

Faculty of Industrial Sciences & Technology

FACULTY OF INDUSTRIAL SCIENCES & TECHNOLOGY

INTRODUCTION

The Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang was established in May 2008 with the initial offering of the Bachelor of Applied Sciences (Hons) Industrial Chemistry during the 2008/2009 Academic Session, followed by the Bachelor of Applied Sciences (Hons) Industrial Biotechnology during the 2009/2010 Session. The latest program addition is the Bachelor of Applied Sciences (Hons) Material Technology with the first intake of students during Semester 1 of the 2012/2013 Session.

The main objective of the Faculty is to address the need for increased manpower requirements in Science and Technology. It is also aligned to efforts to increase knowledgeable and competent human capital especially Research Scientists and Engineers (RSE) as well as technical support in the chemical, petrochemical, oleo-chemical and bioresources - based industries.

The Faculty staff is headed by a Dean. The Dean is assisted by Deputy Deans, Heads of Programmes and Assistant Registrar.

PROGRAMMES OFFERED

For the 2013/2014 intake three programmes are offered as follows:

- Bachelor of Applied Science (Honours) - Industrial Chemistry
- Bachelor of Applied Science (Honours) - Industrial Biotechnology
- Bachelor of Applied Science (Honours) – Material Technology

LABORATORY FACILITIES

Teaching and research laboratory facilities of the Faculty of Industrial Sciences & Technology are designed to meet current teaching and learning, research and industrial requirements. It is also designed to meet current safety guidelines and standards. Laboratories at the faculty comprise of disciplines in industrial chemistry, biotechnology and advanced material technology. These laboratories include :

- Organic Chemistry laboratory
- Inorganic Chemistry laboratory
- Analytical Chemistry laboratory
- Physical Chemistry laboratory
- Unit Operation laboratory
- Physics laboratory
- Bioinformatics laboratory
- Biochemistry laboratory
- Molecular Biology laboratory
- Plant Technology laboratory
- Mamalian Technology laboratory
- Bioprocess laboratory
- Biotechnology Postgraduate laboratory
- Chemistry Postgraduate laboratory
- Microbiology laboratory

- Enzyme Technology and Fermentation laboratory
- Biomaterial & Biosensor laboratory
- Centrifuge Room
- Instrumentation Room
- Computer laboratory
- Lecture Theatre

FACULTY MANAGEMENT

DEAN

Prof. Dr. Mashitah binti Mohd Yusoff

Ph.D. (Chemistry, Wichita State University)
M.A. (Chemistry, Western Michigan University)
B.S. ACS-cert. (Chemistry, Wichita State University)
e-mail : mashitah@ump.edu.my
Tel : 09 549 2015

DEPUTY DEAN OF ACADEMIC & STUDENT AFFAIRS

Dr. Saiful Nizam bin Tajuddin

Ph.D. (Industrial Chemistry, Universiti Malaysia Pahang)
M.Sc. (Chemistry, Universiti Sains Malaysia)
B.Appl.Sc.(Hons) (Industrial Chemistry, Universiti Sains Malaysia)
e-mail : saifulnizam@ump.edu.my
Tel : 09 549 2370

DEPUTY DEAN OF RESEARCH & POST GRADUATE

Dr. Mohd Hasbi bin Ab. Rahim

Ph.D. (Chemistry, Cardiff University)
M.Sc. (Catalysis, Universiti Putra Malaysia)
B.Sc. (Hons)(Petroleum Chemistry, Universiti Putra Malaysia)
E-mail: mohdhasbi@ump.edu.my
Tel : 09 549 2784/2348

HEAD OF TECHNICAL

Muhammad Nor Fazli bin Abd Malek

M.Sc. (Chemistry, Universiti Teknologi Malaysia)
B.Sc. (Industrial Chemistry, Universiti Teknologi Malaysia)
e-mail : mnfazli@ump.edu.my
Tel : 09 549 2458

ACTING HEAD OF PROGRAMME (INDUSTRIAL BIOTECHNOLOGY)

Mohd. Fazli bin Farida Asras

MSc (Industrial Biotechnology, Universiti Putra Malaysia)
B.Sc. (Biotechnology Majoring in Industrial Biotechnology, Universiti Putra Malaysia)
email : mohdfazli@ump.edu.my
No. Tel : 09 549 2345

HEAD OF PROGRAMME (INDUSTRIAL CHEMISTRY)**Dr. Chong Kwok Feng**

PhD. (Physical Chemistry, National University of Singapore)

B.Sc. (Industrial Chemistry, Universiti Teknologi Malaysia)

e-mail : ckfeng@ump.edu.my

Tel : 09 549 2403

HEAD OF PROGRAMME (MATERIAL TECHNOLOGY)**Mazni binti Mustafa**

M.Sc. (Dielectric Physics, Universiti Putra Malaysia)

B.Sc. (Hons) (Physics, Universiti Putra Malaysia)

e-mail : maznim@ump.edu.my

Tel : 09 549 2308

HEAD OF PROGRAMME (SCIENCE)**Dr. Roslinazairimah binti Zakaria**

Ph.D. (Mathematics, University of South Australia)

M.Sc. (Statistik, Universiti Kebangsaan Malaysia)

B.Sc. (Applied Mathematics, Queensland University of Technology)

e-mail : roslinazairimah@ump.edu.my

Tel : 09 549 2264

ASSISTANT REGISTRAR**Ahmad Fadly bin Ibrahim**

Bachelor of Human Resource Development (Universiti Putra Malaysia)

Diploma in Business Studies (Universiti Teknologi MARA)

e-mail : fadly@ump.edu.my

Tel : 09 549 2381

ACADEMIC STAFF**PROFESSOR****Prof. Dr. Mashitah binti Mohd Yusoff**

Ph.D. (Chemistry, Wichita State University)
 M.A. (Chemistry, Western Michigan University)
 B.S. ACS-cert. (Chemistry, Wichita State University)
e-mail : mashitah@ump.edu.my
 Tel : 09 549 2015

Prof. Dr. Mohd Ridzuan bin Nordin

Ph.D (Heterogeneous Catalysis, University of Tasmania)
 B.Sc. (Chemistry, University of Tasmania)
e-mail : mridzuan@ump.edu.my
 Tel : 09 549 2017

Prof. Dr. Jose Rajan

Ph.D. (Physics, Mahatma Gandhi University, India)
 M.Sc.. (Physics, Andhra University, India)
e-mail : joserajan@ump.edu.my
 Tel : 09 549 2451

ASSOCIATE PROFESSOR**Associate Professor Dr. Md. Lutfor Rahman**

Ph.D. (Polymer Chemistry, Universiti Putra Malaysia)
 M.Sc. (Chemistry, University of Rajshahi)
 B.Sc. (Hons) (Chemistry, University of Rajshahi)
e-mail : lutfor@ump.edu.my
 Tel : 09 549 2785

Associate Professor Dr. Nadeem Akhtar

Ph.D. (Organic Chemistry, University of Karachi)
 M.Sc. (Organic Chemistry, University of Karachi)
 B.Sc. (Hons.) (Organic Chemistry, University of Karachi)
e-mail : nadeem@ump.edu.my
 Tel : 09 549 2393

Associate Professor Dr. Jinan Basheer Ahmed

Ph.D. (Solid State Physics, University of Reading)
 M.Sc. (Solid State Physics, Cairo University)
e-mail : jbdabbagh@ump.edu.my
 Tel : 09 549 2783

Associate Professor Dr. Rossi Setiadji

Ph.D. (Chemistry, New Mexico State University)
 M.Sc. (Chemistry, New Mexico State University)
e-mail : rossi_setiadji@ump.edu.my
 Tel : 09 549 2405

Associate Professor Dr. Benjamin Lukas

Ph.D. (Chemistry, University Of Essex)
 B.Sc. (Chemistry, University Of Essex)
e-mail : lukas@ump.edu.my
 Tel : 09 549 2396

Associate Professor Dr. Md. Rezaul Karim

Ph.D. (Enzymology, Kagoshima University)
 M. Sc Ag. (Biochemical Science & Technology, Kagoshima University)
 M.Sc. (Biochemistry, University of Rajshahi)
 B.Sc. (Hons) (Biochemistry, University of Rajshahi)
e-mail : mdrezaul@ump.edu.my
 Tel : 09 549 2420

SENIOR LECTURER**Dr. Saiful Nizam bin Tajuddin**

Ph.D. (Industrial Chemistry, Universiti Malaysia Pahang)
 M.Sc. (Chemistry, Universiti Sains Malaysia)
 B.Appl.Sc.(Hons) (Industrial Chemistry, Universiti Sains Malaysia)
e-mail : saifulnizam@ump.edu.my
 Tel : 09 549 2370

Dr. Mohd Hasbi bin Ab. Rahim

Ph.D. (Chemistry, Cardiff University)
 M.Sc. (Catalysis, Universiti Putra Malaysia)
 B.Sc. (Hons) (Petroleum Chemistry, Universiti Putra Malaysia)
 E-mail: mohdhasbi@ump.edu.my
 Tel : 09 549 2784/2348

Dr. Roslinazairimah binti Zakaria

Ph.D. (Mathematics, University of South Australia)
 M.Sc. (Statistik, Universiti Kebangsaan Malaysia)
 B.Sc. (Applied Mathematics, Queensland University of Technology)
 e-mail : roslinazairimah@ump.edu.my
 Tel : 09 549 2264

Dr. Chong Kwok Feng

PhD. (Physical Chemistry, National University of Singapore)
 B.Sc. (Industrial Chemistry, Universiti Teknologi Malaysia)
 e-mail : ckfeng@ump.edu.my
 Tel : 09 549 2403

Dr. Mohd Zuki bin Salleh

Ph.D. (Mathematics, Universiti Kebangsaan Malaysia)
 M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Mathematics, Universiti Pertanian Malaysia)
 e-mail : zuki@ump.edu.my
 Tel : 09 549 2203

Dr. Shah Samiur Rashid

Ph.D. (Biotechnology Engineering, International Islamic University of Malaysia)
 M.Sc. (Genetics and Breeding, University of Rajshahi, Bangladesh)
 B.Sc. (Hons) (Biochemistry, University of Rajshahi, Bangladesh)
 e-mail : samiur@ump.edu.my

Dr. Tan Suat Hian

Ph.D. (Plant Biotechnology, Universiti Putra Malaysia)
 B. Sc. (Hons) (Biochemistry, Universiti Putra Malaysia)

E-mail: tshian@ump.edu.my

Tel: 09 5492397

Dr. Mohd Ashry Bin Jusoh

Ph.D. (Microwave Physics, Universiti Putra Malaysia)
 M.Sc. (Microwave Physics, Universiti Putra Malaysia)
 B.Sc. (Hons.)(Materials Science, Universiti Putra Malaysia)
 E-mail: ashry@ump.edu.my
 Tel : 09 549 2314

Dr. Wan Mohd Faizal Wan Ishak

Ph.D. (Chemical Engineering, University of Birmingham, UK)
 M. Sc. (Environmental Science, UPM)
 B.Sc.(Hons) (Applied Science, UKM)
 e-mail : faizal@ump.edu.my
 Tel : 09 549 3020

Dr. Seema Zareen

Ph.D. (Organic Chemistry, University of Karachi)
 M.Sc. (Organic Chemistry, University of Karachi)
 B.Sc. (Hons.) (Organic Chemistry, University of Karachi)
 e-mail : seema@ump.edu.my
 Tel : 09 549 2404

Dr. Yuhani binti Yusof

Ph.D. (Mathematics, Universiti Teknologi Malaysia)
 M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Hons.)(Industrial Mathematics, Universiti Teknologi Malaysia)
 E-mail: yuhani@ump.edu.my
 Tel : 09 549 2398

Dr. Gaanty Pragas A/L Maniam

Ph.D. (Chemistry, Universiti Sains Malaysia)
 M.Sc. (Chemical Instrumentation, Universiti Sains Malaysia)
 Grad. Dip. (Analytical Chemistry, National University of Singapore)
 B.App.Sc. (Industrial Chemistry, Universiti Sains Malaysia)
 e-mail : gaanty@ump.edu.my
 Tel : 09 549 2305

Dr. Tan Ling Ling @ Chong Ling Ling

Ph.D. (Chemistry, Universiti Kebangsaan Malaysia)
 B.Sc. (Chemical Technology, Universiti Kebangsaan Malaysia)
 e-mail : lingling@ump.edu.my
 Tel : 09 549 2742

Dr. Azhari Hamid Nour Abduelraman

Ph.D. (Organic Chemistry, University of Gezira)
 M.Sc. (Physical Chemistry, University of Lasher)
 B.Sc. (Chemistry, Nasir University)
 e-mail : azharihamid@ump.edu.my
 Tel : 09 549 2411

Dr. Fathima Shahitha Jahir Hussain

Ph.D. (Chemistry, National University of Singapore)
 M.Sc. (Chemistry, National University of Singapore)
 e-mail : fathima@ump.edu.my
 Tel : 09 549 2334

Dr. Essam Abdellatif Makky Saleh

Ph.D. (Applied Microbiology, Al-Azhar University)
 M.Sc. (Microbial Enzymes Biotechnology, Al-Azhar University)
 B.Sc. (Microbiology, Al-Azhar University)
 e-mail : essammakky@ump.edu.my
 Tel : 09 549 2454

Dr. Neeta Laxman Lala

Ph.D. (Nuclear Chemistry, University of Pune)
 M.Sc. (Physical Chemistry, University of Pune)
 B.Sc. (Chemistry, Zoology and Geology, University of Pune)
 e-mail : neeta@ump.edu.my
 Tel : 09 549 2459

Dr. Gurumurthy Hegde

Ph.D. (Physics, CSMR, INDIA)
 M.Sc. (Materials Science, Mangalore University)
 B.Sc. (Chemistry, Physics, and Mathematics, Mangalore University)
 e-mail : hegde@ump.edu.my
 Tel : 09 549 2778

Dr. Natanamurugaraj Govindan

Ph.D. (Botany, University of Bharathidasan)
 M.Sc. (Botany, University of Bharathidasan)
 B.Sc. (Botany, University of Bharathidasan)
 e-mail : natanam@ump.edu.my
 Tel : 09 549 2465

Dr. Norhayati Binti Rosli

Ph.D. (Mathematics, Universiti Teknologi Malaysia)
 M.Sc. (Statistics, Universiti Sains Malaysia)
 B.Sc. (Pure Mathematics, Universiti Sains Malaysia)
 e-mail: norhayati@ump.edu.my
 Tel: 09-4245924

Dr Mohd Sham Bin Mohamad

Ph.D. (Mathematics, Universiti Teknologi Malaysia)
 M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
 E-mail: mohdsham@ump.edu.my,
izad_00@hotmail.com
 Tel: 09-5492260 / 019-9892748

Dr. Mohd Rashid Bin Ab Hamid

PhD (Quality and Productivity Improvement, UKM)
 M.Tech.Mgmt. (Human Capital Resource, UMP)
 B.Sc.Comp.Ed. (Hons) (Mathematics, UTM)
 E-mail: rashid@ump.edu.my
 Tel: 09-5492389

Dr. Nina Suhaity Binti Azmi
 Ph.D (Biochemistry/Biotechnology,
 University of Liverpool)
 M.Sc. (Biotechnology, Universiti
 Putra Malaysia)
 B. Sc. (Hons.) (Biochemistry,
 Universiti Putra Malaysia)
 E-mail : nina@ump.edu.my
 Tel : 09 5492404

LECTURER

Muhammad Nor Fazli bin Abd Malek

M.Sc. (Chemistry, Universiti
 Teknologi Malaysia)
 B.Sc. (Industrial Chemistry,
 Universiti Teknologi Malaysia)
e-mail : mnfazli@ump.edu.my
 Tel : 09 549 2458

Mohd Fazli bin Farida Asras

M.Sc. (Industrial Biotechnology,
 Universiti Putra Malaysia)
 B.Sc. (Biotechnology Majoring in
 Industrial Biotechnology, Universiti
 Putra Malaysia)
 email : mohdfazli@ump.edu.my
 No. Tel : 09 549 2345

Mazni binti Mustafa

M.Sc. (Dielectric Physics, Universiti
 Putra Malaysia)
 B.Sc. (Hons) (Physics, Universiti
 Putra Malaysia)
e-mail : maznim@ump.edu.my
 Tel : 09 549 2308

Siti Maznah binti Kabeb

M.Sc. (Polymer Engineering,
 Universiti Sains Malaysia)
 B.Tech. (Hons) (Polymer, Universiti
 Sains Malaysia)
e-mail : smaz@ump.edu.my
 Tel : 09 549 2390

Nurlin binti Abu Samah

M.Sc. (Chemistry, Universiti
 Kebangsaan Malaysia)
 B.Sc. (Hons) (Analytical Chemistry,
 Universiti Kebangsaan Malaysia)
e-mail : nurlin@ump.edu.my
 Tel : 09 549 2465

Nurul Nadiyah binti Hamidon

M.Sc. (Industrial Chemistry,
 Universiti Teknologi Malaysia)
 B.Sc. (Chemistry, Universiti
 Teknologi Malaysia)
e-mail : nnadiyah@ump.edu.my
 Tel : 09 549 2303

Tay Joo Hui

M.Sc. (Environmental Chemistry
 and Pollution, Universiti Malaysia
 Terengganu)
 B.Sc. (Analytical and
 Environmental Chemistry,
 Universiti Malaysia Terengganu)
e-mail : tayjoohui@ump.edu.my
 Tel : 09 549 2418

Lee Chin Mei

M.Sc. (Molecular Biotechnology,
 Universiti Putra Malaysia)
 B.Sc. (Bioindustry, Universiti Putra
 Malaysia)
e-mail : lcmei@ump.edu.my
 Tel : 09-5492374

Norhayati binti Nordin

M.Sc. (Chemistry, Universiti
 Kebangsaan Malaysia)
 B.Sc. (Hons) (Chemical
 Technology, Universiti Kebangsaan
 Malaysia)
e-mail : yatinordin@ump.edu.my
 Tel : 09-549 2765

Mohd Hairul bin Ab. Rahim

M.Sc. (Plant Biotechnology,
 Universiti Putra Malaysia)
 B.Sc. (Biotechnology, Universiti
 Putra Malaysia)
e-mail : mhairul@ump.edu.my
 Tel : 09-5492428

Nor Adila binti Mhd Omar

M.Sc. (Medical Biotechnology,
 University of Malaya)
 B.Sc. (Biotechnology, University of
 Malaya)
e-mail : nadila@ump.edu.my
 Tel : 09 549 2763

Nazira binti Mahmud

M.Sc. (Chemical Engineering,
Universiti Sains Malaysia)
B.Eng. (Bioprocess Engineering,
Universiti Malaysia Perlis)
e-mail : nazira@ump.edu.my
Tel : 09 549 234

Nabilah binti Alias

M.Sc. (Solid State Physics,
Universiti Sains Malaysia)
B.Sc. (Hons) (Physics, Universiti
Sains Malaysia)
e-mail : nabilah@ump.edu.my
Tel : 09 549 2782

Siti Aishah binti Harun

M.Sc. (Applied Physics, Universiti
Kebangsaan Malaysia)
B.Sc. (Hons) (Physics, Universiti
Kebangsaan Malaysia)
e-mail : aishah@ump.edu.my
Tel : 09 549 2765

Ezrinda binti Zaihidee

M. Ed. (Mathematics Education,
Universiti Pendidikan Sultan Idris)
B.Eng. (Hons) (Electric &
Electronics Engineering, Universiti
Sains Malaysia)
e-mail : ezrinda@ump.edu.my
Tel : 09 549 2422

Farahanim binti Misni

M.Sc. (Mathematics, Universiti
Teknologi Malaysia)
B.Sc.(Industrial Mathematics,
Universiti Teknologi Malaysia)
e-mail : farahanim@ump.edu.my
Tel : 09 549 2414

Nadirah binti Mohd Nasir

M.Sc. (Statistics, Universiti Sains
Malaysia)
B.Sc. (Pure Mathematics, Universiti
Sains Malaysia)
e-mail : nadirah@ump.edu.my
Tel : 09 549 2781

Nor Hafizah binti Moslim

M.Sc. (Statistics, Universiti Sains
Malaysia)
B.Sc. (Pure Mathematics, Universiti
Sains Malaysia)
e-mail : fizahm@ump.edu.my
Tel : 09 549 2780

Rahimah binti Jusoh@Awang

M.Sc. (Mathematics, Universiti
Teknologi Malaysia)
B.Sc. (Industrial Mathematics,
Universiti Teknologi Malaysia)
e-mail : rahimah@ump.edu.my
Tel : 09 549 2426

Nor Wahida binti Deraman

M. Sc. (Number Theory, Universiti
Putra Malaysia)
B. Sc. (Mathematics, Universiti
Putra Malaysia)
email : norwahida@ump.edu.my
Tel: 09 549 2309

Nor Azila binti Che Musa

M.Sc. (Applied Statistics, Universiti
Teknologi Mara)
B.Sc. (Industrial Statistics,
Universiti Utara Malaysia)
e-mail : nazila@ump.edu.my
Tel : 09 549 2254

Noor Fadhilah Binti Ahmad Radi

M.Sc. (Statistics, Universiti Sains
Malaysia)
B.Appl.Sc.(Hons) (Applied
Statistics, Universiti Sains
Malaysia)
e-mail : nfadhilah@ump.edu.my
Tel : 09 549 2457

Farahani Binti Mohd Saimi

M.Sc (Quantitative Science –
Operation Management, Universiti
Teknologi Mara)
B. Sc (Decision Science, Universiti
Utara Malaysia)
E-mail: farahani@ump.edu.my
Tel: 09 4245922

Laila Amera Binti Aziz

M.Sc. (Statistics, University of
Auckland)
B.Sc. (Hons) (Statistics, University
of Auckland)
B.Sc. (Applied Mathematics &
Statistics, University of Auckland)
E-mail: laila@ump.edu.my
Tel : 09 549 2383

Nur Adilah Binti Abd Jalil

M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Hons) (Industrial Mathematics, Universiti Teknologi Malaysia)
 Email: adilah@ump.edu.my

Nurul 'Azyyati Binti Sabri

M. Eng. (Bioprocess, Universiti Teknologi Malaysia)
 B.App. Sc. (Hons)(Biotechnology, Universiti Sains Malaysia)
 E-mail: azyyatiss@ump.edu.my
 Tel: 09 5492435

Nor Alisa binti Mohd Damanhuri

M.Sc. (Mathematics, Universiti Sains Malaysia)
 B.Sc. (Mathematics, Universiti Sains Malaysia)
 e-mail : noralisa@ump.edu.my

Yusof bin Hashim

M.Sc. (Physics Ed., Universiti Teknologi Malaysia)
 B.Sc. (Hons) (Physics, Universiti Putra Malaysia)
 e-mail : yusof@ump.edu.my
 Tel : 09 549 2306

Samsudin bin Abdullah

M.Sc. (Applicable Mathematics, Cranfield University)
 B.Sc. (Hons) (Mathematics, Universiti Kebangsaan Malaysia)
 e-mail : samsudinab@ump.edu.my
 Tel : 09 549 2376

Siti Fatimah binti Haji Ahmad Zabidi

M.Sc. (Mathematics, Western Michigan University)
 B.Sc. (Mathematics, Western Michigan University)
 e-mail : sfatimah@ump.edu.my
 Tel : 09 549 2304

STUDY LEAVE**Azlyna binti Senawi**

M. Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
 e-mail : azlyna@ump.edu.my
 Tel : 09 549 2382

Najihah binti Mohamad

M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
 e-mail : najihah@ump.edu.my
 Tel : 09 549 2380

Norazaliza binti Mohd Jamil

M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Mathematics, Universiti Teknologi Malaysia)
 e-mail : norazaliza@ump.edu.my
 Tel : 09 549 2428

Norhafizah binti Md.Sarif

M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
 e-mail : norhafizah@ump.edu.my
 Tel : 09 549 2463

Siti Zanariah binti Satari

M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Mathematics, Universiti Teknologi Malaysia)
 e-mail : zanariah@ump.edu.my
 Tel : 09 549 2407

Rozieana binti Khairuddin

M. Sc. (Mathematics, Universiti Teknologi Malaysia)
 B. Sc. (Mathematics, Universiti Malaysia Terengganu)
 e-mail : rozieana@ump.edu.my
 Tel : 09 549 2398

Zulkhibri bin Ismail@Mustofa

M.Sc. (Quality & Productivity Improvement, Universiti Kebangsaan Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
 e-mail : zulkhibri@ump.edu.my
 Tel : 09 549 2401

Izan Izwan bin Misnon

M.Sc. (Chemistry, Universiti Teknologi Malaysia)
 B.Sc. (Chemistry, Universiti Teknologi Malaysia)
 e-mail : iezwan@ump.edu.my

Saiffull Kamaluddin bin Muzakir@Lokman@ Hj. Arshad
 M.Sc. (Physics, Universiti Kebangsaan Malaysia)
 B.Sc. (Hons) (Physics, Universiti Kebangsaan Malaysia)
e-mail : saifful@ump.edu.my
 Tel : 09 549 2372

Muhammad Adam Lee bin Abdullah
 M.Sc. (Animal Cell Biotechnology, Universiti Putra Malaysia)
 B. Sc. (Hons) (Microbiology, Universiti Putra Malaysia)
e-mail : adamlee@ump.edu.my

Noryanti binti Muhammad
 M. Sc. (Mathematics, Universiti Teknologi Malaysia)
 B. Sc. (Hons) (Statistics, Universiti Teknologi MARA)
e-mail : noryanti@ump.edu.my
 Tel : 09 549 2416

Nazikussabah binti Zaharudin
 M.Sc. (Environmental Engineering, Universiti Teknologi Mara)
 B.Sc. (Hons) (Appl. Chemistry, Universiti Teknologi Mara)
e-mail :
nazikussabah@ump.edu.my
 Tel : 09 549 2412

Nor Izzati binti Jaini
 M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B.Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
e-mail : ati@ump.edu.my
 Tel : 09-549 2373

Noor Suhana binti Adzahar
 M.Sc. (Molecular Biology, Universiti Putra Malaysia)
 B. Appl. Sc. (Hons) (Biotechnology, Universiti Sains Malaysia)
e-mail : nsuhana@ump.edu.my
 Tel : 09 549 2413

Siti Roslindar binti Yaziz
 M.Sc. (Mathematics, Universiti Teknologi Malaysia)
 B. Sc. (Industrial Mathematics, Universiti Teknologi Malaysia)
e-mail : roslindar@ump.edu.my
 Tel : 09 549 2425

SCIENCE OFFICER

Norshahida binti Zaidon
 B.Sc. (Hons) (Industrial Chemistry, Universiti Malaysia Sabah)
e-mail : norshahida@ump.edu.my
 Tel : 09 549 3331

Noradila binti Abdullah @ Omar
 B.Sc. (Hons) (Industrial Chemistry, Universiti Putra Malaysia)
e-mail : noradila@ump.edu.my
 Tel : 09 549 2764

Shaharunizam bin Umar
 B.Sc. (Hons) (Biotechnology, International Islamic University of Malaysia)
e-mail :
shaharunizam@ump.edu.my
 Tel : 09 549 3338

ASSISTANT SCIENCE OFFICER

Muhamad Husaini bin Sulaiman
 B.Sc. (Hons) (Biology, Universiti Teknologi Mara)
 Diploma in Science (Universiti Teknologi Mara)
e-mail : husaini@ump.edu.my
 Tel : 09 549 3332

Nurul Salma Munirah binti Ruslan
 Diploma Teknologi Makanan (Politeknik Sultan Haji Ahmad Shah)
 Sijil Teknologi Makanan (Politeknik Sultan Haji Ahmad Shah)
e-mail : salma@ump.edu.my
 Tel : 09-549 3345

Norlaili binti Abd Rahim
 Diploma in Microbiology, (Universiti Teknologi Mara)
e-mail : nlaili@ump.edu.my
 Tel : 09-549 3350

SENIOR LABORATORY ASSISTANT

Abd Latip bin Hj Dris
 Bachelor of Management with
 Honours (Open University)
 e-mail : latip@ump.edu.my
 Tel : 09 549 3330

LABORATORY ASSISTANT

Mohd Farid bin Jaafar
 Diploma in Civil Engineering
 (Universiti Malaysia Pahang)
 e-mail : farid@ump.edu.my
 Tel : 09 549 8094

Nordiana binti Hazari
 Certificate in Mechanical
 Engineering (Politeknik Sultan Haji
 Ahmad Shah)
 e-mail : nordiana@ump.edu.my
 Tel : 09 549 8009

Muhammad Halim Bin Paboh
 Diploma in Mechatronic
 Engineering (Politeknik Port
 Dickson)
 E-mail : mhalim@ump.edu.my

RESEARCH OFFICER

Muhammad Abdul Adib Bin Abd Aziz
 B.Sc(Hons) (Industrial
 Biotechnology, Unisel)
 e-mail: maadib@ump.edu.my
 Tel: 09 549 2753

ADMINISTRATIVE STAFF

Ahmad Fadly Bin Ibrahim
 Bachelor of Human Resource
 Development (Universiti Putra
 Malaysia)
 Diploma in Business Studies
 (Universiti Teknologi Mara)
 Assistant Registrar
 e-mail : fadly@ump.edu.my
 Tel : 09 549 2381

Mohamad Najib bin Mohamad Nor

Diploma in Tourism Management
 (Politeknik Premier Johor Bahru)
 Assistant Administrative Officer
 e-mail : mohamadnajib@ump.edu.my
 Tel : 09 549 2371

Nurul Nadia binti Abd Razak

Diploma in Secretarial Sciences
 (Politeknik Sultan Haji Ahmad
 Shah)
 Administrative Assistant
 (Secretarial)
 e-mail : nnadia@ump.edu.my
 Tel : 09 549 2767

Nenie Zuryati binti Abdullah

Diploma in International Trade
 (Universiti Sultan Zainal Abidin)
 Administrative Assistant
 (Operational/Clerical)
 e-mail : neniez@ump.edu.my
 Tel : 09 549 2765

Siti Suriyanti binti Samingon

Diploma in Civil Engineering
 (Politeknik Sultan Haji Ahmad
 Shah)
 Administrative Assistant
 (Operational/Clerical)
 e-mail : suriyanti@ump.edu.my
 Tel : 09 549 1123

Sabri Bin Mohamad

Diploma in Office Management
 (Universiti Teknologi Mara)
 E-mail : sabrim@ump.edu.my
 Tel : 095491236

Asri Bin Mohd Nor

Diploma Tourism Management
 (Universiti Teknologi Mara)
 E-mail : asrimnor@ump.edu.my
 Tel : 095491239

Jafree Bin Ibrahim

Sijil Pelajaran Malaysia (SPM)
 Office Assistant
 e-mail : jafree@ump.edu.my
 Tel : 09 549 1145

SYNOPSIS & PROGRAMME OBJECTIVES

Bachelor of Applied Science (Honours) – Industrial Chemistry

The objectives of the Bachelor of Applied Science (Honours) – Industrial Chemistry, are to produce graduates with :-

- competency in industrial chemistry and innovative applications,
- high level of professionalism, responsive towards commercial and social issues and,
- competency in analysis, research and development in science, technology and innovation.

PROGRAMME OUTCOMES (PO)

Bachelor of Applied Science (Honours) - Industrial Chemistry

Programme outcomes are specific statements regarding a graduate's knowledge, skills and attitudes that describe what students are expected to know and be able to perform or attain at graduation time. Consistent with world-class applied science programmes, the POs for graduates are as follows:

- PO1 Possess knowledge and understanding of chemical sciences.
- PO2 Ability to design, conduct experiments as well as to analyze and interpret data in relation to laboratory and research works.
- PO3 Possess problem solving skills thru creative and innovative solutions.
- PO4 Ability to communicate effectively in verbal and written forms.

PO5 Ability to work responsibly as a team.

PO6 Ability to undertake life-long learning and strive for continuous knowledge and professional development.

PO7 Possess business acumen and entrepreneurship.

PO8 Possess professional and ethical responsibility, and their obligation to the society.

PO9 Possess effective leadership quality with good interpersonal skills.

PROGRAMME OUTCOMES (PO)

Bachelor of Applied Science (Honours) - Industrial Biotechnology

Programme outcomes are specific statements regarding a graduate's knowledge, skills and attitudes that describe what students are expected to know and be able to perform or attain at graduation time. Consistent with world-class biotechnology programme, the POs for graduates are as follows:

- PO1 Ability to demonstrate comprehensive knowledge in biotechnology and technical skills.
- PO2 An ability to operate and maintain basic biotechnology equipment.
- PO3 An ability to analyze, synthesize and integrate knowledge and information.
- PO4 An ability to conduct basic guided research.

PO5	An ability to utilize theoretical knowledge and practical skills in order to fulfill industrial standard requirement.	responsibility and adaptation in high society. <ul style="list-style-type: none"> • Competent in analysis, research and development in science and technology.
PO6	An ability to demonstrate the ability to seek, adapt, and provide solutions to address challenges and concerns in biotechnology.	The basic concepts of technopreneurship and soft skills are embedded into the curriculum to develop the graduate's acumen towards entrepreneurship, generic and communicative skills.
PO7	An ability to communicate ideas scientifically and demonstrate interpersonal skills.	PROGRAMME OUTCOMES (PO)
PO8	An ability to lead and work efficiently in a multidisciplinary project team.	Bachelor of Applied Science (Honours) – Material Technology
PO9	An ability to demonstrate an understanding and awareness of basic commercial, ethical, legal and social issues related to biotechnology.	Programme outcomes are specific statements regarding a graduate's knowledge, skills and attitudes that describe what students are expected to know and be able to perform or attain at graduation time. Consistent with world-class applied science programmes, the POs for graduates are as follows:
PO10	An ability to recognize the need to engage in lifelong learning.	PO1 Possess comprehensive knowledge and theory of science and material technology in synthesis and characterization of materials.
		PO2 Possess technical skills in guided experiments comprises the synthesis and characterization in material science and technology.
		PO3 Able to identify problems and formulate creative and innovative solutions that comply with principles of material science & technology.
		PO4 Able to communicate well through the medium neither written and oral by project presentation sessions, laboratory reports, project proposals, industrial visits and final year project using the latest ICT technology.

SYNOPSIS & PROGRAMME OBJECTIVES

Bachelor of Applied Science (Honours) – Material Technology

The objective of the Bachelor of Applied Science (Honours) – Material Technology, is to produce a graduate who has mastered the required expertise in advanced material industries as follow:

- Expertise needed in science and material technology industry.
- Possess high level of professionalism, leadership,

- PO5 Able to work as a team in the laboratory work, research and coursework.
- PO6 Adopts the theory, scientific problem-solving skills and technical skills in daily lives and jobs and able to further study at a higher level.
- PO7 Conduct science and material technology research based on entrepreneurship elements.
- PO8 Demonstrate ethical and professional characteristic in appearance, attitude and project management in daily work.
- PO9 Demonstrate leadership characteristics such as participate, taking the role and lead the projects that involve all levels and backgrounds of the members group.

**CURRICULUM STRUCTURE
BACHELOR OF APPLIED SCIENCE (HONOURS)
INDUSTRIAL CHEMISTRY 2013/2014**

YEAR	FIRST			SECOND			THIRD			FOURTH		
	SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
FACULTY & PROGRAMME COURSES		BSK1103 Organic Chemistry I	BSK1143 Inorganic Chemistry I	BSK2002 Business Organization Skill	BSK2133 Separatio Technique	BSK3103 Organic Spectroscopy	BSK3143 Unit Operation	BSK4152 Current Topics in Industrial Chemistry	BSK4608 Industrial Training			
		BSK1402 Organic Chemistry Laboratory	BSK1422 Inorganic Chemistry Laboratory	BSK2143 Instrumentation Method	BSK2123 Material Chemistry	BSK3462 Organic Spectroscopy Laboratory	BSK3472 Unit Operation Laboratory	BSK4614 Industrial Training Report				
		BSK1113 Physical Chemistry	BSK1133 Analytical Chemistry	BSK2442 Instrumentation Method Laboratory	BSK2452 Material Chemistry Laboratory	BSK3163 Inorganic Chemistry Process	BSK3153 Organic Chemistry Process	BSK4314 Final Year Project II				
		BSK1412 Physical Chemistry Laboratory	BSK1432 Analytical Chemistry Laboratory	BSK2183 Thermodynamics	BSF2232 QA & QC for Testing Laboratory	BSF3232 Method Validation & Verification For Analysis	BSK3302 Final Year Project I					
		BUM123 Applied Calculus	BUM2413 Applied Statistics	BSF2222 Laboratory Quality Management		# BSK35*3 Elective I	# BSK*5*3 Elective III	# BSK35*3 Elective IV				
			BSF1212 Laboratory Safety Management				# BSK35** Elective II	# BSK35*** Elective V				
	124	18	18	18	14	13	18	13	18	13	12	
	University Required Courses: Fundamental Of English Language, English For Academic Communication, Islamic & Asian Civilization, Co-Curriculum I, Technical Writing, Co-Curriculum II, English For Technical Academic, English For Professional Communication, Soft Skills I, Ethnic Relationship, Elective Social Sciences, Foreign Language I, Techno preunership, Foreign Language II, Soft Skills II											
	124	Total Unit For Graduation										
	# Elective Subject											

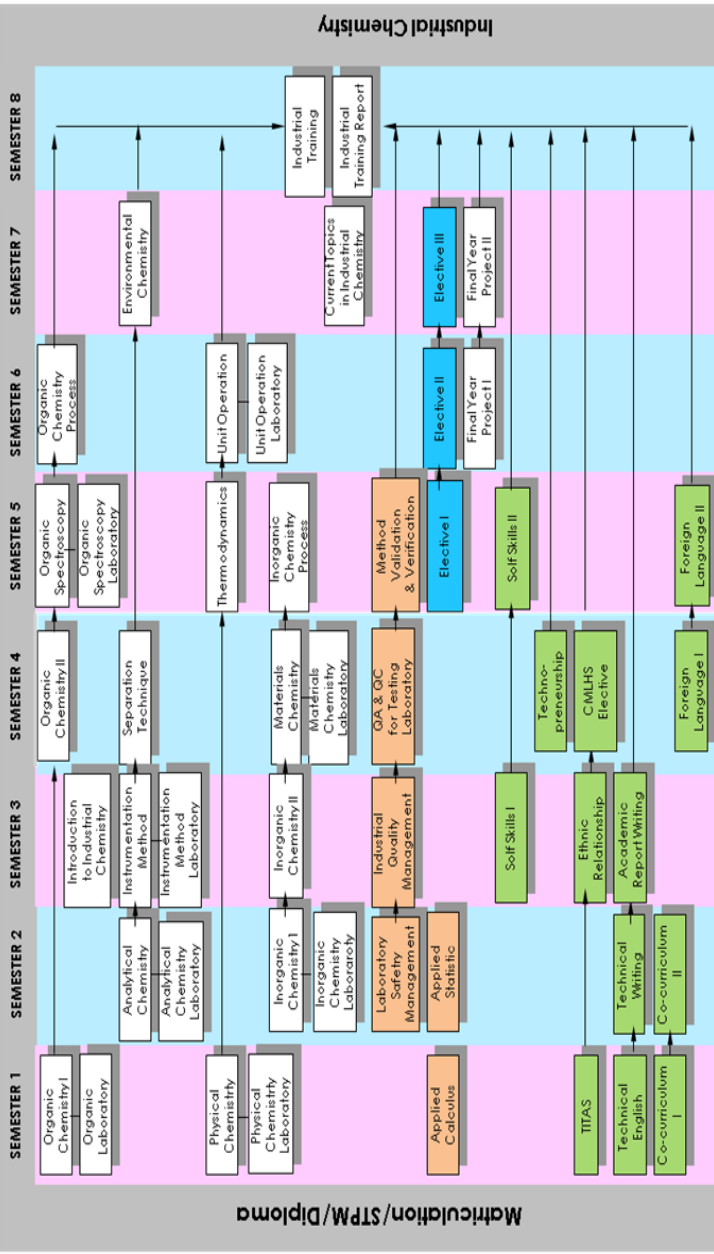
Elective subject to be offer in Bachelor of Applied Science (Honours) – Industrial Chemistry

NO.	CODE	COURSE	CREDIT HOUR
1	BSK3513	Petrochemistry	3
2	BSK3523	Oleochemistry	3
3	BSK3533	Polymer Chemistry	3
4	BSK3543	Industrial Environment & Pollution	3
5	BSK3553	Natural Product Chemistry	3
6	BSK3563	Catalysis Chemistry	3

FACULTY & PROGRAMME COURSES WITH PRE-REQUISITE

Bachelor of Applied Science (Honours) – Industrial Chemistry

BACHELOR OF APPLIED SCIENCE (HONOURS) INDUSTRIAL CHEMISTRY



Matriculation/STPM/Diploma

SYNOPSIS OF FACULTY COURSE

BUM2413
APPLIED STATISTICS
Credit : 3 credits
Pre-requisite : None

Synopsis

Students are introduced to statistics including statistical problem-solving methodology and descriptive statistics, probability distribution commonly used, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by students to implement some of these ideas in practice.

Course outcomes

- CO1 Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.
- CO2 Perform statistical data analysis by using appropriate software and scientific calculator.
- CO3 Apply statistical concepts and methods learned to solve any related problems in various disciplines

BUM2123
APPLIED CALCULUS
Credit : 3 credits
Pre-requisite : None

Synopsis

Calculus is widely used in solving problems in science and engineering applications. Students are exposed limits and continuity; the derivative; the derivative in graphing and applications; integration; applications of the definite integrals in geometry, science and engineering; exponential, logarithmic, and inverse trigonometric functions; principle of

integral evaluation; interpolation, extrapolation, errors.

Course Outcomes

- CO1 Analyze and apply appropriate calculus concepts to solve various science and engineering problems.
- CO2 Use appropriate software and tool to solve the graphical and computational problems in calculus.
- CO3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.
- CO4 Relate and applied the concepts and methods studied into other courses.

BSF1212
LABORATORY SAFETY MANAGEMENT
Credit : 2 credits
Pre-requisite : None

Synopsis

This course exposes students to basic concepts of industrial and laboratory safety. Topics include quality systems (Good laboratory Practice and ISO/IEC 17025) for laboratory management, occupational health & safety and acts and related regulations. Students will be introduced to laboratory and industrial safety, laboratory and industrial accident, safety policy and procedure, emergency response plan, introduction to basic toxicology and first aid.

Course Outcomes

- CO1 Explain the basic concepts of industrial and laboratory safety
- CO2 Apply the information of quality systems and safety policies, procedures and laboratory safety manual based on a task given
- CO3 Relate hazard communication and emergency preparedness and response

- CO4 Report the laboratory and industry functions to comply with safety rules and regulations, write a laboratory safety manual and work in a team for a task given.

**BSF2222
LABORATORY QUALITY MANAGEMENT**

Credit : 2 credits

Pre-requisite : None

Synopsis

This subject is intended to give an understanding on aspects of industrial management and its application to an organization. The topics to be covered are: Introduction to Management and Organization, Management Environment, Organizational Structures, Human Resource Management, Organizational Behavior, Industrial Marketing, Operations and Value Chain Management, Facility Planning, Materials Management, Work Study, Project Management, Financial Accounting & Analysis and Industrial Management in the New Millennium.

Course Outcomes

- CO1 Explain the OECD GLP Principles and the ISO 17025 requirements to Laboratory Quality Management.
- CO2 Follow Good Laboratory Practice Recognition from ISO 17025 Certification.
- CO3 Explain thoroughly and practise the quality infrastructure that supports customer requirements for testing laboratories.
- CO4 Read appropriate reference materials of GLP Principles and ISO 17025.

**BSF3242
METHOD VALIDATION & VERIFICATION**

Credit : 2 credits

Pre-requisite : None

Synopsis

This course serves as a generic introduction to testing and calibration. We will discuss the rationale behind testing and calibration, and the factors that affect the need to test and calibrate measurement equipments. One should always make sure that the data produced by the measurement equipment is reliable and accurate. Naturally the equipment must be fit for the purpose and used in such appropriate and suitable courses. The course is part of a series of faculty of industrial sciences and technology compulsory courses. It will concentrate upon calibration and testing of measurement equipments as an operation that relates an output quantity to an input quantity for measuring system under given conditions. Discussion on the relationships among metrology, calibration, and quality systems will be emphasized. Fundamentals of single component calibration and multispecies calibration as well as practical aspects of calibration will be presented. Finally, a brief introduction to uncertainty and methods validation will also be discussed.

Course Outcomes

- CO1 Describe the technical and philosophical aspects of validation in testing.
- CO2 Trace possible source of uncertainties in testing.
- CO3 Clearly present specific validation method suitable to a particular testing condition or research step.

BSF2232
QA & QC FOR TESTING LABORATORY

Credit : 3 credits

Pre-requisite : None

Synopsis

This course focuses on the design and management of quality of manufacturing, service and public sectors to achieve global competitiveness. Emphasis is placed on new techniques for managing quality. This course is divided by two parts. Part one provides an introduction to quality principles. Part two focuses on the management system, which is concerned with planning to meet customer needs, arranging to meet those needs through leadership and strategic planning, and accomplishing goals through the action of people and work processes.

Course Outcomes

- CO1 Describe principle and basic methodologies of quality management system related to testing lab.
- CO2 Distinguish philosophies of quality and apply it in a management system
- CO3 Explain quality effectively in written and oral form through group discussion and presentation
- CO4 State a clear conclusion or suggestion based on the quality management system to meet customers' needs.

SYNOPSIS OF PROGRAMME COURSES

BSK1103
ORGANIC CHEMISTRY I

Credit : 3 credits

Pre-requisite : None

Synopsis

This course discuss the fundamental theory of properties, synthesis and organic reactions where use the functional group as framework

as a basic for second level courses with an organic chemical content. This course focuses on the key concepts of organic chemistry through a study of the reactions of selected nonfunctional aliphatic, alicyclic, cyclic and aromatic molecules. Particular emphasis is placed on the underlying mechanistic pathways that are involved and their stereochemical consequences. The stereochemistry of the molecular structure is also considered. The development of key skills is facilitated by a program of tutorials and practical.

Course Outcomes

- CO1 Explain the bonding properties of carbon which cause it to be present in such a large number and variety of important compounds and the common types of reaction mechanism and modern synthetic techniques and point out the relationship between structure with physical.
- CO2 Show the ability to communicate the types of functional in organic chemistry orally during the presentation.
- CO3 Select appropriate reference materials for organic chemistry methods.
- CO4 Identify and differentiate the types of organic structure based on their functional groups and describe the reaction involves

BSK1402
ORGANIC CHEMISTRY LABORATORY

Credit : 2 credits

Pre-requisite : None

Synopsis

This course exposes students to basic concepts of industrial and laboratory safety. Topics include quality systems (Good laboratory Practice and ISO/IEC 17025) for laboratory management, occupational health & safety and acts and related regulations. Students will be introduced to laboratory and

industrial safety, laboratory and industrial accident, safety policy and procedure, emergency response plan, introduction to basic toxicology and first aid. The students also are exposed in writing a laboratory safety manual.

Course Outcomes

- CO1 Apply the knowledge of organic chemistry to solve the problem given based on experiments
- CO2 Communicate by explain the questions given based on experiments
- CO3 Report and discuss the data and information of the experiment

BSK1113 PHYSICAL CHEMISTRY Credit : 3 credits Pre-requisite : None

Synopsis

This course discusses some introductory to thermodynamics in physical chemistry followed by continuation topics related to liquids and their mixtures, principles of chemical equilibrium and rate of reactions. The solid surfaces including their applications will also be discussed in this course. The development of key skills is facilitated by a program of tutorials and practices.

Course Outcomes

- CO1 Understand principles in physical chemistry
- CO2 Respond to a given problem based on physical chemistry
- CO3 Select appropriate reference materials for physical chemistry

BSK1412 PHYSICAL CHEMISTRY LABORATORY Credit: 2 credits Pre-requisite: None

Synopsis

Practical comprises laboratory experiments related to physical chemistry. Students will be exposed to chemical equilibrium, thermochemistry, calorimetry, electrochemistry and kinetic theory of gases and various experiments related to physical chemistry concepts.

Course Outcomes

- CO1 Show appropriate experimental technique in physical chemistry laboratory
- CO2 Identify principles in physical chemistry laboratory
- CO3 Write scientific report with relevant reference materials

BSK1123 INORGANIC CHEMISTRY I Credit: 2 credits Pre-requisite: None

Synopsis

The aim of this subject is to provide a comprehensive and contemporary introduction to the diverse and fascinating discipline of inorganic chemistry. Inorganic chemistry deals with the properties of all the elements in the periodic table. These elements range from highly reactive metals to noble metals, such as gold. The nonmetals include solids, liquids and gases. Although this variety and diversity are intrinsic features of inorganic chemistry, there are underlying patterns and trends which enrich and enhance our knowledge of the discipline. The objective is to provide an insight into these ordering principles, and a foundation on which to build understanding.

Course Outcomes

- CO1 Explain principles in inorganic chemistry
- CO2 Respond to a given problem based on inorganic chemistry.
- CO3 Show the ability to communicate inorganic chemistry orally.
- CO4 Select appropriate reference materials for inorganic chemistry.

BSK1422
INORGANIC CHEMISTRY LABORATORY
Credit: 2 credits
Pre-requisite: None

Synopsis

This course provides the students a clear idea of the reactivity of the elements in different groups from IA to VIIA in periodic table.

Course Outcomes

- CO1 Relate the principles and knowledge of inorganic chemistry to solve the problem given based on experiments
- CO2 Show appropriate experimental technique in a team work.
- CO3 Write scientific report with relevant reference materials

BSK1133
ANALYTICAL CHEMISTRY
Credit: 3 credits
Pre-requisite: None

Synopsis

The objective of this course is to provide students with a basic understanding of analytical chemistry, the science of chemical characterization and measurement. The course is an introductory part of a series of analytical chemistry courses for industrial chemistry majors. It will concentrate upon

descriptive analytical chemistry and analytical methods based on chemical equilibria which include precipitation, volumetric and thermal analysis. A brief introduction to instrumental methods, separation methods, instruments calibration and methods validation, process analytical chemistry as well as good laboratory practice will also be discussed.

Course Outcomes

- CO1 Explain principles in analytical chemistry
- CO2 Respond to a given problem based on analytical chemistry
- CO3 Select appropriate reference materials for analytical chemistry analysis

BSK1432
ANALYTICAL CHEMISTRY LABORATORY
Credit: 2 credits
Pre-requisite: None

Synopsis

The objective of this course is to provide students with a basic skills of analytical chemistry field, the science of chemical characterization and measurement. The course is an introductory part of a series of analytical chemistry courses for industrial chemistry majors. It will concentrate upon descriptive analytical chemistry and analytical methods based on chemical equilibria which include precipitation, volumetric and thermal analysis. A brief introduction to instrumental methods, separation methods, instruments calibration and methods validation, process analytical chemistry as well as good laboratory practice will also be practice in lab.

Course Outcomes

- CO1 Show appropriate experimental technique in analytical chemistry laboratory
- CO2 Identify principles in analytical chemistry laboratory

- CO3 Write scientific report with relevant reference materials

**BSK2142
INTRODUCTION TO INDUSTRIAL
CHEMISTRY**

**Credit: 2 credits
Pre-requisite: None**

Synopsis

This course introduces the basic principles and instrumentation of separation methods in chemistry. The major separation method used in chemical analysis, including chromatography and electrophoresis will be discussed. Characterization, mechanism involved in separation, instrumental systems, advantages and limitation of methods will also be discussed. Students will be exposed to development and application of knowledge in explaining the concepts and principles of separation. The development of key skills is facilitated by a program of tutorials and practices.

Course Outcomes

- CO1 Explain the basic chemical resources and their application in chemical industry as well as other relevant industries.
- CO2 Describe the basic process technology and technological economics fundamental to the industries.
- CO3 Identify key pollution prevention (P2) strategies for the industries.
- CO4 Discuss the major regulations impacting the industries.

**BSK2163
INORGANIC CHEMISTRY II
Credit: 3 credits
Pre-requisite: None**

Synopsis

This course focused on a balanced and critical account of a systematic study of transition metals and some of their compounds. Emphasis shall be on the stability, structure and properties based on d-Block chemistry. The students will also be exposed to the complex chemistry through coordination compounds to provide great skill of chemists in developing novel methods for the synthesis of complex materials, and their understanding of the intricacies of structure and bonding.

Course Outcomes

- CO1 Explain and apply the fundamental concepts of d block and complex coordination
- CO2 State different types of complexation and synthesis methods
- CO3 Respond effectively in written and oral form through group discussion (assignment), quizzess and presentation session.
- CO4 Select appropriate reference materials for advanced inorganic chemistry

**BSK2153
INSTRUMENTATION METHOD
Credit: 3 credits
Pre-requisite: BSK1133**

Synopsis

This course is designed to introduce the modern instrumental methods that are used to solve analytical problems in chemistry. A qualitative and quantitative analysis which is studied in Analytical Chemistry course will be further developed. The course will begin with the explanation of instrumentation methods concept and the tools of quantitative analysis. Students will expose to spectroscopy (AAS,

AES, MS, UV/VIS, FTIR, X-RAY, and NMR) and deals with the methods of electroanalytical chemistry and radiochemical.

Course Outcomes

- CO1 Apply analytical chemistry knowledge in modern instrumentation techniques.
- CO2 React to a given problem based on contemporary instrumentation techniques.
- CO3 Show the ability the communicate instrumentation techniques orally.
- CO4 Select appropriate reference materials for instrumentation methods.

BSK2442 INSTRUMENTATION METHOD LABORATORY

Credit: 2 credits
Pre-requisite: None

Synopsis

Students will conduct experiments involving techniques, methods, investigations and data collection using instruments such as UV/VIS spectrophotometer, gas chromatography (GC), gas chromatography mass spectrometry (GC-MS), ion chromatography (IC), atomic absorption spectrometry (AAS), fourier transform infrared spectroscopy (FTIR) and electroanalytical method. Emphasis is on analyses of samples as conducted in industrial laboratories.

Course Outcomes

- CO1 Show appropriate experimental technique in instrumentation method.
- CO2 Identify principles in instrumentation laboratory.
- CO3 Show the ability the communicate instrumentation techniques orally.

- CO4 Write scientific report with relevant reference materials.

BSK2133 SEPARATION TECHNIQUE **Credit: 3 credits** **Pre-requisite: None**

Synopsis

This course introduces the basic principles and instrumentation of separation methods in chemistry. The major separation method used in chemical analysis, including chromatography and electrophoresis will be discussed. Characterization, mechanism involved in separation, instrumental systems, advantages and limitation of methods will also be discussed. Students will be exposed to development and application of knowledge in explaining the concepts and principles of separation. The development of key skills is facilitated by a program of tutorials and practices.

Course Outcomes

- CO1 Analyze separation process based on optimal area of application, performance and limitation of techniques in separation.
- CO2 Respond to a given problem based on separation techniques.
- CO3 Comply to the obligation for green chemistry and other measures that support energy-saving and environmental conservation.
- CO4 Propose solution for problem in separation technique based on the latest innovation.

BSK2193 MATERIAL CHEMISTRY **Credit: 3 credits** **Pre-requisite: None** **Synopsis**

This course exposes students to inorganic, organic materials and recent development in nanomaterials. Composite materials consisting of reinforced polymer with

conventional fillers and nanomaterials will be discussed. The type of reinforcements, the types of matrices as well as others constituent are discussed in details. Emphasis will be placed on types, characteristics, processing and applications of the various types of materials. The course will explain the properties of materials i.e. mechanical, electrical, magnetic, thermal and optical properties.

Course Outcomes

- CO1 Apply fundamental chemistry knowledge in material chemistry technology.
- CO2 Explain solution for a given problem based on knowledge in physical properties of the materials.
- CO3 Show the ability the communicate instrumentation techniques orally.
- CO4 Select appropriate reference materials for material chemistry

BSK2452

MATERIAL CHEMISTRY LABORATORY

Credit: 2 credits

Pre-requisite: None

Synopsis

This course exposes students to the handling of various materials and their laboratory preparations and characterizations. The students will acquire the skill and experimental techniques for the syntheses, determination of their properties and characterizations of some important materials discussed in the Materials Industry course.

Course Outcomes

- CO1 Explain the relationship between the raw material properties, the processing and the physical properties of materials.
- CO2 Explain the mechanical, electrical, magnetic, thermal and optical properties of materials and

their composites as well as the influence of fillers on these properties.

- CO3 Write scientific report with relevant reference materials

BSK2173

ORGANIC CHEMISTRY II

Credit: 3 credits

Pre-requisite: BSK1103

Synopsis

This course introduces classifications, synthesis and reactions of biomolecules such as carbohydrates, peptides and proteins, lipids and nucleic acids.

Emphasis is on three-dimensional structures and fundamental concepts on stereochemistry. Infrared spectroscopy is included as a technique in characterizing the functional groups of these compounds. The development of key skills is facilitated by a programme of tutorials and practical.

Course Outcomes

- CO1 Explain and apply the fundamental concepts of stereochemistry and recognize the stereoisomeric structures
- CO2 Respond effectively in written and oral form through group discussion (assignment), quizzess and presentation session.
- CO3 Select appropriate reference materials for organic chemistry methods
- CO4 State natural and synthetic polymers and methods used to form different types of synthetic one.

BSK3103
ORGANIC SPECTROSCOPY
Credit: 3 credits
Pre-requisite: None

Synopsis

This course deals with the four major instrumental methods such as ultra-violet/visible, infrared, mass spectroscopy and nuclear magnetic resonance spectroscopy. It provides a concise introduction to the physical background of each, describing how molecules interact with electromagnetic radiation or how they fragment when excited sufficiently, and how this information may be applied to the determination of chemical structures of organic compounds. It also includes simple descriptions of instrumentation and emphasizes modern methodologies such as the Fourier transform approach to data analysis. Each chapter is related with a set of problems to be solved in the tutorial lectures to test the understanding of organic spectroscopy.

Course Outcomes

- CO1 Apply concepts in electromagnetic radiation interaction in organic chemistry
- CO2 Explain organic functional groups determination with the aid of spectroscopy instrumentation .
- CO3 Show understanding in spectroscopy knowledge in written and verbal form
- CO4 Discuss spectroscopy knowledge with the updated technology and references.

BSK3462
ORGANIC SPECTROSCOPY
Credit: 2 credits
Pre-requisite: None

Synopsis

The aim of this course is to provide students with a basic understanding of spectroscopic analysis suitable for the determination of the

structure of organic molecules. The course will concentrate upon the most commonly used techniques in organic structure determination, i.e. infrared spectroscopy (IR), ultraviolet-visible (UV-Vis) spectroscopy and gas-chromatography-mass spectrometry (GC/MS). The amount of time devoted to each technique in this course is meant to be representative of their current usage for structure determination.

Course Outcomes

- CO1 Explain the basic concept of spectroscopic analysis in determining the chemical structure of organic molecules.
- CO2 Show the appropriate analytical method in conducting the respective experiments and interpret the spectral data acquired.
- CO3 Explain the principles of spectroscopy effectively in verbal form.
- CO4 Write scientific report with relevant reference materials.

BSK3113
THERMODYNAMICS
Credit: 3 credits
Pre-requisite: BSK1113

Synopsis

This course discusses thermodynamic in greater detail. Changes in physical properties will be extensively discussed in each law of thermodynamics. A special emphasis will be placed on the basic concepts of work, heat, internal energy, heat capacity and enthalpy changes in First Law of Thermodynamic. In the Second Law, entropy changes in reversible and irreversible processes will be discussed. Absolute entropy will be discussed in Third Law. Also discussed in this course is thermal equilibrium in the Zeroth Law, principles and applications of ionic interactions and electrochemical systems.

Course Outcomes

- CO1 Interpret thermodynamics concepts in terms of laws and processes.
- CO2 React to the thermodynamic problems by applying thermodynamic equations.
- CO3 Explain the thermodynamic principles effectively in written form.
- CO4 Form working knowledge on the relationship between the law of thermodynamic principles and its applications.

BSK3163**INORGANIC CHEMISTRY PROCESS****Credit: 3 credits****Pre-requisite: BSK1123****Synopsis**

This course is a continuation from the courses Inorganic Chemistry I and Inorganic Chemistry II and presents modern inorganic chemical processes in the context of society and market demands versus technology offers within the framework of trade globalization and competition.

Course Outcomes

- CO1 Apply and relate the inorganic chemical process industrial to the organizing scales and complexity levels.
- CO2 Respond and discuss technology developments related to the inorganic chemical process.
- CO3 Select appropriate reference materials for advances in industrial chemistry and the chemical processes involved.
- CO4 Explain effectively in written and oral form through group discussion

BSK3153**ORGANIC CHEMISTRY PROCESS****Credit: 3 credits****Pre-requisite: None****Synopsis**

The course covers the basic principles of various organic chemicals manufacturing processes, hazards and safety in organic chemical manufacturing, the principles of catalysis and awareness of this particular process to the environment. Emphasis on manufacturing of C1 chemicals, olefins, synthesis involving carbon monoxide, oxidation products of ethylene, alcohols, vinyl compounds, polyamides, propene conversion products, aromatics and derivatives, and bio fuels are covered in this course. The development of key skills is facilitated by a programme of tutorials and practical.

Course Outcomes

- CO1 Recognize the nature and function of organic chemical industry and the primary products
- CO2 Respond to a given problem based on organic chemistry process
- CO3 Show the ability to communicate organic chemistry process ora
- CO4 Select appropriate reference materials for organic chemistry process

BSK3143**UNIT OPERATION****Credit: 3 credits****Pre-requisite: None****Synopsis**

This course discusses material balance on steady and recycle states and material balance based on chemical processes. Emphasis will be placed on energy balance concept based on chemical processes including calculation of heats of reactions and application of the steam table. Also covered in this course are fluid pressure and fluid dynamics, liquid flow measurement, heat transfer and heat exchangers.

Course Outcomes

- CO1 Apply the equation in solving problems of energy balance, materials balance, fluid mechanics and heat transfer.
- CO2 Respond to a given problem based on unit operation.
- CO3 Propose the concept of energy balance, material balance, fluid mechanics and heat transfer to overcome chemical processes problems

BSK3472**UNIT OPERATION LABORATORY****Credit: 2 credits****Pre-requisite: None****Synopsis**

Laboratory experiments are designed and structured for the course is related to several unit operations in an open laboratory concept. Laboratory practice are based on pilot-scale apparatus i.e. tray drier, mixers, fixed and fluidised unit, batch and continuous distillation column unit, liquid-liquid extraction unit etc

Course Outcomes

- CO1 Follow good laboratory skill in an open laboratory concept and relate into several industrial processes.
- CO2 Apply theory in project scale-up of bench-scale laboratory into pilot scale environment
- CO3 Demonstrate effective communication in written (lab reports) with compile experimentally generated data into concise, clearly written laboratory reports, present the reports within the timeline and also communication through team work.

BSK3302**FINAL YEAR PROJECT I****Credit: 2 credits****Pre-requisite: None****Synopsis**

Students will conduct continuous scientific research activity in a chosen topic under the guidance of a lecturer. Students will be guided and trained on literature review , prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, expected result, treatment of results and list of reference publications. At the end of the semester, each student will be required to write a satisfactory research progress report. Evaluation will be based on written progress report, research work, literature review and oral presentation.

Course Outcomes

- CO1 Originate problem statement, objective and scope of the research based on literature review
- CO2 Demonstrate good organization of laboratory logbook in recording experimental methods and data.
- CO3 Assemble research proposal in professional format such as oral presentation
- CO4 Report satisfactory project progress within the timeline

BSK4314**FINAL YEAR PROJECT II****Credit: 4 credits****Pre-requisite: None****Synopsis**

This course is intended as the second part of Final Year Project I (BSK3302). The students are required to conduct the research, collect and analyze data, discuss the findings and form the conclusions. At the end of the semester, each student is required to present their findings and submit a dissertation.

Evaluation is based on oral presentation and submitted dissertation.

Course Outcomes

- CO1 Summarize the project finding based on data collection, data interpretation and supported by literature reviews.
- CO2 Organize experimental procedure and data collection method for the project objectives.
- CO3 Display novel ideas in completing research project.
- CO4 Organize presentation in professional way and respond to suggestions and critics.
- CO5 Defend about the fulfillment of the project objectives and recommend for further works.

BSK4152 CURRENT TOPICS IN INDUSTRIAL CHEMISTRY

Credit: 2 credits

Pre-requisite: None

Synopsis

The course discusses current topics in industrial chemistry and chemical technology with emphasis on local and regional industries, namely, petrochemical industry, oleochemical industry, green technology, etc.

Course Outcomes

- CO1 Explain the important components of industrial chemical processes
- CO2 Explain the various aspects of chemical processes .
- CO3 Analyze the relationship between process parameters and the output of any chemical process.

- CO4 Communicate effectively in written and oral form through group discussion (assignment) and presentation session.

BSK4163

ENVIRONMENTAL CHEMISTRY

Credit: 3 credits

Pre-requisite: None

Synopsis

This course introduces the concepts of environmental science, environmental analysis, and environmental issues. It covers some fundamental aspects of the science of atmosphere, waters, and soil. This course covers environment quality guidelines used in Malaysia. It also covers the environmental monitoring strategies and analysis of inorganic and organic analyte in environment.

Course Outcomes

- CO1 Classify and explain the complex physical, chemical and biochemical systems of natural environments and different types of environmental monitoring strategies.
- CO2 Construct well-reasoned solutions to environmental predicaments, testing them against relevant criteria and standards.
- CO3 Show the ability to communicate effectively through group assignment or presentation.
- CO4 Read appropriate reference materials regarding environmental issues

BSK4608 INDUSTRIAL TRAINING

Credit: 8 credits

Pre-requisite: All faculty and programme courses

Synopsis

This course aims to give chances for the student to practise and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Students are supervised by industrial and university supervisors to guide and ensure they can do their work as good as possible and achieve the objective for this course.

Course Outcomes

- CO1 Design an appropriate strategy to complete the given task
- CO2 Construct possible solution to a given real problem in the industry
- CO3 Adapt working culture in project, consultant, construction and related industry
- CO4 Work effectively with others in organization to perform task given
- CO5 Demonstrate interpersonal skills and professional ethics in organization

BSK4614 INDUSTRIAL TRAINING REPORT

Credit: 4 credits

Pre-requisite: All faculty and programme courses

Synopsis

During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, student need to provide industrial training report to describe their technical and personal development during

their placement. The industrial training report need to hand in to the university supervisor. Students need to do final presentation for assessment.

Course Outcomes

- CO1 Organize the industrial training knowledge, experience and skill in the preparation of the industrial training report
- CO2 Build effective communication skills in written and oral presentation
- CO3 Practise the related approach to get relevant information from various sources
- CO4 Demonstrate good attitude in fulfilling the requirement of Industrial Training Unit

SYNOPSIS OF ELECTIVE COURSES

BSK3513 PETROCHEMISTRY

Credit: 3 credits

Pre-requisite: None

Synopsis

This course covers topics on petrochemical processes such as refinery and production of methane, ethane-ethylene, propane-propylene, butane-butene, other aromatic hydrocarbon and downstream processes to produce elastomers, fine chemicals other petro-based products.

Course Outcomes

- CO1 Apply fundamental chemistry knowledge in petroleum and petrochemical processes
- CO2 Explain the relationship between the properties of precursor and product in chemical transformations of petroleum and petrochemical products

CO3 Show ability to communicate effectively in written and oral form through assignment presentation session

CO4 Recognize latest petrochemical technology as a strategy in sustainable development

BSK3523

OLEOCHEMISTRY

Credit: 3 credits

Pre-requisite: None

Synopsis

Oleochemistry is the chemistry of oils and fats. The sources of oils and fats can be vegetable or animal. Although oils and fats from these sources have been exploited in the past, the availability of fossil fuel in particular throughout the last century has all but relegated oils and fats of non-fossil origin to mainly the food industries. In recent times, with depleting oils from fossil origin, oils and fats of non-fossil origin have started to make great re-entries into various industries including the fuel sector. The advantage of such oils and fats is that their sources are renewable. As such oleochemical technology research and development have entered a new dimension and is an important component of Green Technology. In this course, recent trends in industrial development of oleochemical technology will be discussed.

Course Outcomes

CO1 Examine underlying physico-chemical principles behind oleochemicals and the global impact

CO2 Recognize oleochemical technology as a strategy in sustainable development

CO3 Communicate effectively in written and oral form through group discussion (assignment), tutorial and presentation session.

BSK3533

POLYMER CHEMISTRY

Credit: 3 credits

Pre-requisite: None

Synopsis

The course discusses the fundamental principles of polymer chemistry. The discussion covers the determination of molecular weight of polymers, reactions mechanism and types of polymers based on reactions category such as chain-growth and step-growth polymerization and polymerization kinetics. The general characteristics of polymer, polymerization process/ polymer synthesis, specific characteristic of polymer including thermal and morphology and progress/ development of industrial polymers. Discuss some advanced polymers such as biomedical engineering and drug delivery, electrically-conductive polymers, liquid crystalline polymers for LCD and polymer dispersed liquid crystals (PLDC).

Course Outcomes

CO1 Examine underlying physico-chemical principles behind polymer chemistry in industry

CO2 Recognize polymer technology as a strategy in sustainable development

CO3 Communicate effectively in written and oral form through group discussion (assignment), tutorial and presentation session.

**BSK3543
INDUSTRIAL ENVIRONMENT &
POLLUTION**
Credit: 3 credits
Pre-requisite: None

Synopsis

This syllabus covers the basic knowledge of environment which includes pollution from industry, the impact of pollution towards environment, preventive measure, and analysis of contamination pollution substances in industry. Syllabus includes current issues in legislation, Environmental Quality Act, Water Quality Standards, Water Quality Management, and Environmental Impact Assessment (EIA). Other aspects that will be discussed are environmental monitoring, toxic and solid waste management, air pollution, water pollution and solid or sediment waste from industry.

Course Outcomes

- CO1 Illustrate the different type of pollutants in air, water and land from industrial sources, their impact on environment and the preventive measures to control pollution from industries.
- CO2 Respond to pollution issues and select the best method to treat the pollution
- CO3 Show the ability to communicate effectively through group assignment or presentation
- CO4 Read appropriate reference materials regarding pollution issues

**BSK3553
NATURAL PRODUCTS CHEMISTRY**
Credit: 3 credits
Pre-requisite: None

Synopsis

The course introduces screening of terrestrial and marine sources of plants, animals, microbials, venoms and toxins, and on bioactive secondary metabolite isolation and purification. Biosynthesis, semisynthesis and total synthesis of secondary metabolites will also be discussed. Students will be exposed to aspects of molecular mining, mechanistic pathways of drugs and pesticides and chemistry of flavors and fragrances.

Course Outcomes

- CO1 Explain the fundamental principles of organic chemistry
- CO2 Show the suitable methods for the identification and isolation
- CO3 Form a working knowledge on the relationship between the principles of organic chemistry and the ongoing research based on natural product
- CO4 Present effectively in written and oral form through group discussion (assignment), tutorial and presentation session.

**CURRICULUM STRUCTURE
BACHELOR OF APPLIED SCIENCE (HONOURS)
INDUSTRIAL BIOTECHNOLOGY 2013/2014**

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
FACULTY & PROGRAMME COURSES 279	BSB1102 Biophysical Chemistry	BSB1133 Organic Chemistry	BSB2152 Industrial Biotechnology	BSB2143 Enzyme Technology	BSF3113 Gene Technology	BSB3163 Plant and Mammalian Cell Technology	BSB3112 Biomanufacturing	BSB4614 Industrial Training Report	
	BSB1113 Biochemistry	BSB1421 Organic Chemistry Laboratory	BSB2163 Microbiology	BSB2492 Enzyme Technology Laboratory	BSB3472 Gene Technology Laboratory	BSB3492 Plant and Mammalian Cell Technology Laboratory	BSB4162 Current Topics in Industrial Biotechnology	BSB4608 Industrial Training Practical	
	BSB1402 Biochemistry Laboratory	BSB1163 Cell & Molecular Biology	BSB2432 Microbiology Laboratory	BSB2193 Industrial Microbiology	BSB3123 Bioprocess Technology	BSB3312 Final Year Project I	BSB4324 Final Year Project II		
	BSB1122 Genetics	BSB1422 Cell & Molecular Biology Laboratory	BSB2173 Bioanalytical Chemistry Laboratory	BSB2462 Industrial Microbiology Laboratory	BSB3482 Bioprocess Technology Laboratory	#BSB35*3 Elective I	#BSB35*3 Elective III		
	BSF1212 Laboratory Safety Management	BUM2413 Applied Statistics	BSB2442 Bioanalytical Chemistry Laboratory	BSB2102 Biomaterial Science	BSB3142 Biosensor Technology	#BSB35*3 Elective II			
	BUM2123 Applied Calculus		BSF2222 Laboratory Quality Management	BSF2232 QA & QC for Testing Laboratory	BSF3232 Method Validation & Verification For Analysis				
	18	18	18	17	16	13	13	12	
	University Required Courses: Fundamental of English Language, English For Academic Communication, Islamic & Asian Civilization, Co-Curriculum I, Technical Writing, Co-Curriculum II, English For Technical Academic, English For Professional Communication, Soft Skills I, Ethnic Relationship, Elective Social Sciences, Foreign Language I, Technopreneurship, Foreign Language II, Soft Skills II								
	125	Total Unit For Graduation							
	# Elective Subject								

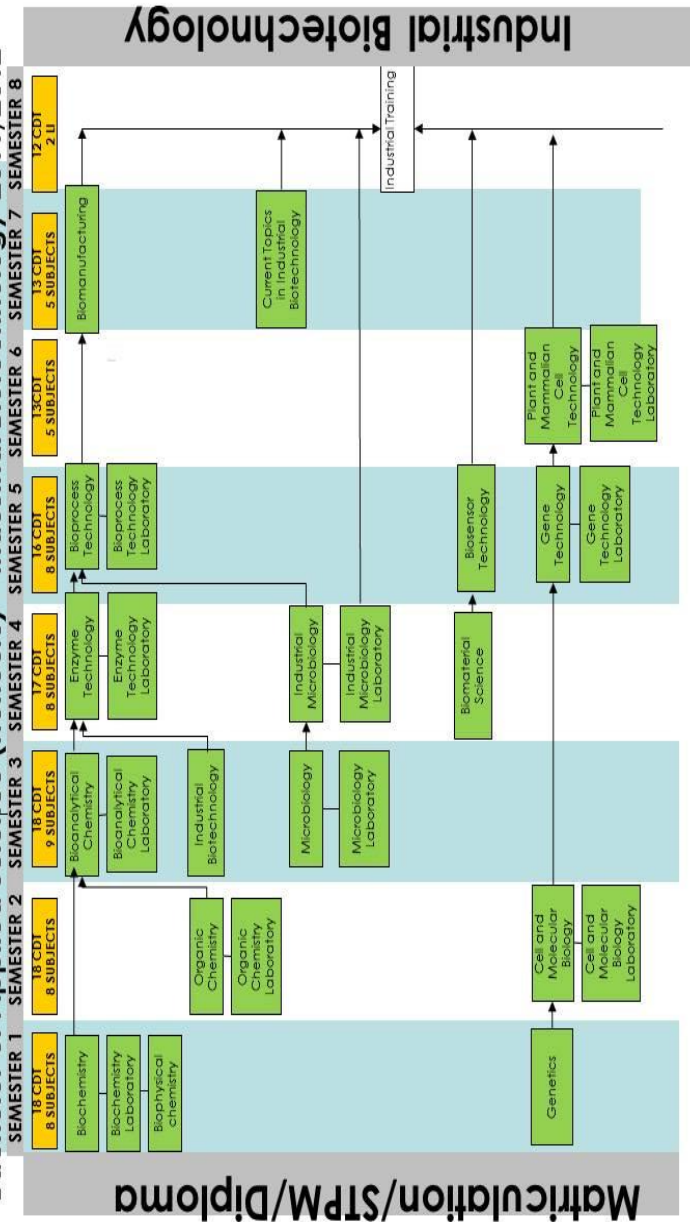
Elective subject to be offer in Bachelor of Applied Science (Honours) Industrial Biotechnology

No.	Code	Elective Course	Credit
1	BSB3513	Immunotechnology	3
2	BSB3523	Bionanotechnology	3
3	BSB3533	Biopharmaceuticals	3
4	BSB3543	Nutraceuticals and Functional Foods	3
5	BSB3553	Bioinformatics	3

FACULTY & PROGRAMME COURSES WITH PRE-REQUISITE

Bachelor of Applied Science (Honours) – Industrial Biotechnology

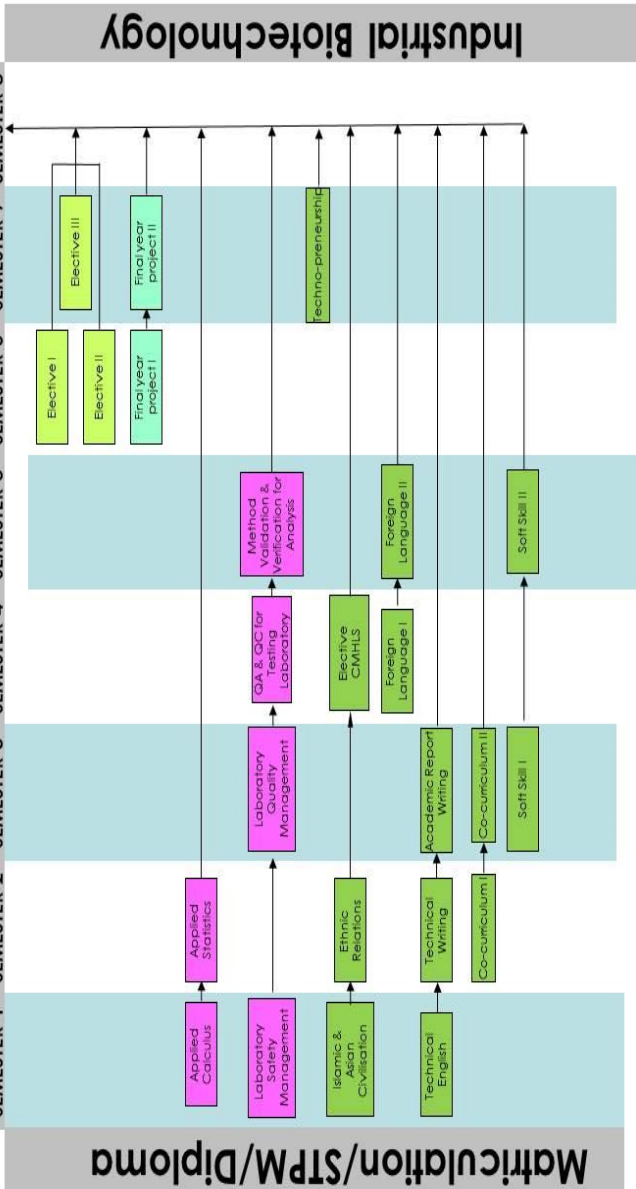
Bachelor of Applied Science (Honours) – Industrial Biotechnology 2011/2012



Bachelor of Applied Science (Honours) – Industrial Biotechnology 2011/2012
 SEMESTER 1 SEMESTER 2 SEMESTER 3 SEMESTER 4 SEMESTER 5 SEMESTER 6 SEMESTER 7 SEMESTER 8

Matriculation/STPM/Diploma

Industrial Biotechnology



SYNOPSIS OF PROGRAMME COURSES**BSB1102
BIOPHYSICAL CHEMISTRY
CREDIT : 3 CREDITS
PRE-REQUISITE : -****Synopsis**

The goal of this course is to emphasize principle and biochemical calculation that are commonly used in biological studies including molecular interactions, thermodynamics, acids and bases, kinetics and aqueous ionic equilibrium

Course Outcomes

- CO1 Describe the principle of physical chemistry in biological systems.
- CO2 Apply biochemical calculation in biological studies.
- CO3 Discuss and explain the bioenergetics principle.
- CO4 Understand and apply the calculation of kinetics.

**BSB1402
BIOPHYSICAL CHEMISTRY LABORATORY
CREDIT : 2 CREDITS
PRE-REQUISITE : -****Synopsis**

The course introduces student with the basic calculation and techniques that are commonly used in a biochemical lab. The principles of spectrophotometry and the application of spectrophotometry in biochemistry. Several quantitative and qualitative tests on important biomolecules such as Lowry assay, Bradford assay and DNS assay.

Course Outcomes

- CO1 Explain and demonstrate skills in biochemistry practices, tools and equipments.

CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.

CO3 Communicate in discussion and presentation of lab results in the laboratory.

CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis.

**BSB1113
BIOCHEMISTRY
CREDIT : 3 CREDITS
PRE-REQUISITE : -****Synopsis**

The course is designed to study the physical and biochemical characteristics of biomolecules including nucleic acids, amino acids and proteins, carbohydrates and lipids. Importance pathways for biosynthesis and degradation of nucleic acids, amino acids, proteins, carbohydrates and lipids will be discussed. Production of energy from carbohydrate and lipids and the related metabolisms will also be discussed. Besides that, the principle of cellular signaling in living organisms also will be described in this course

Course Outcomes

- CO1 Describe and explain structure and properties of carbohydrates, lipids, proteins and nucleic acids and relate the relationship between structure and biological function.
- CO2 Outline biosynthesis and degradation metabolism of proteins, lipids, carbohydrates and nucleic acids.
- CO3 Describe the energy sources and metabolisms that involved in energy storage and energy production.
- CO4 Describe the principle of cellular signaling in living organisms.

BSB1122
GENETICS
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

The course will provide the students with a strong background in the basic concepts of genetics. Students will be introduced to the brief history pertaining to genetics, cell division and chromosomes. Apart from that, the students will be exposed to the Mendelian Law of Inheritance, gene interaction including epistasis, sex linkages and determination, crossing, inbreeding, heterosis and environmental effect on genetics. Other topics to be discussed include genetic application and mechanism in race and species diversification formation. Population genetics and evolutionary genetics will also be discussed

Course Outcomes

- CO1 Demonstrate the theory and concept of fundamental genetics.
- CO2 Explain gene interaction and various ways how the genetic information can be change.
- CO4 Interpret population and conservation genetics.

BSB1133
ORGANIC CHEMISTRY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

Students will be exposed to the technique, methods and data acquisition through experiments in organic chemistry such as basic synthesis, spectroscopy and chromatography

Course Outcomes

- CO1 Describe characteristics and physical properties of organic molecules.

CO2 Recognise the main functional groups in organic chemistry and predict their reaction.

CO3 Relate organic chemistry in life science.

BSB1412
ORGANIC CHEMISTRY LABORATORY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

In this course you will be introduced to the fundamental principles of organic chemistry. Structure, properties and stereochemistry of organic molecules and basic organic reaction to prepare common functional groups will be studied.

Course Outcomes

- CO1 Explain and demonstrate skills in organic chemistry experiments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.
- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis.

BSB1163
CELL AND MOLECULAR BIOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

This course discusses fundamental concepts of cell biology, structure and function of cellular organelles and their biomolecules. Emphasis will be given on compositions, structures and functions of cell membrane and concepts of cell division. Concepts of central dogma of molecular biology and gene regulation and its control are also discussed.

Discussion includes techniques and applications of molecular biology such as DNA recombinant technology, gene cloning application and bioinformatics software.

Course Outcomes

- CO1 Describe and discuss the concept and function of macromolecules of the cells.
- CO2 Describe the structure of chromosome and gene, and explain the principle of DNA replication and repair.
- CO3 Describe and explain the pathway from DNA to protein including transcription and translation.
- CO4 Explain the concept and basic steps in molecular biology including gene cloning and bioinformatics.

BSB1422 CELL AND MOLECULAR LABORATORY CREDIT :2 CREDITS PRE-REQUISITE : -

Synopsis

In this course, students will be introduced and practice modern biotechnology laboratory techniques and theories. The subjects that will be covered are basic laboratory equipments handling and techniques such as nucleic acid isolation and purification, deoxyribonucleic acid (DNA) cloning, polymerase chain reaction (PCR) and gel electrophoresis analysis. In addition, students will be exposed to basic bioinformatics tools for analysis of genes

Course Outcomes

- CO1 Explain and demonstrate skills in cell and molecular biology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.

CO3 Communicate in discussion and presentation of lab results in the laboratory.

CO5 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis.

BSB2152 INDUSTRIAL BIOTECHNOLOGY CREDIT : 2 CREDITS PRE-REQUISITE : -

Synopsis

This multi-disciplinary course provides student to introduction policy, scope and research area in industrial biotechnology sector in Malaysia and global scenario. This subject focuses on interaction between scientific discovery, applications and challenge impact in biotechnology. There are four focus field includes industrial microbiology, agricultural, healthcare, biomaterial, enzyme and bioinformatics potential process will be discussed. Students also will be exposed to important and related components in commercialization such as issues, biosafety, bioethics, regulations, intellectual rights, facilities and expertise needed in biotechnology industries.

Course Outcomes

- CO1 Discuss various fields of biotechnology and relate it to its application.
- CO2 Identify issues and regulations in biotechnology.
- CO3 Explain various tools and processes of biotechnology products.

BSB2163 MICROBIOLOGY CREDIT : 3 CREDITS PRE-REQUISITE : -

Synopsis

This course introduces basic concepts in microbiology, techniques and microscopy. Discussion includes microorganism

characteristics and classification, structures, growth, nutrient requirement and metabolisms, physical and chemical control of microorganisms

Course Outcomes

- CO1 Describe the concepts of microorganisms, their cell structure and nutrition requirements.
- CO2 Actively participate in group discussion on methods to control the growth of microorganisms.
- CO3 Compare and distinguish the basic groups of microbes.
- CO4 Discuss the applications of microbe in food and industrial microbiology by oral presentation.

BSB2432 MICROBIOLOGY LABORATORY CREDIT : 2 CREDITS PRE-REQUISITE : -

Synopsis

This course covers practical in experiments and analyses in microbiology laboratory. Emphasis on the basic techniques in handling microorganisms, including aseptic technique, media preparation, inoculation and isolation of pure culture. Analysis and control of microbial growth, and biochemical and morphological characterization, will also be carried out

Course Outcomes

- CO1 Explain and demonstrate skills in microbiology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.

- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis.

BSB2173 BIOANALYTICAL CHEMISTRY CREDIT : 3 CREDITS PRE-REQUISITE : -

Synopsis

This course introduces spectroscopic methods for matrix characterization, principles of electrophoresis, isoelectric focusing, capillary electrophoresis, centrifugation methods, chromatography and mass spectrometry of biomolecules

- CO1 Discuss theories and applications of bioanalytical chemistry methods.
- CO2 Analyse and interpret analytical biochemistry results.
- CO3 Calculate problems of analytical methods.

BSB2442 BIOANALYTICAL CHEMISTRY LABORATORY CREDIT : 2 CREDITS PRE-REQUISITE : -

Synopsis

This course introduces spectroscopic methods for matrix characterization, principles of electrophoresis, isoelectric focusing, capillary electrophoresis, centrifugation methods, chromatography and mass spectrometry of biomolecules

Course Outcomes

- CO1 Discuss theories and applications of bioanalytical chemistry methods.
- CO2 Analyse and interpret analytical biochemistry results.
- CO3 Calculate problems of analytical methods.

BSB2143
ENZYME TECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

This course provides the theory and knowledge relevant to the enzymology principles including fundamental properties of enzymes, enzyme catalytic mechanisms and enzyme kinetics. Techniques employed in enzymes purification and characterization is also emphasized in this course. Students will also be introduced to the theory as well as applications of enzyme technology in food, medical, and household industries. Finally this course serves to provide an awareness of the current and possible future applications of enzyme technologies.

Course Outcomes

- CO1 Describe and discuss enzyme properties, nomenclature, characteristic and mechanism.
- CO2 Describe enzymes kinetics and apply biochemical calculation for enzyme kinetics.
- CO3 Describe and explain the methods for production, purification and characterization of enzymes.
- CO4 Discuss and present in group the application of enzymes in laboratories and industries.

BSB2452
ENZYME TECHNOLOGY LABORATORY
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

An introduction in theory, techniques and practical in modern enzyme technology laboratory. Emphasis will be given in concept and technique on basic laboratory and instrumentation handling, extraction and purification process, and polyacrylamide gel electrophoresis for enzyme/protein separation.

Course Outcomes

- CO1 Explain and demonstrate skills in enzyme technology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.
- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis.

BSB2123
INDUSTRIAL MICROBIOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

This course introduces various industrial applications of microorganisms in traditional fermentation process and advanced contemporary applications such as productions of biological materials and vaccines, biopharmaceutical, bioemulsifier, biopolymers, and biodegradation. Discussion includes biotechnology unit operation, bioprocess design, process modulation, kinetics and analysis. In addition, students will be introduced to work flow and operation of an industry through a site-visit to a related industry.

Course Outcomes

- CO1 Explain basic concept of industrial microbiology.
- CO2 Compare and contrast metabolite pathways and regulations that are important for the biosynthesis of microbial products.
- CO3 State the flow of product development in industrial microbiology.
- CO4 Discuss various emerging areas in industrial microbiology by oral

presentation.

- CO5 Actively participate in group discussion on regulation and safety of microbiology product.

BSB2462
INDUSTRIAL MICROBIOLOGY
LABORATORY
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

This course covers practical in the application of microbes in industries. Emphasis will be given on techniques for screening of potential industrial microbes, identification of microorganisms, water and food analyses, fermentation processes, immunological and antibiotic tests.

Course Outcomes

- CO1 Explain and demonstrate skills in microbiology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.
- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis

BSB2102
BIOMATERIAL SCIENCE
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

This course covers basic knowledge in biomaterials, which covers structure of solid such as atomic bonding, crystal structure, imperfection in crystal structure, phase transitions, structure of polymers, supercooled and network solids and composite material

structures. Students will be introduced to types the materials such as metallic, ceramic, polymeric, composite and biological materials and characteristics of the materials such as mechanical, magnetic, electrical, thermal, optical and chemical properties

Course Outcomes

- CO1 Differentiate the various classes of biomaterials on the basis of structure and function.
- CO2 Differentiate various analytical methods based on their use to characterize bulk and surface properties of biomaterials.
- CO3 Suggest the suitable material for any biological application.
- CO4 Present in group the application of biomaterial in biological application.

BSB3113
GENE TECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

Topics discussed include the advance techniques in gene technology including molecular markers, genomic and cDNA libraries, recombinant technology, DNA hybridization and plant genetic engineering. This course emphasize on the application of gene technology in medicine, agriculture, forensic and archaeology. Students are also trained to participate in group discussion and present on the application of gene technology and related ethical issues

Course Outcomes

- CO1 Describe and explain advance techniques in gene technology.
- CO2 Describe and explain the applications of gene technology in medicine, agriculture, forensic and archaeology.

- CO3 Discuss and present in groups the application of gene technology and related ethical issues.

BSB3472
GENE TECHNOLOGY LABORATORY
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

Students will be exposed to the latest technique in gene technology such as gene cloning, gene therapy and delivery, genetic and protein engineering, protein microarray technology, monoclonal antibody etc.

Course Outcomes

- CO1 Explain and demonstrate skills in gene technology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.
- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis

BSB3123
BIOPROCESS TECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

The course discuss on the basic operational in bioprocess technology, unit, dimension, mass transfer at the equilibrium phase, stoichiometry of microbial growth and product formation as well. This course explicates the connection between microbial growth, product formation, mass transfer and environment. Likewise, this course gives an overview of the bioprocess from raw material to product. Upstream and downstream processing will be discussed. This course explains the processes and techniques

used for extraction and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques.

Course Outcomes

- CO1 Differentiate unit operation in upstream and downstream process.
- CO2 Solve calculations for unit operations in bioprocess.
- CO3 Translate and construct process flow sheet.

BSB3482
BIOPROCESS TECHNOLOGY
LABORATORY
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

Bioprocess technology laboratory course deals with and cover the extraction and bioseparation of different microbial industrially important by-products. The course will be given on different techniques of mini-project for preparing and drawing the microbial growth curve. Also, mini project will cover the bioprocesses for citric acid production from different microbial isolates including acid production, extraction, titration, quantification, precipitation and filtration

Course Outcomes

- CO1 Explain and demonstrate skills in bioprocess technology practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.

CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis

BSB3142
BIOSENSOR TECHNOLOGY
CREDIT : 2 CREDITS
PRE-REQUISITE : -

Synopsis

This course discusses concept, terms and application of biosensor technology. This multidisciplinary course consist integration of knowledge in genetic engineering, immuno techniques and protein engineering for production of biosensor device for various applications such as medical, food analysis, clinical diagnostics and environmental monitoring. The course also focusing on classification and the principle types of biosensor, measurement, biological materials, transducer descriptions, biosensor characteristics and their applications.

Course Outcomes

- CO1 Implement the fundamental components of a biosensor (biosensing elements and transducers).
- CO2 Compare and contrast types of materials that can be used as biosensing elements in relation to their use in biosensors.
- CO3 Differentiate four methods that can be used to immobilize biomolecules to a transducer for the construction of a viable biosensor.

BSB3163
PLANT AND MAMMALIAN CELL TECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE : -

Synopsis

Topics will be discussed in this course includes concepts, techniques and applications of plant and mammalian cell culture; principle of

totipotency; essential equipment of a tissue and cell culture facility; growth media preparation; methods for growing and store suspension and adhesion cultures; different cell type such as embryogenic culture, callus, independent cell, and stem cells; as well as benefits from clone reproduction in agriculture, livestock, medicine, and other related fields. Principle and benefit of cryopreservation and germplasm collection also will be discussed further.

Course Outcomes

- CO1 Understand and able to explain the principle of plant and mammalian cell/tissue culture.
- CO2 Describe techniques in culturing plant and mammalian cells.
- CO3 Describe the importance animal cell and tissue culture to human.
- CO4 Discuss and present the application of plant cell and tissue culture in agricultural and horticultural industries.
- CO5 Discuss the ethical issues related to the application of mammalian cell/tissue culture.

BSB3441
PLANT AND MAMMALIAN CELL TECHNOLOGY LABORATORY
CREDIT : 1 CREDIT
PRE-REQUISITE :

Synopsis

This course introduces techniques and skills required in both plant and animal cell/tissue culture laboratories. Aseptic techniques and sterilization are emphasized in this course. For plant cell and tissue culture practical, students are exposed to media preparation and several tissue culture techniques including callus induction, organogenesis, shoot and root induction, and acclimatization of tissue cultured plantlets. While in animal cell practical, students are exposed to the techniques of handling mammalian cells, calculating viability of cells and also cell toxicity studies

Course Outcomes

- CO1 Explain and demonstrate skills in plant and animal cell culturing practices, tools and equipments.
- CO2 Present data in appropriate form (graphs, tables, figures, or descriptive paragraphs) and assess validity of result data.
- CO3 Communicate in discussion and presentation of lab results in the laboratory.
- CO4 Work effectively in group to complete laboratory protocols and sharing tasks, results and analysis

BSB3112
BIOMANUFACTURING
CREDIT : 2 CREDITS
PRE-REQUISITE :

Synopsis

This multi-disciplinary course provides student to introduction policy, scope and research area in industrial biotechnology sector in Malaysia and global scenario. This subject focuses on interaction between scientific discovery, applications and challenge impact in biotechnology. There are four focus field includes industrial microbiology, agricultural, healthcare, biomaterial, enzyme and bioinformatics potential process will be discussed. Students also will be exposed to important and related components in commercialization such as issues, biosafety, bioethics, regulations, intellectual rights, facilities and expertise needed in biotechnology industries.

Course Outcomes

- CO1 Discuss various fields of biomanufacturing and related applications.
- CO2 Identify issues and regulations in biomanufacturing.

- CO3 Explain various tools and processes of biomanufacturing products.

SYNOPSIS OF ELECTIVE COURSES

BSB3513
IMMUNOTECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE :

Synopsis

This course provides a comprehensive overview on basic immunology, which covers the innate immune responses and acquired immunity. Topics include specific interactions of target cells and T cells, generation and molecular structure of B and T cell antigen receptors, signaling through immune receptors, development of antigen specific T and B cells, and specific roles of cytokines /lymphokines. This course emphasizes T and B cell-mediated immunity and topics of clinical relevance, such as microbial immunity, allergy, autoimmunity, tumor immunology, transplantation immunology, and immunotherapy. In addition, generation and application of monoclonal antibodies will be discussed.

Course Outcomes

- CO1 Describe the concept of immune system.
- CO2 Explain the contemporary approaches to manipulate the immune system in term of transplantation and immunotherapy.
- CO3 Differentiate the structure of antibody, MHC and their roles in an immune system.

BSB3523
BIONANOTECHNOLOGY
CREDIT : 3 CREDITS
PRE-REQUISITE :

Synopsis

This course will be focused on basic principle of nanotechnology such as fabrication and

collection from building blocks. This topic also introduces biological devices including principle, operation and practical reality in building and application. Other topics will be discussed includes biomolecules, nanofabrication, protein array technology, medical application of bionanotechnology, ethical and policy in bionanotechnology and the future prospect of bionanotechnology.

Course Outcomes

- CO1 Explain principle of bionanotechnology.
- CO2 Describe synthesis of various nanoparticles.
- CO3 Describe current and future application of bionanotechnology.

BSB3533 **BIOPHARMACEUTICALS** **CREDIT : 3 CREDITS** **PRE-REQUISITE :**

Synopsis

This course provides student to introduction of biopharmaceuticals, application of biotechnology especially on transforming proteins and genes into therapeutics, innovation models in the biopharmaceuticals sector, history of plant-made biopharmaceuticals and also risk analysis and safety of plant made biopharmaceuticals.

Course Outcomes

- CO1 Describe the application of biotechnology in therapeutics production.
- CO2 Describe the models used in biopharmaceutical sector.
- CO3 Explain about plant-made biopharmaceuticals, their risk and safety.

BSB3543 **NEUTRACEUTICALS AND FUNCTIONAL FOODS** **CREDIT : 3 CREDITS** **PRE-REQUISITE :**

Synopsis

The course introduces numerous aspects of nutraceuticals and functional foods. Discussion includes different types of functional foods or nutraceuticals ingredients that possess medicinal and health-promoting effects. The efficacy and safety of nutraceuticals and functional foods and the global regulatory arena that influence the development and commercialization of nutraceuticals and functional foods in global markets are also emphasized.

Course Outcomes

- CO1 Describe teleological aspects of nutraceuticals and functional food.
- CO2 Explain the analysis method of nutraceuticals and functional food.
- CO3 Describe preservation and packaging technologies in nutraceuticals and functional food.
- CO4 Apply knowledge for nutraceuticals and functional food case study.

BSB3553 **BIOINFORMATICS** **CREDIT : 3 CREDITS** **PRE-REQUISITE :**

Synopsis

The course will enhance bioinformatics skills among students through the career in biological sciences, molecular biology, biotechnology and medical sciences. The topics include potential and the application of genome analysis and introduce students to the roles of bioinformatics for the analysis of development, functional genomics and proteomics. It also covers the study of protein structure principle and protein structure prediction as well as data and database concept

Course Outcomes

- CO1 Explain theoretical basis of the algorithms used in bioinformatics tools.
- CO2 Describe bioinformatics methods best reveal and conceptualize the raw information.
- CO3 Applied bioinformatics tools for genomics and proteomics analysis.
- CO4 Participate actively in group discussion on data manipulations.

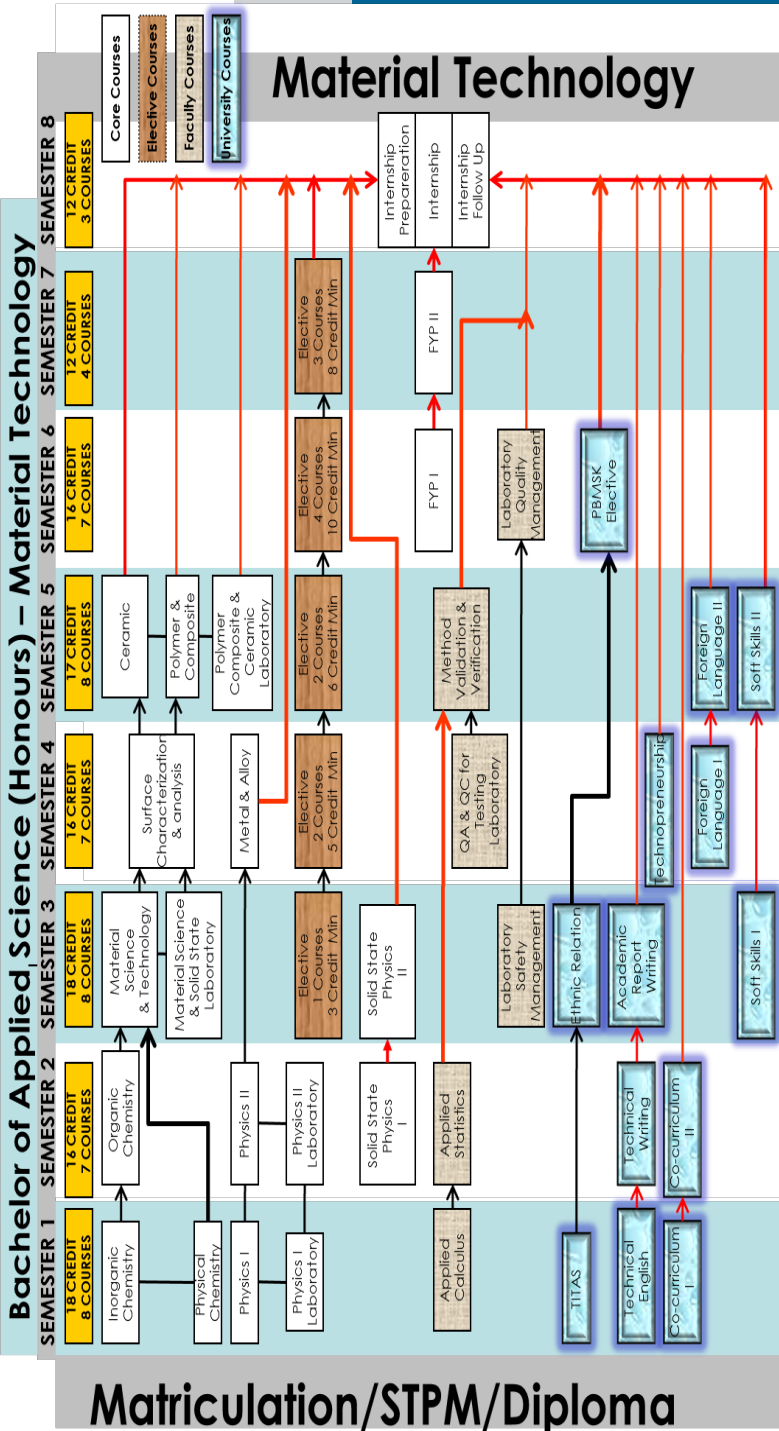
**CURRICULUM STRUCTURE
BACHELOR OF APPLIED SCIENCE (HONOURS)
MATERIAL TECHNOLOGY 2013/2014**

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
PROGRAM CORE COURSES	BSP1113 Physical Chemistry	BSP1133 Organic Chemistry	BSP2173 Solid State Physics I	BSP2193 Rheology	BSP3102 Ceramics	BSP3302 Final Year Project I	BSP4314 Final Year Project II	BSP4614 Industrial Training Report	
	BSP1123 Physics I	BSP1143 Physics II	BSP2422 Material Science and Solid State Physics Laboratory	BSP2183 Surface Characterization & Analysis	BSP3112 Polymer and Composite	BSP3142 Metal & Alloy	BSP4152 Material Processing	BSP4608 Industrial Training	
	BSP1402 Physics I Laboratory	BSP1412 Physics II Laboratory	BSP2163 Colloid & Surface Science	BSP2002 Business Organization Skill	BSP3442 Polymer, Composite and Ceramics Laboratory	BSP3452 Advance Material Laboratory	BSP4163 Nanotechnology		
			BSP2432 Rheology & Colloid Lab	BSP2153 Material Science & Technology	BSP3133 Nondestructive	BSF2222 Laboratory Quality Management	BSP45*3 Elective V		
	BUM2123 Applied Calculus	BUM2413 Applied Statistics	BSP2332 QA & QC for Testing Laboratory	BSP2103 Solid State Physics II	BSF2202 Method Validation and Verification	BSP35*3 Elective II	BSP4*63 Elective IV		
			BSF1212 Laboratory Safety Management	BSF3232 Method Validation & Verification for Analysis	BSP3*03 Elective I	BSP354* Elective III			
	127	15	19	19	16	16	15	12	
	University Required Courses: Fundamental of English Language, English For Academic Communication, Islamic & Asian Civilization, Co-Curriculum I, Technical Writing, Co-Curriculum II, English For Technical Academic, English For Professional Communication, Soft Skills I, Ethnic Relationship, Elective Social Sciences, Foreign Language I, Technopreneurship, Foreign Language II, Soft Skills II								
	125	Total Unit For Graduation							

Elective subject to be offer in Bachelor of Applied Science (Honours) – Material Technology

KOD	KURSUS	CREDIT HOUR
BSP2503	Colloid and Surface Science	3
BSP2523	Rheology	3
BSP2533	Nanotechnology	3
BSP2573	Non Destructive Test	2
BSP2513	Semiconductor Devices	3
BSP2582	Material Processing	2
BSP2543	Molecular Modelling	3
BSP2552	Rheology and Colloid Laboratory	2
BSP2562	Semiconductor Devices Laboratory	2
BSP2592	C Programming	2
BSP3502	Recycle Technology	2
BSP3533	Solar Cell Technology	3
BSP3523	Electronic Ceramics	3
BSP3543	Liquid Crystal Technology	3
BSP3553	Supercapacitor Technology	3
BSP3563	Thin Film Technology	3

FACULTY & PROGRAMME COURSES WITH PRE-REQUISITE
Bachelor of Applied Science (Honours) – Material Technology



Matriculation/STPM/Diploma

SYNOPSIS OF PROGRAMME COURSES

BSP110/3
INORGANIC CHEMISTRY
Credit: 3
Prerequisite: None

Synopsis

The aim of this subject is to provide a comprehensive and contemporary introduction to the diverse and fascinating discipline of inorganic chemistry. Inorganic chemistry deals with the properties of all the elements in the periodic table. These elements range from highly reactive metals to noble metals, such as gold. The nonmetals include solids, liquids and gases. Although this variety and diversity are intrinsic features of inorganic chemistry, there are underlying patterns and trends which enrich and enhance our knowledge of the discipline. The objective is to provide an insight into these ordering principles, and a foundation on which to build understanding.

Course outcomes

CO1	Student will be able to describe general properties of atomic structure in the Main Group Elements.	CO1	Students will be able to describe and explain the bonding properties of carbon which cause it to be present in such a large number and variety of important compounds
CO2	Students will be able to explain the bonding formation in Inorganic Molecules and their theories.	CO2	Student will be able to explain the common types of reaction mechanism and modern synthetic techniques and point out the relationship between structure with physical and chemical properties
CO3	Students will be able to classify the elements according to their groups and periods as well as the relationship between the elements in a particular group or a particular period	CO3	Students will be able to explain the significance of stereochemistry in organic chemistry
CO4	Students will be able to correlate the inorganic logic and knowledge to the industrial landscape.	CO4	Students will be able to describe the different functional groups that undergo reaction in devising syntheses of other organic compounds
CO5	Students will be able to communicate effectively in written and oral form through group discussion	CO5	Students will be able to explain the relationship of chemistry in general and organic in specific to the rest of science to explain the important role of organic chemistry in life, both biological and economical

BSP113/3
ORGANIC CHEMISTRY
Credit: 3
Prerequisite: None

Synopsis

This course discuss the fundamental theory of properties, synthesis and organic reactions where use the functional group as framework as a basic for second level courses with an organic chemical content. This course focuses on the key concepts of organic chemistry through a study of the reactions of selected nonfunctional aliphatic, alicyclic, cyclic and aromatic molecules. Particular emphasis is placed on the underlying mechanistic pathways that are involved and their stereochemical consequences. The stereochemistry of the molecular structure is also considered. The development of key skills is facilitated by a program of tutorials and practical.

Course Outcomes

**BSP111/3
PHYSICAL CHEMISTRY****Credit: 3****Prerequisite: None****Synopsis**

This course discusses some introductory to thermodynamics in physical chemistry followed by continuation topics related to liquids and their mixtures, principles of chemical equilibrium and rate of reactions. The solid surfaces including their applications will also be discussed in this course. The development of key skills is facilitated by a program of tutorials and practices.

Course outcome

- CO1 Students will be able to explain and describe the concept of physical chemistry
- CO2 Students will be able to apply the concept and understanding in physical chemistry to solve a given problem.
- CO3 Students will be able to discuss physical chemistry concept in relations to various fields of research and industries.
- CO4 Respond to the assigned task in group discussion and presentation

**BSP112/2
PHYSICS I****Credit: 2****Prerequisite: None****Synopsis**

This course introduce to the basic Physics principle in Mechanics and Thermodynamics field. Topic covered in this course including measurement, vectors, kinematics, Newton's law of motion, work, energy, power, fluid mechanics, static equilibrium, temperature, heat and also first law of thermodynamics

Course outcomes

- CO1 Student will be able to apply basic Physics concepts and theories learned to solve problems of Mechanics including Kinematics and Dynamics and also basic Thermodynamics.

CO2 Student will be able to explain solution of any related problems using the right principles and laws.

CO3 Student will be able to identify the suitable concepts and theories to solve problems in various fields.

**BSP114/2
PHYSICS II****Credit: 2****Prerequisite: None****Synopsis**

This course is continuity from Physics I course, where the basic principle of physics in Electricity, Magnetism and Optics will be discussed. Topic covered in this course including electric charge, electric field, electric potential and Gauss's law, While in macroscopic view of electricity, student will learned about the capacitance, electric resistance and also electric circuits. In magnetism, topic such as electromagnetic induction, Faraday's law will be discusses. Whereas, student also will be exposed to the basic optics such as the ray of light, Bragg's law and also the duality of particle.

Course outcomes

- CO1 Student will be able to apply basic Physics concepts and theories learned to solve problems of Electricity & Magnetism and basic Optics.
- CO2 Student will be able to explain solution of any related problems using the right principles and laws.
- CO3 Student will be able to identify the suitable concepts and theories to solve problems in various fields.

BSP115/3**SOLID STATE PHYSICS I****Credit: 3****Prerequisite: None****Synopsis**

Crystal structure, fundamental lattice type, reciprocal lattice, Brillouin zones, lattice binding, lattice elasticity, lattice vibrations, phonon, density state of Debye and Einstein model, Fermi free electron, Hall effect, energy band, Bloch functions, Kronig Penney model

Course outcomes

- CO1 Students will be able to apply the basic knowledge about crystal structure and explain the properties of the crystals using various model learned
- CO2 Students will be able to display problem solving and critical thinking skills that associated with the learned properties in the given assignment
- CO3 Students will be able to discuss the proposal in a way to comply the future needs in industries and communities

BSP216/3**SOLID STATE PHYSICS II****Credit: 3****Prerequisite: BSP115/3 / SOLID STATE PHYSICS I****Synopsis**

Semiconductor physics, Fermi Surfaces, Superconductivity, Dielectrics, Ferroelectric and Noncrystalline Materials

Course outcome

- CO1 Students will be able to use the learned electrical properties of solid state to explain some related phenomena hence solve the related problems
- CO2 Students will be able to react on industrial and economic issues in a well constructed study proposal
- CO3 Students will be able to discuss the proposal in a way to comply the

future needs in industries and communities

BSP217/3**MATERIAL SCIENCE & TECHNOLOGY****Credit: 3****Prerequisite: None****Synopsis**

This course is designed to expose the concept of nature and its association with material bonding and the other of atoms and molecules structure (microstructure connection with macrostructure). There are six (6) headlines in the course; atomic structure, bonds and crystal structure, defect structure and strengthening mechanisms, failure, material properties (thermal, electrical, magnetic, optical & mechanical), economic and environmental issues.

Course outcome

- CO1 Students will be able to analyze materials properties in term of atomic bonding and molecular structures
- CO2 Students will be able to explain materials properties in term of defect and diffusion phenomena
- CO3 Students will be able to Work on industrial and economic issues in a well constructed study proposal that benefit society

BSP2193**SURFACE CHARACTERIZATION AND ANALYSIS****Credit: 3****Prerequisite: None****Synopsis**

Provide an introduction to surface characterization and analysis, leading to thorough understanding of the various types of surface analytical methods, especially electron spectroscopy and microscopy. Gain thorough knowledge of the general surface characterization and analysis and be able to apply several methods of electron spectroscopy and microscopy leading to high quality surface analytical characterization and measurement results. Excel on the elucidation of macro and micro structural properties of

materials and in visualizing and measuring microscopic features to nanoscale dimensions.

Course Outcomes

- CO1 Apply and use the theory of spectroscopy and microscopy techniques in problem solving.
- CO2 Measure and analyze of raw data either directly or collectively using spectroscopy and microscopy instruments to determine the characterization of materials.
- CO3 Explain the working principle of spectroscopy and microscopy instrument.
- CO4 Perform in a team and report completely the task given using spectroscopy and microscopy instruments.

BSP310/2

CERAMICS

Credit: 2

Prerequisite: None

Synopsis

This course exposes students to ceramic materials in general. The type of reinforcements, the types of matrices as well as others constituent are discussed in details for composites. The course will further explain the properties of materials i.e. mechanical properties and defects.

Course Outcomes

- CO1 Analyze and discover the knowledge of ceramic materials properties, processing and mechanical behaviour.
- CO2 Reproduce the knowledge learned in solving ceramic problems.
- CO3 Propose a proposal on industrial problem that relate to ceramic materials which benefit society.

BSP311/3

POLYMER AND COMPOSITE

Credit: 3

Prerequisite: None

Synopsis

This course is to give the strong knowledge and understanding about the polymer and composite with emphasize on synthesis, phase behaviour and properties .

Course Outcomes

- CO1 Apply and use polymer and composite synthesis and properties concepts to solve any problem related to polymer and composite.
- CO2 Display the concepts and methods learned about polymer and composite properties and materials comprehensively.
- CO3 Propose a proposal on industrial problem that relate to polymer and composite materials which benefit society.

BSP1402

PHYSICS LABORATORY I

Credit: 2

Prerequisite: Co requisite with PHYSICS I / BSP1112

Synopsis

This is practical course for subject Physics I. In this course, student will conduct and doing the experiments based on the theory and principled learned before. Students will doing nine experiments in total through groups, which are Moments, Hooke's law, Newton second law, free fall, projectile motion, density of liquid, thermal expansion of solid and liquid, ideal gas and metal heat capacity experiments. Students need to submit their laboratory report after each of the experiment being done. At the end of the semester, students will face a written laboratory test.

Course Outcomes

- CO1 Follow and conduct the guided experiment based on learned physics theories
- CO2 Apply data and result analysis from the experiments and be able to

relate to the learned physics theories

- CO3 Present effectively in written (laboratory report assignment) form through group discussion (laboratory work)

BSP1412

PHYSICS LABORATORY II

Credit: 2

Prerequisite: Co requisite with PHYSICS II / BSP 1142

Synopsis

This is practical course for subject Physics II. In this course, student will conduct and doing the experiments based on the theory and principled learned before in that subject. Students will doing ten experiments in total through groups, which are measurement of resistance, current balance, faraday's law, electric field and potential in plate capacitor, capacitance, coulomb's law, dielectric constant, transformers, velocity of light and diffraction experiments. Students need to submit their laboratory report after each of the experiment being done. At the end of the semester, students will face a written laboratory test.

Course Outcomes

CO1 Follow and conduct the guided experiment based on learned physics theories

CO2 Apply data and result analysis from the experiments and be able to relate to the learned physics theories

CO3 Present effectively in written (laboratory report assignment) form through group discussion (laboratory work)

BSP2422

MATERIAL SCIENCES AND SOLID STATE LAB

Credit: 2

Prerequisite: Co requisite with MATERIAL SCIENCE & TECHNOLOGY / BSP 2173 or SOLID STATE PHYSICS I / BSP 1153 or SOLID STATE PHYSICS II / BSP 2163

Synopsis

This course will expose student's about several experiment that will cover material sciences³⁰¹ and solid state physics previous course

Course Outcomes

CO1 Follow the procedure to characterize the mechanical, electrical, optical and magnetic properties of the samples and analyze the data using the correct procedure.

CO2 Display the knowledge of concept and methods to conduct basic guided research related to material sciences or solid state field.

CO3 Select appropriate instruments and techniques to apply in the experiment.

BSP343/2

POLYMER, COMPOSITE & CERAMIC LAB

Credit: 2

Prerequisite: Co requisite with CERAMICS / BSP 3102 or POLYMER & COMPOSITE / BSP 3113

Synopsis

Practical and hands on approach of learning techniques for synthesis, and quantitative and qualitative characterization of materials as applied in industry. Focus of laboratory activities are techniques to analyze the microstructure and mechanical properties. To establish student deductive skill, mini project involves in further analysis and data manipulation of raw data from advance instrumentation techniques, and also collective data approach in determining a particular material property.

Course Outcomes

CO1 Assemble appropriate instrument to prepare and measure the polymer, composite and ceramic properties.

CO2 Follow the procedure to measure the mechanical properties of the materials and analyze data using correct procedure.

CO3 Report the findings in a way to comply the future needs of the technology on polymer, composite and ceramic to be applied in industries and community.

BSP330/2
FINAL YEAR PROJECT I

Credit: 2
Prerequisite: None

Synopsis

To expose and encourage student in doing research, define problems, give an opinion on how to overcome the problems and get related information regarding the problems. The topics that will discuss in this subject are literature review and methods that has been used by previous research, research report (proposal), research ethics and project management.

Course Outcomes

- CO1 Propose a project topic with regards to material science and technology field by referring to literature review.
- CO2 Identify the most suitable solution and technique to be applied.
- CO3 Respond effectively in written and oral form through group discussion and presentation session.
- CO4 Comply the need of society through integration of notion of awareness (safety and cost effective) into the project.

BSP431/4
FINAL YEAR PROJECT II

Credit: 4
Prerequisite: None

Synopsis

Thesis preparation is the second stage of the final year project, the final stage of the four years material technology curriculum. During this phase, students articulate and develop the material technology position they have formulated during preparation of the proposal and transform it into an actual material technology intervention. At the end of this term, each student is expected to submit a fully developed and presented project that reflects the student's command of the tools and processes of material technology knowledge. In Final Year Project II, students work individually on their thesis. Each student is assigned an advisor from the panel of faculty⁰² (lecturer). Students meet with their advisors on

a weekly basis. In addition, a technical advisor is available for students to consult throughout the semester.

Course Outcomes

- CO1 Construct experimental procedure and tools to achieve predetermine research objectives.
- CO2 Manipulate experiment finding with regards to the objectives and transformed them into meaningful informations.
- CO3 Respond and react to suggestions and criticism during presentations.
- CO4 Justify in terms of technical, theoretical, the benefit to the society and the future extension works that can be done.
- CO5 Identify industrial based problems or community based problems use them as objectives to be achieved.

BSP460/2
INTERNSHIP PREPARATION

Credit: 2
Prerequisite: None

Synopsis

Students are required to undergo industrial training at selected industry or research institution for four months. During the training there will be two visits from the faculty panel to monitor their work progress and to get feedback from their supervisor. At the end of the training, students must prepare and submit a report regarding their work. An oral presentation of the industrial training to the faculty panel is mandatory.

Course Outcomes

- CO1 Analyze problems encountered in respective industry using appropriate tools (for example questionnaires etc) to produce a research proposal.
- CO2 Identify industrial based problems or community based problems use them as objectives to be achieved.
- CO3 Organize and work effectively in group consists of multidisciplinary, multiracial and multilevel

environment to solve problems given by the supervisor.

**BSP461/8
INTERNSHIP**

Credit: 8

Prerequisite: None

Synopsis

Students are required to undergo industrial training at selected industry or research institution for four months. During the training there will be two visits from the faculty panel to monitor their work progress and to get feedback from their supervisor. At the end of the training, students must prepare and submit a report regarding their work. An oral presentation of the industrial training to the faculty panel is mandatory.

Course Outcomes

- CO1 Manipulate practical knowledge and data to drive conclusion for problem based cases in the industry (as agreed by the industrial and faculty panels).
- CO2 Evaluate critically the research findings with regards to the predetermined objectives.
- CO3 Organize and work effectively in group consists of multidisciplinary, multiracial and multilevel environment to solve daily tasks given by the supervisor.

**BSP462/2
INTERNSHIP FOLLOW UP**

Credit: 2

Prerequisite: None

Synopsis

Students are required to undergo industrial training at selected industry or research institution for four months. During the training there will be two visits from the faculty panel to monitor their work progress and to get feedback from their supervisor. At the end of the training, students must prepare and submit a report regarding their work. An oral³⁰³ presentation of the industrial training to the faculty panel is mandatory.

Course Outcomes

- CO1 Plan a strategy in order to solve predetermined problems as stated in research objectives.
- CO2 Adapt scientific approach and creativity to comply with current need of the department in order to solve given tasks.
- CO3 Follow the procedure and format of scientific reporting with ample evidence that comply with industry.

SYNOPSIS OF ELECTIVE COURSES

**BSP 250/3
COLLOID & SURFACE SCIENCE**

Credit: 3

Prerequisite: None

Synopsis

Colloid science is the study of systems involving small particles of one substance suspended in another. Suspensions in liquids form the basis of a wide variety of systems of scientific and technological importance, including paints, ceramics, cosmetics, agricultural sprays, detergents, soils, biological cells, and many others. The course is aimed to familiarize students with the fundamentals of colloid and surface science, from various types of colloids and colloidal phenomena, and classical and modern characterization/measurement techniques to applications of colloids and surface science in engineering, technology, chemistry, physics and material science. The course will discuss the "how and why" of modern Colloid science.

Course Outcomes

- CO1 Construct the binary and ternary phase diagram of colloidal system based on structural information from microscopy and spectroscopy results.
- CO2 Explain the association phenomena of surface-active materials such as micellization, emulsification, liquid crystallization and the commercial values.
- CO3 Perform collaborative work as part of a team as well as demonstrate social skills and responsibilities.

**BSP 252/3
RHEOLOGY****Credit: 3****Prerequisite: COLLOID & SURFACE
SCIENCE / BSP 2503****Co requisite: RHEOLOGY AND COLLOID
LABORATORY / BSP 2552****Synopsis**

The course discusses the way in which rheology interacts with in use situations which most of us come across in everyday life at home and work. A few chapters follow on the explanation of the different kinds deformation (chapter 2), the use of graphs in general (chapter 3), and rheology graphs in particular (chapter 4), the Newtonian liquid (chapter 5), calculation of flow behaviour in lots of simple geometries (chapter 6), rheology measurement (chapters 7 & 8) for non-Newtonian behaviour in liquids.

Course Outcomes

- CO1 Apply the knowledge of fluid/semifluid flow and deformation to interpret and generate graphical data.
- CO2 Display the ability to apply the equations of Newtonian's fluid flow calculations to provide solutions that comply with principles of material science & technology and economic values.
- CO3 Perform collaborative work as part of a team as well as demonstrate social skills and responsibilities.

**BSP 255/2
RHEOLOGY & COLLOID LABORATORY****Credit: 2****Prerequisite: COLLOID & SURFACE
SCIENCE / BSP 2503****Co requisite: RHEOLOGY AND COLLOID /
BSP 2552****Synopsis**

Students will experience hands on learning using related experimental set ups and methods. Students will be guided for the first 10 weeks of the course and they are required to accomplish a small project in group. This course consists of two related field of study³⁰⁴ colloidal systems and rheology. Students will

be guided on the synthesis and characterization part.

Course Outcomes

- CO1 Construct phase diagram of colloidal systems consists of micellar, emulsions, nanoemulsions, lyotropic liquid crystals phases using appropriate instruments and technique.
- CO2 Follow the procedure to characterize the optical and mechanical properties of the prepared colloidal samples using microscopy, spectroscopy technique and rheometer and analyze the data using the correct procedure.
- CO3 Report the findings in a way to comply the future needs of colloidal technology to be applied in industries and community.
- CO4 Analyze the raw data from rheology experiments using appropriate methodology and tools.

**BSP 253/3
NANOTECHNOLOGY****Credit: 3****Prerequisite: None****Synopsis**

This course is design to exposes nanotechnology (nanomaterials and nanostructures) for students. Subject will focus on science approach including fundamental sciences, techniques growth, tools for measuring nanostructures and tools to make nanostructures. Student will be introduced to zero-dimension and one-dimension materials, and special topic on carbon-based nanomaterial. Also discuss on important applications of nanomaterial and trends for future.

Course Outcomes

- CO1 Use the knowledge of fundamental sciences, zero-dimension (0D) and one-dimension (1D) of materials for understand in nanotechnology scope

- CO2 Discuss the nanomaterials or nanostructures of future that can use for application in nanotechnology
- CO3 Show the ability to incorporate cost effective and marketable prospect to local industry in mini group project

BSP 251/3**SEMICONDUCTOR DEVICES****Credit: 3****Prerequisite: None****Synopsis**

This course introduce to major application of technology from solid state physics. This course start with the most basic semiconductor devices which is p-n junction and also its fabrication, followed with more complex devices such as MOSFET, MESFET, transistors and some application of those devices such as diode, LED, photodetector and solar cell.

Course Outcomes

- CO1 Apply and explain the basic knowledge about semiconductor devices in term of structure and operation using learned physics phenomena and principles
- CO2 Discuss issues on industrial and economic in a way to comply the future needs in a well-constructed study proposal
- CO3 Show the ability to incorporate cost effective and marketable prospect to local industry in mini group project

BSP 256/2**SEMICONDUCTOR DEVICES****LABORATORY****Credit: 2****Prerequisite: Co-requisite with SEMICONDUCTOR DEVICES****Synopsis**

This subject is a practical course for Semiconductor Devices subject. A total of seven experiment involving semiconductor devices such as diode, JFET, MOSFET and etc. After finish with the experiment, students will have a final project for this course, where student will design and build project of their³⁰⁵ choice.

Course Outcomes

- CO1 Conduct experiments with regards to selected semiconductor devices
- CO2 Manipulate appropriate experimental techniques in order to solve any given problems during laboratory test and project.
- CO3 Respond effectively in oral and written (laboratory report assignment) form through group discussion (laboratory work)

BSP 258/2**MATERIAL PROCESSING****Credit: 2****Prerequisite: None****Synopsis**

To strengthen and expose to students of several processing techniques in polymer, composite and ceramic materials. The main topics include; types of processing techniques in related industries and process control criteria. This course includes methods of manufacturing and processing materials such as polymer, composites and ceramics materials. Emphasis is given to the selection criteria and process control to produce high quality products including the casting, extruding and molding.

Course Outcomes

- CO1 Apply and explain the concept of material processing techniques in problem solving.
- CO2 Display comprehensive understanding in manufacturing and processing of materials using laboratory scale experiments.
- CO3 Respond and react appropriately to suggestions and new ideas during discussions and talk about material processing.
- CO4 Perform in a team and report completely the task given in a group that related to the material processing.

BSP 254/3**MOLECULAR MODELING****Credit: 3****Prerequisite: None****Synopsis**

The course discusses technical development that have made the total-energy pseudopotential the most powerful ab-initio quantum mechanical modeling method presently available. In addition to presenting technical details of the pseudopotential method, the course aims to heighten awareness of the capabilities of the method in order to simulate its application to as a wide range of problems in as many scientific disciplines as possible.

Course Outcomes

- CO1 Apply the knowledge of molecular dynamics using Gaussian 09W software to simulate the needed output by optimization of energy technique.
- CO2 Display the knowledge to conclude the molecular modelling results related with emphasis on economic values.
- CO3 Show collaborative work as part of a team as well as demonstrate social skills and responsibilities.

BSP355/3**SUPERCAPACITOR TECHNOLOGY****Credit: 3****Prerequisite: None****Synopsis**

This course purposed to introduce knowledge about supercapacitor from the electrical and electrochemical properties in more details using the latest technology. This course mainly deals with the properties of supercapacitor and their technology development in industry

Course outcomes

- CO1 Students will be able to apply the knowledge of electrical properties of super capacitor in problem solving
- CO2 Students will be able to organize a working group to solve the given

task related to super capacitor

- CO3 Students will be able to display the knowledge to conduct basic guided research related to latest super capacitor materials in industry with emphasize on entrepreneurship values.

BSP354/3**LIQUID CRYSTALS TECHNOLOGY****Credit: 3****Prerequisite: None****Synopsis**

This course will cover the basic concept of liquid crystals such as order, parameter, phase transition and free energy. The knowledge about defect. Nematic, cholestic, smetic and surface alignment of liquid crystals also will learn in this course. Student expose to the application of liquid crystal likes technology of liquid crystal displays.

Course outcome

- CO1 Students will be able to Sketch the binary and ternary phase diagram of nematic, cholestic, smetic and lyotropic of liquid crystals
- CO2 Students will be able to discuss the characterization techniques and basic concept of liquid crystals such as order, parameter, phase transition and free energy
- CO3 Students will be able to respond about technology of liquid crystal displays in local industry respects to marketable prospects

BSP353/3**SOLAR CELL TECHNOLOGY****Credit: 3****Prerequisite: None****Synopsis**

Students will learn how solar cells convert light into electricity, how solar cells are manufactured, how solar cells are evaluated, what technologies are currently on the market, and how to evaluate the risk and potential of existing and emerging solar cell technologies. The potential & drawbacks of currently manufactured technologies (single- and multi-crystalline silicon, micromorph tandem cells,

CdTe, CIGS, CPV, PVT), as well as pre-commercial technologies (organics, biomimetic, organic/inorganic hybrid, and nanostructure-based solar cells) are also will be discussed. Students will be focusing on limits of solar cell performance and cost, and the major hurdles — technological, economic, and political — towards widespread substitution of fossil fuels. Students will apply this knowledge towards developing and critiquing a solar energy technology prospectus.

Course outcome

- CO1 Students will be able to apply the knowledge basic working principle of photovoltaic to solve problems in solar cell technology
- CO2 Students will be able to Display the knowledge to conduct basic guided research related to solar cell technology with emphasis on entrepreneurship values
- CO3 Students will be able to Perform collaborative work as part of a team as well as demonstrate social skills and responsibilities

BSP352/3

ELECTRONIC CERAMICS

Credit: 3

Prerequisite: None

Synopsis

This subject introduces and discusses the types and the properties of electronic ceramics. Students are exposed to the materials in each electronic ceramics category such as barium titanate. This course explained the details in several types of electronic ceramic such pyroelectric ceramics, dielectric ceramics and their applications

Course outcome

- CO1 Students will be able to distinguish types of electronic ceramics and apply the knowledge in problems solving
- CO2 Students will be able to work in a team and report completely the task given in a group that related to the properties of electronic ceramics³⁰⁷

CO3

Students will be able to display the knowledge to conduct basic guided research related to latest electronic ceramic materials in industry with emphasize on entrepreneurship values

BSP351/3

THIN FILM TECHNOLOGY

Credit: 3

Prerequisite: None

Synopsis

This course exposes students to overview the Thin Film Technology in various industry. This course will explain the preparation method of thin film and the properties of thin film such as optical properties, electrical properties, magnetic properties and mechanical properties. The reactions of thin film and several techniques for thin film characterization are discuss in details. Students will also learn the applications of thin film.

Course outcomes

- CO1 Students will be able to Use the knowledge of preparation methods, properties, reactions and applications of thin film
- CO2 Students will be able to differentiate every techniques that can be use in thin film characterization in group
- CO3 Students will be able to Show the ability to incorporate cost effective and marketable prospect to local industry in mini project

BSP350/2

RECYCLE TECHNOLOGY

Credit: 2

Prerequisite: None

Synopsis

Material resources to support our industrial age have become increasingly scarce. On the other hand, garbage or trashes or solid wastes resulted from our economic system that urges disposable lifestyles have become difficult problem to solve for those responsible for their management. Indeed, much of these discarded materials which could not be otherwise reused, sold, or salvaged may contain valuable amount of materials and or energy if appropriate technology and

management are applied to convert these wastes to wealth. This course deals with materials recycling and recovery. The course content includes four parts, i.e. (1) Principles of Solid Waste Management, (2) Materials Recycling, (3) Hazardous Waste Recovery, and (4) Future Strategies for Waste Management.

Course outcomes

- CO1 Students will be able to apply and explain the concept of recycle technology to solve related problems
- CO2 Students will be able to follow the procedure and analyze data from materials recovery techniques of hazardous solid waste, such as Activated Carbon Adsorption, Distillation, Hydrolysis, Ion Exchange, Solvent Extraction, Electrolytic Recovery, Membrane Separation, Air and Steam Stripping, Thin Film Evaporation, and Freeze Crystallization
- CO3 Students will be able to display comprehensive understanding in completing the assignment related to the recycle technology
- CO4 Students will be able to perform in a team and report completely the task given in a group that related to the recycle technology

BSP259/2 C PROGRAMMING Credit: 2 Prerequisite: None

Synopsis

This course introduces computer programming using the C programming language. Topic covered include the computer and computing fundamentals, program structure, printing, comments, variables, constants, arithmetic operations, math functions, input and output, program control and looping, functions, numeric arrays and pointers

Course outcomes

- CO1 Students will be able to apply the flowchart/ pseudochart to represent

and solve programming problems

- CO2 Students will be able to reproduce simple C programs with the most suitable variables and constant declarations during laboratory work
- CO3 Report effectively in written and practical form

BSP257/3 NON DESTRUCTIVE TEST Credit: 3 Prerequisite: None

Synopsis

Nondestructive testing (NDT), also called nondestructive evaluation (NDE) and nondestructive inspection (NDI), is testing that does not destroy the test object. NDE is vital for constructing and maintaining all types of components and structures. The course contains a few focus techniques of NDT namely as, dye penetrant inspection, radiographic testing, electromagnetic testing and ultrasonic testing. Upon completion of this course, the students will be able to understand the principle, needs and the technique to conduct a simple testing. This course will elaborate on the theory behind each method, the production of the probes and the mechanism to detect them, the properties of materials to be tested, the test methods involved and the advantages and disadvantages of each method.

Course outcomes

- CO1 Students will be able to manipulate the NDT equipments for material analysis during lab works
- CO2 Students will be able to analyze the data from Non Destructive Test experiments using appropriate methodology and tools.
- CO3 Students will be able to follow the appropriate technique of and methodology of NDT during lab work
- CO4 Students will be able to Report the findings in a way to comply the future needs of colloidal technology to be applied in industries and community

**CURRICULUM STRUCTURE
COMMON COURSE (SCIENCE & MATHEMATICS)
BACHELOR LEVEL 2013/2014**

FACULTY	SEMESTER 1			SEMESTER 2		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FSKPP	BUM1213	Fundamental Discrete Structure	3			
FKASA	BUM2123	Applied Calculus	3	BUM2133	Ordinary Differential Equations	3
	BUF1113	Basic Physics	HL/HG			
FKM	BUM2123	Applied Calculus	3	BUM2133	Ordinary Differential Equations	3
	BUF1113	Basic Physics	HL/HG			
FKEE	BUM2133	Ordinary Differential Equations	3	BUM2123	Applied Calculus	3
	BUF1113	Basic Physics	HL/HG			
FKKSA	BUM2133	Ordinary Differential Equations	3	BUM2123	Applied Calculus	3
	BUF1113	Basic Physics	HL/HG			
FT	BUM2123	Applied Calculus	3			
	BUM1123	Mathematics for Management	3			
FKP	BUM***3	Mathematics 1	3	BUM***3	Mathematics 2	3
	BUF1113	Basic Physics	HL/HG			
FSTI	BUM2123	Applied Calculus	3	BUM2413	Applied Statistics	3

FACULTY	SEMESTER 3			SEMESTER 4		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FSKPP	BUM2223	Discrete Structure & Applications	3	BUM2413	Applied Statistics	3
FKASA	BUM2313	Numerical Methods	3			
FKM	BUM2313	Numerical Methods	3	BUM2413	Applied Statistics	3
FKEE	BUM2313	Numerical Methods	3	BUM2413	Applied Statistics	3
FKKSA	BUM2413	Applied Statistics	3			

FACULTY	SEMESTER 5			SEMESTER 6		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FKASA	BUM2413	Applied Statistics	3			
FT	BUM2413	Applied Statistics	3			

FACULTY	SEMESTER 7			SEMESTER 8		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FKP				BUM***3	Mathematics 3	3

**CURRICULUM STRUCTURE
COMMON COURSE (SCIENCE & MATHEMATICS)
DIPLOMA LEVEL 2013/2014**

FACULTY	SEMESTER 1			SEMESTER 2		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FSKPP	DUM1113	Basic Mathematics	3	DUM1213	Fundamental Discrete Structure	3
	DUM1113	Basic Mathematics	3	DUM1123	Calculus	3
	DUF1113	Physics	3			
FKM	DUM1113	Basic Mathematics	3	DUM1123	Calculus	3
	DUK1113	General Chemistry I	3			
	DUF1113	Physics	3			
FKEE	DUM1113	Basic Mathematics	3	DUM1123	Calculus	3
	DUF1113	Physics	3			
	DUM1113	Basic Mathematics	3	DUM1123	Calculus	3
FKKSA	DUK1113	General Chemistry I	3	DUK1123	General Chemistry II	3
	DUF1113	Physics	3			

FACULTY	SEMESTER 3			SEMESTER 4		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FSKPP	DUM1123	Calculus	3	DUM2413	Statistics & Probability	3
FKASA	DUM2133	Technical Mathematics	3			
FKM	DUM2413	Statistics & Probability	3			
FKEE	DUM2133	Technical Mathematics	3			

312

FACULTY	SEMESTER 5			SEMESTER 6		
	CODE	COURSE	CREDIT HOUR	CODE	COURSE	CREDIT HOUR
FKKSA	DUM2413	Statistics & Probability	3			

**BUM2133
ORDINARY DIFFERENTIAL EQUATIONS**

Credit : 3 credit

Pre-requisite : None

Synopsis

This course introduces to the Ordinary differential equations, Laplace transform and Fourier series and their applications in solving engineering problems.

Course Outcomes

- CO1 Use the basic principles and methodologies of differential equations ,Laplace transform and Fourier series to solve various problems in differential equations,Lapalace transform and Fourier Series.
- CO2 Use appropriate tool to solve the computational problems in ordinary differential equation.
- CO3 Apply concepts and methods learned to solve any related problem of differntial equations ,Laplace Transform and Fourier Series in various fields.

**BUM1213
FUNDAMENTAL DISCRETE STRUCTURE**

Credit : 3 credit

Pre-requisite : None

Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for futher work. Students are exposed to logic, set theory, elementary number of theory, functions, relations, fundamentals of counting, Boolean algebra and simple proof technique. This course integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcomes

- CO1 Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure. Use appropriate tool to solve discrete structure problems. Apply concepts and methods learned to

solve any related problem of discrete structure in various fields.

Relate and apply the concepts and methods studied into other courses.

**BUM2223
DISCRETE STRUCTURE & APPLICATIONS**

Credit : 3 credit

Pre-requisite : BUM1213

Synopsis

This subject discusses an in depth of the discrete structures as they apply to computer science, focusing on providing a basic theoretical foundation for further work. Topics include review on algorithm, integers and matrices, advanced counting technique, graphs, trees, and modeling computation. This course integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcomes

- CO1 Use the basic principles and methodologies of advanced discrete structure to solve various problems in discrete structure.
- CO2 Write programs to describe and solve discrete structure problems using any programming language.
- CO3 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.
- CO4 Relate and apply the concepts and methods studied into other courses.

**BUM2123
APPLIED CALCULUS**

Credit : 3 credits

Pre-requisite : None

Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

Course Outcomes

- CO1 Analyze and apply appropriate calculus concepts to solve various science and engineering problems.

Synopsis

- CO2 Use appropriate software and tool to solve the graphical and computational problems in calculus.
- CO3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.
- CO4 Relate and applied the concepts and methods studied into other courses.

BUM2313**NUMERICAL METHODS****Credit : 3 credit****Pre-requisite : None****Synopsis**

This course introduces basic concepts of round-off and truncation errors, roots of equations, linear algebraic equations and matrices, curve fitting, numerical differentiation and integration, ordinary differential equations and partial differential equations. Appropriate software is used by students to implement some of these ideas in practice.

Course Outcomes

- CO1 Use numerical methods to solve mathematical problems which is difficult to be solved analytically.
- CO2 Select appropriate tool to solve different type of numerical problem arise from engineering fields.
- CO3 Relate and apply numerical methods studied into other courses.

BUM2413**APPLIED STATISTICS****Credit : 3 credits****Pre-requisite : None****Synopsis**

Students are exposed to statistics including statistical problem-solving methodology and descriptive statistic, probability distributions commonly used in practice, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit test and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by

students to implement some of these ideas in practice

Course Outcomes

- CO1 Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.
- CO2 Perform statistical data analysis by using appropriate software and scientific calculator.
- CO3 Apply statistical concepts and methods learned to solve any related problems in various disciplines

BUM1123**MATHEMATICS FOR MANAGEMENT****Credit : 3 credit****Pre-requisite : None****Synopsis**

This subject introduce the use of mathematical technique in the field of business administration and management. The topics introduce to the inequality, matrices, functions and the key business topics susch as simple interest, compound interest, notes and bank discount, mathematics of buying, markup and markdown.

Course Outcomes

- CO1 Use the basic principle and methodologies of mathematics to solve the mathematical analysis problems.
- CO2 Use scientific calculator to solve the exponential and logarithmic functions
- CO3 Apply the mathematical concepts and the usage of the mathematical technique in business administration and management

MATHEMATICS COURSES (DIPLOMA PROGRAMME)

DUM1213 FUNDAMENTAL DISCRETE STRUCTURE

Credit : 3 credit

Pre-requisite : None

Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic, set theory, elementary number of theory, functions, relations, fundamentals of counting, Boolean algebra and simple proof technique. This course integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcomes

- CO1 Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure.
- CO2 Use appropriate tool to solve discrete structure problems.
- CO3 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.
- CO4 Relate and apply the concepts and methods studied into other courses.

DUM2413 STATISTICS & PROBABILITY

Credit : 3 credit

Pre-requisite : None

Synopsis

In this course, students are exposed to basic statistics and analyze statistically. The topics covered are introduction to statistics, descriptive statistics, probability, discrete probability distributions, continuous probability distributions, and correlation and simple linear regression.

Course Outcomes

- CO1 Analyze and interpret data using statistical theory and methodology
- CO2 Perform statistical data analysis by

using appropriate software and scientific calculator.

- CO3 Apply statistical concepts and methods learned to solve any related problems in various disciplines

DUM1113 BASIC MATHEMATICS

Credit : 3 credit

Pre-requisite : None

Synopsis

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic

Course Outcomes

- CO1 Define and use the concepts and properties of basic mathematics.
- CO2 Solve any related problem of basic mathematics using scientific calculator.
- CO3 Relate and apply the concepts and methods studied into other courses

DUM1123 CALCULUS

Credit : 3 credit

Pre-requisite : None

Synopsis

This subject discusses single-variable calculus as they apply to engineering and focusing on providing a basic theoretical foundation for further work. Students are exposed to limits and continuity, derivatives, application of the derivatives, integrals, and application of the integrals. This course integrates symbolic tools, graphical concepts and numerical calculations.

Course Outcomes

- CO1 Apply and solve for elementary function and any related problem using the basic techniques and methodologies of calculus.

CO2 Use scientific calculator to solve the elementary functions in calculus

CO3 Relate and apply the concepts and methods studied into other courses

DUM2123

APPLIED CALCULUS

Credit : 3 credit

Pre-requisite : DUM1123

Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

Course Outcomes

CO1 Apply appropriate calculus concepts to solve various science and engineering problems.

CO2 Use appropriate software and tool to solve the graphical and computational problems in calculus.

CO3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.

CO4 Relate and applied the concepts and methods studied into other courses

SYNOPSIS SERVICES COURSE

CHEMISTRY COURSES

(DIPLOMA PROGRAMME)

DUK1113

GENERAL CHEMISTRY I

Credit : 3 credit

Pre-requisite : None

Synopsis

This is an introductory course in organic chemistry designed to strengthen the student's basic knowledge. Topics covered include structure, bonding, nomenclature, properties, reactions, synthesis and the importance of the various classes of organic compounds as well as optical and geometrical isomerism. The analytical chemistry topics of data handling, sample preparation and the major analytical method such as spectroscopic method, atomic

spectrometric, method and chromatography method will also be covered.

Course Outcomes

CO1 Apply the basic concepts and methodologies of organic and analytical chemistry into other related courses.

CO2 Explain and discuss the basic mechanism behind organic chemical reactions.

CO3 Define the analysis method and manipulate equations/methods to solve the analytical problems.

CO4 Construct and manage decision based on good understanding of organic and analytical chemistry knowledge.

CO5 Communicate effectively in written and oral form through group discussion (assignment), tutorial and presentation session

DUK1123

GENERAL CHEMISTRY II

Credit : 3 credit

Pre-requisite : DUK1113

Synopsis

This is an introductory course in general chemistry designed to strengthen the student's basic knowledge in organic, physical and analytical chemistry. Topics in this course include nomenclature, structure, bonding, properties, synthesis and reaction mechanisms of various classes of organic compounds. It also includes

optical and geometrical isomerism. Some topics in physical chemistry like laws of thermodynamics, entropy, Gibb's free energy and chemical equilibrium are covered. Apart from this the students

are exposed to electrochemistry and acids and bases. Students will also learn some topics in analytical chemistry which includes data handling, sample preparation and major analytical methods such as spectroscopy and chromatography.

Course Outcomes

CO1 Apply the basic concepts of organic, physical and analytical chemistry to other related courses.

- CO2 Explain and discuss the basic mechanism involved in organic chemical reactions.
- CO3 Define the analysis method and manipulate equations/methods to solve the analytical problems.
- CO4 Construct decision based on good understanding of organic and analytical chemistry.
- CO5 Communicate effectively in written and oral form through group discussion (assignment), tutorial and presentation session.
- CO6 Work in group to complete the assigned tasks in a given time.

**SERVICES COURSE
PHYSICS COURSES
(BACHELOR PROGRAMME)**

**BUF1113
BASIC PHYSICS
Credit : 3 credit
Pre-requisite : None**

Synopsis

This course is intended to expose the central ideas and principles of physics to students requiring a general background in physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electricity and magnetism.

Course Outcomes

- CO1 Apply basic Physics concepts and theories learned to solve problems covered in the syllabus in terms of physical principles and concepts.
- CO2 Explain solution of any related problems using the right principles and laws.
- CO3 Study and report the solutions of a given physical problem covered in the syllabus by a group activity

**SYNOPSIS SERVICES COURSE
PHYSICS COURSES
(DIPLOMA PROGRAMME)**

**DUF1113
PHYSICS
Credit : 3 credit
Pre-requisite : None**

Synopsis

This course is intended to expose the central ideas and principles of physics to students requiring a general background in physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electricity and magnetism.

Course Outcomes

- CO1 Apply the physical principles and concepts to solve related problems within the syllabus.
- CO2 Reproduce the laboratory reports following the manual.
- CO3 Study and report the solutions of a given physical problem covered in the syllabus by a group activity

CAREER OPPORTUNITIES

Graduands of the Faculty of Industrial Sciences & Technology will have career opportunities as:

- a) Application Scientist
- b) Academicians (Lecturer, Teacher)
- c) Forensic Scientist
- d) Science Officer
- e) Technopreneur
- f) Science and Research Engineer
- g) Sales Executive
- h) Project Consultant
- i) QA/QC Executive
- j) Research Officer
- k) Patent Office
- l) Biochemist
- m) Process Engineer
- n) Technologist
- o) Biotechnologist
- p) Laboratory Technologist

ADDRESS :

Dean
Faculty of Industrial Sciences & Technology
Universiti Malaysia Pahang
Lebuhraya Tun Razak
26300 Gambang
Kuantan, Pahang Darul Makmur
Tel : 09-549 2765
Fax : 09-549 2765
E-mail : fist@ump.edu.my