biological control systems, measurement tools and techniques involved in biological systems.

Learning Outcomes

At the end of the course, the students will be able to:

- Identify various instruments, components and control technique related to a bioprocessing system.
- Show appropriate sensing and measuring sets in a bioprocessing system.
- Present on the elements related to measurement and instrumentation in bioprocessing

IEK212/3 Process Heat Transfer s IUK102/3

This course introduces the student to the fundamental principles of heat transmission by conduction, convection, radiation, and evaporation. This course will also discuss on the applications of these principles to the solution of industrial heat transfer problems and the design calculations for industrial heat exchanger equipment.

IEK213/3 Mass Transfer and Separation Processes s IUK102/3

This course introduces the students to the concepts and principles of mass transfer and separation processes. Additionally, unit operations such as distillation, absorption, adsorption, humidification, filtration, centrifugation and drying will be discussed.

IBA306/8 Bioprocess Technology Research Project

This course will introduce the student to challenges relating to Technology. Through research, the student will attempt to solve the challenge. Lecturers will supervise the students in carrying out the literature search, laboratory work, and dissertation writing. The student will also attend a series of lectures on research philosophy, experimental design, scientific thinking, laboratory safety, thesis writing, Viva Voce presentation.

**Course is offered in TWO (2) semesters Course

Learning Outcomes

At the end of the course, the students will be able to:

- Research planning for solving problems in bioprocess technology using new ideas or alternatives.
- Present and defend research output clearly and confidently during Viva Voce.
- Prepare dissertation of final year project ethically.
- Practice professional and ethics during performing research work.
- Organize literature review and research in the form of dissertation.

IBA312/3 Bioprocess and Society

This course describes the field of bioprocess technology and discusses the aspects and social implications in a technological solution. Discuss the question of ethics, social responsibility and selected issues. Emphasizes on the contribution of science toward local communities.

Learning Outcomes

At the end of the course, the students will be able to:

- Correlating the implications and importance of bioprocess technology issues with alternative solutions
- Present via oral and written on selected issues in bioprocess technology with the collaboration of local communities.
- Respect the views, principles and trust of group members during the execution of project.
- Execute group project effectively, and exemplify the characteristics of leadership, autonomy and responsibility.

IBA319/3 Advanced Practical in Bioreactor Systems

This course emphasizes practical exercises of various types of bioreactor system. Theoretical principle for each bioreactor system and factors influencing the fermentation process will be discussed. This course also emphasizes bioreactor design, types, classification and selection for each system. Scaling up to pilot scale fermenter will be taught in general.

Learning Outcomes

At the end of the course, the students will be able to:

- Demonstrate the ability to identify and operate different types of bioreactors in different fermentation modes.
- Explain and apply the principles, types and modes of operation for each type of fermentation in accordance with the product produced.
- Report orally and in writing effectively in explaining the principles, types and modes of operation for each type of fermentation.

IBG307/3 Bioprocess Optimization and Simulation

Introduction to fermentation process and operation modes, optimization process. Kinetics and modeling of fermentation. Mass balance, estimation

of kinetic parameter values; measurement of growth, rates of substrate consumption and product formation. Model of (batch, continuous, fed-batch) fermentation; simulation of growth in (batch, continuous, fed-batch) fermentation using statistical software and measurement of simulation parameters.

Learning Outcomes

At the end of the course, the students will be able to:

- Report the results of practical findings in orally and writing.
- Formulate experimental data obtained using statistical software for simulation process.
- Correlate the design of experiment knowledge and process optimization, and fermentation process with the use of an appropriate simulation and optimization software.

IBG319/4 Bioproduct Design and Development

The course covers theoretical knowledge and group project of marketable bioproduct design and development. Theoretical knowledge includes discussion on a case which analyzing factors of the declining and increasing product demand; product design principles; innovation strategy; knowledge in product development; consumer in product development and management in product development

Learning Outcomes

At the end of the course, the students will be able to:

- Critically evaluate the relationship between theoretical knowledge and the proposed bioproduct.
- Explain in writing and orally about the idea, design, production, marketing and business planning of a bioproduct.
- Relate individual roles to group planning and implementation in bioproduct development.
- Propose business opportunities for the developed bioproduct.
- Relate individual roles to organize and lead a group project in the process of bioproduct development.

IBK314/3 Downstream Process Technology

This course is a theoretical course on the downstream processes that are required for separation, release, recovery, concentration and purification of products produced through fermentation, and will emphasize on con-

cepts and methods that are commonly used for each stage of the downstream process.

Learning Outcomes
At the end of the course, the students will be able to:

- Identify the appropriate downstream process for a product by relating the concepts and functions of the downstream processes involved.
- Describe in groups the appropriate downstream system in the production of a bioproduct in a real industry.

IBK315/2 Bioinformatics s IBG205/3

This course is offered to expose the students to the Bioinformatics and steps to retrieve and analyze biological data such as DNA and protein sequences. The main topics involved in this course are the introduction of bioinformatics and the application of some databases to find DNA sequences and proteins using FASTA and BLAST. Several processes related to pairing and multiplication sequences are also emphasized in determining the similarity of the sequence. In addition, the course includes tutorials on some software and computing approaches used in Bioinformatics.

Learning Outcomes
At the end of the course, the students will be able to:

- Describe the related biological computing structure and its application.
- Analyze biological data problems using a related computing method from various particular database.
- Demonstrate a good skill set in analyzing common biological sequences and databases.

IBK316/3 Food Bioprocess Technology

This course covers the processing of food commodities (plants and animals) via the usage of enzymes, tissue cultures and microorganisms, with the aim of increasing quality and the production of value-added products. The production of food ingredients and additives, as well as food processing aids through bioprocessing will also be discussed (eg probiotics, enzymes, coloring) The use of foods from genetically modified microbial sources will also be studied and issues on concerns and acceptance by the community/ masses will also be discussed.

Learning Outcomes

At the end of the course, the students will be able to:

- Understand and able to apply fermentation of foods, enzymes, microbial biomass, and plant tissue culture in food bioprocess technology.
- Understand and able to apply genetically modified foods and nutrition, and humanity issues including food biotechnology.
- Present on the use of microorganisms and fermentation in the production of foods with confidence.

IBK317/3 Mathematical Physiology

This course introduces the knowledge mathematics modelling to answer human physiological questions and to predict the biological process. The focus of this course will be on the understanding of basic cell biology, human physiology and mathematical modelling. The course will also explain the used of mathematical physiology in the production of medical devices.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain the basic principles of cell biology, human physiology and mathematical physiological modeling.
- Relate the knowledge of human physiology and mathematics in the production of mathematical physiological models.
- Apply mathematical knowledge to predict human physiological changes using computational methods.
- Produce mathematical formulas to predict changes in human physiology by referring to existing formulas

IBK318/3 Pharmacogenomic

This course will cover the knowledge on how gene influence individual's response towards medication. This course will also discuss on pharmacogenomics application in specific medicine production suitable for each individual.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain the principles of Pharmacology and its relation to the field of Genomics.
- Relate the knowledge in Pharmacogenomics to produce diagnostic tools.
- Present issues related to Pharmacogenomics and bioethics.

IBA407/4 Practical in Downstream Processing

This course will enhance the techniques of downstream processing via laboratory practical. This course focuses on downstream processing, which are removal of insoluble, isolation of products and purification of products. In the aspects of insoluble removal, focus will be given to design of filtration, design of centrifugation and coagulation processes. In the aspect of product isolation, focus will be given to the design of solvent extractions, precipitation and adsorption. Purification will cover topics on design of separation process and application of chromatography techniques

Learning Outcomes

At the end of the course, the students will be able to:

- Display the ability to handle various techniques in downstream processing
- Apply various downstream principles and techniques with the related products.
- Report bioprocess downstream methods confidently for various downstream processing techniques.
- Present confidently regarding the downstream processing of bioprocess products.

IBA406/12 Bioprocess Technology Industrial Training

This course involves placement of students to undertake internship in an industry. During the internship, students are able to gain an insight into industrial practices and appreciate how principles of science, technology and management are applied in the actual workplace.

Course Prerequisites:

Students have completed six semesters of study, regardless of the accumulated units.

Learning Outcomes

At the end of the course, the students will be able to:

- Manipulating materials and tools at the training site.
- Apply theory and academic knowledge to find alternative solutions to training ground problems.
- Present and discuss effectively at various levels of the organization.
- Demonstrate a professional and ethical attitude by understanding the economic, environmental and socio-cultural impact in professional practice.

IBK411/3 Quality Assurance and Safety of Bioprocess Products

The course is related to legal import/export of food and biopharmaceutical products especially produced through the process of bioprocess technology. Students are exposed to the various quality management systems (Quality Management System, QMS), including a comprehensive quality management (total quality management, TQM), ISO 9001:2000, ISO 14000 and Halal. Statistical control process for interpretation of quality control data will be emphasized. Controlling method for quality products such as raw materials received, during the preparation, packing material and the packaging process and processing methods will be emphasized with the approach of good manufacturing practices (GMP). This course also includes the evaluation of bioprocess product safety and relevant risk assessment.

Learning Outcomes

At the end of the course, the students will be able to:

- Suggest on the improvements of quality managements system and the suitable legislative process for bioprocess products
- Present confidently regarding the safety of bioprocess products and the related procedures
- Make decisions with full of ethics based on the principles of quality system managements for bioprocess industries

IBK412/3 Environmental Bioprocess Technology

Students are exposed to ethical issues and the effects of bioprocess industries on the environment. Aspects of regulation and design of treatment systems are emphasized to expose students to the existing and potential technology. Treatment systems including basin setting, anaerobic digester, lagoons and composting system will be discussed. Meanwhile, treatment with conversion industrial or domestic effluent to valuable products also will be discussed detail.

Learning Outcomes

At the end of the course, the students will be able to:

- Relate the environmental pollution issues with the laws.
- Describe the correct sampling method for test on the pollution rate as well as the other parameters that should be analyzed according to the standard methods which comply the environmental regulation.
- Analyze and evaluate the ethical solutions on environmental complex problem through bioprocess technology.

IBK413/3 Protein Engineering s IBG205/3, s IBK315/2

This course introduces to the methods and strategies in protein engineering and protein modification techniques. The theories and concepts behind rational design and directed evolution methods will be covered in this course. Students will also learn about the basics of protein structures and the related biophysical analyses along with the strategies of bioinformatic database searches. Topics of screening, isolation, expression and purification methods of novel protein variants with improved properties will also be covered in this course.

Learning Outcomes

At the end of the course, the students will be able to:

- Explain on the basic knowledge of structural functions of protein.
- Relate the basic knowledge of protein with the suitable protein modification techniques.
- Analyze and suggest protein modification strategies to improve protein functionalities.

8.1.5 GENERAL COURSES

IUK102/3 Basic Chemical Process Calculations

This course is about general calculations involved in chemical processes. The students will be exposed to mass and energy balance and the steps needed to solve related problems. These topics will help the students solve problems effectively through the correct problem-solving methodology, relevant data collection and data analysis. This course also introduces the student to the properties and phase behaviour of steam, gases as well as basics of chemistry and physics.

IUK107/4 Chemistry for Technologist

The course syllabus aims for a comprehensive coverage to bolster students' organic and general chemistry foundation. Topics include molecular structure, acidity and basicity, organic nomenclature, stereochemistry, synthesis and reactions of diverse compounds. Spectroscopic methods will be taught for sample constituent and functional group identification.

IUK108/4 Statistics with Computer Applications

This course discusses basic statistical techniques, frequency tables, graph types, mean, variance and standard deviation. This course will also discuss various methods for analyzing data, including z-test, t-test, chi-square test,

analysis of variance, linear correlation and linear regression. These analysis methods are also applied using computer software.

IUK190/3 Occupational Safety and Health Coordinator

The course provides students with concepts and principles of occupational safety and health (OSH), and OSH management in suggesting justificable solutions.

IUK191/4 Mathematics I

This course introduces the concepts of functions and limits of single variable. Linear, polynomial, logarithmic, exponential and trigonometry functions will be discussed. The focus will be on the understanding of concept and solving of differentiation and integration with applications. Students are then introduced to differential equations focusing on separable differential equation and first-order linear equations. Matrices and determinants are taught in solving systems of linear equations by using Gauss and Cramer methods.

IUK208/3 Experimental Design with Computer Applications

This course discusses on the Replication, Randomization, Blocking, and Definitions in Experimental Design (Experiment, Treatment, Factor, Level, Experimental unit, Experimental design, Random, Replicate).

IUK291/4 Mathematics II s IUK191/4

This course expands the concepts of functions and limits to two variables. Linear, polynomial, logarithmic, exponential and trigonometry functions will be discussed. The focus will be on the understanding and solving partial derivatives of differentiation and solving double and triple integration with simple applications. Students are then introduced to differential equations focusing on separable differential equation and second-order linear equations. Infinite series, Taylor-Maclaurin series and Fourier series are taught with a view to examine the theory and properties of certain functions that can be represented as sums of series.

IUK292/3 Ergonomics and Ergonomic Trained Person

The course will introduce students to the concept of ergonomics and its applications in the industry. The course will also include topics covered in the competency programme of “ergonomic trained person.”

8.2 COURSES FROM OTHER SCHOOLS

8.2.1 SCHOOL OF CHEMICAL SCIENCES

KAT245/4 Analytical Chemistry 1

Stoichiometry calculations, statistical data treatment, concepts of equilibrium, gravimetric analysis, acid-base equilibria, acid-base titrations, complexometric titrations, precipitation reactions and titrations, electrochemical cells and redox titrations.

KFT233/4 Physical Chemistry I s KOT122 / s KTT112

Properties of gases; gas laws, van der Waals equation, kinetic theory of gases, principle of the corresponding states, Maxwell-Boltzmann distribution, effusion, diffusion, viscosity and thermal conductivity. Chemical kinetics; rate laws, temperature effect, experimental methods, complex reactions. First law of thermodynamics: work, heat, energy, enthalpy change, heat capacity, adiabatic and isothermal processes, reversible and irreversible processes. Thermochemistry.

KOT122/4 Organic Chemistry 1

Electronic structure and bonding. Acids and bases. An introduction to organic compounds and functional groups. Nomenclature and representation of structure. Reactions of alkanes, alkenes and alkynes. Stereochemistry: the arrangement of atoms in space, the stereochemistry of addition reactions. Nucleophilic substitution reactions of alkyl halides, Elimination reactions of alkyl halides and compounds with leaving groups other than halogen Structure, synthesis and reactions of alcohols, ethers and epoxides.

8.2.2 SCHOOL OF BIOLOGICAL SCIENCES

BOI102/3 Ecology

This is an introductory course on general ecology for students to understand various principles of ecology. The concept of ecology will be defined in term of the basic components, structures and processes that occur in the ecosystems, communities and population together with the analysis and interpretation of organisms distribution patterns.

9.0 INDEX

10.0 STUDENTS' FEEDBACK

The aim of this feedback form is to obtain students' response regarding the content of this guidebook. The information obtained will be useful in improving it.

Please respond to items 1 - 5 below based on the following 4-point scale.

1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree

Please circle the number.

1. This guidebook is very useful.

1	2	3	4

2. The information provided in this guidebook is accurate.

1	2	3	4

If you chose 1 or 2 for question no. 2, please provide the number of the pages(s) that contain the inaccurate information.

3. The information provided in this guidebook is clear and easy to understand.

1	2	3	4

4. Overall, I would rate the quality of this guidebook as good.

1	2	3	4

5. I prefer to use CD compared to this guidebook.

1	2	3	4

6. If there is any other information that you think should be included in the guidebook, please suggest in the space below.

Please send this feedback form to School's General Office in the 4th week of Semester I, Academic Session 2024/2025.