



Master of Science
**ENVIRONMENTAL
SCIENCE**
ACADEMIC HANDBOOK



School of Industrial Technology
Universiti Sains Malaysia
www.indtech.usm.my

Academic Handbook
Master of Science (Environmental Science)
Academic Calendar of 2022/2023

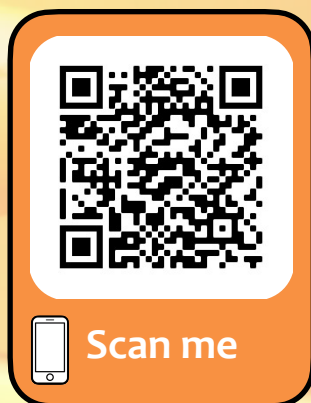
© 2022 School of Industrial Technology, Universiti Sains Malaysia

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronically or mechanically, including photocopying, recording or any information storage or retrieval system, without prior permission in writing from the publisher.

The advice and information in this Academic Handbook are believed to be true and accurate at the date of going to the press, but neither the author nor publisher can accept any legal responsibility or liability for any errors or omissions.

A full version of the Academic Handbook can be access from USM Division of Academic & International website (<http://baa.usm.my>) or via the QR code provided. The Academic Handbook is for staff and student in USM only. A valid USM Campus Online username and password are required to access the Academic Handbook.

Published by: School of Industrial Technology, Universiti Sains Malaysia



Full version of the Academic Handbook

Vision and Mission

Universiti Sains Malaysia

Vision

Transforming Higher Education for a Sustainable Tomorrow

Mission

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

Vision and Mission

School of Industrial Technology

Vision

World class centre in technological innovation for a sustainable tomorrow

Mission

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

Niche Research Area

School of Industrial Technology

Sustainable Materials, Processing, and Energy Technologies

History

School of Industrial Technology

1973

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

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.

1986

The School was split into :

- School of Electrical and Electronic Engineering
- School of Materials and Mineral Resources Engineering
- School of Industrial Technology

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.

2001

Polymer Technology and Quality Control & Instrumentation programmes were upgraded into:

- Polymer Engineering programme
- Mechatronics Engineering programme

1999

Environmental Technology programme was introduced by School of Industrial Technology.

2002

Wood, Paper and Coatings Technology programme was renamed Bioresource, Paper and Coatings Technology programme.

2008

Bioprocess Technology programme was introduced by School of Industrial Technology.

2018

Master of Science (Environmental Science) programme was introduced by School of Industrial Technology.

2020

Bioresource, Paper and Coatings Technology programme was renamed Bioresource Technology programme.

2022

Bioprocess Technology programme was changed to Bioprocess Engineering Technology programme.

Administrative Staff

School of Industrial Technology



- | | | |
|----|--|--|
| 1 | Dean | Prof. Datuk Ts. Dr. Abdul Khalil Shawkataly, <small>D.S.P.N., D.P.S.M.</small> |
| 2 | Deputy Dean (Academic, Career & International) | Assoc. Prof. Dr. Mardiana Idayu Ahmad |
| 3 | Deputy Dean (Research, Innovation & Industrial - Community Engagement) | Assoc. Prof. Dr. Husnul Azan Tajarudin |
| 4 | Deputy Dean (Resource Development & Branding) | Assoc. Prof. Dr. Leh Cheu Peng |
| 5 | Programme Chairman (Food Technology) | Assoc. Prof. Dr. Uthumporn Ultra @ Sapina Abdullah |
| 6 | Programme Chairman (Environmental Technology) | Assoc. Prof. Dr. Yusri Yusup |
| 7 | Programme Chairman (Bioresource Technology) | Ts. Dr. Nurul Fazita Mohammad Raw |
| 8 | Programme Chairman (Bioprocess Engineering Technology) | Dr. Mohamad Hafizi Abu Bakar |
| 9 | Senior Assistant Registrar (Academic & Administration) | Mdm. Rasslene Rass Rasalingam |
| 10 | Assistant Registrar (Postgraduate & Human Resource) | Ms. Nur 'Aqila Badrul Hisham |

Academic Programme

Classes for this master programme are held on weekends. Registration is open twice a year. You can register in either the first or the second semester.

To graduate, you would need to complete 40-unit courses, which cover core and elective courses, 27 and 20 units, respectively. You need to take all core courses (a total of 27 units), but you can choose the elective courses (a total of 13 units). A typical programme would consist of two semesters; each semester would be 18 weeks or four months long.

Environmental Science

This programme, which is spread between 1 to 2 years for full-time students and 2 to 4 years for part-time students, is gaining popularity and its importance require no introduction since environmental problems are reported and discussed every day globally. This programme is designed to enable our graduates to become thinkers, leaders, and innovators that will respond to various environmental challenges in driving any sector of industries towards environmental sustainability.

The programme combines the aspect of natural and social sciences within a technology-based interdisciplinary framework, providing a foundation for candidates to appreciate the interconnectedness of air, water, and soil processes.

Details of Programme

Type of Study	Minimum	Maximum
Full Time	2 semesters	4 semesters
Part Time	4 semesters	8 semesters

Programme Educational Goal & Objectives

The full coursework Master of Science in Environmental Science programme is designed to develop your environmental scientific and analytical skills for a professional career in the government or private sectors. It is an interdisciplinary programme that combines the natural and social sciences within a technology-based multidisciplinary framework.

Therefore, the academic programmes are designed to produce graduates who:

- are competent in knowledge of environmental sciences towards environmental sustainability
- are experts in skills related to environmental sciences towards environmental sustainability
- are leaders in academic, consultancy, research, governmental and non-governmental bodies, and industry

Programme Learning Outcomes

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

1. Acquire knowledge in the specialised area of environmental science holistically.
2. Exhibit extensive technical skills related to environmental science, technology, and sustainability issues.
3. Integrate the knowledge acquired in solving environmental science, technology, and sustainability issues using transdisciplinary approach based-on critical, creative, and innovative thinking.
4. Articulate the knowledge acquired efficiently to experts and non-experts community.
5. Display sense of responsibility and master the social skills in contributing to community well-being.
6. Evaluate professionally and ethically based-on science, technology, and management for environmental sustainability.
7. Manage information for lifelong learning education.
8. Apply knowledge on environmental science, technology, and sustainability for career development.
9. Display leadership and skills in developing and implementing sustainable strategies and plans scientifically and critically.
10. Demonstrate basic digital skills for career development.
11. Demonstrate numeracy skills in all aspects of life.

Entry Requirements

Study Level Qualification	CGPA*	Amendment of Entry Requirement
Bachelor in Science, Technology, Engineering or Selected Arts Degree	>2.75	<ul style="list-style-type: none"> • Subject to additional conditions of the School
	2.50 - 2.74	<ul style="list-style-type: none"> • One year of research experience; or • Professional experience in the relevant field for one year; or • one publication in the applied field; or • grade B for major or elective courses; or • grade B+ for final year project
	2.00 - 2.49	<ul style="list-style-type: none"> • Five years of research experience; or • Professional experience in the relevant field for five years; and • one publication in the applied field; or • grade B for major or elective courses; or • grade B+ for final year project

* Cumulative Grade Point Average.

English Requirements

	Score or Band
TOEFL by ETS (Internet-based Test); or IELTS; or MUET; or	Minimum score 80 Minimum band 6 Minimum band 4
The native language or national language of the applicant is English	Not applicable

Programme Structure

Sample of the Study Plan for a Full-Time Student (2 semesters / 1 year)

Course Type	2022/2023 Academic Session	
	Semester 1	Semester 2
CORE (T)	IEA501/3	IEA504/4
	IEA505/8*	IEA505/8*
	IEA518/3	IEG502/3
	IEG503/3	IEK516/3
	13	SEM BREAK
		14
ELECTIVE (E)	IEA506/4	IEA519/3
	IEA515/3 or IEA517/3	IEG513/4 or IEA514/3
	7	7 or 6
Total Unit	20	21 or 20

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

Sample of the Study Plan for a Full-Time / Part-Time Student
(4 semesters / 2 years)

2022/2023 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA501/3	SEM BREAK	IEA504/4
	IEA518/3		IEG502/3
	6		7
ELECTIVE (E)	IEA515/3 or IEA517/3		IEA519/3
	3		3
Total Unit	9		10
2023/2024 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA505/8*	SEM BREAK	IEA505/8*
	IEG503/3		IEK516/3
	7		7
ELECTIVE (E)	IEA506/4		IEG513/4 or IEA514/3
	4		3 or 4
Total Unit	11		10 or 11

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

Sample of the Study Plan for a Part-Time Student (6 semesters / 3 years)

2022/2023 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA518/3	SEM BREAK	IEG502/3
	3		3
ELECTIVE (E)	IEA506/4		IEG513/4 or IEA514/3
	4		3 or 4
Total Unit	7		6 or 7
2023/2024 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEG503/3	SEM BREAK	IEK516/3
	3		3
ELECTIVE (E)	IEA515/3 or IEA517/3		IEA519/3
	3		3
Total Unit	6		6
2024/2025 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA501/3	SEM BREAK	IEA504/4
	IEA505/8*		IEA505/8*
Total Unit	7		8

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

Sample of the Study Plan for a Part-Time Student (8 semesters / 4 years)

2022/2023 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA518/3	SEM BREAK	IEG502/3
	3		3
ELECTIVE (E)	IEA506/4		IEG513/4 or IEA514/3
	4		3 or 4
Total Unit	7		6 or 7
2023/2024 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEG503/3	SEM BREAK	IEK516/3
Total Unit	3		3
2024/2025 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA501/3	SEM BREAK	IEA504/4
Total Unit	3		4
2025/2026 Academic Session			
Course Type	Semester 1		Semester 2
CORE (T)	IEA505/8*	SEM BREAK	IEA505/8*
	4		4
ELECTIVE (E)	IEA515/3 or IEA517/3		IEA519/3
	3		3
Total Unit	7		7

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

List and Synopsis of Courses

1. IEA501/3 Atmospheric Science and Air Quality

This course discusses the relationship between physical processes of the atmosphere and air quality. The student will be taught the structure, composition, atmospheric boundary layer, and energy balance of the atmosphere and how to apply this knowledge to model the dispersion of air pollutants using AERSCREEN and AERMOD models. A brief introduction to the state-of-the-science weather forecasting model, such as WRF (model Weather Research Forecasting), would also be discussed.

2. IEA504/4 Ecosystem Services

This course focuses on the concept of ecosystem services by exploring the ways in which ecosystem services can be valued, measured and monetized/unmonetized by society, across the spectrum of 4 main aspects; provisioning services, regulating services, supporting services and cultural services. Both theoretical and practical applications of ecosystem services and valuation are explored through case studies. Strategies for effective group work will be explored and the students will be able to reflect on their own participation and their role within the learning group. This course includes guest lectures, video and film shows, student seminars and a group project related to a selected community and its ecosystem services and issues and ways to solve them in a transdisciplinary approach.

3. IEA505/8 Research Project

This course provide opportunities to students to conduct research related to environmental issues and ways to address these issues via instrumentation techniques, modelling, management or legislation. These components will be assessed through publication ready manuscript and viva voce.

4. IEA506/4 Environmental Scientific Writing

This course trains the students on the methods of environmental scientific writing and communication. These topics will be assessed through project paper, media review, and presentation.

5. IEA514/3 Applied Environmental Forensics

This course will provide basic knowledge in environmental forensics by emphasising the use of the latest 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. Students will be exposed to a variety of scenarios and problems related to environmental pollution and will be tested to propose appropriate techniques to find the source of the problems. Students will also gain exposure to the process of investigation in the field from a legal perspective. In addition, the students will be taught on how to use multivariate statistical methods in order to recognise patterns of data and thus obtaining the best information and interpretation from the analyses carried out. At the end of this course, students will know how to organise information and data from various sources in order to find the source of environmental pollutions using critical and logical thinking.

6. IEA515/3 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 in bio-deterioration and bioremediation.

7. IEA517/3 Environmental Law, Monitoring and Enforcement

This course provides a general introduction covering environmental regulations and their implementation by government agencies. The course can be an effective and efficient method for students to master various types of problems in environment in relation to regulation, monitoring, and enforcement.

8. IEA518/3 Environmental Sampling Techniques

This course introduces basic knowledge related to environmental sampling and analysis of air, water, and soil. Students will be exposed to practical, quality control, and data management and analysis.

9. IEA519/3 Environmental Issues

This course intends to provide students with basic scientific understanding of environmental issues and the ability to critically assess issues in the mass media. Case studies and mass media will be used to illustrate various environmental issues.

10. IEG502/3 Aquatic Ecotoxicology

This course provides students with essential knowledge in the field of aquatic ecotoxicology that includes basic classification of chemical pollutions, sources and issues related to aquatic ecosystems. Students will be exposed to the understanding of the fate and behaviour of chemical pollutants in the aquatic environment, emerging pollutants and the effects on organisms and populations. The standard methods of chemical toxicity assessment, monitoring, assessment of environmental risks, and legislation will also be introduced to give added value to the students' competency.

11. IEG503/3 Hydrogeology and Watershed Management

This course aims at combining hydrogeology fundamentals and watershed management for a comprehensive understanding of geo-scientific fundamentals with a specific focus on issues that are essential in hydrogeology and environmental management. This course focuses on watershed management and planning as one of the sustainability components in sustainable development. In addition, this course will discuss local and international related watershed management regulations, laws, standards, and guidelines.

12. IEG513/4 Environmental Disaster Management

This course provides management theory which includes environmental disaster and emergency measures involving preparation, prevention, recovery, and emergency response. Students will also be exposed to the concept of risk assessment and vulnerability analysis.

13. IEK516/3 Sustainable Energy Resources

The course provides the students with an overview of the most significant renewable and sustainable energy resources, basic terms, concepts, technologies, state of the art, and challenges to overcome carbon dioxide emissions and climate change issues as well as other sustainable development goals. It also provides the students with an insight into the possible solutions to sustainable energy usage and efficiency management practices. Students will be able to understand the renewable and sustainable energy resources, energy conversion technologies, efficiencies and practical utilisation of the renewable and sustainable energy resources.



Academic Staff

Prof. Datuk Ts. Dr. Abdul Khalil Shawkataly

Prof. Dr. Liong Min Tze

Prof. Dr. Norli Ismail

Assoc. Prof. Dr. Cheng Lai Hoong

Assoc. Prof. Dr. Lee Chee Keong

Assoc. Prof. Dr. Mardiana Idayu Ahmad

Assoc. Prof. Dr. Mohd Rafatullah

Assoc. Prof. Dr. Tay Guan Seng

Assoc. Prof. Dr. Yusri Yusup

Dr. Abdorreza Mohammadi Nafchi

Dr. Ana Masara Ahmad Mokhtar

Ts. Dr. Azniwati Abd Aziz

Dr. Esam Bashir Abdulsalam Yahya

Dr. Hayati Samsudin

Dr. Khozema Ahmed Ali

Dr. Lee Lai Kuan

Dr. Mark Harris Zuknik

Dr. Mohamad Anuar Kamaruddin

Dr. Mohammed Danish

Dr. Mohd Hafidz Jaafar

Dr. Mohd Saiful Samsudin

Dr. Musfirah Zulkurnain

Dr. Nor Hawani Salikin

Dr. Norazatul Hanim Mohd Rozalli

Dr. Norhaniza Amil

Dr. Nur Izzaati Saharudin

Dr. Rabeta Mohd Salleh

Dr. Siti Balqis Zulfigar

Dr. Syahidah Akmal Muhammad

Dr. Tan Thuan Chew

Mdm. Wan Zafira Ezza Wan Zakaria

Prof. Dato' Dr. Azhar Mat Easa

Prof. Dr. Fazilah Ariffin

Prof. Dr. Rosma Ahmad

Assoc. Prof. Dr. Husnul Azan Tajarudin

Assoc. Prof. Dr. Leh Cheu Peng

Assoc. Prof. Dr. Mohamad Haafiz Mohamad Kassim

Assoc. Prof. Dr. Muhammad Izzuddin Syakir Ishak

Assoc. Prof. Dr. Uthumporn Utra @ Sapina Abdullah

Dr. Akbar John

Dr. Arniza Ghazali

Dr. Effarizah Mohd Esah

Dr. Harlina Ahmad

Dr. Japareng Lalung

Dr. Kushairi Mohd Salleh

Dr. Maizura Murad

Dr. Mazlan Ibrahim

Dr. Mohamad Hafizi Abu Bakar

Dr. Mohd Asyraf Kassim

Dr. Mohd Nurazzi Norizan

Dr. Muaz Mohd Zaini Makhtar

Dr. Noor Aziah Serri

Dr. Nor Shariffa Yusoff

Dr. Noreen Suliani Mat Nanyan

Dr. Norlia Mahror

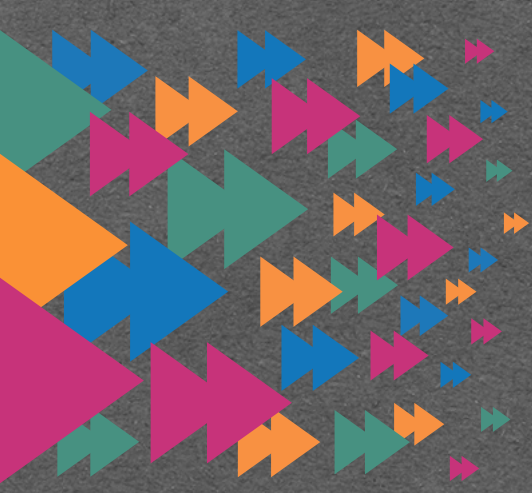
Ts. Dr. Nurul Fazita Mohammad Rawi

Dr. Siti Baidurah Yusoff

Dr. Syahariza Zainul Abidin

Dr. Tan Joo Shun

Dr. Widad Fadhullah



Universiti Sains Malaysia
THE PREFERRED UNIVERSITY
by design

#usm #welead

School of Industrial Technology
Universiti Sains Malaysia
11800 USM, Pulau Pinang, Malaysia
Tel. no.: +604-653 2219 | Fax no.: +604-653 6375
Email: msc_env@usm.my