UNIVERSITI SAINS MALAYSIA

Bachelor of Technology (Honours)

BIORESOURCE

ACADEMIC HANDBOOK

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

2020/2021

Academic Handbook
Bachelor of Technology (Honours) (Bioresource)
Academic Calendar 2020/2021

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.

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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 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.

2020

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

Administrative Staff

1	Dean	Prof. Dr. Norli Ismail
2	Deputy Dean (Research, Innovation & Industrial - Community Engagement)	Assoc. Prof. Dr. Mohamad Haafiz Mohamad Kassim
3	Deputy Dean (Academic, Career & International)	Assoc. Prof. Dr. Yusri Yusup
4	Programme Chairman (Food Technology)	Prof. Dr. Fazilah Ariffin
5	Programme Chairman (Environmental Technology)	Assoc. Prof. Dr. Mardiana Idayu Ahmad
6	Programme Chairman (Bioresource 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)	Mr. Mohd Faisal Abu Bakar
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

Programme Outcomes

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

1. Acquire the knowledge and skills in the area of technology specialised (Knowledge)
2. Exhibit extensive technical skills in the area of specialisation (Technical Skill, Practical Skill, Psychomotor)
3. Identify and resolve issues and problems in a critical, creative, and innovative manner (Thinking Skill and Scientific Approach)
4. Acquire the skill to communicate effectively in all walks of life (Communication Skill)
5. Display a sense of responsibility and master social skills (Social and Responsibility Skill)
6. Understand and manage the industry in a professional and ethical manner (Professionalism, Value, Attitude and Ethics)
7. Manage current information and recognise the importance of lifelong learning (Lifelong Education and Information Management)
8. Acquire entrepreneurial knowledge base for career development (Management and Entrepreneurship Skill)
9. Function effectively as an individual and in a team with the ability to lead (Leadership Skill)

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.	Dr. Mazlan Ibrahim	343	6364	maz@usm.my
2.	Dr. Ts. Azniwati Abd Aziz	341	2204	azniwati@usm.my

Academic Programme

The School of Industrial Technology offers the following bachelor degrees:

- Bachelor of Technology (Honours) (Food)
- Bachelor of Technology (Honours) (Bioresource)
- 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 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) 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

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.

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. ● 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	72	72	120
E	30	10	
M	0	20	
U	18	18	

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 (7 semesters) of the residential requirement for the programme of study and has not exceeded the maximum period of study (12 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), Appreciation of Ethics and Civilisations, Philosophy and Current Issues, and Core Entrepreneurship.

University Requirements for Graduation

LOCAL STUDENTS	
Compulsory Courses	**Units**
❖ LKM400/2 Bahasa Malaysia IV	2
English Language **(MUET Band 6)**	
❖ (LHP451/452/453/454/455/456/457/458/459) **and/or**	
❖ Foreign language courses	
English Language **(MUET Band 5)**	
❖ LSP402/2 Scientific and Medical English **and**	
❖ LHP451/452/453/454/455/456/457/458/459	
English Language **(MUET Band 2 – 4)**	4
❖ LSP300/2 Academic English **and**	
❖ LSP402/2 Scientific and Medical English	
English Language **(MUET Band 2 – 3)**	
❖ LMT100/2 Preparatory English* **or**	
❖ Re-sit MUET	
** Prerequisite for LSP300/2 Academic English*	
❖ HFE224/2 Appreciation of Ethics and Civilisations	2
❖ HFF225/2 Philosophy and Current Issues	2
❖ WUS101/2 Core Entrepreneurship	2
❖ Co-curricular	2
Optional Courses	**Units**
❖ Co-curricular/Skills Courses/Foreign Language Courses/Options	
❖ WSU101/2 Sustainability: Issues, Challenges & Prospect	4
❖ HTV201/2 Thinking Techniques	
Minimum Requirements	**18**

INTERNATIONAL STUDENTS	
Compulsory Courses	**Units**
❖ LKM100/2 Bahasa Malaysia I	2
❖ English Language courses	4
** Students may obtain advice from the School of Languages, Literacies and Translation if they have different English Language Qualification.*	
❖ SEA205E/4 Malaysian Studies	4
❖ Option/Bahasa Malaysia/English Language	2
❖ Co-curricular	2
Optional Courses	**Units**
❖ Co-curricular/Skills Courses/Foreign Language Courses/Options	
❖ WSU101/2 Sustainability: Issues, Challenges & Prospect	4
❖ HTV201/2 Thinking Techniques	
Minimum Requirements	**18**

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

Curriculum Structure

COURSE TYPE	LEVEL 100 (2020/2021)				LEVEL 200 (2021/2022)				LEVEL 300 (2022/2023)				LEVEL 400 (2023/2024)				TOTAL UNIT
	SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		SEMESTER 1		SEMESTER 2		
CORE (T)	IWK 100/2 IWK 102/4 IUK 191/4 IEK 101/3	SEMESTER BREAK	IWK 101/4 IWK 103/4 IWK 105/4	SESSION BREAK	IWK 201/4 IWK 203/4 IWA 281/2 IWA 282/2 IUK 108/4	SEMESTER BREAK	IWK 205/3 IWA 283/2	SESSION BREAK	IWK 301/3 IWA 382/2 IWA 383/2 IWA 313/8**	SEMESTER BREAK	IWK 308/3 IWA 381/2 IWA 313/8**	SESSION BREAK	IWA 404/6*	SEMESTER BREAK			72
	13		12		16		5		11		9		6				
ELECTIVE (E)	IUK 107/4 KOT 122/4		IEK 115/3 IUK 291/4				IWK 204/3 IUK 208/3 IBK 212/2 IEK 108/3 KAT 245/4 IUK 303/3		IWK 304/3 IWK 307/2 IEK 212/3		IWK 305/2 IWK 306/2						30
	4		7				18		8		4						
UNIVERSITY (U)	WUS 101/2 LKM 400/2 or Ko-K/1–2		WSU 101/2 LKM 400/2 Ko-K/Skill Courses/ Foreign Languages Courses/Option/2		HFF 225/2 HTV 201/2		HFE 224/2 LMT 100/2 or LSP 300/2		LSP 300/2 or LSP 402/2		LSP 402/2						18
	3–4		6		5		2		2		2						
TOTAL MINIMUM CREDIT FOR GRADUATION																	120

*** 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. IEK 101/3 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.

2. IEK 108/3 Process Fluid Mechanics

Course Prerequisites: s IEK 101/3

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.

3. IEK 115/3 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.

4. IUK 107/4 Chemistry for Technologist

This syllabus is aimed to be comprehensive in scope and mainly intended to strength the applied chemistry background of the students. Students will learn the basics of inorganic chemistry, nuclear and radiochemistry, organic chemistry, and instrumental analysis. Spectroscopy methods such as FT-IR, NMR, ICP, and AAS will be used for the characterisation of functional groups, hydrogen atoms characterisation, and analysis of inorganic elements.

5. IUK 108/4 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.

6. IUK 191/4 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.

7. KOT 122/4 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.

8. IWK 100/2 Bioresource as Industrial Raw Materials

This course introduces students to the various types of lignocellulose materials. Main resources of raw materials from the forest and agricultural wastes will be discussed. Benefits to economy, national and international trade will also be discussed. The potential of lignocellulose as a source of energy will be introduced. Emphasise is also given on the resources from the non-wood, such as oil palm, bamboo, rattan, and other types of the lignocellulose fibres, as raw materials for pulp and paper, biocomposites (thermoplastic, thermoset and elastomer), and others applications. Various types of products and the importance of raw materials for products application derived from the bioresources will be highlighted.

9. IWK 101/4 Basic Coatings Technology

This course comprises of the introduction to the basics of polymer science, chemistry of addition polymerisation by free radical initiators, ionic and etc. It also discusses on the chemistry for condensation polymerisation and copolymerisation. Industrial polymerisation 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. Characterisation of polymer consists of molecular weight definition, molecular weight measurement and various polymer characterisation techniques.

10. IWK 102/4 Basic Bioresource Science and Technology

This course is a basic introduction to structure of bioresource and organisation of wood anatomy – fibre, vessel, parencyma. Wood cell ultrastructure – cell wall organisation, microfibril. Physical property of wood; moisture content, shrinkage and wood swelling, density. Mechanical property of wood; wood-flexural strength, compression, tension, shear, impact, MOR, MOE. Natural resistance of wood. Degradation and wood destructive agents – termites, fungi, insects, borer, parasite and control. Electrical and acoustic properties of wood. Preservation - chemicals (CCA, boric-borate, etc), preservation schedule. Wood drying - kiln and air-drying process, relationship of water vapour movement in wood drying, degradation resulting from drying and ways to reduce degradation. Production and machining of sawn timber.

11. IWK 103/4 Pulp Production and Paper Recycling

This course emphasises on the principles of pulping, chemical recovery, pulp bleaching and paper recycling. The main topics include various types of raw material for pulping, effects of biomass components on pulping, principles and types of pulping and pulp bleaching, advantages and disadvantages of conventional and chlorine-free bleaching, paper types, resource and various types of secondary fibres, utilisation rate and waste paper procurements. The advantages and disadvantages of paper recycling in terms of economical and technical aspects are also included.

12. IWK 105/4 Bioresource Based Products

Course Prerequisites: s IWK 102/4

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 utilisation. Wood chemical technology will include chemicals obtained from trees and lignocellulose; thermal modification; charcoal and activated carbon; wood gas, and chemical modification.

Level 200

13. IBK 212/2 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 emphasised 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.

14. IEK 212/3 Process Heat Transfer

Course Prerequisites: s IEK 101/3

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.

15. IUK 208/3 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.

16. IUK 291/4 Mathematics II

Course Prerequisites: s IUK 191/4

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.

17. IWA 281/2 Coatings Technology Laboratory I

Course Prerequisites: s IWK 101/4

This course is a practical course which teaches students how to prepare polymeric resins for coating applications. The resins prepared are unsaturated polyester resin, epoxy resin, polyvinyl acetate and polymethyl methacrylate. Methods of preparation are systematically outlined. Basic resin properties are also studied. Students are familiarised with the application of each resin in the coating industry.

18. IWA 282/2 Bioresource Technology Laboratory I

Course Prerequisites: s IWK 102/4

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, hemicellulose, and lignin.

19. IWA 283/2 Paper Technology Laboratory I

Course Prerequisites: s IWK 103/4

This practical course will expose the students to various kinds of pulping methods such as craft, soda and chemi-mechanical. Students are also required to run the pulp beating and lab papermaking process; also pulp and paper testing.

20. IWK 201/4 Raw Materials and Coatings Chemistry

Course Prerequisites: s IWK 101/4

This course teaches the students on various material components that are required to prepare coating products such as paints, adhesives and printing inks. Specific raw materials used for each component are identified. The preparation, properties and functions of the raw materials are systematically discussed. The chemistry of coatings is also covered in this course in order to enhance the scientific knowledge in coatings.

21. IWK 203/4 Stock Preparation and Papermaking

Course Prerequisites: s IWK 103/4

This course covers general stock preparation and papermaking processes which are being practiced in the paper industry. Stock preparation part involves the pulp disintegration, pulp beating, wet-end additives addition, pulp blending, metering, and approach flow system. Including the stock preparation on secondary fibre (waste paper) processes, such as re-pulping, washing, cleaning, and de-inking. For papermaking part, its covers formation of paper, pressing, drying, calendaring and reeling processes.

22. IWK 204/3 Bioresource, Paper and Coatings Product Development

In this course steps involved in developing a product are discussed. Product design is the main focus of this course. Students will be exposed to various types of materials, material properties and processing techniques used to make products. The technique to choose the most suitable material and processing technique to produce a selected product will also be taught.

23. IWK 205/3 Chemical Additives and Paper Properties

Course Prerequisites: s IWK 203/4

This course emphasises on the importance of fibre properties in papermaking; analyses and measurement techniques of paper properties, including physical properties, mechanical strength, and optical properties. Besides, this course also discusses various additives that are used in paper industry including sizing agents, dry and wet strength additives, fillers, retention aids, surface sizing, dyes and pigments and brightening agents.

24. KAT 245/4 Analytical Chemistry I

Course Prerequisites: s KOT 122/4 or s IUK 107/4

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.

Level 300

25. IUK 303/3 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.

26. IWA 313/8 Research Project of Bioresource, Paper and Coatings Technology

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

Course Prerequisites:

- ***(i) Students must take all core courses of levels 100 and 200.***
- ***(ii) Students must also collect at least 40 credit units of core courses.***

This course will introduce the student problems relating to Bioresource, Paper and Coatings Technology 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.

27. IWA 381/2 Coatings Technology Laboratory II

Course Prerequisites: s IWA 281/2

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.

28. IWA 382/2 Bioresource Technology Laboratory II

Course Prerequisites: s IWA 282/2

This practical course enables students to analyse and understand the mechanical, physical, thermal, and fundamental identification characterisation of fibres raw materials, include thermosets and thermoplastics matrices. Chemical modification of lignocellulosic (solid wood and plant fibres) will be prepared and analysed. Production of conventional biocomposites, thermoplastics, and thermosets (filled/reinforced) composites will be produced and characterised.

29. IWA 383/2 Paper Technology Laboratory II

Course Prerequisites: s IWA 283/2

This course exposes the students to the process of pulp bleaching including the calculation of chemical used and analyses of the resultant pulp and paper properties, determination of paper properties, and starch content of commercial paper products, and also the process of paper recycling. Experiments involved are determination of various commercial paper properties, bleaching of pulp, determination of starch content of commercial papers quantitatively, and effect of pH and beating toward re-pulping.

30. IWK 301/3 Coatings Process and Equipment

Course Prerequisites: s IWK 201/4

This course deals with coating, which covers paint technology in details. Individual component used in paints and formulation will be explained. Corrosion control and barrier coatings will be discussed in detail. Also, standard testing methods will be elaborated to evaluate the performance of the paints. Furthermore, colour systems will be classified by different methods.

31. IWK 304/3 Furniture Manufacturing

Course Prerequisites: s IWK 102/4

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, different types of machines used in furniture production, various types of joints used in furniture making, finishing processes, and introducing some aspects of ergonomic pertaining to furniture manufacturing.

32. IWK 305/2 Advanced Technology of Coatings

Course Prerequisites: s IWK 201/4

This course covers the advanced technology related to coating in industry. The students are exposed to various aspects of coating technology. Particular emphasis is given to release coating, coating methods for pressure-sensitive adhesives, specialty rubber adhesives, and ultraviolet (UV) and electron beam (EB) radiation curing. The students are familiarised with the materials selection and applications for each coating technology.

33. IWK 306/2 Fibre and Lignocellulosic Composite

This course is about the fundamental study of natural fibre, especially non-wood type from agriculture waste, such as rice husk and oil palm biomass, and the importance of in producing a composite. Natural adhesive source from lignocellulosic like tannin, lignin, furfural alcohol, and starch will be also included in this course. Students will learn about the preparation of lignocellulosic based composites, include polymer matrix composite by various types of process and moulding, such as extrusion, compression moulding, injection moulding, and resin transfer moulding. In addition, the interfacial properties of a composite, interaction between filler/fibre and polymer matrix, and surface treatment of natural fibre will be discussed.

34. IWK 307/2 Advanced Paper Technology – Instrumental Analysis for Pulp and Paper

This course exposes students to the various instrumental techniques for analysis of biomass, pulp, paper and materials related to the papermaking industry. Emphasis is placed on the criteria, application and capacity of an instrumental technique to provide students the necessary problem-solving skill involving the application of solo and serial analysis using advanced and classic instrumental techniques. The course supports students' higher-order thinking skills through exposure to case studies as a way of simulating problem-solving situation.

35. IWK 308/3 Mechanics of Structural Materials

Course Prerequisites: s IUK 191/4

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.

Level 400

36. IWA 404/6 Bioresource, Paper and Coatings Technology 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.

"There is a great need for the introduction of new values in our society, where bigger is not necessarily better, where slower can be faster, and where less can be more."

–Gaylord Nelson–

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	0H01
	Malay Linguistics	0H02
	Geography	0H03
	Literature	0H04
	Islamic Studies	0H05
	History	0H06
	Japanese Studies	0H11
	Philosophy and Civilisations	0H15
	Translation and Interpretation	0H14
School of Language, Literacies, & Translation	Japanese Language Studies	0L01
	Chinese Language Studies	0L02
	Communicational Arabic	0L06
School of Art	Fine Arts	0H07
	Performing Arts	0H08
	Musics	0H09
	Drama and Theatre	0H10
	Communicational Graphics	0H12
	Acting and Directing	0H13
	Music Technology	0V01
School of Communication	Communication Studies	0Y05
	Science and Environment Journalism	0Y06
School of Management	Management	0A03
Centre for Global Archeological Research	Archeology	0U01

School	Minor Package	Code
School of Social Science	Anthropology and Sociology	0S01
	Economics	0S02
	Social Development and Administration	0S04
	Political Science Development	0S05
	Planning and Management	0S07
	Industrial Relation Public	0S08
	Policy and Administration	0S09
	International Relation	0S10
	South-East Asian Studies	0S11
	Psychology	0S12

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

(a) Communication Studies (0Y05)

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 (0S12)

No.	Code/Units/Course Title
1.	STU231/4 Foundation in Psychology (*Compulsory*)
	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 (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

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

(d) 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.	SEW103/3 Macroeconomics (*Compulsory*) - 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 (0H05)

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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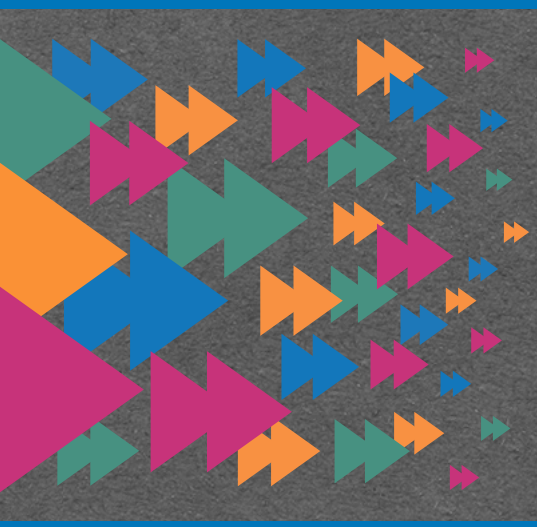

Universiti Sains Malaysia

THE PREFERRED UNIVERSITY

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#USMstyle

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