

**Bachelor of Science  
Industrial Chemistry with  
Honours**



Information contained in this proforma is true at the time of printing and the University has the right to make any amendments according to the needs.

All rights reserved. No part of this proforma may be reproduced in any form or by any means, either through electronic, photocopying, recording, visual, or otherwise, without prior written permission of the Vice Chancellor of Universiti Tun Hussein Onn Malaysia.

©Centre for Academic Development and Training  
Universiti Tun Hussein Onn Malaysia  
September 2020

## Contents

Foreword from Vice Chancellor  
Foreword from Deputy Vice Chancellor (Academic and International)  
Foreword from Dean, Faculty of Applied Sciences and Technology  
Vision of University  
Mission of University  
Education Philosophy of University  
Logo of University  
Chancellor  
Pro Chancellor I  
Pro Chancellor II  
Board of Directors of University  
Members of Senate  
Faculty of Applied Sciences and Technology  
Vision of the Faculty  
Mission of the Faculty  
Visiting Professor at the Faculty  
External Examiner at the Faculty  
Industrial Advisor at the Faculty  
*Amal Ilmuan* at the Faculty  
Faculty Staff Directory  
Programme Name  
Aims of the Programme  
Programme Educational Objectives (PEO)  
Programme Learning Outcomes (PLO)  
Curriculum Structure  
Synopsis of University Courses  
Synopsis of Faculty Courses  
Synopsis of Programme Core Courses  
Synopsis of Programme Elective Courses  
Career and Further Education Prospect

## Foreword by The Vice Chancellor



Assalamualaikum Warahmatullahi Wabarakatuh and Greetings.

Congratulations and welcome to all new students. We appreciate your trust for choosing to be with UTHM to pursue your study in order to achieve better future and be prosperous in life.

The Coronavirus Disease 19 (COVID-19) pandemic has become one of the greatest challenges to mankind and is yet to show any sign of it being over. In order to meet the standard operating procedures (SOP) issued by the Ministry of Health (MOH) and Ministry of Higher Education (MOHE), UTHM has employed various initiatives to prevent the spreading of the disease in UTHM. Among the steps taken are the implementation of Learning and Teaching activities via Full Online Classroom (FOC), Smart Classroom, Flip Learning, Massive Open Online Course (MOOC) and many others. It is hoped that the continuous effort by the University's administration and staff will stop the spread of this infectious disease to ensure conducive learning environment to all students.

The year 2019 saw UTHM continue to move forward in an effort to be a leader in the field of science and technology education. This is evidenced by the overall 4 stars rating by the QS Stars Rating with 5 out of 7 categories were rated with 5 stars rating, namely: Teaching, Employability, Facilities, Social Responsibility and Inclusiveness. In addition, UTHM is now ranked at number 8 in Malaysia in the Webometrics Ranging Web of Universities, and is listed at number 1378 among the world universities. Apart from that, UTHM students won various awards at the international level and thus, making UTHM known around the world.

Last but not least, I believe that you will become a successful University graduate and will continue the university tradition of academic excellence. I am also confident that you will grow to become a member of the society who are able to apply knowledge gained and contribute good deeds, service and expertise for the country.

All the Best.

**“WITH WISDOM WE EXPLORE”**

**YBHG. PROFESSOR DATUK TS. DR. WAHID BIN RAZZALY**

Vice Chancellor

Universiti Tun Hussein Onn Malaysia

## Foreword by The Deputy Vice Chancellor (Academic and International)



Assalamualaikum Warahmatullahi Wabarakatuh and Greetings.

I would like to take this opportunity to congratulate all new students for being chosen to further your studies at Universiti Tun Hussein Onn Malaysia this 2020/2021 session. Congratulations to the Centre for Academic Development and Training for successfully publishing this proforma which serve as a guide for all students in planning their learning at the university beginning their first semester until graduation.

The Coronavirus Disease 19 (COVID-19) pandemic has transformed the Malaysian higher education landscape. The conventional teaching and learning process which used to be conducted via face to face meeting has now changed to online method in order to comply with the standard operating procedures designed to stop the spread of the disease. UTHM also promotes hybrid teaching and learning activities, i.e. a combination of face to face meeting and online learning. It is hoped that this effort will reduce the risk of contracting the disease among students and academic staff.

To ensure the learning and teaching activities run smoothly, UTHM has taken proactive steps to provide the best ICT infrastructure including increasing the broadband capacity and ICT equipments and providing various online platform applications such as Author and e-portfolio. In addition, academic staff are provided with sufficient online teaching and learning training to ensure the teaching process and experience run efficiently.

I do hope that with all the initiatives rolled out by UTHM, you will gain valuable experiences while exploring knowledge and skills at UTHM. I would like to call out on you to take the opportunity to explore your own potential through various co-curricular activities and programmes prepared by UTHM. Early preparations guided by this proforma will help you to plan your journey throughout your studies at UTHM, besides, to achieve UTHM aspirations. I am optimise you will be able to gain excellent academic results and outstanding success.

Last but not least, I wish you all the best and pray that you will be successful in your studies at the university and be able to contribute for the development of the nation.

**“WITH WISDOM WE EXPLORE”**

**PROFESSOR DR. ISMAIL BIN ABDUL RAHMAN**  
Deputy Vice Chancellor (Academic and International)  
Universiti Tun Hussein Onn Malaysia

## Foreword by The Dean



*Assalamualaikum Warahmatullahi Wabarakatuh and Greetings.*

It is my distinct pleasure to welcome everyone of you including our new students to the Universiti Tun Hussein Onn Malaysia (UTHM) campus and the Faculty of Applied Science and Technology (FAST).

FAST welcome you to explore all aspects of the Faculty through the website. We are always looking for the next generation of students to join our University. We share the aspiration of the University to produce professionals through high quality academic programmes based on Science and Technology. In line with the requirements by the country and industry, the learning process that you will go through emphasizes on the understanding and mastering of the core field, apart from building up competency that focuses among others in Mathematics Technology, Industrial statistics, Applied Physics, Food Technology and Biodiversity & Conservation.

We are proud to mention that our programmes have received accreditation from Malaysian Qualification Agency (MQA). The programmes also emphasize our commitment to integrate the aspects of industrial experience and also international exposures. Professionals from various industries have been appointed as faculty's Industrial Advisors. They have participated and contributed actively towards the developments of our programmes and students through meeting and seminars, industrial visits and trainings. It also compulsory for the students to spend part of their time for Industrial training.

Undoubtedly the availability of good infrastructure and expensive research equipment is important to accelerate the success of a Faculty particularly the postgraduate programmes and research. To date, we have a few of the latest equipment's to support our teaching and research activities. However, it is important to note that the success of FAST and UTHM will depend highly on the commitment and dedication of the professional academic and support staffs, working together with our enthusiastic students, as they are the ultimate architects of the Faculty's success.

Finally, on behalf of FAST, I wish you every success for your future endeavours. I am sure the journey that you will experience with us will contribute towards creating responsible graduates with positive attributes. Let's also hope that the knowledge, skills, and wisdom will guide you as we shape a better future for the country and humankind.

Best wishes!

Thank you.

**PROFESSOR DR. HASHIM BIN SAIM**

Dean, Faculty of Applied Sciences and Technology  
Universiti Tun Hussein Onn Malaysia



### **Vision**

Towards a world class university in Engineering, Science and Technology for sustainable development

### **Mission**

UTHM is committed to generate and disseminate knowledge, to meet the needs of industry and community and nurture creative and innovative human capital, based on the tauhidic paradigm.

### **Education Philosophy of the University**

The education and training practice in this university is a continuous effort to become the leader in market oriented academic programmes. These programmes are student-focused and are conducted through experiential learning in order to produce well-trained human resource and professionals who are the catalysts for sustainable development.

### **Logo of the University**

The logo of UTHM displays a proton, a book, a tiered mortar board (levels of learning), a book-rest and a shield.

Symbolism:

- |                |   |
|----------------|---|
| • Red          | Bravery   |
| • Blue         | Collaboration                                   |
| • Silver       | Quality/ Prestige                               |
| • Book-rest    | Knowledge                                       |
| • Proton       | Science and Technology                          |
| • Book         | Knowledge                                       |
| • Mortar board | Levels of study                                 |
| • Circle       | Resilient and related to global characteristics |
| • Shield       | Confidence                                      |

The whole concept of the logo represents UTHM as a learning institution that supports knowledge expansion and development at all levels of study in science and technology.

**Blue** represents the close relationship among UTHM community in ensuring successful and resilient implementations of the University programmes as well as its education and research activities that are carried out for the benefit of mankind.

**Red** symbolises the adventurous nature of UTHM in exploring new fields to establish itself as a leader in the applications of science and technology. Thus, this reflects the spirit and self-esteem of the UTHM community.



## Chancellor



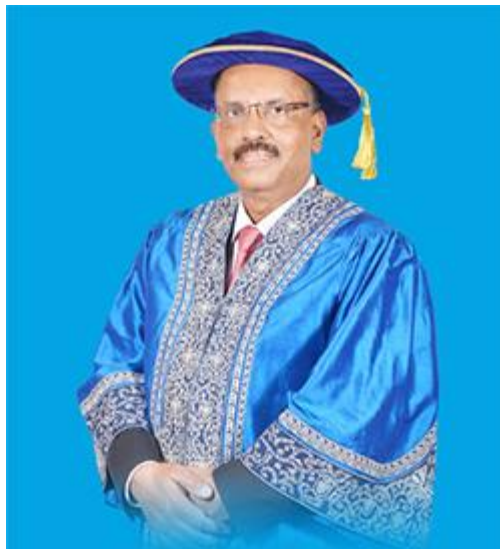
**Duli Yang Maha Mulia Sultan Ibrahim ibni Almarhum Sultan Iskandar**  
Sultan Yang Dipertuan Bagi Negeri Dan Jajahan Takluk Johor Darul Ta'zim  
D.K., D.K.(Pahang), SPMJ, SSIJ, S.M.N., S.P.M.T., S.M.P.K., P.I.S.

## Pro Chancellor I



**Duli Yang Amat Mulia Tunku Ismail Ibni Sultan Ibrahim**  
Tunku Mahkota of Johor (TMJ)  
D.K., SPMJ, P.I.S

## Pro Chancellor II



**YBhg. Tan Sri Dr. Ali Hamsa**

## **Board of Directors of the University**

### **Chairman**

---

**YBhg. Dato' Dr. Mohd Sofi Osman**

Managing Director & Vice President  
PEN Operations

### **Members**

---

**YBhg. Prof. Datuk Ts. Dr. Wahid bin Razzaly**

Vice Chancellor  
Universiti Tun Hussein Onn Malaysia

**YB Dato' Haji Nooh bin Gadot**

Advisor  
Majlis Agama Islam Johor

**YBhg. Datuk Ts. Pang Chau Leong**

Member  
Board of Directors

**YBhg. Dato' Ir. Dr. Haji Abdul Rashid bin Maidin**

Akademi Profesional Koperasi Serbaguna Anak-anak Selangor Berhad (KOSAS)

**YBrs. En. Ahmad Luqman bin Mohd. Azmi**

Chief Operations Officer  
Malaysia Airlines Berhad

**YBrs. Dr. Sharifah Adlina binti Syed Abdullah**

Ministry of Finance Malaysia

**YBrs. Ts. Dr. Mohommad Naim bin Yaakub**

Ministry of Education Malaysia

**YBhg. Prof. Dr. Azme bin Khamis**

Universiti Tun Hussein Onn Malaysia

**YBhg. Dato' Dr. Mohd. Padzil bin Hashim**

Industry Representative

### **Secretary**

---

**En. Abdul Halim bin Abdul Rahman**

Registrar  
Universiti Tun Hussein Onn Malaysia

## Members of Senate

### Chairman

---

**YBhg. Prof. Datuk Ts. Dr. Wahid bin Razzaly**

Vice Chancellor

### Members

---

**Prof. Dr. Hj. Ismail bin Abdul Rahman**

Deputy Vice Chancellor (Academic and International)

**Prof. Dr. Mohd Shahir Shamsir Bin Omar**

Deputy Vice Chancellor (Research and Innovation)

**Assoc. Prof. Dr. Afandi bin Ahmad**

Deputy Vice Chancellor (Student Affairs and Alumni)

**Prof. Madya Ts. Dr. Mohd Kamarulzaki bin Mustafa**

Provost UTHM Pagoh Campus

**Prof. Dr. Ahmad Tarmizi bin Abd Karim**

Assistant Vice Chancellor (Strategic Planning and Corporate Relations)

**Prof. Madya Dr. Mas Fawzi bin Mohd Ali**

Assistant Vice Chancellor (Financial Sustainability)

**Prof. Dr. Azme bin Khamis**

Dean, Centre for Graduate Studies

**Prof. Ir. Ts. Dr. Mohd Irwan bin Juki**

Dean, Faculty of Civil and Environmental Engineering

**Assoc. Prof. Dr. Rosli bin Omar**

Dean, Faculty of Electrical and Electronic Engineering

**Assoc. Prof. Dr. Shahrudin bin Mahzan @ Mohd Zin**

Dean, Faculty of Mechanical and Manufacturing Engineering

**Prof. Dr. Wan Fauzi@Fauziah binti Wan Yusoff**

Dean, Faculty of Technology Management and Business

**Assoc. Prof. Ts. Dr. Abdul Rasid bin Abdul Razzaq**

Dean, Faculty of Technical and Vocational Education

**Ts. Dr. Azizul Azhar bin Ramli**

Dean, Faculty of Computer Science and Information Technology

**Prof. Dr Hashim bin Saim**

Dean, Faculty of Applied Science and Technology

**Prof. Madya Dr Jumadi bin Abdul Shukor**

Dean, Faculty of Engineering Technology

**Assoc. Prof. Dr. Mohamad Zaky bin Noh**

Dean, Centre for Diploma Studies

**Assoc. Prof. Dr. Khairul Azman bin Mohamad Suhaimy**

Dean, Centre for General Studies and Co-curricular

**Dr. Zailin Shah binti Yusoff**  
Dean, Centre for Language Studies

**Assoc. Prof. Dr. Ishak bin Baba**  
Director, Centre for Academic Development and Training

**Prof. Madya Ts. Dr. Razali bin Hassan**  
Director, Malaysian Research Institute for Vocational Education and Training (MyRIVET)

**Prof. Dr. Rosman bin Md. Yusoff**  
Director, Institute for Social Transformation and Regional Development

**Prof. Ts. Dr. Abd Halid bin Abdullah**  
Faculty of Civil and Environmental Engineering

**Prof. Dr. Noridah binti Mohamad**  
Faculty of Civil and Environmental Engineering

**Prof. Dr. Mohammad Faiz Liew bin Abdullah**  
Faculty of Electrical and Electronic Engineering

**Prof. Ir. Dr. Md Saidin bin Wahab**  
Faculty of Mechanical and Manufacturing Engineering

**Prof. Dr. Yusri bin Yusof**  
Faculty of Mechanical and Manufacturing Engineering

**Prof. Dr. Abdul Talib bin Bon**  
Faculty of Technology Management and Business

**Prof. Dr. Rosziati binti Ibrahim**  
Faculty of Computer Science and Information Technology

**Prof. Dr. Nazri bin Mohd Nawi**  
Faculty of Computer Science and Information Technology

**Prof. Dr. Rozaini bin Roslan**  
Faculty of Applied Science and Technology

**Ir. Ts. Shamrul-Mar bin Shamsuddin**  
Director, Office of Development and Maintenance

**Assoc. Prof. Ts. Dr. Mohd. Farhan bin Md. Fudzee**  
Director, Information Technology Centre

**Ir. Dr. Raha binti Abd. Rahman**  
Industry Fellow

**En. Abdul Halim bin Abdul Rahman**  
Registrar / Secretary of Senate

**En. Norzaimi bin Hamisan**  
Bursar

**Pn. Zaharah binti Abd Samad**  
Chief Librarian

**Pn. Norliah binti Yaakub**  
Head of Legal Unit

## **Faculty of Applied Sciences and Technology**

### **Faculty Vision**

Aspires to pioneer the application of science and technology for universal prosperity

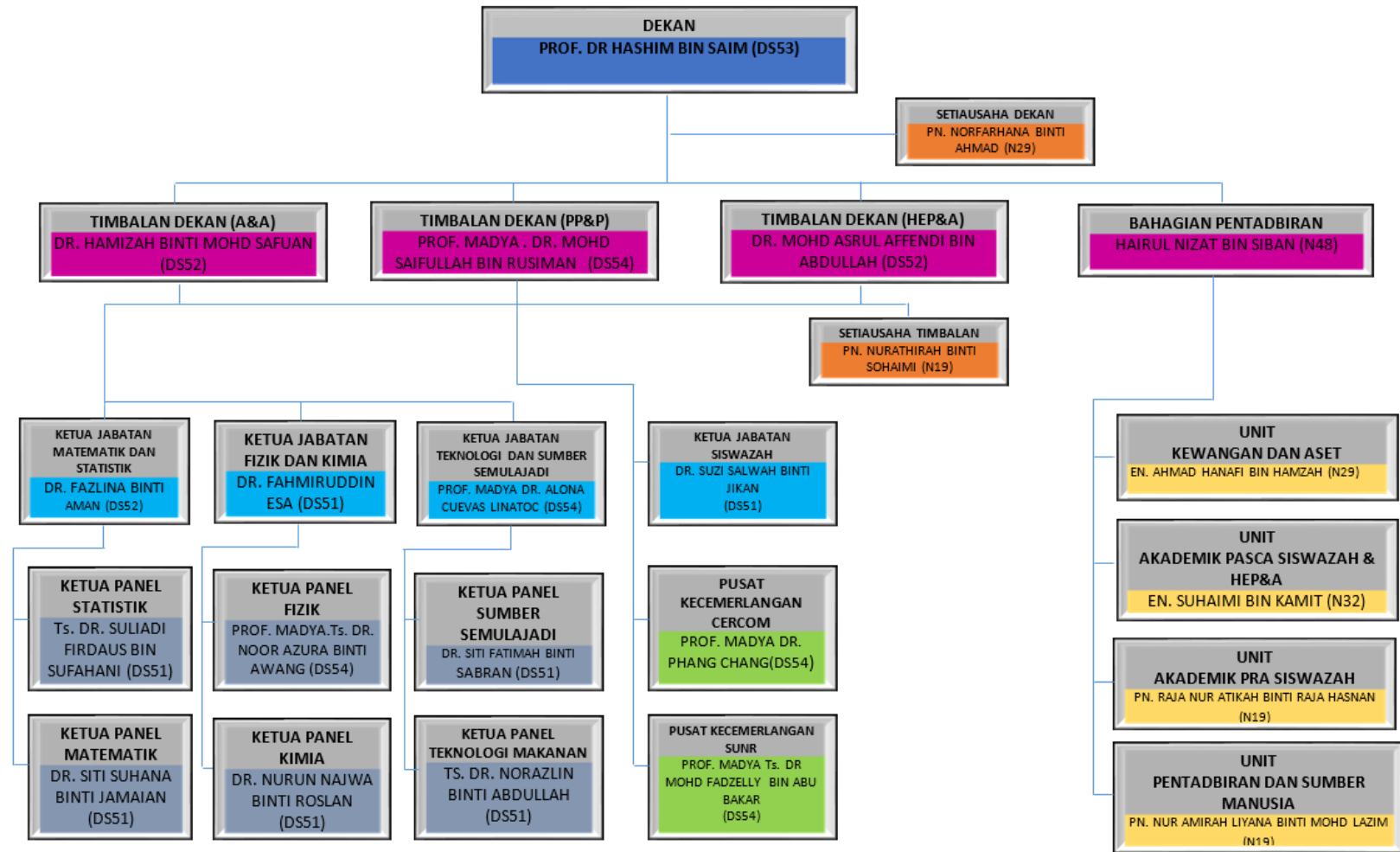
### **Faculty Mission**

To produce and train competitive professionals and technologists of high ethical values in the global arena through holistic academic programmes, knowledge and research culture, based on the concept of Tauhid

Faculty of Applied Sciences and Technology (FAST) was previously known as Centre of Science Studies (PPS) and was based in Parit Raja Campus. The Centre of Science Studies offered courses such as Physics, Chemistry, Mathematics and Statistics to other faculties at the university. In 2009, the Centre was promoted as a faculty called Faculty of Science, Art and Heritage (FSSW). The faculty was established by the merging two centres: - Centre of Science Studies and Centre of Humanities Studies and Communication that comprised two departments: - Department of Science and Mathematics and Department of Humanities. Later in 2011, the faculty changed its name to Faculty of Science, Technology and Human Development (FSTPi) to cater the multidisciplinary areas of studies. FSTPi was made up of five departments Science; Mathematics and Statistics; Technology and Natural Resources; Islamic Studies and Social Science; and Social Science and Language and Communication. FSTPi started with four academic programs in 2012/2013 session and new program launched in 2014/2015 session.

On 7th May 2017, FSTPi was once again reshuffled and it was divided into three entities – Faculty of Applied Sciences and Technology (FAST); Centre for Language Studies (PPB); and Centre for General Studies and Co-Curricular (PPUK). This new arrangement was to cater for the development at the Pagoh Campus where FAST would stand on its own.

FAST offers six academic programs in Bachelor Degree (BSc.), Masters Degree (MSc.) and Doctor of Philosophy (Ph.D). FAST abbreviation represents the tauhidic paradigm as it represents F-Fatonah, A-Amanah, S-Siddiq and T-Tabligh, the characters of the Prophet Muhammad s.a.w. FAST has a number of collaborations locally – which include the Department of Statistics Malaysia (DOSM); Forest Research Institute of Malaysia (FRIM); Johor National Parks Corporation (PTNJ); Ministry of Health Malaysia (KKM); Malaysia Nuclear Agency (ANM); Significant Technology (SigTech); MIMOS Semiconductor; Universiti Malaysia Sabah (UMS) and Universiti Utara Malaysia (UUM); and internationally – with Universitas Gadjah Mada (UGM); Institute of Technology Bandung (ITB); and Institute of Technology Surabaya (ITS); YARSI. The graduates of this faculty are able to contribute their skills and knowledge in the areas of Food Technology, Mathematics Technology, Industrial Statistics, Applied Physics, Biodiversity and Conservation and Chemistry at all government and private organizations.



Dikemaskini pada 1 Julai 2020

## **Visiting Professor at the Faculty**

---

**Professor Dr. Ishak Hashim**

Universiti Kebangsaan Malaysia (UKM)

**Professor Dr. Razamin Ramli**

Universiti Utara Malaysia (UUM)

**Professor Emeritus Dato' Dr. Abdul Latiff Mohamad**

Universiti Kebangsaan Malaysia (UKM)

**Professor Ts Dr. Sharifudin Md. Shaarani**

Universiti Malaysia Sabah (UMS)

**Professor Ts Dr. Suriani Abu Bakar**

Universiti Pendidikan Sultan Idris (UPSI)

## **External Examiner at the Faculty**

---

**Professor Dr. Norihan Md Ariffin**

Universiti Putra Malaysia (UPM)

**Associate Profesor Dr. Suhairul Hashim**

Universiti Teknologi Malaysia (UTM)

## **Industrial Advisor at the Faculty**

---

**Dr. Zamros Dzulkifli**

Maybank Investment

**Mr. Veera Vignesvaran Marimuthu**

Dyson Malaysia

**Mr. Hong Peck Keong**

S-QI Consultings

**Mr. Wan Zawawi Md Zin**

MIMOS Berhad

## ***Amal Ilmuan at the Faculty***

---

**Professor Emeritus Dato' Dr. Mohd Noh bin Dalimin**

Ph.D, DIC (Solid State Physics) (Imperial College, Univ. London), MSc. (Solid State) (Univ. London), Bachelor (Physics) (Univ. Gadjah Mada)

**Professor Emeritus Datin Dr. Maryati binti Mohamed**

Ph.D (Entomology) (Univ. London), BSc (Biology) (Univ. Gadjah Mada)



## **Faculty Staff Directory Administration**

---

### **Dean**

#### **Professor Dr. Hashim Bin Saim**

Ph.D (Microelectronics) (Loughborough University), MSc. (Semiconductor) (Univ. Of Dundee), BSc. (Physics) (UKM)

### **Deputy Dean (Research, Development and Publication)**

#### **Associate Professor Dr. Mohd Saifullah bin Rusiman**

Ph.D (Math.) (UTM), MSc. (Math.) (UTM), BSc. (Statistics) (UKM)

### **Deputy Dean (Academic and International)**

#### **Dr. Hamizah binti Mohd Safuan**

Ph.D (Math.) (The University Of New South Wales), MSc. (Math.) (Appl. Math.) (UTM), BSc. & Comp. with Edu. (Math.) (UTM)

### **Deputy Dean (Students Affairs and Alumni)**

#### **Dr. Mohd Asrul Affendi bin Abdullah**

Ph.D (Biostatistics) (USM), MSc. (Applied Stat.) (UKM), BSc. (Decision Sc.) (UUM), Dip. (Accountancy) (Kolej Professional MARA Melaka)

### **Office Secretary**

#### **Pn. Norfarhana Binti Ahmad**

Dip. (Secretarial Science) (Polytechnic Port Dickson)

### **Office Secretary**

#### **Pn. Nurathirah binti Sohaimi**

Dip. (Banking) (UiTM)

### **Senior Assistant Registrar**

#### **En. Hairul Nizat bin Siban**

B.A. Hons (Arts) (UM)

### **Administrative Officer Assistant (Administration and Finance)**

#### **En. Ahmad Hanafi bin Hamzah**

B.A. Hons (Technology Management) (UTM)

### **Senior Administrative Officer Assistant (Academic and Graduate Studies)**

#### **En. Suhaimi Kamit**

Dip. (Business Studies) (UiTM)

### **Administrative Assistant (Administration)**

#### **Cik Nur Amirah Liyana Binti Mohd Lazim**

Dip. (Office Technology and Management) (UiTM)

### **Administrative Assistant (Academic and Student Affairs)**

#### **En. Muhammad Ammar Haziq Bin Marsuni**

Dip. (Information Technology) (Polytechnic Tuanku Syed Sirajuddin)

### **Administrative Assistant (Academic and Student Affairs)**

#### **Pn. Raja Nur Atikah binti Raja Hasnan**

Dip. (Medical Lab Technology) (UNISEL)

### **Administrative Assistant (Finance)**

#### **Pn. Normala binti Tohid**

**Senior General Office Assistant**  
**En. Mohammad Ismael bin Mizad**

## **Department of Mathematics and Statistics**

---

### ***Academic Staff***

#### **Head of Department**

**Dr. Fazlina binti Aman**

Ph.D (Math.) (UKM), MSc. (Math.) (UKM), BSc. & Comp. with Edu. (Math.) (UTM)

#### **Professor Dr. Azme bin Khamis**

Ph.D (Math.) (UTM), MSc. (Statistics) (UKM), BSc. (Statistics) (UKM)

#### **Professor Dr. Rozaini bin Roslan**

Ph.D (Math.) (UMS), MPhil. (Math.) (Leeds University), BSc. (Math.) (UKM)

#### **Associate Professor Dr. Mohd Saifullah bin Rusiman**

Ph.D (Math.) (UTM), MSc. (Math.) (UTM), BSc. (Statistics) (UKM)

#### **Associate Professor Dr. Kavikumar Jacob**

Ph.D (Math.) (Annamalai Univ.), MPhil. (Math.) (Annamalai Univ.), MSc. (Math. with Comp. Application) (Annamalai Univ.), BSc. (Math.) (Manonmanian Sundarnar Univ.)

#### **Associate Professor Dr. Phang Chang**

Ph.D (Math. & Stat) (Curtin Univ), MSc. (Appl. Math.) (UTM), BSc. & Edu. (Math./Physics) (UTM)

#### **Associate Professor Ts Dr. Aida Mustapha**

Ph.D (Artificial Intelligence) (UPM), MSc. (Artificial Intelligence) (UKM), BSc. (Computer) (Michigan Tech. University)

#### **Dr. Kek Sie Long**

Ph.D (Math.) (UTM), MSc. (Math.) (UTM), BSc. (Math.) (UKM)

#### **Dr. Siti Noor Asyikin binti Mohd Razali**

Ph.D (Decision Science) (UUM), BSc. (Decision Science) (UUM)

#### **Dr. Siti Suhana binti Jamaian**

Ph.D (Appl. & Comp. Math.) (The University of Edinburgh), MSc. (Math.) (UTM), BSc. (Industrial Math.) (UTM)

#### **Dr. Mahathir bin Mohamad**

Ph.D (Math.) (Osaka Univ.), MSc. (Math.) (UKM), BSc. (Pure Math.) (UPM)

#### **Dr. Rohayu binti Mohd Salleh**

Ph.D (Math.) (UTM), MSc. (Applied Statistics) (UPM), BSc. (Statistics) (UiTM)

#### **Dr. Mohd Asrul Affendi bin Abdullah**

Ph.D (Biostatistics) (USM), MSc. (Applied Stat.) (UKM), BSc. (Decision Sc.) (UUM), Dip. (Accountancy) (Kolej Professional MARA Melaka)

#### **Dr. Choy Yaan Yee**

Ph.D (Math.) (UTM), BSc. (Pure Math.) (UTM)

**Dr. Muhamad Ghazali bin Kamardan**

Ph.D (Mech. Eng.)(UPNM), MSc. (Math.) (UKM), BSc. (Math.) (UTM)

**Dr. Maria Elena binti Nor**

Ph.D (Math.) (UTM), MSc. (Statistics) (USM), BSc. (Statistics) (UKM)

**Dr. Hamizah binti Mohd Safuan**

Ph.D (Math.) (The University Of New South Wales), MSc. (Math.) (UTM), BSc. & Comp. with Edu. (Math.) (UTM)

**Dr. Syahira binti Mansur**

Ph.D (Applied Math)(UKM), MSc. (Math.) (UTM), BSc. (Math.) (UIAM)

**Ts. Dr. Shuhaida bte Ismail**

Ph.D (Math.) (UTM), MSc. (Math), BSc. (Comp. & Control) (UTM)

**Ts. Dr. Suliadi Firdaus bin Sufahani**

Ph.D (Math.) (UTM), MSc. (Statistics) (Nottingham Univ.), BSc. (Decision Science) (UUM)

**Dr. Khuneswary a/p P. Gopal Pillay**

Ph.D (Statistical Modeling) (Univ of Glasgow), MSc. (Statistics) (UMS), BSc. (Mathematics with Economics) (UMS)

**Ts. Dr. Norziha binti Che Him**

Ph.D (Statistics) (Univ. of Exeter), MSc. (Statistics) (UKM), BSc. (Statistics and IT) (UKM)

**Dr. Sabariah binti Saharan**

Ph.D (Statistics) (Univ of Canterbury), MSc. (Statistics) (UKM), BSc. (Statistics) (UiTM), Dip. (Statistics) (UiTM)

**Dr. Isaudin bin Ismail**

Ph.D (Actuarial Math.) (Univ. of Leicester), MSc. (Financial Engineering) (UiTM), BSc. (Math.) (UKM)

**Dr. Norzuria binti Ibrahim (Study Leave)**

Ph.D (Biomedical Eng.) (UM), MSc. (Math.) (UKM), BSc. (Math.) (Industrial Math.) (UTM)

**En. Lee Siaw Chong**

MSc. (Math.) (USM), BSc. (Math.) (Pure Math.) (USM)

**En. Kamil bin Khalid**

MSc. (Statistics) (UKM), BSc. (Statistics) (UiTM), Dip. (Statistics) (UiTM)

**Pn. Azila binti Md Sudin**

MSc. (Math.) (UTM), BSc. (Industrial Math.) (UTM)

**Pn. Noor Azliza binti Abd Latif**

M.Sc. (Math.) (UKM), BSc. (Math.) (UPM)

**Pn. Norhaidah binti Mohd Asrah**

MSc. (Statistics) (UKM), BSc. (Statistics) (UiTM), Dip. (Statistics) (UiTM)

**Pn. Noorzehan Fazahiyah binti Md Shab**

MSc. (Math.) (UKM), BSc. (Math.) (UKM)

**Pn. Cik Sri Mazzura binti Muhammad Basri**  
MSc. (Math.) (UTM), BSc. & Comp. with Edu. (Math.) (UTM)

**Pn. Syahirbanun binti Isa**  
MSc. (Math.) (UTM), BSc. (Industrial Math.) (UTM)

### ***Supporting Staff***

#### **Assistant Engineer**

**En. Zukarnain Abdul Rahim**  
Dip. (Electrical & Electronics) (Polytechnic JB)

**En. Muhammad Ghazali bin Ibrahim**

## **Department of Physics and Chemistry**

---

### ***Academic Staff***

#### **Head of Department**

**Dr. Fahmiruddin bin Esa**  
Ph.D (Physics)(UPM), MSc. (Physics) (UTM), BSc. (Pure Physics) (UPM)

#### **Professor Dr. Hashim Bin Saim**

Ph.D (Microelectronics) (Loughborough University), MSc. (Semiconductor) (Univ. Of Dundee),  
BSc. (Physics) (UKM)

#### **Associate Professor Ts. Dr. Mohd Kamarulzaki bin Mustafa**

Ph.D (Biophysics) (Univ. Sheffield, UK), MSc. (Physics Optic) (UTM), BSc. (Physics  
Instrumentation) (UTM)

#### **Associate Professor Dr. Mohd Arif bin Agam**

Ph.D (Physics) (Univ. Birmingham), MSc. Ed. (Physics) (UTM), BSc. (UPM), Dip (Sc. & Edu.)  
(UOM)

#### **Associate Professor Dr. Zaidi bin Embong**

Ph.D (Surface Science Physics) (Univ. Bristol, UK), MSc. (Nuclear Physics) (UTM), BSc. &  
Comp. with Edu. (Physics) (UTM)

#### **Associate Professor Dr. Mohamad Zaky bin Noh**

Ph.D (Material Engineering) (USM), MSc. (Physics) (UTM), BSc. (Physics) (UTM)

#### **Associate Professor Ts. Dr. Rosmila binti Abdul Kahar**

Ph.D (Science) (UTHM), MSc. (Physics) (Univ. North Texas) (USA), BSc. (Physics) (Univ.  
North Texas) (USA) Dip. Edu. (UKM)

#### **Associate Professor Ts. Dr. Noor Azura binti Awang**

Ph.D (Optoelectronics) (UM), MSc. (Physics) (Optic and Laser) (UTM), BSc. (Industrial  
Physics) (UTM)

#### **Ts. Dr. Ahmad Hadi bin Ali**

Ph.D (Solid State) (USM), MSc. (Physics) (UTM), BSc. (Industrial Physics) (UTM)

#### **Dr. Suhadir Shamsuddin**

Ph.D (Physics and Adv. Material) (UiTM), BSc (Physics) (UiTM), Dip (Physics) (UiTM)

**Dr. Mohd Zul Hilmi bin Mayzan**

Ph.D (Material Science) (Univ.of Sheffield), MSc (Materials) (UPM), BSc. (Hons) (Instrumentation) (UPM)

**Dr. Siti Amira binti Othman**

Ph.D (Material Science) (UKM), BSc. (Nuclear Science) (UKM)

**Dr. Amira Saryati binti Ameruddin**

Ph.D (Physics) (Australian National University), MSc. (Physics) (UTM), BSc. (Physics Material) (UTM)

**Dr. Nurul Nadia binti Adnan**

Ph.D (Physic) (UTM), BSc. (Physic Industry) (UTM)

**Dr. Afishah binti Alias**

Ph.D (Eng.) (Muroran Inst.), MSc. (Physics) (UMS), BSc. (Electronic Eng.) (Univ. Of Electro-Communications)

**Dr. Ahmad Hassan Sallehudin bin Mohd Sarif**

Ph.D (Nuclear Science) (UKM), MSc. (Appl. Quantum Physics and Nuclear Eng.) (Kyushu Univ.), BSc. (Energy Science and Eng.) (Kyushu Univ.)

**Dr. Syed Zuhaib Haider Rizvi**

Ph.D (Physics) (UTM), MSc. (Physics) (Uni of Eng. & Tech, Lahore), BSc. (Physics) (Uni of Eng. & Tech, Lahore).

**Associate Professor Dr. Hatijah Binti Basri**

Ph.D (Chemical Engineering) (UTM), MSc. (Chemistry) (UTM), BSc. (UTM)

**Dr. Suzi Salwah binti Jikan**

Ph.D (Material Engineering) (USM), MSc. (Material Engineering) (USM), BSc. (Material Engineering) (USM).

**Dr. Nurun Najwa binti Ruslan**

Ph.D (Chemistry) (UTM), BSc. (Industrial Chemistry) (UTM)

**Dr. Faridah binti Abu Bakar**

Ph.D (Nanomaterial, Photocatalysis) (Uni of Canterbury), MSc. (Chemistry) (UTM), BSc. (Analytical Chemistry & Environmental) (UMT)

**Dr. Saliza binti Asman**

Ph.D (Analytical Chemistry) (UM), MSc. (Analytical Chemistry) (UPM), BSc. (Chemistry) (UPM)

**Dr. Shakila bt Abdullah**

Ph.D (Civil Eng.) (UTM), MEng (Enviroment) (UTM), Bachelor (Applied Chemistry) (UiTM)

**Dr. Zalilah Murni binti Mat Ali @ Yunus**

Ph.D (Applied Science) (UTHM), MSc. (Chemistry) (UTM), BSc. (Chemistry) (UTM)

**Dr. Syazwan Hanani binti Meriam Suhaimy**

Ph.D (Environmental Science) (UM), MEng (Material) (UM), B.Eng (Chem.) (Chiba, Japan)

### ***Supporting Staff***

#### **Science Officer**

**Muhamad Muizzudin bin Azali**

BSc. (Physics) (UTM),

#### **Science Officer Assistant**

**En. Mohd Azman bin Mohd Sadikin**

Dip. Science (UTM)

#### **Assistant Engineer**

**En. Mohd Marhafidz bin Marjori**

Dip. (Electric Eng.) (Polytechni Merlimau)

**En. Nooriskandar bin Sani**

**En. Tajul Asmawee bin Abdullah**

#### **Senior Laboratory Assistant**

**Pn. Norsidah binti Harun**

Bachelor (Information Tech. & Management) (OUM)

#### **Laboratory Assistants**

**En. Kamarul Affendi bin Hamdan**

Dip. (Civil Administration) (UiTM)

**Pn. Norhafizam binti Mohamed Yusof**

**En. Sufian bin Abd Rahim**

## **Department of Technology and Natural Resources**

---

### ***Academic Staff***

#### **Head of Department**

**Associate Professor Dr. Alona Cuevas Linatoc**

Ph.D (Forest Physiology) (UMS), MSc. (Forest Botany) (UPM), BSc. (Sc. in Forestry) (Univ. Philippines Los Banos), Forest Ranger Certificate (Univ. Philippines Los Banos)

**Associate Professor Ts. Dr. Mohd. Fadzelly bin Abu Bakar**

Ph.D (Biomedical Science) (University Of Nottingham), MSc. (Food Biochem) (UPM), BSc. (Nutrition and Community Health) (UPM)

**Dr. Balkis binti Hj. A. Talip**

Ph.D (Molecular Biology for Microbes) (University of Ulster), MSc. (Virology) (UPM), BSc. Hons. (Microbiology) (UPM)

**Ts. Dr. Kamarul Rahim Kamarudin**

Ph.D (Food Biotechnology) (USIM), MSc. (Marine Biotechnology) (UKM), BSc. (Molecular Ecology) (UNIMAS)

**Dr. Siti Fatimah Zaharah binti Mohamad Fuzi**

Ph.D (Bioprocess Eng.) (UTM), BSc. Hons. (Industrial Biology) (UTM)

**Ts. Dr. Faridah binti Kormin**

Ph.D (Chem Eng.) (UMP), M.Eng (Bioprocess Eng.) (UTM), BSc (Food Technology) (UPM)

**ChM. Dr. Norhayati binti Muhammad**

Ph.D (Chem) (UKM), MSc (Maths) (UTM), BSc (Chem) (UKM), Dip (Edu. Sc.)(MPTI)

**Ts. Dr. Norazlin binti Abdullah**

Ph.D (Food Engineering) (UPM), MEng (Food Engineering) (UPM), BEng (Food and Process Engineering) (UPM)

**Dr. Furzani binti Pa'ee**

Ph.D (Science) (Univ of Manchester), BSc (Biotechnology) (Rochester Institute of Technology)

**Dr. Siti Fatimah binti Sabran**

Ph.D (Science) (UTHM), BSc. (Biotechnology) (Rochester Institute of Technology, USA)

**Ts. Dr. Muhammad Abdul Latiff bin Abu Bakar**

Ph.D (Genetic) (UKM), MSc (Biology) (UKM), BSc. (Biology) (UKM)

**Dr. Nor Atiqah binti Norazlimi**

Ph.D (Ecology) (UM), BSc. (Biology) (UKM)

**Dr. Arney Binti Sapaat**

Ph.D (Muziumology) (UTHM), MSc (Biodiversity & Biosistematics) (UMS), BSc. (Conservation Biology) (UMS)

**Dr. Yap Jing Wei**

Ph.D (Biology) (Queen Mary University), MSc (Genetics) (UKM), BSc. (Biotechnology) (University of Tasmania)

**Dr. Aqilah Binti Awg Abdul Rahman**

Ph.D (Computational Biology) (UTHM), BSc. (Food Biotechnology) (Rochester Institute of Technology)

**Dr. Munira binti Zainal Abidin**

Ph.D (Food Processing) (University of Reading), MSc (Food Engineering) (UPM), BSc. (Process & Food Engineering) (UPM)

**Dr. Nur Hafizah binti Malik**

Ph.D (Food Processing) (University of Birmingham), MSc (Food Technology) (UPM), BSc. (Food Technology) (UPM)

***Supporting Staff***

**Laboratory Assistant**

**Pn. Norzieyana binti Md Arshad**

Dip. (Computer Science)(UiTM)

**Pn. Nurul Fatimah binti Mohd Jailan**

Dip. (Biotechnology) (Politeknik Nilai)

**Assistant Engineer**

**Pn. Siti Zarah Binti Imam Tohit**

Dip. (Civil Eng.) (Building Services) (PoliMAS)

**En. Mohd Akmal Hakim bin Razak**

Dip. (Mechanical Eng.) (PSAH)

**En. Mohd Hafidz Mohd Aman**



## **Programme Name**

### **Bachelor of Science Industrial Chemistry with Honours**

## **Programme Aims**

To produce graduates who are competent and tauhidic attitude by training and a holistic multidisciplinary program to meet current market needs and be able to compete globally. This effort is realized with the energy deployment and the optimization of expertise. This objective is in line with the objectives of the university and faculty.

## **Programme Educational Objectives (PEO)**

The programme educational objectives for Bachelor of Science Industrial Chemistry will produce professional chemist who are:

PEO 1	Competent and innovative in providing sustainable solutions to fulfill the needs of industry.	PLO 1, 2, 3, 6,7
PEO 2	Continuously self-updating and contributing knowledge to the betterment of community, society and nation.	PLO 1,5, 9, 10, 11
PEO 3	Key member in any organisation with high consideration to the environment and ethics.	PLO 4, 8, 11

## Programme Learning Outcomes (PLO)

At the end of the programme, the students of Bachelor of Science Industrial Chemistry with Honours programme will be able to:

PLO 1	Apply adequate knowledge and understanding in industrial chemistry.	Knowledge & Understanding
PLO 2	Resolve any problems in industrial chemistry, analytically with creative and innovative solutions.	Cognitive Skills
PLO 3	Apply a range of essential methods and procedures, using latest tools to solve a broad range of scientific problems in industrial chemistry.	Practical Skills
PLO 4	Exhibit good relationship, interact with others and work effectively in fulfilling individual and group tasks when tackling issues related to Industrial Chemistry.	Interpersonal Skills
PLO 5	Communicate and deliver information effectively in both written and verbal forms.	Communication Skills
PLO 6	Use a broad range of information and media technologies to support the learning process.	Digital Skills
PLO 7	Incorporate numerical and graphical techniques in Industrial Chemistry.	Numeracy Skills
PLO 8	Demonstrate decision making professionally, autonomously and responsibly in managerial capacities.	Leadership, Autonomy and Responsibility
PLO 9	Engage in continuous enhancement of knowledge in the field of industrial chemistry and related discipline.	Personal Skills
PLO 10	Initiate a plan of self-driven entrepreneurship.	Entrepreneurial Skills
PLO 11	Identify ethical issues, make decision ethically, and act professionally within the varied social and professional environment.	Ethics and Professionalism

## Curriculum Summary for Bachelor of Science Industrial Chemistry with Honours

### Year 1

Sem	Course Code	Course Name	Credit	
1	UHB10102	English for Higher Education	2	
	UQI10102	Pengajian Islam	2	
	UQI10202	Pengajian Moral		
	UQI10902	Islam in Malaysia		
	UQU10103	Kenegaraan dan Pembangunan Mutakhir Malaysia		3
	UQU10303	** Malaysia Studies and Culture	0	
	UHB1XX02	Bahasa Asing	2	
	BWK10103	Physical Chemistry	3	
	BWK10203	Inorganic Chemistry I	3	
	BWK10303	Organic Chemistry I	3	
	BWK10402	Chemistry Laboratory I	2	
	<b>Total</b>			<b>20</b>

Sem	Course Code	Course Name	Credit
2	UQ* 1XX01	Ko-Kurikulum I	1
	UQI11202	Falsafah dan Isu Semasa	2
	UQI11102	**Civilizational Studies in Asia	
	UQU10702	Penghayatan Etika dan Peradaban	
	UWB11002	**Malay Language	2
	BWK10503	Inorganic Chemistry II	3
	BWK10603	Organic Chemistry II	3
	BWK10703	Instrumental Analysis	3
	BWK10802	Chemistry Laboratory II	2
	<b>Total</b>		

### Year 2

Sem	Course Code	Course Name	Credit
3	UQ*1XX01	Ko-Kurikulum II	1
	UHB20102	Essential Academic English	2
	BWK20103	Material Science and Technology	3
	BWK20203	Industrial Chemistry	3
	BWK20303	Statistics in Chemistry	3
	BWK20403	Colloid and Surface Chemistry	3
	BWK20502	Chemistry Laboratory III	2
	<b>Total</b>		

Sem	Course Code	Course Name	Credit
4	BWU10102	Entrepreneurship	2
	BWU10202	Creativity and Innovation	2
	BWU10302	Occupational Safety and Health	2
	BWK20603	Chemical Industry Unit Process and Operation	3
	BWK20702	Industrial Water and Wastewater Treatment	2
	BWK20803	Natural Product Chemistry	3
	BWK20902	Chemistry Laboratory IV	2
	<b>Total</b>		

Year 3

Sem	Course Code	Course Name	Credit
5	UHB30102	English for technical Purposes	2
	BWK30103	Total Quality Management	3
	BWK30203	Green Chemistry	3
	BWK30303	Oil, Gas and Petrochemical Industry	3
	BWK30402	Digitalization in Industry	2
	BWK30503	Plastic and Rubber Industry	3
		<b>Total</b>	<b>16</b>

Sem	Course Code	Course Name	Credit
6	UHB40102	English For Occupational Purposes	2
	BWK30602	Chemical Industry Seminar	2
	BWK30703	Separation Techniques	3
	BWK30803	Oleochemical Industry	3
	BWK30903	Industrial Catalysis	3
	BWK31003	Agricultural Chemical Industry	3
		<b>Total</b>	<b>16</b>

Year 4

Sem	Course Code	Course Name	Credit
7	BWK40103	Quality Control and Assurance	3
	BWK40204	Industrial Safety	4
	BWK40304	Industrial Technology and Operations	4
	BWK40403	Industrial Project Proposal	3
		<b>Total</b>	<b>14</b>

Sem	Course Code	Course Name	Credit
8	BWK40503	Industrial Project Framework	3
	BWK40605	Industrial Project Development	5
	BWK40704	Industrial Project Writing	4
		<b>Total</b>	<b>12</b>

Total Credit: 127

## Synopsis of University Courses

Year	Sem	Course Code	Courses	Credit	Total
1	I	UHB10102	English for Higher Education	2	8
		UQU10103 UQU10303	Islamic Studies Moral Studies	2 2	
		UQU10103 UQU10303	Nationhood and Current Development of Malaysia Malaysian Studies and Culture*	3 3	
		UQ* 1**01	Co-curriculum I	1	
	II	UQ* 1**01	Co-curriculum II	1	7
		UHB1**02	Foreign Language	2	
		UQI11202	Phylosophy and Current Issues	2	
		UQU10702	Appreciation of Ethics and Civilization	2	
2	I	UHB20102	Essential Academic English	2	2
3	I	UHB30102	English for Technical Purposes	2	2
4	I	UHB40102	English for Ocupational Purposes	2	2
<b>Total Overall Credit</b>					<b>21</b>

\*For international students only

## UHB10102 English for Higher Education

---

**Prerequisite Course(s):** None

### **Synopsis**

This course focuses on 4 main skills; reading, writing, listening and speaking and is designed to help students use and understand English for everyday situations. Students will be exposed to topics of personal and professional interests. By the end of the course, students should be able to use English for a wide range of real world situations, converse about familiar topics, narrate and describe reactions as well as write personal letters.

### **References**

1. Abd. Aziz, A., *et al.* (2005). *English for Academic Communication*. Kuala Lumpur: Mc Graw Hill Malaysia.  
Call number: PE1128.A2 .E53 2005
2. Kaur, B., Richards, C., Ratnam, P., Rajaretnam, T. & Kaur, N. (2011). *Text MUET A Strategic Approach*. Petaling Jaya : Pearson Longman.  
Call number: PE1114 .T49 2011
3. Koh, S.L. (2005). *MUET Moments: Malaysia University English Test*. Selangor: Pearson.  
Call number: PE1128 .K63 2005
4. Mohd Don, Z. (2002). *Excel in MUET*. Malaysia: Fajar Bakti.  
Call number: PE1112 .E93 2002
5. Richards, C. (2009). *Longman Text MUET: A Strategic Approach*. Petaling Jaya: Pearson Malaysia  
Call number: PE1128 .K97 2009

## UHB20102 Essential Academic English

---

**Prerequisite Course(s):** UHB10102 English for Higher Education

### **Synopsis**

The course enhances students' English language skills, emphasizing on listening, writing and reading skills necessary for academic contexts. It provides opportunities for students to learn the strategies to help them understand information and develop listening to differentiate between facts and opinions. Besides, it presents opportunities for students to critically respond to video learning materials by producing essays such as descriptive, compare and contrast, as well as cause and effect. Also, this course aims to boost students' confidence in speaking when delivering impromptu speech.

### **References**

1. Fairbairn, G.J, 2011. *Reading, writing and reasoning: A guide for students*. Maidenhead: Open University Press.
2. Lewis, J. 2002. *Reading for Academic Success: reading and strategies*. Boston: Houghton Mifflin.  
Call number: LB2395.3. L48 2002
3. Metcalfe, M. 2006. *Reading Critically at University*. Los Angeles: Sage.  
Call number: LB2395.3. M47 2006.
4. Owen, E, 2010. *Listening in broadcasts, speeches and interviews*. Edinburgh: Edinburgh University Press.
5. Shipside, S. 2007. *Effective Communication: Get your message across and learn how to listen*. London: Dorling Kindersley.  
Call number: HF5718. S54 2007.
6. Smith, L.C. 2005. *Exploring Content 1: Reading for academic success*. White Plains, NY: Longman.  
Call number: PE1122.S64 2004.

## **UHB30102 English For Technical Purposes**

---

**Prerequisite Course(s): UHB20102 Essential Academic English**

### **Synopsis**

This course aims to prepare students with the skills to write documents and express ideas or opinions competently. Students will be equipped with persuasive strategies that can be applied to writing term paper. The course will also enable them to practise these techniques by drafting and collaborating to produce assigned tasks. The students are also expected to orally present their report before an audience.

### **References**

1. Paige, W. (2015). *The least you should know about English: writing skills*. Stamford, CT: Cengage Learning.  
Call number: PE1408 .G43 2015.
2. Randall, V. (2015). *The College writer: a guide to thinking, writing, and researching*. Australia: Wadsworth.  
Call number: PE1408 .C64 2015.
3. Sullivan, N. (2015). *Essential grammar for today's writers, students, and teachers*. New York: Routledge.  
Call number: PE1112. S94 2015.

## **UHB40102 English for Occupational Purposes**

---

**Prerequisite Course(s): UHB30102 English for Technical Purposes**

### **Synopsis**

This course employs a task-based learning approach and focuses on developing students' oral and written communication in job application, job interviews and meetings. Particular emphasis will be given to promote the mastery of self-directed learning, team-work, research, reasoning and creativity. This course also enables students to acquire the knowledge and skills necessary in dealing with the English language demands at the workplace.

### **References**

1. Editors of Socrates. (2015). *Essential Business Letters*. New York, NY: Socrates Media Llc.
2. Samsiah & Rosyati. (2012). *Mastering English for employment*. Malaysia: Cengage Learning Asia Pte Ltd.
3. Shak, P., & Kamlun, K. (2015). *Ready to work: English for employment*. Malaysia: Cengage Learning Asia Pte Ltd.
4. Toh, H. (2017). *Get hired! Modern resume writing & interview techniques*. Malaysia: MPH Group Publishing Sdn Bhd.
5. Wendleton, K. (2014). *Mastering the job interview and winning the game*. (5th Ed.). Boston: Cengage Learning.  
Call number: HF5549.5 .I6.W46.

## **UQI10102 Islamic Studies**

---

**Prerequisite Course(s): None**

### **Synopsis**

This course explains about Islamic concept as ad-deen. It discusses the study of al-Quran and al-Hadith, Sunnism, schools of Islamic theology, development of schools of Fiqh, principles of muamalat, Islamic Criminal Law, Islamic work ethics, issues in Islamic family law and current issues.

## References

1. Abd Shakor dan Lain-lain (2017), Modul Pembelajaran Pengajian Islam (UQ110102/10602), cetakan keenam 2017, Batu Pahat: Penerbit UTHM.
2. Roziah Sidik (2011), Pengajian Islam, Selangor: Oxford Fajar.  
Call number: BP42 .R69 2011
3. Al-Anjari, Fouzi (2013), Al-Asya'irah: Akidah Sebenar Ahli Sunnah Wal Jamaah, Seremban: Creative Publika.  
Call number: BP166.14 .A54 2013
4. Ramli Awang (2013), Akidah Penghayatan Tauhid al-Quran, Johor: Penerbit UTM Press.  
Call number: BP165.5 .R35 2013
5. T. Nama (2013), Pengurusan, Etika Kerja dan Personaliti: Perspektif Islam, Perlis: UMP.  
Call number: BP190.5.M28 .P46 2013
6. Mohd Fauzi Mohd Amin (2011), Pemerkasaan Fardhu Kifayah berteraskan al-Quran dan al-Sunnah, Negeri Sembilan: USIM.  
Call number: BP130.8 .P45 2011
7. Azzam, Abdul Aziz Muhammad (2010), Fiqh Muamalat: Sistem Transaksi dalam Fiqh Islam, Jakarta: Amzah.  
Call number: BP158.C59 .A99 2010

---

## UQ110202 Moral Studies

**Prerequisite Course(s):** None

### Synopsis

This course explains on concepts of moral, aspects of moral and its importance in daily lives, Western moral theories and moral values of great religions of the world, moral values in work and current moral issues.

### References

1. Eow Boon Hin (2008), Moral Education. Shah Alam: Longman.  
Call number: LC268.E48 2008
2. Ahmad Khamis (1999), Etika Untuk Institusi Pengajian Tinggi, Kuala Lumpur: Kumpulan Budiman.  
Call number: LC315.M3.A35 1999
3. Mohd Nasir Omar (1992), Falsafah Etika: Perbandingan Islam dan Barat, Kuala Lumpur: JPM.  
Call number: BJ1291 .M53 1992

---

## UHB10402 Arabic Communication 1

**Prerequisite Course(s):** None

### Synopsis

This course is designed for students to learn the basic of Arabic. Students are exposed to the skills of listening, reading, speaking and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Arabic.

### References

1. Nurulisyazila Othaman; Abu Hanifa Abu Mukhtar; Nurul Sabrina Zan; Idayu NurIllyana Daud; Idayu NurIllyani Daud. 2017. *Bahasa Arab Tahap 1*. Batu Pahat: Penerbit UTHM.
2. Mohd Hisyam bin Abdul Rahim. 2005. *Senang Berbahasa Arab*. Batu Pahat: Penerbit KUITTHO.  
Call number: PJ6115 .M44 2005 a



3. Ab. Halim Mohammed; Rabiyyah Hajimaming; Wan Muhammad Wan Sulong. 2007. *Bahasa Arab Permulaan*. Serdang: Penerbit UPM. (PJ6065 .A32 2007).
4. Fuad Ni'mat. 1973. *Mulakhas qawa'id al-lughatul 'arabiyyah*. Damsyik: Darul Hikmah. Call number: PJ5161 .F62 1973
5. Abdullah, Mustaffa Siti Rohaya Sarnap Siti Sujinah Sarnap. 2006. *Cara mudah belajar Bahasa Arab*. Singapore: Jahabersa. Call number: PJ6106 .A22 2006
6. Abu 'Amiir 'Izzat. 2008. *Kamus adik: bahasa Melayu-bahasa Inggeris-bahasa Arab*. Kuala Terengganu: Pustaka Darul Iman Call number: PJ6640 ABU 2008
7. Mohd Azani Ghazali, Abdul Aziz Hassan @ Yahya. 2000. *Kamus ringkas Bahasa Melayu-Bahasa Arab*. Johor Bahru: Jahabersa. (PL5091.8 .A7 .M393 2000 rd) Chanson, H. (2004). *The Hydraulics of Open Channel Flow: An Introduction*. Amsterdam: Elsevier. Call number: TC175 .C42 2004

### **UHB10502 French Communication 1**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn the basic of French. Students are exposed to the skills of listening, reading, speaking and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using French.

#### **References**

1. Junainah binti Tarmidi, 2019. *Module de Communication Française 1*. Parit Raja, Batu Pahat: Penerbit UTHM
2. Junainah binti Tarmidi, 2016. *Module de Français Niveau 1*. Parit Raja, Batu Pahat: Penerbit UTHM.
3. Booth, Trudie Maria, 2008. *French Verbs Tenses*. Mc Graw-Hill.
4. Heminway, Annie, 2008. *Complete French Grammar*. Mc Graw-Hill. Call number: PC2112, H45 2008
5. Hatier, 1995. *Le Nouveau Bescherelle Complete Guide 12 000 French Verbs*. Paris: LIBRAIRIE HATIER.
6. Kaneman-Pougatch, Massia et al, 1997. *Méthode de français: Café Crème 1*. Paris: HACHETTE F.L.E.
7. Grégoir, Maïa et al, 1995. *Grammaire Progressive du Français avec 500 exercices*. Paris: CLE International.
8. Capelle, Guy et Gidon, Noëlle, 1995. *Méthode de français: Le Nouvel Espaces 1*. Paris: HACHETTE F.L.E.

### **UHB10602 Spanish Communication 1**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn basic Spanish. Students are exposed to listening, reading, speaking, and writing skills with basic vocabulary, grammar and sentence structure. Students are also exposed to real daily situations which will help them to communicate using Spanish.

#### **References**

1. Nurul Sabrina Zan. (2016). UWB11102 La lengua espanola –Nivel 1. 2nd Edition, Batu Pahat: Penerbit UTHM. 10-0150.

2. Nurul Sabrina Zan, (2010). *Hola! Hablo español* First Edition Batu Pahat: Penerbit UTHM. Call number: PC4445 .N72 2010a
3. Salina Husain, (2005). *Vamos a aprender español lengua extranjera* Batu Pahat: Penerbit UTHM. Call number: PC4121 .S24 2005a
4. Maria Angeles Palomino. (2017). *¿Español? ¡Porsupuesto!*, Edelsa Grupo Didascalía, S.A.
5. Alejandro B.T, Esther D.M & Miguel S.R.O. (2010) *El Cronometro Nivel 1 A1*. Edinumen Madrid.

---

## UHB10702 German Communication 1

**Prerequisite Course(s):** None

### Synopsis

This course is designed for students to learn the basic German language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using German.

### References

1. Vaic, N. (2018, October 02). German Definite Articles Der, Die, and Das: Everything You Need to Know. Retrieved July 02, 2019, from <https://www.clozemaster.com/blog/german-definite-articles/>.
2. Flippo, H. (2019, February 02). How Do You Translate the World's Countries From English to German? Retrieved July 01, 2019, from <https://www.thoughtco.com/countries-of-the-world-index-4101906>.
3. Luscher, R, & Stevens, J (2011) *Deutsch ganz leicht A1: Selbstlernkurs Deutsch für Anfänger: Zweisprachiges Arbeitsbuch = A german self-study course for beginners: Bilingual workbook*. Ismaning, Regensburg: Hueber Verlag.
4. Swick, E. (2007). *German vocabulary: Practice makes perfect*. New York, USA: McGraw-Hill. Doi: 10.1036/0071482857.
5. Amir Hamzah, N. Z. (2007). *Guten Tag! Der deutschen Sprachen (Modul Pembelajaran)*. Johor.
6. Niebisch, D. (2006). *Schritte 1 international: Kursbuch Arbeitsbuch*. Ismaning, Deutschland: Hueber Verlag.
7. Henschel, A. (2006). *German verb tenses*; New York, NY: McGraw-Hill.

---

## UHB10802 Japanese Communication 1

**Prerequisite Course(s):** None

### Synopsis

This course is designed for students to learn the basic Japanese language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Japanese.

### References

1. Rosmahalil dan rakan-rakan, (2014): UWB10802: Hiragana Learning Module, Batu Pahat: Penerbit UTHM.
2. Siti Hajar Bidin dan rakan-rakan, (2016): Japanese Language Level 1 (UWB10802): Learning Module, Batu Pahat: Penerbit UTHM.
3. Rosmahalil Azrol Abdullah, (2008): Bahasa Jepun (UMJ 1312): Learning Module (2nd Edition), Batu Pahat. Penerbit UTHM. Call number: PL539.3 .R67 2008a

4. Surie, Network (2010). *AE Minna no Nihongo 1-2 Elementary: Translation and Grammatical Notes*, Tokyo: 3A Corporation.  
Call number: PL539.3 .M57 2010
5. Surie, Network (2010). *AE Minna no Nihongo 1-1 Elementary: Main Textbook*, Tokyo: 3A Corporation.  
Call number: TK7885.7 .V44 2000r
6. Surie, Network (2009). *AE Minna no Nihongo 1-1 Elementary: Translation and Grammatical Notes*, Tokyo: 3A Corporation.  
Call number: PL539.3 .M567 2009
7. Surie, Network (2009). *AE Minna no Nihongo 1-2 Elementary: Main Textbook*, Tokyo: 3A Corporation.  
Call number: PL539.3 .M569 2009

---

### **UHB10902 Mandarin Communication 1**

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn the basic of Mandarin. Students are exposed to the skills of listening, reading, speaking and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Mandarin.

#### **References**

1. Lim Hong Swan, Yeoh Li Cheng, 2010. *Mandarin Made Easy Through English*. Batu Pahat: Penerbit UTHM.  
Call number: PL1129.E5.L554 2009 a
2. Liping Jiang, (2006). *Experiencing Chinese*. China: Higher Education Press.  
Call number: PL1129.E5 .T59 2006
3. Kang Yuhua, (2005). *Conversational Chinese 301*. China: Beijing Language and Culture University Press.  
Call number: PL1121.C5 .K36 2005
4. Kang Yuhua, (2007). *Conversational Chinese 301:Vol. 2*. China: Beijing Language and Culture University Press.  
Call number: PL1121.C5 .K364 2007
5. Liu Xun, (2010). *New Practical Chinese Reader: textbook*. China: Beijing Language and Culture University Press.  
Call number: PL1129.E5 .L58 2010

---

### **UHB11002 Malay Language**

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn the basic Malay language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Malay language.

#### **References**

1. Ainun Mohd (2011). *Tesaurus Bahasa Melayu*. PTS Professional Publishing.  
Call number: PL5123 .A364 2011

2. Kamaruddin Saad (2009). *105 karangan bahasa melayu UPSR*. Minerva Publishing. Call number: PL 5108 KAM 2009
3. Nik Safiah Karim (2008). *Tatabahasa Dewan*. Call number: DBP. PL5108 .T37 2008 r
4. Asmah Hj. Omar (1993). *Susur Galur Bahasa Melayu*. Call number: DBP: KL. PL5127 .A85 1993 N1
5. Asmah Hj. Omar (1993). *Nahu Melayu Mutakhir*. Call number: DBP: KL. PL5137 .A85 1993
6. Asmah Hj. Omar (1985). *Kamus Ayat*. Eastview. Call number: PL5091 .A85 1985 rd

---

### **UHB11102 Korean Communication 1**

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn basic Japanese. Students are exposed to listening, reading, speaking, and writing skills with basic vocabulary, grammar and sentence structure. Students are also exposed to real daily situations which will help them to communicate using Korean.

#### **References**

1. Henry J. Amen IV, Kyubyong Park, 2010. *Korean for Beginners: Mastering Conversational Korean*. North Clarendon: Tuttle Publishing.
2. Laura Armitage, 2015. *Let's Learn Korean Kit: 64 Basic Korean Words and Their Uses*. North Clarendon: Tuttle Publishing.
3. Fuchs, Carl, (2001): *Korean Made Nice & Easy!* Piscataway, NJ: Research & Education Association.
4. Rou, Seng Yoan, (2004): *Bahasa Korea, Bangi*: Penerbit UKM.
5. Sang-Oak Lee (1999): *Korean Through English*, Elizabeth, NJ: Hollym.

---

### **UHB11202 Thai Communication 1**

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed for students to learn basic Thai language. Students are exposed to listening, reading, speaking, and writing skills with basic vocabulary, grammar and sentence structure. Students are also exposed to real daily situations which will help them to communicate using Thai language.

#### **References**

1. Henry J. Amen IV, Kyubyong Park, 2010. *Thai for Beginners: Mastering Conversational Thai*. North Clarendon: Tuttle Publishings
2. Laura Armitage, 2015. *Let's Learn Thai Kit: 64 Basic Thai Words and Their Uses*. North Clarendon: Tuttle Publishing.
3. Fuchs, Carl, (2001): *Thai Made Nice & Easy!* Piscataway, NJ: Research & Education Association.
4. In-Seok Sim, (1996): *Colloquial Thai: The Complete Course For Beginners*, London: Routledge.
5. Rou, Seng Yoan, (2004): *Bahasa Korea, Bangi*: Penerbit UKM.
6. Sang-Oak Lee (1999): *Thai Through English*, Elizabeth, NJ: Hollym.

## **UHB11302 Javanese Communication 1**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course is designed for students to learn the basic Javanese language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Javanese.

### **References**

1. Majendra, Maheswara (2010). Kamus lengkap Indonesia-Jawa, Jawa-Indonesia/ Majendra Maheswara. Pustaka Mahardika.  
Call number: XX (131732.1)
2. Yrama, Widya (2008). Cara belajar membaca dan menulis huruf jawa, jilid 1 . Yrama Widya. Publication info:, 2008  
Call number: XX (131738.1)
3. Yrama, Widya (2008). Cara belajar membaca dan menulis huruf jawa, jilid 2. Yrama Widya .Publication info:, 2008  
Call number: XX (131739.1)
4. Budhi Santosa, Iman (2010). Nguri-uri paribasan Jawi = Melestarikan peribahasa Jawa. Intan Pariwara.  
Call number: XX (131751.1)
5. Purwanto, Eko (2011). Pepah Bahasa Jawi. Cara mudah belajar cepat dan tuntas bahasa Jawa. Diva press.  
Call number: XX (131748.1)

## **UQU10103 Nationhood and Current Development of Malaysia**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course will provide students a fundamental concept, the processes of formation and development of Malaysia. The topics covered include the concept of state, Malacca Kingdom, implication of imperialism and colonization, spirit of patriotism and nationalism, independence and formation of Malaysia. Besides, students will also be exposed to the constitution of Malaysia, Malaysian Government System, Economic and Social Development Policy as the main policy in the national development. At the end of the course students will able to appreciate the roles and responsibilities of a good citizen to the country.

### **References**

1. Zahrul Akmal Damin, Fauziah Ani, Lutfan Jaes, Khairunesa Isa, Siti Sarawati Johar, Harliana Halim, Khairul Azman Mohd Suhaimy, Shamsaadal Sholeh Saad, Ku Hasnan Ku Halim dan Mohd Akbal Abdullah (2009). Kenegaraan & Pembangunan Malaysia. Batu Pahat: Penerbit UTHM.
2. Ruslan Zainudin, Mohd Mahadee Ismail & Zaini Othman. (2005). Kenegaraan Malaysia. Shah Alam: Fajar Bakti.  
Call number: JQ715 .R87 2005
3. Nazaruddin Mohd Jali, Ma'rof Redzuan, Asnarulkhadi Abu Samah & Ismail Mohd Rashid. (2005). Pengajian Malaysia. Petaling Jaya: Prentice Hall.  
Call number: DS596.6 .P46 2001 N2
4. Mohd Ashraf Ibrahim. (2004).Gagasan Bangsa Malayan yang Bersatu 1945-57. Bangi: Penerbit UKM.  
Call number: DS597 .M37 2004

5. Noor Aziah Mohd Awal. (2003). *Pengenalan kepada Sistem Perundangan di Malaysia*. Petaling Jaya: International Law Book Services.  
Call number: KPG68 .N66 2003

### **UQU10303 Malaysian Studies and Culture**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course will provide students in basic understanding of Malaysia from various perspectives. Topics to be discussed include Malaysia in relation to its history, achievement and international affairs. In addition, students will also be exposed to the ethnic composition of the country, culture and heritage. Teaching and learning process enables student to acquire knowledge and appreciates the reality of life in Malaysia through experiential learning.

#### **References**

1. Abdul Halim Nasir. (2004). *Mosque Architecture in the Malay World*. Bangi: Penerbit Universiti Kebangsaan Malaysia.  
Call number: NA4670 .A23 2004
2. Nazaruddin Mohd. Jali. (2003). *Malaysian Studies: Nationhood and Citizenship*. Petaling Jaya: Pearson Prentice Hall.
3. Francis Loh kok Wah dan Khoo Boo Teik. (2002). *Democracy in Malaysia*. Cornwall: Curzon Press.
4. Khoo Kay Kim. (2001). *Malay Society: Transformation and Democratisation*. Kelana Jaya: Pelanduk Publications.
5. Yahaya Ismail. (1989). *The Cultural Heritage of Malaysia*. Kuala Lumpur: Dinamika Kreatif Sdn. Bhd.
6. Andaya, B.W. and Andaya, L. Y. (1982). *A History of Malaysia*. London: Macmillan.  
Call number: DS596 .A52 2001
7. Mohamed Noordin Sopiee. (1974). *From Malayan Union to Singapore Separation, Political Unification in the Malaysian Region, 1945-65*. Kuala Lumpur: University of Malaya Press.  
Call number: DS597 .M56 2005

### **UQI11202 Phylosophy and Current Issues**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course encapsulates philosophical relation to National Education Philosophy and the Rukun Negara. The use of philosophy as a tool to purify the culture of thought in life through the arts and methods of thinking and human concepts. The main topics in philosophy, namely epistemology, metaphysics and ethics, are discussed in the context of current issues. Emphasis is given to philosophy as a basis for intercultural dialogue and to foster universal values. At the end of the course, students should be able to view the disciplines of knowledge as a whole and interdependent body of knowledge.

#### **References**

1. Al-Attas, S.M. Naquib. (1991). *The Concept of Education in Islam*. Kuala Lumpur: ISTAC.
1. Nazaruddin Mohd. Jali. (2003). *Malaysian Studies: Nationhood and Citizenship*. Petaling Jaya: Pearson Prentice Hall.
2. Al-Farugi, I.R. (1994). *Al-Tawhid: Its Implications for Thought and Life*, (2nd Ed.). Herndon: IIIT.
3. Phillips, D.C. (Ed.) (2014). *Encyclopaedia of Educational Theory and Philosophy*, (1st Ed.). SAGE Publication.
4. Dzulkifli, A.R. & Rosnani, H. (2019) *Pentafsiran Baharu Falsafah Pendidikan Kebangsaan dan Pelaksanaannya Pasca 2020*. Kuala Lumpur: IIUM Press.
5. Hospers, J. (1997). *An Introduction to Philosophical Analysis*, (4th Ed.). London: Routledge.

6. Mitchell, H.B. (2011). *Roots of Wisdom: A Tapestry of Philosophical Traditions*, (6th Ed.). Wadsworth: Cengage Learning.
7. Osman Bakar. (1999). *The Classification of Knowledge in Islam*. Cambridge, U.K.: The Islamic Texts Society.
8. Rosnani Hashim. (2017). *Revitalization of Philosophy and Philosophical Inquiry in Muslim Education*. Kull of Education, IIUM.

## **UQU10702 Appreciation of Ethics and Civilization**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course explains the ethical concepts from the perspective of different civilizations. The course also aims to identify system, the level of development, advancement and culture in strengthening social cohesion. Besides, discussion on the contemporary issues in the aspects of economy, politic, social, culture and environment from an ethical and civilization perspectives can produce students who are morally and professionally.

### **References**

1. Shamsul Amri Baharuddin. (2012). *Modul Hubungan Etnik Edisi Dua*. Bangi: Institut Kajian Etnik. Universiti Kebangsaan Malaysia. [DS595 .M62 2007]. Al-Farugi, I.R. (1994). *Al-Tawhid: Its Implications for Thought and Life*, (2nd Ed.). Herndon: IIIT.
2. Dworkin, A.G. (1999). *The minority report: An introduction to racial, ethnic and gender relations*. Fort Worth: Harcourt Barce College Pub.  
Call number: E184.A1 .M56 1999
3. Wan Hashim Wan Teh. (2011). *Hubungan Etnik di Malaysia*. Kuala Lumpur: ITNM.  
Call number: DS595.W36 2011
4. Zaid Ahmad. (2010). *Hubungan Etnik di Malaysia*. Oxford Fajar: Shah Alam.  
Call number: DS595 .H822010
5. Holst, F. (2012). *Ethnicization and identity construction in Malaysia*. New York: Routledge.  
Call number: DS595 .H64 2012 v. 12
6. Mohd. Ashraf Ibrahim. (2004). *Gagasan Bangsa Malayan yang Bersatu 1945-57*. Bangi: Penerbit UKM.  
Call number: DS597.M37 2004

## Synopsis of Faculty Courses

### **BWU10102 Entrepreneurship**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course introduces students to the theory of entrepreneurship and its practical implementation. It focuses on different stages related to the entrepreneurial process, including business model innovation, formation and registration of business, organizational management for business start-up, marketing management and financial planning as well as strategies that improve performance of new business ventures. This course also provides of theoretical exploration as well as case studies of real-world examples and guest lectures. Upon completion, students will develop an understanding of successes, opportunities and risks of entrepreneurship. Students will also develop skills in written business communication and oral presentations that allow students to integrate entrepreneurship concepts and interact with business experts.

#### **References**

1. Byers and Thomas H. (2019). Technology ventures from idea to enterprise. New York: McGraw-Hill Education  
Call number: HC79.I55 .T46 2019
2. Josiah G and Chiqui, E.G. (2018). Entrepreneurship Starting an Enterprise Having an Innovation Mindset. Rexstore.
3. Ariffin, S, Hamidon, S (2017). Introduction to Entrepreneurship. Oxford Fajar, Kuala Lumpur.
4. Donald, F.K. (2016). Entrepreneurship (Theory, Process, Practice).10th Edition. South-Wester College Pub.
5. Hess, Frederick M. (2016). Educational entrepreneurship today. Massachusetts: Harvard Education Press  
Call number: LA217.2 .E38 2016
6. Sangeeta, S. (2016). Entrepreneurship Development, PHI Learning Private Limited.

### **BWU10202 Creativity and Innovation**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course focuses on developing a creative person who will eventually think strategically, creatively and critically. The knowledge and skills acquired throughout the course will later be applied by the students in solving problems and making decisions in the future. In this course, students will be exposed to various creativity and problem solving techniques. Some of the skills to be covered throughout the course are problem solving, techniques in creativity and techniques in innovation

#### **References**

1. De Bono, E. 2003. Serious Creativity 1: Lateral Thinking Tools, Techniques and Application. Allscript Books, Singapore. Call number: BF408 .D366 2003.
2. Bernacki, E. 2002. Wow! That's a Great Idea!. Prentice Hall, Singapore. Call number: HD53 .B47 2002.
3. Sherwood, D. 2001. Smart Things to Know about Innovation and Creativity. Capstone Oxford. Call number: HD53 .S53 2001.
4. Ceserani, J. and Greatwood, P. 2001. Innovation and Creativity. Creast Publishing House, New Delhi. Call number: HD58.8 .C47 2001.



## **BWU10302 Occupational Safety and Health**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course introduces students to knowledge and skills in occupational safety and health in workplace. Scope of study includes Health, Safety and Environment Managements: introduction to OSH, OSHA 1994 (Act 514), FMA 1967, EQA 1974, occupational safety and health management system, safety, health and environment culture; Risk Management and Assessment: introduction to risk management, risk assessment techniques, HIRARC; Physical Injury & Controls: introduction to physical injury, construction work, electrical work, mechanical work, chemical work; Health Hazards: introduction to health hazards & hygiene, chemical hazards, physical hazards, biological hazards, hygiene; Accident Investigation & Reporting: introduction, accident investigation, investigations and causes of incident, incident analysis and data collection method.

### **References**

1. Burke, Ronald J (2011). Occupational health and safety. Burlington, VT: Gower, 2011.  
Call number: RC967 .O32 2011.
2. Friend, Mark A (2014). Fundamentals of occupational safety and health. Lanham: Berman Press, 2014.  
Call number: T55 .F74 2014.
3. Kelloway, E. Kevin (2011). Management of occupational health and safety. Toronto: Nelson Education, 2011.  
Call number: JQ5349.H39 .K44 2011.
4. Davies, V. J. and Tomasin K. (2006). Construction Safety Handbook. 2nd ed. London: Thomas Telford.  
Call number: TH443.R43 2006.
5. Anton, Thomas J. (2009). Occupational Safety and Health Management. 3rd ed. New York: McGraw-Hill.  
Call number: T55.A57 1989.

## Synopsis of Programme Core Courses

### **BWK10103    Physical Chemistry**

---

**Prerequisite Course(s):** None

#### **Synopsis**

The aim of this course is to provide understanding the fundamentals of chemical thermodynamics and equilibrium involving gases, liquids and solutions, analysis of phase equilibrium, and kinetics of the reactions. The delivery methods throughout the courses include lectures, discussion and assignment. The communications and problem solving skills will be developed during the course.

#### **References**

1. Peter Atkins, Julio de Paula and James Keeler. 2018. Atkins' Physical Chemistry 11th Edition ISBN 9780198769866
2. Abdulsalam, Mohammed I. 2016. Applied Physical Chemistry ISBN 9781682511053 (QD453.2.A66 2016)
3. Thomas Engel and Philip Reid. 2018. Thermodynamics, Statistical Thermodynamics, and Kinetics 4th Edition ISBN 9780134804583
4. Nivaldo J Tro. 2016. Chemistry: A Molecular Approach 4th Edition ISBN 9780134112831
5. Nivaldo J Tro. 2015. Principal of Chemistry : A Molecular Approach 3rd Edition ISBN 9780321971944
6. Thomas Engel and Philip Reid. 2018. Quantum Chemistry and Spectroscopy 4th Edition ISBN 9780134804590

### **BWK10203    Inorganic Chemistry I**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course is designed to introduce students to fundamental principles underpinning inorganic chemistry. The course will give detailed consideration to theories of atomic structure, the nature of bonding in molecules and inorganic complexes as well as chemical equilibrium and chemical kinetics. This course is aim to provide a fundamental knowledge for the vast industrial applications in relevent industries.

#### **References**

1. Pfennig, Brian W. 2015. Principles of Inorganic Chemistry ISBN 9781118859100 (QD151.3 .P43 2015)
2. Catherine Housecroft and Alan G. Sharpe. 2018. Inorganic Chemistry 5th Edition ISBN 9781292134147
3. Mark Weller, Tina Overton, Jonathan Rourke and Fraser Armstrong 2018. Inorganic Chemistry 7th Edition ISBN 9780198768128
4. Wai-Kee Li, Hung Kay Lee, Dennis Kee Pui Ng, Yu-San Cheung, Kendrew Kin Wah Mak, and Thomas Chung Wai Mak. 2018. Problems in Structural Inorganic Chemistry 2nd Edition ISBN 9780198823902
5. Mark T. Weller and Nigel A. Young. 2017. Characterisation Methods in Inorganic Chemistry ISBN 9780199654413

### **BWK10303    Organic Chemistry I**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course provides students with fundamental knowledge on the structure, properties, and reactions of hydrocarbons compounds. Topics include carbon compounds, alkanes and cycloalkanes, alkynes and alkenes, alcohols and ethers, alkyl halides, stereochemistry and Infrared and UV- VIS Spectroscopy. In order to emphasize the importance of organic chemistry in industrial application, the course also include a study on the interpretation of spectroscopic data of organic compounds. The delivery methods throughout this course include lectures, assignments and project. The communication and leadership skills will be developed through group discussion via project.

#### References

1. Mukherjee. A. 2018. Integration of Fundamental Organic Chemistry with Green Chemistry: A Laboratory Manual. Alpha Science International, Limited. ISBN 9781783323982
2. Biltz, H., Biltz, W. 2017. Laboratory Methods of Inorganic Chemistry. BiblioBazaar. ISBN 9781358649752.
3. Isac-Garcia, Joaquin. 2016. Experimental organic chemistry : laboratory manual. London : Academic Press, 2016 (QD261 .E96 2016)
4. Kriz, G. L. 2015. A Microscale Approach to Organic Laboratory Techniques.
5. Seager, S. L. 2014. Chemistry for Today : General, Organic, and Biochemistry. Belmont, CA : Cengage Learning. (QD31.3 .S42 2014)
6. Vladimir, H. 2014. Natural Products Analysis : Instrumentation, Methods, and Applications. QD75.22 .N37 2014

---

### **BWK10402    Chemistry Laboratory I**

**Prerequisite Course(s): Calculus**

#### Synopsis

This course will help students to further understand the theory of organic and inorganic chemistry in BWK 10203 and BWK10303. It introduces the laboratory techniques, and experiments demonstrating principles of inorganic and organic chemistry laboratory including preparation of solutions, solubility properties, classification of elements, reactions, standardisation reaction, determination of melting point, purifying process, separation and extraction, and determination of unknown. Scientific and teamwork skills will be developed during the course in the form of practical and lab report.

#### References

1. Mukherjee. A. 2018. Integration of Fundamental Organic Chemistry with Green Chemistry: A Laboratory Manual. Alpha Science International, Limited. ISBN 9781783323982
2. Biltz, H., Biltz, W. 2017. Laboratory Methods of Inorganic Chemistry. BiblioBazaar. ISBN 9781358649752
3. Isac-Garcia, Joaquin. 2016. Experimental organic chemistry : laboratory manual. London : Academic Press, 2016 (QD261 .E96 2016)
4. Kriz, G. L. 2015. A Microscale Approach to Organic Laboratory Techniques.
5. Seager, S. L. 2014. Chemistry for Today : General, Organic, and Biochemistry. Belmont, CA : Cengage Learning. (QD31.3 .S42 2014)
6. Vladimir, H. 2014. Natural Products Analysis : Instrumentation, Methods, and Applications. QD75.22 .N37 2014

---

### **BWK10503    Inorganic Chemistry II**

**Prerequisite Course(s): None**

#### Synopsis

This course provides a systematic presentation of the chemical elements, coordination and organometallic chemistry. Its aim is to give a comprehensive and contemporary knowledge which correlates the inorganic logic and knowledge to the industrial landscape. Through this course students are expected to be able to communicate effectively in written and oral form through group discussion. Problem solving and lifelong learning skills will be developed during the course.

#### References

1. Pfennig, Brian W. 2015. Principles of Inorganic Chemistry ISBN 9781118859100 (QD151.3 .P43 2015)
2. Catherine Housecroft and Alan G. Sharpe. 2018. Inorganic Chemistry 5th Edition ISBN 9781292134147
3. Mark Weller, Tina Overton, Jonathan Rourke and Fraser Armstrong 2018. Inorganic Chemistry 7th Edition ISBN 9780198768128
4. Wai-Kee Li, Hung Kay Lee, Dennis Kee Pui Ng, Yu-San Cheung, Kendrew Kin Wah Mak, and Thomas Chung Wai Mak. 2018. Problems in Structural Inorganic Chemistry 2nd Edition ISBN 9780198823902
5. Mark T. Weller and Nigel A. Young. 2017. Characterisation Methods in Inorganic Chemistry ISBN 9780199654413

---

#### **BWK10503    Inorganic Chemistry II**

**Prerequisite Course(s):** Inorganic Chemistry I

#### **Synopsis**

This course provides a systematic presentation of the chemical elements, coordination and organometallic chemistry. Its aim is to give a comprehensive and contemporary knowledge which correlates the inorganic logic and knowledge to the industrial landscape. Through this course students are expected to be able to communicate effectively in written and oral form through group discussion. Problem solving and lifelong learning skills will be developed during the course.

#### References

1. Pfennig, Brian W. 2015. Principles of Inorganic Chemistry ISBN 9781118859100 (QD151.3 .P43 2015)
2. Catherine Housecroft and Alan G. Sharpe. 2018. Inorganic Chemistry 5th Edition ISBN 9781292134147
3. Mark Weller, Tina Overton, Jonathan Rourke and Fraser Armstrong 2018. Inorganic Chemistry 7th Edition ISBN 9780198768128
4. Wai-Kee Li, Hung Kay Lee, Dennis Kee Pui Ng, Yu-San Cheung, Kendrew Kin Wah Mak, and Thomas Chung Wai Mak. 2018. Problems in Structural Inorganic Chemistry 2nd Edition ISBN 9780198823902
5. Mark T. Weller and Nigel A. Young. 2017. Characterisation Methods in Inorganic Chemistry ISBN 9780199654413

---

#### **BWK10603    Organic Chemistry II**

**Prerequisite Course(s):** Organic Chemistry I

#### **Synopsis**

This course provides students with further knowledge on aromatic and heterocyclic compounds, Carbonyl compounds, Amines and Amides, Carboxylic Acid & Derivatives, Reaction Mechanisms. In order to emphasize the importance of organic chemistry in industrial application, the course also includes a study on the identification of the compounds using methods of IR spectroscopy, NMR and MS. The delivery methods throughout the courses

include lectures and SCL group work. Problem solving and lifelong learning skills will be developed during the course.

#### References

1. Solomons, T.W.G. 2016. Organic Chemistry. ISBN 9781119248972. (QD251 .S64 2016)
2. Carey, Francis A. 2017. Organic Chemistry. ISBN 9780073511214. (QD251.3 .C37 2017).
3. Elnagdi, M. H., Sadek, K. U., & Mekheimer, R. A. (2018). Spectroscopic Identification of Organic Molecules: WORLD SCIENTIFIC.

---

### **BWK10703 Instrumental Analysis**

**Prerequisite Course(s):** None

#### Synopsis

This course aims to focus on the introduces quantitative analysis in chemistry using both classical wet techniques and modern instrumentation with a focus on statistical analysis. Topics include are the basic tools of analytical chemistry, principles and application of chemical equilibrium systems in quantitative analysis, sampling techniques and types of samples, chromatography, molecularoptical spectroscopy and spectroscopy spectroscopy. The delivery methods throughout the courses include lectures, assignment and discussion and assess through quiz, test, final exam, assignment report and presentation. The course emphasizes the data collection and data analysis from analytical technique measurement effectively.

#### References

1. Douglas A. Skoog, F. James Holler, Stanley R. Crouch. 2016. Principles of Instrumental Analysis 7th edition. ISBN: 978-1-305-57721-3
2. Justyna P-W, Jacek. N. 2019. Green Analytical Chemistry: Past, Present and Perspectives. ISBN: 978-9811391040
3. Charan, D.D. 2017. Analytical Chemistry. Second Edition, PHI Learning Private Limited.
4. Hussain, C.M. 2019. Handbook of Nanomaterials in Analytical Chemistry: Modern Trends in Analysis. Elsevier.
5. Miguel, N. 2019. Analytical Chemistry. Larsen & Keller Education.

---

### **BWK10802 Chemistry Laboratory II**

**Prerequisite Course(s):** None

#### Synopsis

This course will help students to further understand the theory of organic and inorganic chemistry in BWK 10203 and BWK10303. The experiments include titration, preparation and determination of complexes. For organic part includes experiments on separation, distillation and dehydration. Scientific and teamwork skills will be developed during the course in the form of practical and lab report.

#### References

1. Mukherjee. A. 2018. Integration of Fundamental Organic Chemistry with Green Chemistry: A Laboratory Manual. Alpha Science International, Limited. ISBN 9781783323982
2. Biltz, H., Biltz, W. 2017. Laboratory Methods of Inorganic Chemistry. BiblioBazaar. ISBN 9781358649752
3. Isac-Garcia, Joaquin. 2016. Experimental organic chemistry : laboratory manual. London : Academic Press, 2016 (QD261 .E96 2016)
4. Kriz, G. L. 2015. A Microscale Approach to Organic Laboratory Techniques.

5. Seager, S. L. 2014. Chemistry for Today : General, Organic, and Biochemistry. Belmont, CA : Cengage Learning. (QD31.3 .S42 2014)
6. Vladimir, H. 2014. Natural Products Analysis : Instrumentation, Methods, and Applications. QD75.22 .N37 2014

---

**BWK20103     Material Science and Technology**

---

**Prerequisite Course(s):** None

**Synopsis**

This course introduces the types, classification, properties, processing and application of materials. Topics include are solid state chemistry, metals and alloys, ceramics, polymers and advanced materials. The delivery methods throughout the courses include lectures, practical and discussion and assess through various quiz, test, final exam, individual observation and presentation. Upon completion, students should be able to gain knowledge of materials science and technology in order to expose students to the current scenario in materials industries.

**References**

1. Gupta, A. 2016. Material Science for Engineers. CBS Publishers (TA403.6.G87 2016)
2. Castiglioni, C. and Milani, A. 2017. Introduction to Materials Science. McGraw-Hill Education.
3. Shackelford, J.F. 2015. Introduction to Materials Science for Engineers. Pearson Education Limited.
4. Marikani, A. 2017. Materials Science. PHI Learning Pvt. Ltd.
5. Brostow, W., Haley E. and Lobland, H. 2017. Materials: Introduction and Applications. John Wiley & Sons, Inc.

---

**BWK20203     Industrial Chemistry**

---

**Prerequisite Course(s):** None

**Synopsis**

This course aims to approach the advance issue related to industrial chemistry. This course also explains the operational management in industry, protection of intellectual properties and correlating fundametal knowledge on thermodynamis and kinetics upon development of economically acceptable and benign products. The delivery methods include lectures, practical and discussion and assessment method are quiz, test, final exam, observation, assignment report and presentation. Communication skills will be developed during this course.

**References**

1. Kroos, Kenneth A. 2015. Thermodynamics for engineers. SI ed, Stamford, CT : Cengage Learning.(TJ265 .K764 2015)
2. Maiti, J., Ray, Pradip Kumar. 2018. Industrial safety management : 21st century perspectives of Asia.Singapore : Springer. (T55 .I528 2018)
3. Jürgen Gmehling, Michael Kleiber, Bärbel Kolbe, Jürgen Rarey. 2019. Chemical Thermodynamics for Process Simulation. Wiley-VCH.
4. Sultan Al-Salem. 2018. Plastics to Energy: Fuel, Chemicals, and Sustainability Implications. William Andrew Applied Science Publisher : Elsevier.
5. Cantwell, J., Takabumi Hayashi. 2019. Paradigm Shift in Technologies and Innovation Systems. Springer. ISBN 978-981-32-9350-2

---

**BWK20303     Statistics in Chemistry**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course is aimed to expose students with statistical tools and analyses related to theoretical chemistry and chemical industry. Topics will include are Introduction to Statistics, Statistics of Repeated Measurement, Significance Tests, The Quality of Analytical Measurement, Calibration and Instrumental Analysis and Non-parametric and Robust Methods. This course is delivered by lecture and assignment task. Problem solving and teamwork skills will be developed in this course. The collected experimental data will be analysed, validated and presented using statistical tools and method.

### **References**

1. Burdick, R.K., LeBlond, D.J., Pfahler, L.B., Quiroz, J., Sidor, L., Vukovinsky, K., Zhang, L. 2017. Statistical Applications for Chemistry, Manufacturing and Controls (CMC) in the Pharmaceutical Industry. Springer International Publishing.
2. Matthias, O. 2017. Chemometrics Statistics and Computer Application in Analytical Chemistry. ISBN: 978-3-527-34097-2
3. Christian, H., Michael S., and Shalabh. 2016. Introduction to Statistics and Data Analysis : With Exercises, Solutions and Applications in R. ISBN: 978-3-319-46162-5
4. Roxy, P., Chris, Olsen, Jay, L.D. 2015. Introduction to Statistics and Data Analysis. ISBN: 9781305115347
5. Crouch, S. R. 2014. Applications of Microsoft Excel in Analytical Chemistry. Pacific Grove, Calif.: Brooks/Cole Cengage Learning. (QD75.4.E4 .C76 2014)

---

## **BWK20403 Colloid and Surface Chemistry**

**Prerequisite Course(s):** None

### **Synopsis**

This course provides students with an understanding of the physical chemistry of surfaces and colloidal processes, introduces examples of interfacial engineering, and acquaint students with the current literature and industrial processes. Topics included are thermodynamics of surfaces, properties of solids, surfactant solutions and surface films, electrostatic and electrokinetic phenomena at interfaces, adsorption and interfacial mass transfer. In order to emphasize the importance of colloid and surface chemistry in industrial application, the course also include application of scanning probe microscope to colloidal and surface chemistry, drug delivery design, surface and colloidal effect in cement industry, formation of detergent and dye micelles, paper and emulsion industry. This course is delivered through lecture and assignment task.

### **References**

1. Glatter, O. 2018. Scattering Methods and Their Application in Colloid & Interface Science, 2nd Edition. Elsevier.
2. Hpffer, R., Matharu S. A., Zhanrong Zhang. 2019. Green Chemistry for Surface Coatings, Ink & Adhesive: Sustainable Applications. The Royal Society of Chemistry Press.
3. Churaev, N.V. 2019. Liquid and Vapour Flows in Porous Body, Gordon and Breach Science Publisher.
4. Sparks, D. 2018. Soil Physical Chemistry. 2st Edition. CRS Press.
5. Konsolakis, M. 2018. Surface Chemistry and Catalysis. 3rd Edition. MDPI

---

## **BWK20502 Chemistry Laboratory III**

**Prerequisite Course(s):** None

### **Synopsis**

An introduction to the principles of analytical and physical chemistry laboratory. Topics include planning experiment and evaluating the hazard in laboratory managing chemicals ad waste,

safe use of laboratory equipments, personal protective equipment, rule and regulations .This course complements the theoretical knowledge acquired in the general lecture course.

#### References

1. Andrade-Garda, J. M., Carlosena-Zubieta, A., Gómez-Carracedo, M. P., Maestro-Saavedra, M. A., Prieto-Blanco, M. C., & Soto-Ferreiro, R. M. (2016). Problems of Instrumental Analytical Chemistry: WORLD SCIENTIFIC (EUROPE).
2. Szabolcs Fekete (University of Geneva, Switzerland) and Imre Molnár (Institute of Applied Chromatography, Berlin, Germany). Software-Assisted Method Development in High Performance Liquid Chromatography. (2018): WORLD SCIENTIFIC (EUROPE).
3. Katja Lindenberg (University of California at San Diego, USA), Ralf Metzler (University of Potsdam, Germany & Tampere University of Technology, Finland) and Gleb Oshanin (Sorbonne University, France). Chemical Kinetics. (2018): WORLD SCIENTIFIC (EUROPE).
4. Trapp, C. A., Cady, M. P. and Atkins, P. W. 2011. Solutions Manual To Accompany Physical Chemistry For The Life Sciences. 2nd Edition. Oxford University Press (XX(140102.1))
5. Garland, C. W., Nibler, J. W. and Shoemaker, D. P. 2009. Experiments In Physical Chemistry. 8th Edition. McGraw-Hill, Boston (QD457 .G37 2009)
6. Schafer, R. and Schmidt, P. C. 2012. Methods In Physical Chemistry. Wiley-VCH, Weinheim (QD453.3 .M47 2012 V. 1)
7. Davis, W. M. and Dykstra, C. E. 2012. Physical Chemistry : A Modern Introduction. 2nd Edition. CRC Press, Boca Raton. (QD453.3 .D38 2012)
8. Trimm, H. H. 2011. Physical Chemistry : Chemical Kinetics And Reaction Mechanisms. Apple Academic Press, Oakville, Ont. (QD453.3 .T74 2011)

---

#### **BWK20603      Chemical Industry Unit Process and Operation**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course is aim to cover the principles of unit operation of chemical industry, introduction of technical terms, chemical engineering calculations, properties of gases, vapours, liquids and solids, material balance, energy balances, heat transfer and its application, fluids mechanics, and mass transfer and its applications. This course is delivered by lecture and assignment task. Upon completion, students should be able to gain knowledge of the chemical processing and operations in order to expose students to the current scenario in chemical industry. Communication and problem-solving skills will be developed during the course.

#### References

1. Nakayama, Y. 2019. Introduction to Fluid Mechanics. 2nd Ed. Elsevier
2. Hendriks, D. 2018. Water Treatment Unit Process. CRC, Taylor & Francis
3. Foo, D.C.Y.F., Chemaattuvalappil, N. and Ng, D.K.S. 2017. Chemical Engineering Process Simulation. Elsevier
4. Augustin, C. 2019. Material Balance Calculation. Independently Published,. ISBN 1793883505, 9781793883506
5. Martín, M.M. 2016. Industrial Chemical Process Analysis and Design. Elsevier

---

#### **BWK20702      Industrial Water and Wastewater Treatment**

---

**Prerequisite Course(s):** None

#### **Synopsis**



This course provides students with principle knowledge on waste management of different types of industrial wastes. Highlight will be given on the types of waste and their characteristics, pollution prevention technology and pollution reduction in various types of industry and industrial estate, including resource management in both regional and local areas, solid waste and hazardous waste management, water and wastewater, air pollution, treatment technologies and green waste management. Apart from lecture, students will participate in industrial visit to have real experience on the topics learned in the semester.

#### References

1. Hendriks, D. 2018. Water Treatment Unit Process. CRC, Taylor & Francis
2. VanGuilder, C. 2019. Hazardous Waste Management: An Introduction. 2nd Ed. David Pallai
3. Xuan-Thanh Bui, Chiemchaisri, C., Fujioka, T., SVarjani, S. 2017. Water and Wastewater Treatment Technologies. Springer
4. Rav, S. B. and Unnisa, S. A. 2013. Sustainable Solid Waste Management. Apple Academic Press, Toronto
5. Lehmann, S. and Crocker, R. 2012. Designing For Zero Waste: Consumption, Technologies And The Built Environment. EarthScan, London ; New York
6. Pires, A., Martinho, G., Rodrigues, S., Gomes, M.I. 2017. Sustainable Solid Waste Collection and Management. Springer
7. Popov, V., Itoh, H. and Brebbia, C. A. 2012. Waste Management and the Environment VI. Wit Press, Boston. (TD785 .W37 2010)

---

#### **BWK20803     Natural Product Chemistry**

---

**Prerequisite Course(s):** None

#### **Synopsis**

The aim of this course is to provide the knowledge on natural products chemistry. The topics included are Introduction to Natural Products, isolation and extraction of bioactive molecules from natural sources, Bioplastics, Biocosmetic, Medicinal Natural Products and Malaysian Natural Products Industry. This course is delivered by lecture and assignment task. Upon completion, students should be able to gain knowledge on natural product in order to expose students to the current commercial needs and technologies related to natural product industry.

#### References

1. Ullah, M.F. & Ahmad, A. 2019. Nutraceuticals and Natural Product Derivatives: Disease Prevention & Drug Delivery. Wiley Blackwell.
2. Walsh, C.T. & Tang, Y. 2017. Natural Product Biosynthesis. Royal Society of Chemistry. CPI Group (UK) Ltd.
3. Mehmood, S. 2016. Plant Pigments, Flavors And Textures : The Chemistry And Biochemistry Of Selected Compounds. New York : Delve Pub. LLC. (QK899.P52 2016)
4. Atta-ur-Rahman. 2016. Frontiers in Natural Product Chemistry. Bentham Science Publishers.
5. Kumar, S. 2016. Analytical Techniques for Natural Product Research. CPI Group (UK) Ltd.

---

#### **BWK20902     Chemistry Laboratory IV**

---

**Prerequisite Course(s):** None

#### **Synopsis**

This course introduces the laboratory techniques, experiments demonstrating chemical principles in analytical and physical chemistry, including separation, determination and identification analysis, titration, calorimetry, behaviour of gases and molecular kinetic. Scientific and teamwork skills will be developed during the course in the form of practical and lab report.

## References

1. Andrade-Garda, J. M., Carlosena-Zubieta, A., Gómez-Carracedo, M. P., Maestro-Saavedra, M. A., Prieto-Blanco, M. C., & Soto-Ferreiro, R. M. (2016). Problems of Instrumental Analytical Chemistry: WORLD SCIENTIFIC (EUROPE)
2. Szabolcs Fekete (University of Geneva, Switzerland) and Imre Molnár (Institute of Applied Chromatography, Berlin, Germany). Software-Assisted Method Development in High Performance Liquid Chromatography. (2018): WORLD SCIENTIFIC (EUROPE)
3. Katja Lindenberg (University of California at San Diego, USA), Ralf Metzler (University of Potsdam, Germany & Tampere University of Technology, Finland) and Gleb Oshanin (Sorbonne University, France). Chemical Kinetics. (2018): WORLD SCIENTIFIC (EUROPE)
4. Trapp, C. A., Cady, M. P. and Atkins, P. W. 2011. Solutions Manual To Accompany Physical Chemistry For The Life Sciences. 2nd Edition. Oxford University Press (XX(140102.1))
5. Garland, C. W., Nibler, J. W. and Shoemaker, D. P. 2009. Experiments In Physical Chemistry. 8th Edition. McGraw-Hill, Boston (QD457 .G37 2009)
6. Schafer, R. and Schmidt, P. C. 2012. Methods In Physical Chemistry. Wiley-VCH, Weinheim (QD453.3 .M47 2012 V. 1)
7. Davis, W. M. and Dykstra, C. E. 2012. Physical Chemistry : A Modern Introduction. 2nd Edition. CRC Press, Boca Raton. (QD453.3 .D38 2012)
8. Trimm, H. H. 2011. Physical Chemistry : Chemical Kinetics And Reaction Mechanisms. Apple Academic Press, Oakville, Ont. (QD453.3 .T74 2011)

---

## BWK30103 Total Quality Management

**Prerequisite Course(s):** None

### Synopsis

This course introduces the principles and practices of total quality management (TQM) systems. It consists of introduction to quality management, principles and practices, benchmarking, environmental management system, quality function deployment, implementing ISO/IEC 17025, product liability and statistical process control. Apart from lecture, the students are required to do group work and presentation.

### References

1. Dr. Don, W. G., & Dr. Marylee, Z. S. (2019). PRODUCT QUALITY ATTRIBUTE CONTROL (9th edition. ed.). New York: McGraw-Hill Education.
2. Rodney, T. (2014). BENEFICIAL CHANGE (4th ed. ed.). New York: McGraw-Hill Education.
3. Alvin S. Goodman, P. D. P. E. F. A., & Makarand Hastak, P. D. P. E. C. C. P. M. A. (2015). Infrastructure Planning, Engineering, and Economics, Second Edition (2nd edition. ed.). New York: McGraw-Hill Education.
4. Tasmin R. Total Quality Management, Batu Pahat: Penerbit UTHM (2013) HD62.15.R68 2013 a
5. Goetsch D.L. Quality Management for Organizational Excellence : Introduction to Total Quality, Boston: Pearson Education (2013) HD62.15.G634 2013

---

## BWK30203 Green Chemistry

**Prerequisite Course(s):** None

### Synopsis

This course aims to introduce students with the principles of green chemistry in line with industries. Students will do a project related to the courses studied or a related chemical industry problem. This course involves teamwork, project management, project design, and project presentation. Each team is expected to address current issues, problem statement, problem-solving, method design, analysis and discussion of project development towards chemical industry problem solution. The student also has to ensure that the green chemistry project meets a specified needs with appropriate consideration for public health and safety, economy, and environmental. There are 12 principles of green chemistry should be related in this project which are waste prevention, atom economy, less hazardous chemical synthesis, designing safer chemicals, safer solvents and auxiliaries, design for energy efficiency, use of renewable feedstock, reduce derivatives, catalysis, design for degradation, real-time pollution prevention and safer chemistry for accident prevention.

### References

1. Moayad N. K. 2016. Green polymers and environmental pollution control. Toronto : Apple Academic Press, 2016 (TP156.P6 .G74 2016)
2. Suresh, S. 2015. Green chemical engineering : An Introduction to Catalysis, Kinetics, and Chemical Processes. Boca Raton : CRC. (TP155.2.E58 .S98 2015)
3. Luque, R. 2015. Gasification for Synthetic Fuel Production : Fundamentals, Processes and Applications. Woodhead Publishing. (TP339 .G37 2015)
4. Ameta, Suresh C. 2014. Green Chemistry : fundamentals and applications. Toronto : Apple Academic. (TP155.2.E58 .G76 2014)
5. Craddock. H. A. 2018. Oilfield Chemistry and its Environmental Impact. Wiley. ISBN 9781119244257.

### **BWK30303 Oil, Gas and Petrochemical Industry**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course introduces an overview of the oil, gas and petrochemical industry. This course consists of raw materials for the petrochemical industry, production of the basic petrochemical feed stocks, petrochemical derivatives based on methane, ethylene, propylene, C4's, benzene, toluene and xylene, production of ammonia, methanol and urea and the various alternatives for technology suppliers, key process equipment and operating conditions. Problem-solving skills will be developed during the course in the form of mini project proposed and assignment given.

### References

1. Bahadori, Alireza 2014. Pollution control in oil, gas and chemical plants. Cham : Springer. (TD899.P4 .B33 2014)
2. Robert A. Meyers, P. D. 2019. Handbook of Petrochemicals Production Processes, Second Edition (2nd edition. ed.). New York: McGraw-Hill Education.
3. Christopher, G. Z. 2019. Double-Walled Piping: A Handbook for the Petroleum and Petrochemical Industry. New York: McGraw-Hill Education.
4. Singh, Murari P. 2014. Expanders for oil and gas operations. ISBN 9780071799928. (TP159.F47 .S56 2014)
5. Speight, J.G. 2011. Handbook of Industrial Hydrocarbon Processes. Elsevier Inc, UK.
6. Surhone, L.M., Timpledon, M.T., Marseken, S.F. 2010. Petrochemical. VDM Verlag Dr. Mueller AG &Co.
7. Riazi, M. R., David C. 2018. Biofuels Production and Processing Technology. CRC Press Taylor & Francis.

### **BWK30402 Digitalization in Industry**

---

**Prerequisite Course(s):** None

### **Synopsis**

Digitalization in industry exposes students on industrial problems and the adoption of digitalization theory and techniques in enhancing and/or upgrading the conventional processes. Digitalization in Industry consist of the current industrial transformation with automation, data exchanges, cloud, cyber-physical systems, robots, Big Data, IoT and (semi-)autonomous industrial techniques to realize smart industry and manufacturing goals in the intersection of people, new technologies and innovation. Some of the essential technological components of the fourth industrial revolution are highlighted namely IoT (Internet of Things), cyber-physical systems, robots manufacturing, autonomous production, consistent engineering across the entire value chain, thorough data collection and provisioning, the cloud, big data analytics, virtual/augmented reality and edge computing amidst a shift of intelligence towards the edge (artificial intelligence indeed). Problem-solving skills will be developed during the course in the form of project design in the assignment given.

### **References**

1. Uğur, Ç. (2019). Analog Integrated Circuit Design by Simulation: Techniques, Tools, and Methods (1st edition. ed.). New York: McGraw-Hill Education.
2. Gregory, K. M., & P. Hunter Vegas, P. E. (2019). Process/Industrial Instruments and Controls Handbook, Sixth Edition (6th edition. ed.). New York: McGraw-Hill Education.
3. Hwang, K., Chen, M., 2017, Big Data Analytics for Cloud, IoT and Cognitive Learning,. John Wiley & Sons. Ltd.
4. Bock, T., Linner, T., 2015, Robot- Oriented Design: Design and Management tools for the Deployment of Automation and Robotics in Construction, Cambridge University Press.
5. Wien, V., 2014, Cloud Computing Patterns – Fundamentals to Design, Build and Manage Cloud Applications, Springer.
6. Berman, J.J., 2013, Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, British Library Cataloging in Publication.
7. Schaeffer, E., 2017, Industry X.0- Realizing Digital Value in Industrial Sectors, Elsevier.

### **BWK30503 Plastic and Rubber Industry**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course is designed to give students a general background in the field of plastic and rubber processing through lectures and assignment. Topics covered in this course are the structure and history of the plastics and rubber industry, its basic concepts, melt rheology, viscoelasticity, plastics and rubber processing, solid state properties, degradation and stability and recycling and environmental impact of plastic and rubber. The delivery methods throughout this course include lectures, discussions and assignment. Upon completion, students should be able to gain knowledge of plastic and rubber technology in order to expose students to the current scenario in polymer industry. Problem solving skills will be developed during this course.

### **References**

1. Rodriguez, F. 2015. Principles of Polymer Systems. 6th Edition. Boca Raton & CRC Press. (TP156.P6 .P74 2015)
2. Chaudhary, R. G. 2016. Polymer Characterization. New Rochelle, New York, Magnum Publishing LLC. (QD139.P6.P64)
3. Subramanian, M.N. 2017. Basics of Polymer Chemistry. River Publishers.
4. Carraher Jr., C.E. 2017. Introduction to Polymer Chemistry. 4th Edition. CRC Press, Taylor & Francis Group.
5. Tang, B.Z., Zhao, Z., Hu, R., and Qin, A. 2019. Synthetic Polymer Chemistry: Innovations and Outlook. The Royal Society of Chemistry.

## **BWK30602 Chemical Industry Seminar**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course aims to provide students exposure to background on several consumer-based in chemical industries which has a large impact to nation economic building and consumer needs. Therefore, this course offers various topics related to current industries namely soaps and detergents, forensic chemistry, oil and gas, agricultural chemistry and dyes industries. Occupational safety and health topic is also included in this course emphasized on the industrial exposure aspect, workplace hazards, hazards analysis, prevention and safety management. The delivery methods throughout this course are lectures, seminar and discussions on respected topics. This course requires the students to complete project report by applying their knowledge obtained which is to distinguish consumer-based chemical industry hence to organize and construct a business opportunity.

### **References**

1. Coker, A. K. 2015. Ludwig's Applied Process Design for Chemical and Petrochemical Plants. Boston : Elsevier Gulf Professional Pub. (TP155.7 .C66 2015)
2. Maiti, J. 2018. Industrial Safety Management : 21st century Perspectives of Asia. Singapore : Springer. (T55.I528 2018)
3. Elkins, K. M. 2018. Introduction to Forensic Chemistry. Taylor and Francis Group. ISBN 978-149876-310-3
4. NPCS Board of Consultants & Engineers. 2019. Soaps, Detergents and Disinfectants Technology Handbook- 2nd Revised edition. Asia Pacific Business Press. ISBN 978-93-81039-93-9
5. Hilfiker, R., Markus von Raumer. 2019. Polymorphism in the Pharmaceutical Industry: Solid Form and Drug Development. Wiley-VCH
6. Shabbir, M. 2019. Textiles and Clothing: Environmental Concerns and Solutions. Wiley Scrivener Publishing
7. Ingram, D. S. 2016. Science and the Garden : The Scientific Basis of Horticultural Practice. West Sussex : John Wiley. (SB318 .S24 2016)
8. Thiago R. L. C. Paixão, Wendell, K. T. 2019. Forensic Analytical Methods. The Royal Society of Chemistry. ISBN 978-1-78801-459-5

## **BWC30703 Separation Techniques**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course aims to provide students with a general background in the field of separation processes, separation of gaseous and liquid mixtures by adsorption, evaporation and distillation, adsorption and ion-exchange, filtration, membrane separation technology (reverse osmosis, ultrafiltration), separation method selection and other product recovery methods. The delivery methods throughout this course include lectures, discussions and assignment. Students are required to sit for quiz, test and final exam to assess the students's ability on distinguishing suitable separation technique used for particular separation process. Apart from that the students need to complete and submit assignment or project report, demonstrate and present their work in order to achieve the course's learning outcomes. Communication skills will be developed during the course.

## References

1. Robert, F. 2017. Engineering Aspects of Membrane Separation and Application in food Processing. Boca Raton : CRC Press. (TP371 .F53 2017)
2. Steve. T. 2015. Progress in Filtration and Separation. London : Academic Press. (TP156.F5 .P76 2015)
3. Andrzej. G. 2014. Distillation : Operation and Applications. Amsterdam : Elsevier Academic Press. (TP156.D5 .D59 2014)
4. Yoshinobu, T. 2015. Ion Exchange Membranes : Fundamentals and Applications, 2nd ed. Amsterdam : Elsevier. (QD562.I63 .T36 2015)
5. Annarosa. G. 2014. Membranes for Clean and Renewable Power Applications. Cambridge, UK : Woodhead Publishing Limited. (TJ808 .M45 2014)
6. Pal, P. 2017. Industrial Water Treatment Process Technology. Butterworth Henneiman. ISBN 978-0-12-810391-3

## BWC30803 Oleochemical Industry

---

**Prerequisite Course(s):** None

### Synopsis

This course gives an introduction to the oleochemical industry operation. It covers some introduction to oils and fats compositions, vegetable oil/plant mill operations, plant oil refinery process, production of edible products, fatty acid and soap production, as well as biofuel derived from vegetable oil and fats. Physicochemical characterization and process technology of fats and oil will be discussed. Various other oleochemical reactions, process sustainability, environmental impact and waste management will be discussed based on specific applications. Upon completion, students should be able to gain knowledge of oleochemical processes using different unit operations in order to expose to the current scenario in the oleochemical industry. Problem solving skills will be developed during the course.

### References

1. Monoj K.G. 2017. Practical Guide to Vegetable Oil Processing. 2nd ed. Cambridge, MA : Elsevier. (ISBN 9781630670504).
2. Corley, R. H. V., and Tinker, P. B. H. 2016. The Oil Palm. John Wiley and Sons. (ISBN 9781405189392)
3. Foo, D.C.Y. and Aziz, M.K.T.A. 2018. Green Technologies for the Oil Palm Industry. Springer. (ISBN 978-981-13-2235-8).
4. Waisundara, V. 2018. Palm Oil. London, United Kingdom, IntechOpen. (ISBN 978-1-78923-426-8).
5. Lai, O.M., Tan, C.P. & Akoh, C.C. 2015. Palm Oil: Production, Processing, Characterization, and Uses. Elsevier.

## BWK30903 Industrial Catalysis

---

**Prerequisite Course(s):** Bachelor Degree Project I

### Synopsis

This course is aimed to provide the study of different types of catalysts, their properties and their applications. The topics are overview of catalysis, heterogeneous catalyst, oxide-based catalytic materials, selectivity of catalyst. The delivery methods are throughout lecture, assignment and project. Upon completion, students should be able to gain knowledge of industrial catalysis used in different kind of reactions in order to expose to the current needs in the industry. Problem solving skills will be developed during the course.

## References

1. Jacques C. V. 2018. Metal Oxides in Heterogeneous Catalysis. Elsevier. ISBN 978-0-12-811631-9
2. Pierre H. Dixneuf, Jean-François Soulé 2018. Organometallics for Green Catalysis. Springer. ISBN 978-3-030-10954-7
3. Sundaramurthy, S. 2015. Green Chemical Engineering : An Introduction To Catalysis, Kinetics, And Chemical Processes. Boca Raton : CRC. (TP155.2.E58 .S98 2015)
4. Antoni, L. 2014. Molecular Water Oxidation Catalysis : A Key Topic For New Sustainable Energy Conversion Schemes. Chichester, West Sussex : John Wiley and Sons, Inc. (TJ808 .M64 2014)
5. Karen, W. and Adam, F.L. 2014. Heterogeneous Catalysts For Clean Technology : Spectroscopy, Design, And Monitoring. Weinheim : Wiley-VCH. (TP155.2.E58 .H47 2014)

## **BWK31003 Agricultural Chemical Industry**

---

**Prerequisite Course(s):** None

### **Synopsis**

The aim of this course is to introduce students the role of chemistry in enhancing agriculture industry. Topics included such as introduction to agricultural chemistry, soil chemistry, problematic soil and soil testing, quality of irrigation water, plant nutrients, fertilizers and manures, protection of plants, pesticide classification and mode of action, and application techniques of agrochemical in agricultural and agroindustry will be covered. Upon completion, students should be able to gain knowledge of agricultural technology in order to expose students to the current needs in industry. Communication skills will be developed during this course.

## References

1. Sílvio Vaz Jr. 2018. Sustainable Agrochemistry: A Compendium of Technologies. Springer. ISBN 978-3-030-17890-1.
2. Maestroni, H. B., Cannavan, A. 2018. Integrated Analytical Approaches for Pesticide Management. Academic Press, Elsevier. ISBN 978-0-12-816155-5
3. Siddiqui, M. W. 2017. Postharvest management of horticultural crops : practices for quality preservation. Oakville, ON ; Waretown, NJ : Apple Academic Press. (SB311 .P67 2017)
4. Jimenez-Lopez, Jose C. 2016. Advances in agricultural science : research collection. Croatia : InTech. (S21 .A38 2016)
5. Ray V. H. 2015. Agricultural mechanics : fundamentals and applications. Clifton Park, NY : Cengage Learning. (S675.3 .A37 2015)

## **BWK40103 Quality Control and Assurance**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course provides the students with practical exposure of Industrial Chemistry applied in various industries. The topics include Introduction to the industry, Approaches of analytical chemistry in quality control & assurance, Organizing quality management and Standards and specifications. Student shall be placed in an industry. A progress meeting is to be arranged by the company between the student, academic supervisor and the industrial supervisor.

## References

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM.
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Piotr Konieczka, Jacek Namiesnik (2018). Quality Assurance and Quality Control in the Analytical Chemical Laboratory: A Practical Approach, Second Edition. ISBN: 9781315295015
4. Boyd L. S. 2019. Effective Processes for Quality Assurance. CRC Taylor & Francis. ISBN 978-0-36717296-1
5. Vardeman, Stephen B., Jobe, J. Marcus (2016). Statistical Methods for Quality Assurance: Basics, Measurement, Control, Capability, and Improvement. ISBN: 978-0-387-79106-7
6. Chee Kai Chua, Chee How Wong and Wai Yee Yeong (2017). Standards, Quality Control, and Measurement Sciences in 3D Printing and Additive Manufacturing. ISBN: 9780128134894
7. Zaman, G. 2018. Quality Control in Laboratory. IntechOpen. ISBN 978-1-78923412-1
8. Georgios, S., Joshi, K. M., Paivandi, S. 2017. Quality Assurance in Higher Education: A Global Perspective. Studera Press: New Delhi. ISBN 978-93-85883-27-9

---

## BWK40204 Industrial Safety

**Prerequisite Course(s):** None

### Synopsis

This course covers the importance of industrial safety. It provides students an understanding on the skills in occupational safety, health and environment in the workplace. Other topics include; Understanding the occupational health hazards & hygiene in the workplace, Understanding the physical injury and its preventions and Laboratory safety such as orientation to laboratory safety, GHS safety data sheets, flammables and explosives in the laboratory, preventing contamination in the laboratory and laboratory emergencies. Student shall be placed in an industry. A progress meeting is to be arranged by the company between the student, academic supervisor and the industrial supervisor.

## References

1. Maiti, J. (2018). Industrial safety management : 21st century perspectives of Asia. ISBN:9789811063275
2. Väyrynen, Seppo. (2015). Integrated Occupational Safety and Health Management : solutions and industrial cases. SIBN: 9783319131795
3. Malaysia, Legal Research Board. (2019). Occupational Safety and Health Act 1994 (Act 514) and regulations and orders: As at 15th April 2019. ISBN:9789678911016
4. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM.
5. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
6. Wilson, L. & McCutcheon, D. (2003). Industrial safety and Risk management. The University of Alberta Press. ISBN: 0-88864-394-2.

---

## BWCK40304 Industrial Technology and Operations

**Prerequisite Course(s):** None

### Synopsis

This course shall expose students to the real working environment and develop soft skills in the areas of management, operational, production and research in related industries. Collections of relevant information on the academic, social and professional aspects through their experiences in industries. Student shall be placed in an industry. A progress meeting is to be arranged by the company between the student, academic supervisor and the industrial supervisor.



## References

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM.
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Stamatis, D.H. 2016. Quality Assurance: Applying Methodologies for Launching New Products. CRC Press, Taylor & Francis Group.
4. Henrie, S.A. 2015. Green Chemistry Laboratory Manual for General Chemistry. CRC Press, Taylor & Francis Group.
5. Golwalkar, K.R. 2016. Production Management of Chemical Industries. Springer.

## **BWK40403 Industrial Project Proposal**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course would provide the essential steps to be taken in the process of producing quality in writing project proposal for the chemistry field. This course focusses on starting with selecting the title, writing abstract and introduction, selection of appropriate methodology by using existing or developing new methodology and writing the reference. This course also provides student how to manage the timetable and how to overcome the project challenges along the study. All skills learned are transferable and applicable to other genre writing as well.

### **References**

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Panduan Penulisan Tesis UTHM
4. Mohd Noor, N. 2011. Writing Research And Thesis Proposals : Guidelines And Examples. Shah Alam : University Publication Centre (UPENA) (LB2369 .N66 2011)

## **BWK40503 Industrial Project Framework**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course will expose the students on the process of conducting research in order to provide the skills and ability in carrying out research project framework in the chemistry field. The covered areas for Integrated Project Framework consisting of research approach, research design, data collection and analysis. All the works can consider to publish via conference and journal publication.

### **References**

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Panduan Penulisan Tesis UTHM
4. Mohd Noor, N. 2011. Writing Research And Thesis Proposals : Guidelines And Examples. Shah Alam : University Publication Centre (UPENA) (LB2369 .N66 2011)

## **BWK40605 Industrial Project Development**

---

**Prerequisite Course(s):** None

### **Synopsis**

This course introduces students with the principles of integrated project based on a topic selected from the courses studied or a related chemistry problem. It involves individual work, project management, design and innovation. Students are expected to address problem statement, in-depth survey, design, analysis, evaluation and revision of design towards chemistry problem solution. The students also have to ensure that the designed project meets a specified needs with appropriate consideration for industry, public health and safety, cultural, society, economy and environmental.

### **References**

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Panduan Penulisan Tesis UTHM
4. Mohd Noor, N. 2011. Writing Research And Thesis Proposals : Guidelines And Examples. Shah Alam : University Publication Centre (UPENA) (LB2369 .N66 2011)

## **BWK40704 Industrial Project Writing**

---

**Prerequisite Course(s):** None

### **Synopsis**

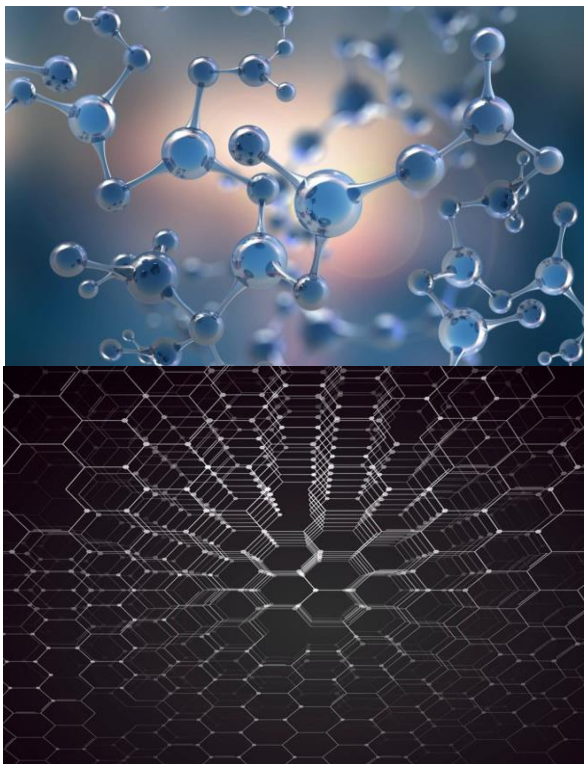
This course provides conceptual framework of project report and professional communication. Students will have opportunity to complete integrated project into report and thesis, preparing and delivering presentations of report successfully and to implementation of this delivery method on an industrial project.

### **References**

1. Buku Log Latihan Industri UTHM. (Bahagian A). Pejabat Penerbit UTHM
2. Guidelines to good practices: work-based learning (GGP:WBL) MQA 2015
3. Panduan Penulisan Tesis UTHM
4. Mohd Noor, N. 2011. Writing Research And Thesis Proposals : Guidelines And Examples. Shah Alam : University Publication Centre (UPENA) (LB2369 .N66 2011)

## Career and Further Education Prospect

Scientist, Academician, Chemist, Research Officer, Forensic Scientist, Nanotechnologist, Biotechnologist, Pharmacologist, Toxicologist, Chemistry Lecturer / Teacher, Material Scientist, Quality Control / Assurance Chemist, Environmental Officer, Geochemist.





**Centre for Academic Development and Training  
Universiti Tun Hussein Onn Malaysia  
86400 Batu Pahat, Johor Darul Ta'zim  
[www.uthm.edu.my](http://www.uthm.edu.my)**