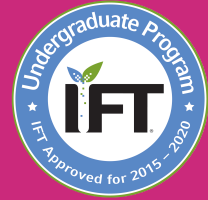




Bachelor of Technology (Honours)

FOOD

ACADEMIC HANDBOOK



School of Industrial Technology

Universiti Sains Malaysia

www.indtech.usm.my

2019/2020

**Academic Handbook
Bachelor of Technology (Honours) (Food)
Academic Calendar 2019/2020**

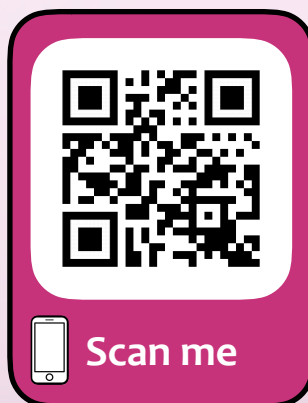
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Full version of the Academic Handbook

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.

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

–Alvin Toffler–

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
- Mechatronic 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.

Administrative Staff



- | | | |
|----|--|---------------------------------------|
| 1 | Dean | Prof. Dr. Norli Ismail |
| 2 | Deputy Dean (Research, Innovation & Industrial - Community Engagement) | Prof. Dato' Dr. Azhar Mat Easa |
| 3 | Deputy Dean (Academic, Career & International) | Assoc. Prof. Dr. Yusri Yusup |
| 4 | Programme Chairman (Food Technology) | Assoc. Prof. Dr. Fazilah Ariffin |
| 5 | Programme Chairman (Environmental Technology) | Assoc. Prof. Dr. Mardiana Idayu Ahmad |
| 6 | Programme Chairman (Bioresource, Paper & Coatings Technology) | Assoc. Prof. Dr. Leh Cheu Peng |
| 7 | Programme Chairman (Bioprocess Technology) | Dr. Lee Chee Keong |
| 8 | Senior Assistant Registrar (Academic & Administration) | Mdm. Rasslene Rass Rasalingam |
| 9 | Senior Assistant Registrar (Postgraduate & Human Resource) | Mdm. Nor Farah Shaik Omar |
| 10 | Senior Research Officer | Mr. Che Ku Abdullah Che Ku Alam |
| 11 | Senior Science Officer | Mr. Jeffiz Ezuer Shafii |
| 12 | Science Officer | Mr. Mohd Syukri Baharudin |

Academic Programme

The School of Industrial Technology offers the following bachelor degrees:

- Bachelor of Technology (Honours) (Food)
- Bachelor of Technology (Honours) (Bioresource, Paper and Coatings)
- Bachelor of Technology (Honours) (Environment)
- Bachelor of Technology (Honours) (Bioprocess)

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 enrol for courses relevant to their respective programmes up to level 300 (Bioresource, Paper and Coatings and Environmental Technologies) or 400 (Food and Bioprocess Technologies), 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. This training is aimed at exposing the students to actual working practice and atmosphere of the industry.

General Educational Goal & Objectives

The general goal of Bachelor of Technology degree programme is to produce graduates who have specialised expertise in their respective technologies (Food, Bioprocess, Environment, and Bioresource, Paper and Coatings) to meet the employment needs of the country for various related industries/agencies.

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

- are competent to work and able to solve problems
- have communication and team work skills
- have leadership skills, positive attitude and professional ethics
- are capable of contributing to the well-being of the society and sustainability of the environment
- have interest in entrepreneurship and lifelong learning

Programme Outcomes

On successful completion of the Bachelor of Technology (Honours) (Food) programme at Universiti Sains Malaysia, a graduate should be able to fulfil the following 5 Programme Outcomes:

1. Demonstrate adequate knowledge and understanding of different principles of food science and technology.
2. Exhibit communication skills and leadership qualities.
3. Capable to perform as an entry level food technologist and be able to engage with multidisciplinary teams in all the areas of food processing industry.
4. Establish high level competency with higher order thinking skills in various disciplines of food science and technology.
5. Exhibit ethical values, social skills, and responsible attitudes towards the society.

Mentor-Mentee System & Counselling Service

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

The mentors appointed are as listed below:

No.	Name	Room No.	Phone Extension	E-mail Address
1.	Assoc. Prof. Dr. Cheng Lai Hoong	238	5209	lhcheng@usm.my
2.	Dr. Norazatul Hanim Mohd Rozalli	220	6361	norazatulhanim@usm.my
3.	Dr. Tan Thuan Chew	258	6217	thuanchew@usm.my

Food Technology

Food Technology Programme Curriculum was arranged in such a way to train and produce competent graduates to serve food industries as well as the government sectors. Students will be imparted with knowledge on physical and chemical properties of food, composition analysis, processing and preservation, packaging, evaluation and quality control, product development, legislation, industrial waste treatment, factory sanitation management, and etc. Having the knowledge, our food technology graduates contribute their expertise in the relevant industries and consequently play a role in developing the industrial sector of the country.

Courses in the curriculum for Food Technology Programme are spread over four years of study, which emphasise the logical sequence of related courses, while ensuring that teaching - learning activities are equally distributed throughout the study period. Food Technology programme is internationally accredited by the professional body, Institute of Food Technologists (IFT), USA.

Details of Programme

Type of Programme	Structure of Programme
Bachelor of Technology with Elective	Students choose several elective courses to widen their specialisation area and their knowledge in industrial technology.
Bachelor of Technology with Minor	Students choose and complete one minor area offered by other schools. <ul style="list-style-type: none">● Starting at the beginning of the second semester of Year I.

Programme Requirements

Course Code Classification	Normal Programme	Minor Programme	Min. Total Unit Requirements
T	78	78	
E	33	13	
M	0	20	131
U	20	20	

Notes:

T (Core Courses) – compulsory courses for a particular area of specialisation that must be taken and passed.

E (Elective Courses) – courses must be taken by students with Elective programme to strengthen their Technology specialisation courses.

M (Minor Courses) – minor specialisation offered by another school.

U (University Requirements) – courses to fulfil the University requirements

Graduation Requirements

- ☑ Fulfil the minimum required (8 semesters) of the residential requirement for the programme of study and has not exceeded the maximum period of study (14 semesters).
- ☑ Fulfil all credit requirements of the courses for the programme of study required units such as the requirements for each component (Core, Elective/ Minor and University courses/Option).
- ☑ Obtained a CGPA of 2.00 and above for Core components.
- ☑ Obtained a CGPA of 2.00 and above for the programme.
- ☑ 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.

University Requirements for Graduation

LOCAL STUDENTS		INTERNATIONAL STUDENTS	
Compulsory Courses	Units	Compulsory Courses	Units
<ul style="list-style-type: none"> ❖ LKM400/2 Bahasa Malaysia IV English Language (MUET Band 6) <ul style="list-style-type: none"> ❖ (LHP451/452/453/454/455/456/457/458/459) and/or ❖ Foreign language courses English Language (MUET Band 5) <ul style="list-style-type: none"> ❖ LSP402/2 Scientific and Medical English and ❖ LHP451/452/453/454/455/456/457/458/459 English Language (MUET Band 2 – 4) <ul style="list-style-type: none"> ❖ LSP300/2 Academic English and ❖ LSP402/2 Scientific and Medical English English Language (MUET Band 2 – 3) <ul style="list-style-type: none"> ❖ LMT100/2 Preparatory English* or ❖ Re-sit MUET * Prerequisite for LSP300/2 Academic English	2	<ul style="list-style-type: none"> ❖ LKM100/2 Bahasa Malaysia I ❖ English Language courses * Students may obtain advice from the School of Languages, Literacies and Translation if they have different English Language Qualification.	2 4
<ul style="list-style-type: none"> ❖ HTU223/2 Islamic and Asian Civilisations (TITAS) ❖ SHE101/2 Ethnic Relations ❖ WUS101/2 Core Entrepreneurship 	2 2 2	<ul style="list-style-type: none"> ❖ SEA205E/4 Malaysian Studies ❖ Option/Bahasa Malaysia/English Language 	4 2
<ul style="list-style-type: none"> ❖ Co-curricular 	2	<ul style="list-style-type: none"> ❖ Co-curricular 	2
Optional Courses	Units	Optional Courses	Units
<ul style="list-style-type: none"> ❖ Co-curricular/Skills Courses/Foreign Language Courses/Options ❖ WSU101/2 Sustainability: Issues, Challenges & Prospect ❖ HTV201/2 Thinking Techniques 	6	<ul style="list-style-type: none"> ❖ Co-curricular/Skills Courses/Foreign Language Courses/Options ❖ WSU101/2 Sustainability: Issues, Challenges & Prospect ❖ HTV201/2 Thinking Techniques 	6
Minimum Requirements	20	Minimum Requirements	20

*Student must pass all University courses with the minimum grade of C.



Curriculum Structure

COURSE TYPE	LEVEL 100 (2019/2020)		LEVEL 200 (2020/2021)		LEVEL 300 (2021/2022)		LEVEL 400 (2022/2023)		TOTAL UNIT
	SEMESTER 1	SEMESTER 2	SEMESTER 1	SEMESTER 2	SEMESTER 1	SEMESTER 2	SEMESTER 1	SEMESTER 2	
CORE (T)	IUK108/4	IMG103/3	IMG203/3	IMG223/4	IMG324/4	IMA321/6*	IMA411/8**	IMA411/8**	78
	IUK191/4	IMK106/2	IMK225/3	IMG204/3	IMK316/3	IMA321/6*	IMA411/8**	IMA411/8**	
	IMK103/2	IMK105/2	ZCA101/4	IMG204/3	IMK319/2	IMA321/6*	IMA411/8**	IMA411/8**	
	KOT122/4	IMG111/3	IMG222/3	IMG222/3	IMG322/2	IMA321/6*	IMA411/8**	IMA411/8**	
ELECTIVE (E)	IEK101/3	10	13	7	11	6	10	4	33
	WUS101/2	IMK113/3	IMK221/3	IMK226/2	IMK320/3	IMA321/6*	IMG405/3	IMK410/3	
	Ko-K/1-2	KAT245/4	IBK104/3	IUK208/3	IBK316/3	IMA321/6*	IMK421/2	IUK303/3	
	3-4	7	KFT233/4	IMK209/2	6	IMA321/6*	5	IBG214/4	
UNIVERSITY (U)	WUS101/2	SHE101/2	HTUJ223/2	LMT100/2 or LSP300/2	LSP300/2 or LSP402/2	LSP300/2 or LSP402/2	LSP300/2 or LSP402/2	LSP300/2 or LSP402/2	20
	Ko-K/1-2	LKM400/2	4	4	4	4	2	2	
TOTAL MINIMUM CREDIT FOR GRADUATION									131

* Students must register for this course online during their internship.
 ** Course is offered in TWO (2) semesters (unit counted per semester is 4).

List and Synopsis of Courses

Level 100

1. 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.

2. IEK101/3 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.

3. 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.

4. IMG111/3 Food Microbiology I

This course begins with an overview and history of microbiology. Topics discussed include prokaryotic and eukaryotic structure & function, criteria used in classification, physiology of microorganisms (including reproduction, growth and metabolism), genetics (classical and molecular), physical and chemical control of microorganisms. The laboratory component of this course will cover techniques of microbiology such as microscopy, various culture techniques, isolation, identification, and enumeration.

5. 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.

6. IMK105/2 Biochemistry

This course covers the acid-base chemistry, structure and functions of cell organelles, cell bioenergetics (enzymes kinetics, inhibition and regulation, various metabolic pathways). The course also covers DNA replication, transcription, translation and gene expression.

7. IMK106/2 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.

8. IMK113/3 Management of Halal Food

This course introduces basic principles of Halal Haram and sources of food according to Syariah. This course also covers slaughtering method, hygiene, and sanitation in the preparation of food for Muslims and processing of halal ingredients and additives including packaging, storage, and transportation. In addition, this course will elaborate on the method and implementation of halal system in food industry.

9. IUK108/4 Statistic with Computer Applications

This course discusses on probability models for quality control of discrete random variation: random variation, cumulative distribution function, mean, variance and standard deviation. The course also discusses Discrete distribution: hypergeometric distribution, Binomial distribution, Poisson distribution, Continuous distribution, Normal distribution, exponential distribution and uses in reliability modelling.

10. 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.

11. KOT122/4 Organic Chemistry I

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.

12. ZCA101/4 Physics I (Mechanics)

This course discusses the basic principles of mechanics and fundamental laws of physics will be taught. Problem solving methods which relate to basic principles of mechanics and fundamental laws of physics will be taught too.

Level 200

13. IBG214/4 Enzyme Technology

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

14. IMG203/3 Chemical Food Analysis

Course Prerequisites: p IMG103/3

The course introduces the basic principles and procedures commonly used for the analysis of major food components. The concepts involved in sampling protocols and the preparation, reporting and analysis of data to achieve valid measurement are emphasised. The course covers topics on proximate analysis of the major food components (moisture, ash, nitrogen or protein, lipid, carbohydrate) and analysis methods for other food components, such as vitamin C and preservatives, such as benzoic acid and sulphur dioxide. Practical experience of relevant experimental procedures will be conducted.

15. IMG204/3 Instrumental Food Analysis

Course Prerequisites: p IMG103/3

This course introduces the principles and applications of instrumental methods in food analysis. The covers spectrochemical analysis methods that use absorption of electromagnetic radiation (molecular ultraviolet-visible spectroscopy, fluorescence, infrared spectroscopy, atomic absorption/emission spectroscopy); chromatographic methods, such as HPLC and GC; thermal analysis, and electrophoresis methods. In all instrumental methods of food analysis discussed, aspects of instrumentation parts and practical considerations for qualitative and quantitative analysis such as sample preparation and sources of error will be discussed.

16. IMG222/3 Food Microbiology II

Course Prerequisites: p IMG111/3

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 food-borne pathogens are also discussed. The laboratory component of this course covers microbiological examination of foods for both indicator and pathogenic organisms.

17. IMG223/4 Processing Technology of Animal-Based Food Products

Course Prerequisites: p IMG103/3

This course discusses structure and composition of animal based-product, such as fish, meat, poultry, egg, and dairy. This course will also discuss the biochemical changes during post-harvest and its effects on the product quality. Processing technologies of animal-based product, such as freezing, drying, and canning, will be discussed. Effects of processing on product quality will also be discussed.

18. 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.

19. 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.

20. IMK225/3 Unit Operation in Food Processing

Course Prerequisites: p IMK106/2

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.

21. IMK226/2 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. Students will be taught comprehensively on various changes occurring during the post-harvest stages after harvesting of fruits and vegetables. 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 (Good Agricultural Practices, Good Manufacturing Practices, Good Handling Practices, etc). The course will be of immense help to students to have a better understanding on the harvesting systems (traditional and modern), post harvest biology (microbes and insect pests) as well as the physiology and chemistry of horticultural crops. The course will also be of use, wherein students will learn more about the importance of quality, safety and marketability of the fresh horticultural produce, all of which are directly dependent on the consumers’ attitude.

22. IUK208/3 Experimental Design with Computer Applications

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

Completely Randomised Design: Randomisation, Analysis of variance, equal replication and unequal replication, Estimation of the model Parameters, Comparison of Individual Treatment Means: Comparing of pair Treatment Means, Comparing with a control, orthogonal contrast.

Randomised Block Design: blocking, Randomised block design, Model and Assumptions, Missing values, Relative efficiency. Latin Square design Incomplete Block design: balanced incomplete block designs, Partially Balanced incomplete block designs.

Factorial Experiments (Designs): General factorial experiments, 2k Factorial experiment, 3k factorial experiment, Confounding, regression analysis, Response surface: Method of steepest ascent, Analysis of second-order model, Location of stationary point, Designs for fitting the first-Order and second-order models. Mixture experiments.

23. KAT245/4 Analytical Chemistry I

Course Prerequisites: s KOT122/4

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.

24. KFT233/4 Physical Chemistry I

Course Prerequisites: s KOT122 or s KTT112

Properties of gases: gas laws, van der Waals equation, kinetic theory of gases, principle of the corresponding states, Maxwell-Boltzman 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 and thermochemistry.

Level 300

25. IMA321/6 Food Industrial Training

Course Prerequisites: Students have completed FOUR (4) semesters of study, regardless of the accumulated units.

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.

26. 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.

27. IMG322/2 Food Sensory Evaluation

Course Prerequisites: p IUK108/4

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.

28. 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.

29. 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.

30. IMK319/2 Nutrition

Course Prerequisites: s IMK105/2

This course discusses the sources of nutrient in food, functions of nutrient in metabolic processes and its relationship to health. This course will emphasise the ability to evaluate nutritional status and methods to disseminate knowledge of nutrition to consumer.

31. IMK320/3 Functional Foods

This course covers the science, technology, regulatory aspects and consumerism towards a class of foodstuffs referred to as '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.

32. IUK303/3 Industrial Waste Management

This course exposes students to various industrial waste management practices in terms of philosophy and practical technology. Among practical philosophies are "Just-in-time", Lean Manufacturing, "5R", and zero waste management. Students will also be introduced to technologies used in sustainable industrial waste processing. This course also includes laws, regulations and protocols implemented in industrial waste management. In addition, students will conduct case studies and journals review as exposure to industrial waste management practices in developed and developing countries as well as recent research in sustainable industrial waste management.

Level 400

33. IMA404/3 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.

34. IMA411/8 Food Technology Research Project

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

Course Prerequisites:

- (i) **Students must take all core courses of levels 100, 200, and 300.**
- (ii) **Students have collected at least 50 credit units of core courses.**

This course will introduce to the student a problem relating to food technology, and students will be supervised by lecturers in carrying out literature search, laboratory work, and thesis writing. A series of lectures on research philosophy, experimental design, scientific thinking, laboratory safety, thesis writing, viva presentation, and others also must be attended.

35. IMG405/3 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.

36. IMK407/3 Food Safety

Course Prerequisites: p IMG111/3 & p IMG222/3

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 sanitisers; 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.

37. IMK410/3 Food Borne Pathogens

Course Prerequisites: p IMG111/3 & p IMG222/3

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 food borne illness and their investigations will also be discussed.

38. IMK421/2 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.

“At the intersection of food science and technology, food replacement startups are creating substitutes for the basic components of meals as well as replacements for complete meals.”

–Steve Blank–

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	oB01
School of Physics	Physics	oZ01
School of Chemical Sciences	Chemistry	oK01
School of Mathematical Sciences	Mathematics	oM01
School of Humanities	English Language	oH01
	Malay Linguistics	oH02
	Geography	oH03
	Literature	oH04
	Islamic Studies	oH05
	History	oH06
	Japanese Studies	oH11
	Philosophy and Civilisations	oH15
	Translation and Interpretation	oH14
	School of Language, Literacies, & Translation	Japanese Language Studies
Chinese Language Studies		oL02
Communicational Arabic		oL06
School of Art	Fine Arts	oH07
	Performing Arts	oH08
	Musics	oH09
	Drama and Theatre	oH10
	Communicational Graphics	oH12
	Acting and Directing	oH13
	Music Technology	oV01
School of Communication	Communication Studies	oY05
	Science and Environment Journalism	oY06
	Management	oA03
Centre for Global Archeological Research	Archeology	oU01

School	Minor Package	Code
School of Social Science	Anthropology and Sociology	oS01
	Economics	oS02
	Social Development and Administration	oS04
	Political Science Development	oS05
	Planning and Management	oS07
	Industrial Relation Public	oS08
	Policy and Administration	oS09
	International Relation	oS10
	South-East Asian Studies	oS11
	Psychology	oS12

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

(a) Communication Studies (oY05)

No.	Code/Units/Course Title
A. Compulsory (9 credits)	
i) Choose any 1 course (3 credits)	
1.	YKT101/3 Introduction to Human Communication
2.	YKT102/3 Introduction to Mass Communication
3.	YKT104/3 Introduction to Communication Studies
ii) Choose any 2 courses (6 credits)	
4.	YKT218/3 Communication Theory 1
5.	YKT220/3 Communication Theory 2
6.	YBP201/3 Communication for Sustainable Development
B. Choose (11 credits)	
7.	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 and Gender

(b) Psychology (oS12)

No.	Code/Units/Course Title
1.	STU231/4 Foundation in Psychology (<i>Compulsory</i>) Choose any 3 courses (12 credits)
2.	STU241/4 Health Psychology
3.	STU242/4 Social Psychology
4.	STU243/4 Development Psychology
5.	STU244/4 Abnormal Psychology
6.	STU337/4 Counselling

(c) Management (oA03)

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

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

(d) Economics (oS04)

No.	Code/Units/Course Title
1.	SKE109/3 Principles to Economics Issues (<i>Compulsory</i>) - Sem. II
2.	SEW101/3 Microeconomics (<i>Compulsory</i>) - Sem. II
3.	SEW103/3 Macroeconomics (<i>Compulsory</i>) - Sem. II Choose any 3 courses (11 credits)
4.	SEU226/4 Labour Economics
5.	SEU228/4 Malaysian Economy
6.	SEU333/3 Industrial Organisation
7.	SEU334/3 Money, Banking and Financial Markets
8.	SEU336/3 Environmental and Natural Resources Economics
9.	SEU339/3 Economic Planning and Project Analysis

(e) Islamic Studies (oHo5)

No. Code/Units/Course Title

Package A (12 credits)

1. 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

Package B (8 credits)

4. HIS224/4 The Islamic Family Institution
5. HIU226/4 Akhlaq and Islamic Spiritual
6. HIS311/4 Zakat and Wakaf
7. HIS315/4 Mu'amalat: Concept and Application
8. HIU321/4 Al-Quran, Tawhid, and Science

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.

“Tell me and I forget. Teach me and I remember. Involve me and I learn”

–Benjamin Franklin–

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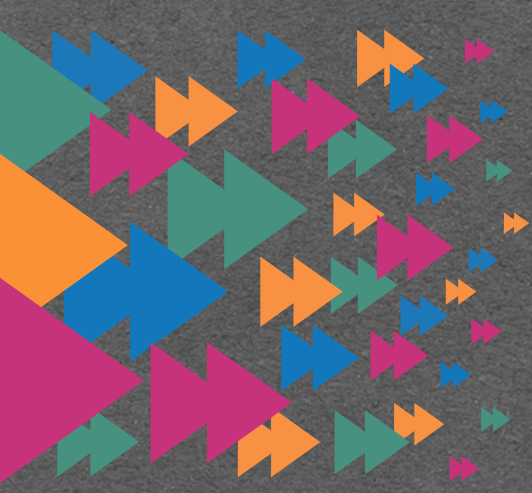
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